Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/emjengineeringmi86newy

THE ENGINEERING AND MINING JOURNAL

VOLUME [illegible]XXVI, JULY TO DECEMBER, 1908

Illustrated Articles are De[illegible] by an Asterisk (*). Names of Books are Indicated by a Dagger (†).

A

PAGE
A. K. R. Gold M. & M. Co. 545
A. Y. & Minnie, Colo. 1123, 1275
Abbott, A. A., Death of. 869
Abel on dust explosions. 10, 11, 12
Abundancia mine, Mex. *76, 72
Acadia Coal Co.'s mines. *624
Accident-Indemnity bill, Ind. 1232
Accident—Treating victim. 32
Accidents, Belgian collieries. 90, 1209
Accidents, B. C. coal mines. 89, 1207
Accidents, British mines. 139, 426, 627, 676, 1108, 1210
Accidents, Colliery, John Mitchell on. 1167
Accidents, Colliery—Laws, labor, etc. 18
Accidents, Fatal, in coal mines of America and other countries—Tabulated statistics. 1207, 1216
Accidents, Houghton Co., Mich. 827
Accidents in different countries. 627
Accidents, Mine, due to electricity. 726
Accidents, New Mexico. 90, 1207
Accidents, Pennsylvania. 428, 1207
Accidents, Mine, Prevention of. 1088
Accidents—Treating victim—Note. 818
Accidents—U. S. C. & O. Co.'s rules. 236
Accidents—Views of inspectors. 1171
Acetylene lamps in mines. 967
Adair-Usher process, Improved. 463
Adams, Geo. I. 44
Adams, J. H. 349
Adams, W. J. 342
—"Hints on Amalgamation, etc." †632
Adamson, T. A. 152
Addis, John, Death of. 779
Adkinson, H. M., Advancing Hot Time lateral, Newhouse tunnel. *757, 773, 918, 971, 1066
—Ore contracts (discussion.) *73, 189, 317
Aduddell mine, Colo. 248
Adventure mine, Mich. 249, 557, 639
Africa. See also "West," "South," "Transvaal," "Rand," "Natal," "Rhodesia," "German," etc.
African coal statistics. 90
Agassiz, A. L. 92, 43
Agitation, Air, Notes on. *901, 1116
Agitation, Pinguico mill. 947, *1001
Agitators at Pachuca. *325, *650, *653, 668, *991
Agitators, Pachuca, Goldfield Consol.'s. †471
"Agricultural Analysis." †1219
Aguacate mines, Costa Rica. 445
Aguascalientes. 271
Ahmeek mine, Mich. 105, 198, 442, 830, 1124
Air. See also "Ventilating," "Agitation."
"Air, Compressed, for Mines." †732
Air, Compressed, Mine signaling by. *857
Air, Compressed—Notes, etc. 480, 859
Air, Compressed, Use of, for hoisting. 532
Air compression, Hydraulic, Clausthal. *228, 733
Air compressor, Hydraulic, McFarlane. *716
Air vs. electricity—Mining flat seams. *286
Air-pipe, Need of care in laying. 1152
Akermann, R. Iron and steel, Sweden. 776
Alabama Coal Operators' Asso. 1023
Alabama coal-miners' strike. 335, 148, 253, 344, 481
Alabama Consol. Coal & Iron Co. 977, *1046, *1083
Alabama Fuel and Coal Co. 47
Alabama gold, coal, iron, Papers on. 725
Alabama Marble Co. 345
Alabama, N. E., Iron operations in. *1083, *1043
Alaska, Copper River, dist. 680
Alaska Mexican G. M. Co. 512
—Report. *282
Alaska Mines Securities Co. 196
Alaska, Mineral Resources of. †241
Alaska Perseverance Mg. Co. 922
Alaska Petroleum & Coal Co. 155
Alaska, Seward Peninsula Gold Placers. †241
Alaska Treadwell G. M. Co. 512, 681, 711, 713, 755
Alaska United G. M. Co. 512
Alaska's great coal reserve. 1059
Albemarle mine, N. M. 174
Alcohol flame tester. 480
Aldrich, T. H., Jr. Gold ore treatment, Hog Mtn., Ala. 725
Alice mine, Idaho. 299, 1027
Alkalinity—Cyaniding, Homestake. 292, 294
Alladin mine, Mo. 784
Allen, Anson W. 588
Allen, Carl A. 145
Allen, Capt. Wm. 44
Allen, J. V. 588

PAGE
Allen, Robert. *122
Allis-Chalmers machinery. *467
Allouez, Mich. 557
Alloys of gold and tellurium. 567
Almeda Consol. Mines Co. 740
Alta-Sonora Mg. Co. 1082
Altar, Northwestern mines, Mex. *71
Altoft colliery, Eng. 817
Alton mine, Colo. 248
Alum and aluminum salts—Use; market; U. S. statistics. 293
Alum, Dominican Republic. 115
Alumina in copper blast-furnace slags. 270, 483, 730, 1111, 1264
Alumina separation in iron ores. 168
Aluminum industry, Situation in. 1016
Aluminum-magnesium alloy. 526
Aluminum price reduced. 865
Aluminum sulphate, Market for. 733
Alunite, Camp, New Nev. gold dist. *1203, 1216
Alunite in Nevada. *1099, *1157
Alunite Mg. Co. 687
Alvarado Consol. Mex. 485, 881
Alvarado, Pedro. 278, 280
Alvarado Mg. Co., Ariz. 1177
Ama Queen, S. D. 251, 880
Amador Mg. Co., Mont. 49
Amador property, Idaho. 197
Amador companies' consolidation. 488
Amalgam, Gold, absorption by copper plates. 996
Amalgam stealing from dredges. 826
Amalgamated Cop. Co. 43, 590, 827, 1176
Amalgamated mine, Cobalt, Ont. 741
Amalgamated M. & M. Co. 395
"Amalgamation, Hints on," etc. †632
Amazon-Dixie mine, Idaho. 592, 878
Amber, Burma and India. 672, 972
American Chemical Society. 140, 342, 720
American Coal Products Co. 1231
American direct concentrator, Macquisten. *23
American Electrochemical Soc. 193, 825
American Flag. Mg. Co., Utah. 101, 152
American Foundrymen's Asso. 295
American Inst. Chem. Engineers. 133, 825, 1119
American Inst Mg. Engineers. 429, 1263
—Chattanooga meeting plans. 614, 678
—Chattanooga meeting. 725, 770
—Pres. Hammond's address. 717
—Gayley dry-air blast. *810, 820, 1200
American Iron & Steel Asso. 292, 387
American mine, Colo. 638
American Mining Congress. 543, 590, 634, 683, 779, 875, 1223
—Forest Reserve Committee. 1050
—Mine accident laws, summary of. 1088
—Pittsburg meeting. 1171, 1023
American Refractories Co. 1087
American Sm. & Ref. Co. (See also "Garfield," etc.) 35, 201, 303, 350, 336, 497, *610, 781, 970, 1070
—Cost of silver-lead smelting. 315, 585
—Report. 526, 535
—Smelter charges, Colo. 827
—The policy in Colo., etc. 960, 969
—Statements by D. Guggenheim. 43, 1266
—Lead tariff. 1262, 1268
—Smelting competition. 1263
American Lead, Zinc & Smg. Co. 158, 327, 879, 1073
—Power shovel underground. *1056
Amparo mine, Mex. 549, 881
Amphlett, A. W. 541
Anaconda Cop. Mg. Co. 43, 45, 639, 687, 1125, 1227
—The smelters. 130
—Machine sampling. 338, 431, 631, 776, 917, *951, 1018, 1111
—Protective hood. *708
—Operation of a converter. *747
Anaconda smoke question. 1224, 1261, 1273
Analyses in coal washing. *424
Anchor mine, Idaho. 491
Anderson Apache Co. 47, 829
Anderson, Robert. 1110
Angelo mine, Ore. 199
Angle & Cason mines. 539
Angle work—Mining flat seam. *285
Anglo-Greek Co., Ltd. 201, 962
Anklostomiasis. 1005
Anthracite. See "Coal."
Anti-coal breaker. 724
Anti-debris. See "Debris," "Dredging."
Anti-smelter fight, Calif. See "Smelter."
Antimonial-lead production, U. S. 620
Antimony ore, Victorian companies. 1019
Antisell, F. L. Copper for the foundry. *225

PAGE
Apex, Law of. 281
Appalachian Engineering Asso. 1023
Apprenticeship for coal miners. 337
Araluen dist., N. S. W. 913
Arcadia group, Calif. 637
Arcadian Cop. Co., Mich. 1224
Archbold, J. D., Testimony of. 1116
"Architect's and Builder's Pocket Book." †96
Argall, Philip. Machine sampling. 291 (For rest of discussion see "Sampling.")
—Ore deposits, Magdalena. *366
Argonaut mine, Calif. 591, 737
Arizona Commercial. 149, 158, 423
Arizona Consol. 423
Arizona Cop. Co., Ltd. 37, 298, 391, 423
Arizona, Copper, Cost of production. *37
Arizona-Michigan Cop. Co. 1177
Arizona mines, production 1907—Copper, gold, silver. 422
Arizona Mg. & Trading Co. *659
"Arkansas, Clays of." †1219
Arkansas, University of. 99
Arley colliery, England. 1166
Arsenic ore, Value of. 95
Arsenic, U. S. statistics. 753, 842
Arundel, S. D. 251
Asbestos, Humboldt Co., Calif. 977
Asbestos in Quebec. 461
Asbestos, United States production. 97
Asbestos, Urals, production. 140
Ash Peak Mg. Co. 298, 423
Ashanti Goldfield's Corp. 344
Ashes, Coke, Variable color. 533
Ashes for pillars in coal mines. 581
Ashworth, J. Recent mine disasters. 332, 1107, 1110
—Underground fire, Hamstead. *1060
Aspen, Colo., Ores of. 239
Asphalt, California production. 731
Asphalt, Trinidad exports. 752, 755, 756, 857
Assay for cyanide solution, New. 294
Assay, Lead—Chromate-oxalate. 77, 324
Assay—Lead determination in spelter and ore. 178
Assay of cyanide solution. 759
Assay—Silver cupellation. 326
Assaying, Effect of borax in. 656
Assessment work, Law of. 81
Assessments, Coal-land, Penn. 40, 50, 148, 152, 1229
Associated Oil Co. 683, 707
Associated Pipe Line Co. 707
Asso. of American Cement Mfrs. †1115
Asso. of Iron and Steel Elec. Eng. 869
Atlanta gold dist., Idaho. *176
Atlanta—Monarch mine, Idaho. 177
Atlantic mine, Mich. 198, 593, 557, 638, 783, 878, 1227
Atlas Cement Co. 1027
Atmosphere, Mine, A safe. 919
Atolia Mg. Co. *573
Attala mines, Ala. *1083
Attinger, F. A. 1120
Aubury, Lewis E. 189
—Calif. mineral production. 731
Auerbach, H. S. North side Coeur d'Alene. *65
—Tungsten, Coeur d'Alene. *1146
Auerbach & Co. 119
Auger, Coal, to find temperature. 862
Austin, L. S. Alumina in slags. 270 (For discussion see "Slags.")
—Machine sampling. 238 (For discussion see "Sampling.")
Austin Manhattan Consol., Nev. 106
Austin Run Mg. Co. 493
Australasia, Colliery fatalities. 1209, 1210, 1211
Australasia, Gold mining, 1908. 481, 604, 1160, 1214
Australasia, Tin. 144, 412, 582, 913
Australasia mining in 1908. 143
Australia, Gems in. 115
Australia, Mining engineers' prospects in. 42
Australia—N. S. W.—Zinc concentrates. 620
Australia, South, production. 1021
"Australia, South, Record of Mines." †96
Australia, Tin. 582
Australia, West, blasting experiments. 823
Australia, West, Sampling in. 340
Australia, Western, gold stealing. 94
Australian collieries, Electricity in. 966
Austria, Coal and iron. 1260
Austria, Colliery fatalities. 1208
Austria, Mineral production. 1214
Austria-Hungary, Magnesite; chromite 808
Automobile, Prospector and. 336

108292
4/13/11

TA
E42
v.86

PAGE
Avenue Top Mg. Co. 805
Ayrton, Wm. E., Death of. 1023
Aztec group, Colo. 1275
Azules district, Mex. *78
Azure turquoise mine, N. M. *843

B

Baby Florence, Goldfield. 245, 250, 300, 488, 639, 687
Back-stoping vs. underhand, mining large bodies of iron pyrites. 365
Badham, H. L. 253
Badische nitric-acid furnace. 892
Bag-house, etc., Selby, Calif. *451, *604
Bag-shaking device for smelters. 1009
Bagdad-Chase Pettit mine, Idaho. 176
Bagdad-Chase mine, Soulsbyville, Calif. 299
Bagley, Colo. 638
Bailey, E. G. Combustion of coal. 184
Bain, H. F. Illinois coals. 726
Baker-Burwell process. 198
Balaklala Cop. Co. 164, 487, 591, 913, 975, 977
Baldwin-Westinghouse locomotives. *26, *466
Baltic, Mich. See "Copper Range Consol."
Baltimore Cop. Mg. Co. 639
Baltimore & Ohio R. R. 482
—Coal-car case. 623, 678
Bancroft, Geo. J. 869
Bandemann, C. J. 342
Banner mine, Calif. 637, 829
Bantjes Consol., Transvaal. 992
Barbour, P. E. Cochiti mining dist. *173
—Goldfield Consol. mill. *467, 680
Bardill, J. O. Furnace bomb. *763
Barge, Self-discharging. *1153
Barium carbonate, Sellers of. 95
Barnes and associates, Okl. 740
Barnes-King, Mont. 250, 492, 784, 1180
Barnes on high temperature measurement. 662
Barometric pressure and explosions. 11, 14, 461, 482
Barron mine, Mex. *520, 523, 524
Bartlett tunnel, Colo. 783
Bartlett, W. P. 242
Barton, W. H. Assay for cyanide solution. 294
Barytes, Crude, Market for. 293
Barytes, Crude, U. S. production 755
Barytes, North Carolina. 321
Base metals in Transvaal. 579
Baskerville, C. Rare metals. 907, 916, 960, 1055, 1100, 1241
Baskets, Excavating with, Mex. *1245
Batan coal mines, Philippine Is. 153, 594, 1058
Bauxite and laterization. 128
Bauxite deposits, French. 5
Bauxite tract purchased, Ga. 638
Bauxite, U. S. production. 868
Baxter, Harold. 44
Bay Counties Anti-Smelter Asso. 536
Beacham Coal Co. 393
Bear Creek Coal & Mg. Co. 1072
Bear Top mine, Idaho. 70, 878
Beard, J. T. Mine accidents. 1171
Bearings, Roller—Two recesses. 724
Beatty, A. Chester. 295
Beckman, Geo., Death of 388
Beddow, Thos., Death of. 193
Beemer, H. J. 247
Belcher mine, Colo. 1123
Belen Mg. Co. 662
Belgium, Coal-mine death rate. 90, 1207
Belgium, Iron and steel. 39
Bell, Joseph, Death of. 588
Bell, Robert N. 1090
—Atlanta gold dist., Idaho. *176
—Electric fuse spitting device. *528
—Anaconda protective hood. *708
Bellamy, H. R. 145
Bellevue, Ltd., mine, Treating concentrates. 716
Bellinger, Herman C. 1222
Belmont. See "Tonopah."
Belting notes. 334, 382
Belvidere group, Colo. 346
Bement, A. 145
Benedict's bag-shaking device. 1009
Benguet Consol. Mg. Co. 785, 1230
Bennett, J. C. Handling bullion, Selby works. *83
—Bag-house at Selby. *451
—Disposal of gases, Selby, Calif. *604
Bennetts, B. H. 1119
Benson, John W. 734
Benson Mines Co. 1029
Bent, Thatcher T., Death of. 1174
Benton M. & M Co. 547
Benton, W. Lake Creek dist. 36
Berdella tunnel, Colo. 926
Berlin mines, Nev. 739
Bernardhütte, Silesia. *265
Bernstein, P. Hydraulic air compression. *228, 733
Berry's safety crosshead. *41
Bertha Mineral Co. *908
Beryllium. 907, 916
Bethune, Compagnie de. 534
Beuret, G. Hoisting-rope connection *185
Big Bend Consol. Placer Mg. Co. 1272

PAGE
Big Blue Lead Mg. Co. 591, 637
See also "Blue Lead."
Big Chief mine, Calif. 296
Big Fissure Co., Ont. 518
Big Four mine, Calif. 48
Big Injun mine, Nev. 151
Big Murray tunnel, Idaho 830
Big Six, Colo. 638, 686, 782, 830, 978, 112
Big Stick Mg. Co. 49
Bigelow, A. S. 43, 92, 736, 773, 102
Bingham Central Standard. 445, 64
Bingham Metal Mines. 929
Bingham, Ore occurrence, Fortuna mine. *1191
Birchville Mg. Co. 544
Bird, Testing gas with. 1108
Birmingham dist., etc., Iron operations *1043, *1083
Bisbee dist., Ariz. *37
Bishop, Calif., Discoveries near. 487
Bishop, Roy N. 99, 193
Bishop, Wm. 869
Bismuth at Sylvanite, N. M. 962, *1103
Bismuth, Electrolytic determination. 115
Bismuth, U. S. statistics 824, 842
Bissell, R. W. 486
Bituminous Mine Foremen's and Fire-bosses' Asso. 99
Black Butte, Nev. 1180
Black creek mines, Ind. 197
Black Eagle mine, S. D. 833
Black Hole mine, Nev. 1074
Black Horse Mg. Co. 442, 488
Black sand, Cracker Jack mine. 1003
Black sand, Humboldt Co, Calif. 1223
Black Sand Mining Co. 826
Blackbird Co., Nev. 199
Blacktail Mg. Co. 299
Blackwell, G. G., Death of. 541
Blair, A. A. "Chem. Analysis of Iron." †1115
Blaisdell Coscotitlan Syndicate. 559, *561, *562
Blaisdell stacker, Jesus Maria mill. *617
Blake, Edwin T. 1154
Bland, N. M. *173
Blast. See "Furnace," "Gayley," "Gas."
Blast hole, Loading; inserting fuse. *433
Blasting and explosions—Foreign experts' report. 860, 864, 590, 736
Blasting coal, Randolph co., Mo. *6
Blasting coal—"Star" elec. safety fuse. *1014
Blasting furnace accretions. *763
Blasting gelatin, Du Pont—Cripple Creek adit. 1206
Blasting in Hot Time lateral. *757, 773
(Loading blast holes.) 918, 971, 1066, 1111
Blasting—Longwall in Eng. *965
Blasting—Mercury detection; fuse compression. 823
Blasting—New English method. 769
Blasting notes., etc. 32, 186, 332, 334, 479, 480, 676, 769, 818, 909, 914, 1015, 1062, 1211, 1222
Blasting—Powder packages; methods —Ohio law. 50, 762, 823
Blasting powder, Treatises on. 919
Blasting rules, Acadia Coal Co.'s. *625
Blasting rules, U. S. C. & O. Co.'s. 236
Blasting—Selective electric fuse spitting device. *528
Blasting—Tamping bars. 42
Blasting—Various State laws. 1088
Blasting without powder—Notes. 186
Blatchley, W. D. Coal, Indiana. 723
Blende, Magdalena, N. M. *368, *370
Blende, Value in Wales. 709
Blindness of mine mules. 25
Blossburg colliery explosion. 737
Blue Bell mine, Idaho. 545
Blue Bird mine, Mont. 593
Blue, F. K. Handling crushed rock, San Francisco bay. *1153
Blue John Mg. Co. 977
Blue Lead Mg. Co. 103, 977
See also "Big Blue Lead."
Blue Light Cop. Co. 492
Blue Point hydraulic mine, Calif. 100
Board of Trade mine, Wis. 880
Boardman, D. F. Power, Joplin dist. 327
Boecker, A. B., Death of. 1222
Boiler fuel, Natural-gas, Joplin dist. *568
Boiler grates—Coal combustion. 184
Boiler notes. 32, 90, 186, 334, 428, 480, 534, 724, 818, 1014, 1062
Boiler-plant test—Gas analysis. 858
Bolaños mines, Jalisco, Mex. 549
Bolling, Randolph. 99
—Chemical control of coal washers. *424
Bomb for furnace accretions. *763
Bombay Gold Mg. Co. 45
Bonanza Creek Mg. Co. 543
Bonsall locations, Ont. 929
Borax, California production. 731
Borax, effect of, in assaying. 656
Borax Properties, Ltd. 146
Bordeaux, A. F. J. Mex. mines. 770, 808
Boring. See also "Drill."
Boring, Underground, to prove lower coal seam. 581
Borneo, Gold in. 339
Boscaswell United Tin & Cop. Mines, Ltd. 102, 148
Bosnia coal production. 984
Bosqui, Francis L. *467

PAGE
Boston-Aurora. 784
Boston Consol. mines, Calif. 147, 422, 544
Boston Consol., Utah. 195, 389, 542, 735, 880, 1191, 976, 1273, 1277
Boston & Corbin Mont. 687, 784, 879, 1028, 1227
Boston Electrolytic Ref. Co. 1069
Boston & International Oil Co. 494
Boston & Mont. 43, 147, 250, 492, 536, 542, 736
Boston-Richardson mine, N. S. 394, 549
Boston & Sunshine, Utah. 394
Bote mine, Mex. *116, *401, *405, 1031
Botsford, C. W ., on Guanajuato. *671
Boulder No. 1 Co.—St. George mill. 1145
Bounties, Canadian iron and steel. 489
Boutwell, J. M. 682
Bowers, L. M. 788, 835
Bowhill Coal Co. *1211
Boys' wages, anthracite field. 769
Brackets, Framing, Broken Hill. *796
Bradford quicksilver mine, Calif. 440
Bradley, J. W. 145
Brakpan Mines, Ltd. 290, 294, 417, 540, 992
Branch Mint, S. D. 688, 740, 1277
Branner, J. C. Manganese, Morro de Mina. *1196
—"Clays of Arkansas." †1219
Brass notes—Castings, etc. 220, 228, 280, 282, 292, 340, 719, 756, 764, 1022, 1103
Bray, Charles W. 1271
Brazil Factory Promoting Club. 827
Brazil, Mineral exports. 303
Brazil, Morro de Mina, Manganese. *1196
Breathing—Anaconda protective hood. *708
Breathing apparatus, New. 8
Breathing apparatus—Notes. 186, 227, 288
Breathing apparatus, Oxygen, Fighting fire with. 858
Breathing helmets in coal dust. 89, 98
Breitung, E. N. & Co. 1271
Bretherton, S. E. 825
—Alumina in copper blast-furnace slags. 270, 483, 730, 1111, 1264
Brewer, Luther C. 779
Breynœrt, F. Coal-mine dust. *89
Brick, Basic refractory, in metallurgy. 802
Brick, Magnesite. 1087
Bridge, Suspension, Peñoles Co.'s 310, *312
Brigham, H. A. Examining and fitting up a hydraulic mine. 1257
Briquets, Coal, Binders for. †96
Briquets, Mud, Russia and Holland. 90
Briquets on French railway. 818
Briquetting notes. 382, 914
Briseis mines, Tas. 144
Britain mine, Calif. 248
British. See also "United Kingdom," "Institution."
British Association. 636
British Butte, Mont. 49, 300, 492, 639, 875, 979, 1227
British Col. coal output; labor; accidents. 89, 142, 1207
British Col. Cop. Co. 107, *952
British Col. Iron ore. 419
British Columbia mining report. 142
British Canadian Smelter Co. 445
British East Africa, Copper in. 417
"British Empire, Mines and Minerals." †96
British Guiana. See "Guiana."
British mine, Broken Hill. *793, *795, *799, 893
British Ore Concentration Syndicate, etc. 321, 636, 778, 973, 1121
British South Africa Co. 727
Brittain, D. Pumping problems, Joplin dist. *214
—Use of nat. gas, Joplin dist. *568
Brock, R. W. 869
Broddy, J. W. 1124
Broken Hill Block 10. *710, 893
Broken Hill Junction North. *793, *799, 893
Broken Hill mines in 1908. 143
Broken Hill, Notes on. 753
Broken Hill, Ore concentration. 636
Broken Hill Prop. Co. 143, 144, 175, 640, 778, *793, 893, 913, 954, 970, 972, 1100, 1155, 1199
—Report; zinc smelting. 912
Broken Hill, Silver-lead-zinc mines. *793
—Metallurgy. 893
—Elmore process—Correction. 1169
Broken Hill South Silver Mg. Co. 712, *793, 893
Broken Hills mine, Nev. 981, 1028, 1228
Bromine, U. S. production. 801
Bromly, A. H. 99
Bronze, Roman, Analysis of. 386
Brooks, A. H. Mineral Resources of Alaska. †241
—Alaska coal. 1059
Brooks, W. W., and Temagami-Cobalt Mines, Ltd. 587, 628, 631, 773
Brough, B. H., Death and successor of. 825, 1222
Brown agitators. *325, *471, 647, *653, 668, *901, *991, 1116
Brown, Austin H. 99, 193
Brown, A. S. Electricity, Australian collieries. 966
Brown Bear mine, Calif. 487, 638, 735
Brown, Bennett. 734, 1222

PAGE
Brown, Harvey S. 779
Brown, H. V. L. South Australia Mines. †96
"Brown" straight furnace, Bernardhütte. *265
Browne, R. E. Rand costs. 565
Browney colliery, Durham. 89
Brunton on sampling. 952, 1018, 1111
(For rest of discussion see "Sampling.")
Bruseh Hydraulic Tin-Mining Co. 371
Brush, Edw., on lead tariff. 1262, 1268
Bryan, Jos., Death of. 1068
Bua Mg. Co. 1230
Buburon, Hacienda, Mex. silver mill. *663
Buck, C. Austin. 921
Buckeye Mg. Co., Calif. 440
Bulkley, Edward. 734
Bucyrus Co. 1021
Bucyrus Poutiloff dredges. *701
Buehler, H. A. "Mo. Lime and Cement." †920
Buell mine, Colo. 636
Buffalo mines, Ont. 518, 636, 689, *856, 1076, 1278
—Statement to stockholders. 1057
Bulls and Bears property, Nev. 975
Bullfrog Gold Bar mine. 487, 1126
Bullion Beck & Champion. 880, 923, 976
Bullion, Blast-furnace, Handling at Selby smelting works. *83
Bullion, Gold-silver, Refining. 733
Bullwhacker, Ariz. 247
Bully Hill M. & S. Co. 544
Bundi Tin Mining Syndicate. 371
Bunker Hill & Sullivan. 140, 299, 389, 592, 783, 874, 878, 927, 1024, 1027, 1116, 1199
Burch, H. Kenyon. 734
Burchard, E. F. Iron ores, Ala. 725
Burchell coal areas, N. S. 344
Bureau, Mining, Proposed. 915, 1261, 1278
Burke, John M., Death of. 734
Burkhart, Otto C. 44
Burleigh on the ferrites. 421
Burma and India amber. 672, 972
Burma Oil Co. 95
Burma ruby mines. 1022, 614, 972
Burners, Gas, for boiler firing. *568
Burner, Lab., for volatile fuel. *867
Burns, F. 1119
Burr, Samuel D., Death of. 921
Burra Burra mine, Tenn. *1237
Burrard, S. G. "Himalaya Mtns." †920
Burro mtns., Turquoise mining. *843
Burrows, A. G., on Ont. geology. 712
Burt, Edwin. Filters at El Oro. *458
Bushnell, A. F. Electrical equipment, Butte-Balaklava mine. *714
Buskett, E. W. Sampling and buying ore, Joplin dist. *190
—Determination of sulphuric anhydride in sulphuric acid. 407
Bustos mill. See "Guanajuato Reduc."
Butler, G. M. "Pocket Handbook of Minerals." †777
Butler, M. Safety of coal mines. 337
Butte-Balaklava Cop. Co. 389, 1180
—Electrical equipment. *714
Butte Boys mine, Nev. 199
Butte & Boston. 43
Butte-Cable Mg. Co. 392
Butte-Carlisle Cop. Mg. Co. 739
Butte Central & Boston. 106, 542, 736, 1024, 1176
Butte-Coalition, Mont. 1073
Butte & Coeur d'Alene. 1027, 1072, 1275
Butte companies' production, Report. 43
Butte copper-producing costs. 167
Butte & London. 226, 347
Butte & Milwaukee. 392, 739
Butte, Mont., Ore shoots at. 226
Butte-Montana mine. 492, 739, 1028, 1125
Butte-Radersburg Mg. Co. 827
Butte, St. Paul extended to. 290
Butte & Superior. 442, 784, 976, 1276
Butters filters, Goldfield Consol.'s. *472
Butters, Henry A., Death of. 974

C

C. O. D.—Waverly, Nev. 347
Cable Consol. Mg. Co. 347
Cable, Steel, Packing 13,000 feet of, over mountain trail. *672, 775
Cabot, G. L. Pyritic origin of iron-ore deposits. 630
Cabrera mine, Mex. *521, *524
Cabrestante mine, Mex., Ore sorting. *464, *207
Cactus Club at Newhouse mines. *1189, 1216
Cactus Range G. M. Co. 251
Caddo oil field. 1266
Cadium as a by-product. 92, 538
Cadmium recovery, Silesia. *268
Cahaba Coal Co. 490
Cairnes' analysis, gold production. 1038, 1168
Calcium chloride for coal dust. 620
Caldecott, W. A. Cyaniding, Mex. 654
Caldwell, O. A., Death of. 682
Calera Co., Mex. 640
California. See also "Debris," "Dredging," etc.
PAGE
California, Building stone, sand, clay. 269, 731
California desert, Mining in. 38
California desert, Opening the. 436
California Development Co. 913
California, Drift mining in. 457
California gold and silver output. 579, 683, 731
California gold-mining prospects. 92, 430
California, Magnesite in. 242, 387, 731
California mine complication. 1244
California, Mine taxes in. 1156
California mineral production. 731
California Mother Lode Mg. Co. 345
California mine, Calif. 345
California mines, Old, Reopening. 422
California, New mineral products. 387
California petroleum notes. 100, 850, 1195
California pipe line, A. 707
California quicksilver mines. 1161, 1178, 544, 1120
California, Revival of hydraulic mining. 1087
California, Smelters' troubles. See "Smelter."
California, Tungsten mining. *573, 460, 731
California water-power plant affairs. 8, 871, 1161
Calkins, F. C. "Coeur d'Alene." †732
Callahan, C. J. 780
Calsado, Alfonso, Death of. 1068
Calumet & Ariz. 38, 47, 391, 423, 1274
Calumet & Hecla. 43, 92, 151, 198, 346, 546, 639, 736, 738, 773, 830, 1124
—Quality of copper. 842, 1022
Camelia mine, Mex. *519
Camp Alunite, New Nev. gold dist. *1203, 1216
Camp Bird, Ltd. 433, 491, 543, 686, 1025, 1178, 1224
—Discovery of the mine. 223
—Report. 489, 511
—Cost of mining. 514
Camp, Sol. 1102
Campbell, C. M., on Granby mines. 93
Campbell, J. C. 146, 438, 635
Camptonite in Altar district. *72
Canada, Cement. 681
Canada, Colliery fatalities. 1207
Canada Hill Consol., Calif. 874
Canada, Iron and steel. 39, 387, 900, 1202
Canada, Iron and steel bounties. 489
Canada Iron Corp. 881
Canada iron industry and resources. 419
"Canada's Fertile Northland." †632
Canadian coal-land leases. 769
Canadian Geol. Survey work. 46
Canadian gold coinage, First. 1225
Canadian Lash Steel Process Co. 419
Canadian Mfrs. Asso.—technical education. 636
Canadian Mg. Inst.—Corrections. 93
—Summer excursion, etc. 145, 193, 486, 541, 921, 1174
Canadian National Exhibition. 846
Canadian Northern Ry. Co. 741
Canadian Oil Fields, Ltd. 549
Cananea Consol. Cop. Co. 603, 1127
—Alumina in slags. 270, 1265
(For discussion see "Alumina.")
—Growth of smelting works. *954
—Permanganate method for copper. 1155
Cananea-Duluth mine. 52
Cananea, Resumption at. 188, 201
Candelaria, Mex. 1031
Candles in coal mines. 1020
Cañon mill, Manhattan, Nev. *1002
Cap, Timber, Reinforced. *427
Cape Nome Mg. Co., Mont. 106, 639
Capricorn mine, Nev. 348
Car, Coal, distribution and private ownership. 623, 678
Car dump, Alabama Consol.'s. *1084
Car-dump for waste, North Star. *711
Car-dump, Remarkable. Daly Reduc. Co.'s. *754
Car, Mine, Koppel, Copper Queen's. *532
Car, Scales, Daly Reduc. Co.'s. *804
Cars, Mine, Repair cost, etc. *135, *284
Cars, Unloading, Hopper for. *1009
Cars, Youngstown industrial. *1050
Caracahui Mtn. Cop. Co. 640
Carbolineum Wood Preserving Co. 1066
Carbon and properties of cast iron. *943
Carbon Hill Coal Co. *31
Carbon Lake mine, Colo. 1121
Carbonic-acid gas, Note on—Test. 1108
Carborundum, Amorphous. 906
Carbon monoxide, Test for. 914
Cardiff mine explosion, Facts on. 93
Carey, Juan R. 243
Caribou and Poorman mines, Colo. 245
Carisa mine, Utah. 874
Carizo, Mex., discoveries. 640
Carkeek, Wm., Death of. 974
Carlisle Coal & Clay Co. 783, 830
Carlton, A. E. 1206
Carmaux coal mines, France, Operation. *574
Carmichael-Bradford process. 954
Carn Brea mine, Cornwall. 181
Carne, J. E. N. S. W. Coalfields. †1115
Carnegie Coal Co. 640
Carnegie on steel production and tariff. 1054, 1063, 1261, 1263, 1269
Carpenter, Franklin R. 486
PAGE
Carter, B. E. 193
Carter, T. Lane, 634, 779
Cartridges, Hydraulic. 186, 1211
Cartwright location, Ont. 445
Carufel, Didace. 1070
Carwheels made profitably. 82
Case, B. H. Lining-up timbers in inclined shafts. *612
Casings, Annular-grid electric. 30
Casparis Stone Co. 1227
Casting machine, Slag and matte, Kelley. *610
Casting plant, Bullion, Selby smelter. *83
Cata mine, Mex. 670, *806
Catalogs, Manufacturers'. 484
Catawba gold mine, N. C. 832
Caved ground, Reclaiming after squeeze. *411
Caving, Cumberland hematite mines. *360, *362
Caving danger, Anthracite region. 1074
Cedar-Talisman Consol. 683, 736, 875
Cement, California production. 731
Cement, Canada. 681
Cement engineering, Degree in. 141
Cement for tubbing in deep shafts. 427
Cement plant, American, in Mex. 610
Cement plants, Electric power. 80
Cement supports in mines. 480, 491
Cementation, Shaft sinking by. *221
Centennial, Mich. 557
Central Colo. Power Co. 1225
Central Eureka, Calif. 149, 298, 490
Central Gold Dredging Co. 1021
Central mine, Broken Hill. *793, *799, 893
Central Mg. & Invest. Corp., Ltd. 439, 489
Central Pacific Ry. Co. 474, 1113
Central Phosphate Co. 1148
Central power plant, Anthracite mines. 817
Central R. R. of N. J. 582, 584
Cerro Gordo, Calif., ores. 31
Certificate, Miners—Shaleen case. 787
Certuchena y Anexas, Mex. 982
Chain coal cutters. 531
Chains, Hoisting—Notes. 288
Chalcopyrite and molybdenite separation. 824
Chalmers, Thos., Jr., Death of. 295
Chambers, E. J. "Canada's Fertile Northland." †632
Chambers-Ferland, Ont. 251, 640, 786, 881, 1076, 1127
Champion Cop. Mg. Co. Alumina in slags. 273
(For discussion see "Alumina.")
Champion mine, Mich. 557
Champion Mg. Co., Calif. 100, 296
Champion Reef mine, India. 516, 566
Chance, H. M. Origin of coal. 27, 238
—Pyritic origin, iron-ore deposits. 408, 630
Chandler Coal Co. 46
Chandler mine, Minn. 392
Channing, J. Parke. 148
Chapin mine, Mich. 299
Chapman, E. W., Death of. 1222
Charging machine, Copper-melting furnace. *867
Charles Dickens mine, Idaho. 48, 105, 150, 197, 927, 1072
Chastan Syndicate. 98
Chautard, J. Laterization. 128
Cheever mine, N. Y. 106
Chemical control of coal washers. *424
Chemical Engineers, Am. Inst. 133, 825, 1119
"Chemical Laboratories, Small." R. K. Meade. †732
Chemical Society, American. 140, 342, 720
Chemists, Cyanide, Duties of. 759
Chemistry, Applied, Intern'l Congress. 145
Chesapeake & Ohio Ry. 495, 678
Cheseau, G. Amorphous carborundum. 906
Chicago Copper Refining Co.; Tom Head mines. 244, 343, 876, 1071
Chihuahua, Mex., Oil wells. 852
Chihuahua mineral output, 1907. 1076
Chihuahua Mg. Co. 33
Chihuahua, Western, On horseback in. *159
Chile, Coal consumption. 642
Chilean mills, Improved. *989, 1017
Chilean nitrate statistics. 217
Chili gulch, Calif., Dredging. 244
Chimneys, Concrete vs. brick. 1218
Chimneys, Smelter—Note. 336
China clay, Is it a mineral? 415
China, Coal in. 382
China, Mining in. 410
Chinese concession—Note. 14
Chinese miners in Transvaal. 1114
Chinese mining law. 480
Chittenden, H. W. Copper-precip. plant. *853
Chlorine gas for gold chlorination. 824
—Electrolytic chlorine. 971
Christensen, A. O. Gas analysis needed. 1169
Christensen, C. C. Construction of 100-ton copper-smelting plant. *847
Christensen mine, Colo. 441
Chrome-iron ore, Grecian. 294
Chrome ore, New Caledonia. 1173
Chromite—Use for linings; ore analyses; sources; production by countries. 802
Chromium and maganese detection. 322
Chronology, Monthly. 43, 240, 485, 681, 913, 1116
Church, J. A., on Guanajuato. *671
—Ore sampling by machines. 113, 142, 238, 291, 338, 431, 631, 776, 917, 1111

PAGE
—Principles of machine sampling. *951, 1018
Chutes, Inclination of. 818
Cinco Minas, Mex. 1182
Cinnabar. See "Quicksilver."
Cirkel, F. Asbestos in Quebec. 461
Citizens Gas Co. 684
City of Cobalt mine, Ont. 445, 518, 636, 833, *856, 1182
Clapp, F. G. 342
Clara Consol. G. & C. Co. 440, 829, 925
Clark Bros. discovery, Sylvanite. *1102
Clarkson, H. B. 1174
Classifiers, Drag, Esperanza. *760
Classifiers, Pulsator, Richards. *621
Clausthal mines. *228, 733
Clay, California. 269, 731
Clay, China, is it a mineral? 415
Clay, Fire, and coal, Origin. 27, 238
"Clays of Arkansas." †1219
Clearance letters for coal miners. 337
Clearwater mine, Idaho. 491, 546
Cleland, E. D. Sampling, West Australia. 340
Clennell, J. E. Borax in assaying. 656
Cleveland mine, Colo. 877
Clifton-Morenci dist., Ariz. 37
Clinton location, Ont. 929
Clinton iron ore, N. Y., Stripping. *1150
Clinton ores, Ala. *1043, *1083
Clio mine, Calif. 299
Clover Leaf mine, Ind. 1227
Cloverdale quicksilver mine, Calif. 100
Coahuila L. & Z. Co. 151
Coal, Africa. 90
Coal, Alaska's great reserve. 1059
Coal and petroleum, Equivalency of. 1218
Coal, Anthracite—Central power plant. 817
Coal, Anthracite, "combination." 916
Coal, Anthracite, miners' agreement. 820, 828
Coal, Anthracite, roads—Hepburn law decision. 582, 584
Coal, Anthracite—State consumption. 382
Coal, Austria. 1260
Coal beds—Thickness of vegetation. 186
Coal, Bosnia and Herzegovina. 984
Coal breaking, To prevent. 724
Coal Briquets, Binders for. †96
Coal, Brit. Col., output; labor; accidents. 89, 142
Coal, California, Amador county. 589
Coal-car distribution and ownership. 623, 678
Coal, Chile consumption. 642
Coal, Chinese deposits. 382
Coal combustion upon grates. 184
Coal commission—Foreign experts—Explosion precautions. 860, 864, 590, 736
Coal consumption, mines and railroads. 428
Coal cost and waste. 1015
Coal cutter, Shortwall, Jeffrey. *24
Coal-cutting machine, Kuhn's. 688
Coal-cutting machinery, Operation of. 530, 1112
Coal cutting, northern field. *1104, 1110
Coal decision, Important—Safety lamps. 536
Coal, Dominican Republic. 5
Coal dredging, Susquehanna. 334
Coal dust and recent disasters. 333
Coal dust as factor of explosions. 1107, 1109
Coal dust, Calcium chloride for. 620
Coal-dust experiments, Altoft, Eng. 817
Coal dust in mine explosions. *9
Coal dust in mines, Problem of treating. 814, 819
Coal-dust notes, etc. 89, 98, 479, 534, 627, 968, 1108, 1171, 1252
Coal dust, Ohio law. 50
Coal dust, Water-jet spray, etc. *89
Coal-dust wetting, Foreign experts on. 861, 864
Coal Fields, N. D. & Mont., Geol. Surv. †1115
Coal—Flushing, Advantages of. *1
Coal freight rates, Anthracite and bituminous. 678
"Coal, Geology of, and Coal Mining." †777
Coal, George's Creek small vein. 482
Coal handling, Rapid, on Lakes. 235
Coal, Ill., Modification by low-temp. distillation. 1014
Coal, Illinois—Notes. 1015
Coal, India. 972
Coal, Indiana, discoveries. 442, 1027
"Coal." James Tonge. †777
Coal, Japan, Takashimi field. 288
Coal lands—Mining-law talks. 363
Coal—Lehigh Valley report. 719
Coal—"Lehrbuch der Bergbaukunde." †96
Coal merchants who sell steam. 724
Coal mine. See also "Accident," "Law," "State names, etc.
Coal mine accidents, Fatal, in America and elsewhere—Tabulated statistics. 1207, 1216
Coal-mine atmosphere, A safe. 919
Coal-mine curve problems. *230
Coal-mine disasters, Recent, Notes on. 332
Coal-mine disasters—Laws, labor, etc. 18
Coal-mine explosion, Cardiff. 93
Coal mine, Jersey, fighting fire. *86
Coal mines, Ashes for pillars in. 581
Coal mines, Australia, Electricity in. 966
Coal mines, Carmaux, France, Operation. *574
Coal mines, Coöperative. 1252
Coal mines, Electric power development. 1011
Coal mines, Eng., Steam winding engines. 1013

PAGE
Coal mines? Is electric current safe in—Precautions; British and other foreign investigations; appliances to prevent firedamp ignition. 29
Coal mines, Nova Scotia, Operating Acadia. *624
Coal mines, Overcasts in. *1106
Coal mines, Safety of—Examinations, apprenticeship, clearance letter, camp conditions. 337
Coal mines, Underground haulage in. 859
Coal miners, Education of. 723
Coal miners, Eyesight of. 1012
Coal miners, Protection of—Rules. 236
Coal miners, U. S., Number of. 235
Coal miners', Indiana, pension fund. 1099
Coal mining by retreating room- and pillar- system. *17, *1251
Coal-mining machines, Types of. 1252
Coal-mining depth, Maximum. 1252
Coal Mg. Inst. of Am. *9, 1119, 1222
Coal-mining labor affairs, Ala., 335, 148, 253, 344, 481
—Indiana. 390, 430, 439, 495, 550, 590, 638, 738, 882, 978, 1072, 1078, 1128
—Wyoming. 595, 635
—Anthracite. 820, 828
Coal-mining law. See also "Law," "Tax," and names of States.
Coal-mining law, Oklahoma. 729
Coal mining methods, Randolph co., Mo. *6
Coal-mining methods—Notes. 334
Coal-mining methods, Silesia. *887
Coal mining, Modern, Electricity in. 1106
Coal mining, Southern anthracite field. *475, 680
Coal—"Modern Practice in Mining." †1219
Coal, New Mexico, Rich fields. 1251
Coal, New South Wales, Geol. Surv. †1115
Coal, New Zealand. 724
Coal, Origin of. 27, 238
Coal, Penn., unmined, Valuing and taxing. 40, 50, 148, 152, 1229
Coal, Philippine Is. 153, 466, 594, 595, 785
—Paper by A. J. Cox. 1058
Coal piles, Temperature of. 817, 862
Coal, Pittsburg, trade and prices. 970
Coal, Polar regions—Spitzbergen. 1012
Coal, Prince Edward island. 246
Coal production, Decline in. 430
Coal puncher, Pneumoelectric. *580, 1112
Coal resources, Conservation of. 339, 583, 1172, 1265
Coal resources, Geol. Surv. map. 480
Coal, Russia—Wages; production. 724, 1184
Coal samples; moisture. 724, 859
Coal seam, Lower, Underground boring to prove. 581
Coal seam, Mining, Longwall methods. *19
Coal seam, Pittsburg, Method for. *330
Coal seam, Thick, Method for working. *15
Coal seam, Thickest. 1020, 1169
Coal seams, Flat, Mining under heavy cover. *135
—Losses in mining. *284
Coal seams—Why local sulphur. 14
Coal shrinkage in transit, Detecting. 914
Coal, Spanish imports. 90
Coal storage, Loss by. 724
Coal trade and mining conditions, Ind. 723
Coal, United Kingdom—Thick seam. *15
—Royal Commission's report. 30, 186, 817, 968
—Eight-hour day. 92
—Cardiff mine explosion. 93
—Accidents and safety—Notes. 139, 186, 627, 676
—Underground boring. 581
—South Staffordshire methods. *673
—Seaton-Delaval colliery. *765
—Ancient mine. 769
—Cost of longwall. *964
—Cutting, northern coalfield. *1104, 1110
Coal, U. S., Area of fields. 186
Coal, U. S. consumption. 1252
Coal, U. S. production in 1908. 1017
Coal, Vancouver island output. 419
Coal, Volatile matter in, Nature. 720
Coal, Wales. 724
Coal washers, Chemical control. *424
Coal washery, Dawson Fuel Co.'s. *182
Coal washery in Colo., Operation of. *1248
Coal washing, Notes on. 723, 818, 968
Coal, Washington. 152
Coal, West Va. Supp. Report. †920
Coals, Coking, Practical test for. 479
Coalfield, Largest in U. S. 1105
Coalite. 186
Cobalt Central, Ont. 302, 350, 518, *856, 881, 1278
Cobalt dist., Ont.—Shipments; future; extension, etc. 518
—Dividends. 636, 856
—Geology. 711, †777
—Present position; statistics. *855
Cobalt Lake Mg. Co. 153, 200, 518, *856, 1182
Cobalt Silver Queen, Ont. 153, 252, 518, 636, *855, *856
"Cobalt Silver Special." 976
Cobalt Townsite mine, Ont. 856
Cobar gold and copper field, N. S. W. *957
Cobar Gold Mines, Ltd. 828
Cobralla mine, Ariz. 103
Cochiti mining dist., N. M. *173

PAGE
Cochrane mine, Ont. 51
Coeur d'Alene assessments. 389
"Coeur d'Alene Dist." Ransome; Calkins. †732
Coeur d'Alene mines, Reports. 140
Coeur d'Alene mining costs. 607
Coeur d'Alene, North side. *65
Coeur d'Alene ores—Notes. 85, 240
Coeur d'Alene Placer Co. *66, 70
Coeur d'Alene tungsten-ore deposits. *1146
Coeur d'Alene Vulcan mine. 488
Coke ashes, Variable color. 533
Coke, Birmingham dist. *1047, *1085
Coke, British Columbia. 89
Coke, Connellsville, production. 773
Coke, Indiana, tests. 197, 489
Coke-making notes. 288, 480, 534, 627, 862, 1062
Coke, Mexican imports. 256
Coke mfr., northern West Va. 426
Coke Oven and By-Products Asso. 634
Coke ovens, Modern, New system. *378
Coke, Peat. 724, 919
Coke plant, Carmaux, France. 576
Coking coals, Practical test for. 479
Colbran-Bostwick claim. 43
Colburn, C. Lorimer. 145
Colburn, E. A., Jr., Loading holes. 1111
Colby, Albert Ladd. 921
Cole, T. F. 97
Coleman, Professor. 734
Coll, H. E. Operating a N. S. coal mine. *624
Colledge, Alexander. 388
Collier, A. J. Seward Peninsula Placers. †241
Colliery. See also "Coal," "Accident," etc.
Colliery disasters—Laws, labor, etc. 18
Colliery engineer for gold mines. 482
"Colliery Explosions," etc. †341
"Collieries, Mechanical Engineering of." †1219
Collins on Goldfield ores. 1096
Colne & Co. 1244
Colombia, Gold, silver, platinum. 14, 852
Colonial mine, Ont. *856
Colorado, Coal washery in, Operation. *1248
Colorado Fuel & Iron Co. 788, 835, 1248
—Report. 813
Colorado mine-accident laws. 1088
Colorado Mining Congress. 590, 634
Colorado Mg. Co., Utah. 393
Colorado State School of Mines. 99, 1222
Colorado tungsten, 293, 636, 738, 830, 1071, 1123, 1176, 1178, 1275
Columbia Butte Mg. Co. 1125
Columbia mine, Ore., Signaling. *857
Columbine tunnel, Colo. 441
Columbium. 960
Columbus, Ont. 302
Columbus Extension, Utah. 688
Comanche M. & S. Co. 251, 785, 1229
Combination, Goldfield. *1097, 1098, 1272
Combination Fraction, Goldfield. 101, 147, 492, 593, 780, 980, 1180, 1272
Combustion of coal upon grates. 184
Comet mine, Mont. 492, 784
Commissions, Engineers'. 717, 867
Commodity prices and gold production. *1037, 1168
Commonwealth M. & M. Co. 423
Compagnie des Mines et Minerals. 827
Compagnie Industrielle du Platine. 703, 705
Compañía. See also proper names.
Compañía Beneficiadora de Metales. *560, *647, 846
Compressed air. See "Air."
Comstock mines, Merger rumored. 780
Comstock mines, Profit sharing. 172
Comstock mining companies, Reform. 94, 188
Concentrates, Treating, Bellevue Ltd. mine. 716
Concentration. See also "Table," etc.
Concentration at Broken Hill. 893, 1169
Concentration, Ore, experiments—Glass table. *904
Concentrator, Ore, Hennig. *134, *1198
Concheño, Mex. *159
Concrete chimneys vs. brick. 1218
"Concrete Houses, Competitive Designs." †1115
Concrete notes. 32, 130, 480, 534, 627, 818
"Concrete, Reinforced." †241
Concrete, Reinforced, Selby, Calif. *451
Concrete work, Goldfield Consol. mill. *467
Condensers, Notes on. 724
Conductivity, Copper—Diagram. *225
Congo, French, production. 1173
Congress mine, Colo. 346, 592
Coniagas mines, Ont. 518, 636, 786. *856, 881
—Report. 1161
Conklin, H. R. 145
Conlin mine, Calif. 1175
Connellsville coke production. 773
Conservation of resources. 336, 339, 583, 288, 1168, 1172, 1217, 1265
—Water powers. 727, 866, 1066, 1172
Consolidated Arizona Smelting Co. 681, 876, 1026, 1116
Consol. Fuel Co. 349
Consol. Goldfields of So. Af.—Report, etc. 1190, 1121, 1176, 436
(See also constituent mines.)
Consol. Jefferson G. M. Co. 781
Consol. Main Reef. 540

PAGE
Consol. Mercur. 194, 394, 735, 781, 875, 880
Consol. Mines Selection Co., Ltd 924
Consol. M. & S. Co. of Can. Report. 756
Consol. Red Top, Nev. 300, 347, 492, 594, 739, 1073
Consolidation Coal Co. 492
Constapl, C. L. 734
Consumption, Miners', To prevent. 480
Contra tiro shaft sinking system. *1051
Contracts, Ore, from smelter's standpoint. *73, 189, 317
Controller device, Sandwell colliery. 674
Converter, Anaconda copper, Operating. *747
Converter, Surface-blown. 1244
Converters, Cananea Consol.'s. *954, *956
Conveyer for filling, Dodson colliery. *1
Conveyers, Crushed-rock, San Francisco. *1153
Conveyers, Underground, Kleinfontein mine. 715
Cook, E. B. Gayley dry-air blast at Warwick furnace. *810, 820, 725
Coolgardie dist., Calif. 38
Coolgardie Mg. Co., Calif. 683
Cooling-pot system, Selby works. *82
Cooper, C. A. Lead assaying. 178
Coöperative coal mines. 1252
Copeland Sampling Co. 346
Copper, Arizona mines' production. 423
Copper, Australasia. 144, 1021
Copper blast-furnace slags, Alumina in. 270, 483, 730, 1111, 1264
Copper—Butte companies' reports. [illegible]
Copper, California production. 731
Copper, Calumet & Hecla. 1022, 842
Copper—Casting, heating, etc.—Notes. 220, 228, 280, 282, 292, 340, 620, 719, 756
Copper, Cheapest producer of. 824
Copper converter, Anaconda, Operation of. *747
Copper, Cost of producing, Ariz. *37
—World's—Various districts. 165
Copper, Costs of producing, Official reports. 555, 584
Copper Eagle, Mont. 106, 300, 546, 687, 784
Copper electrolysis, Temperature effect. 755
Copper field, Cobar, N. S. W. *957
Copper for foundry; conductivity, etc. *225
Copper furnace, Fink. 976
Copper furnace, Regenerative reverberatory. *898
Copper furnaces, Basic linings for. 802
Copper furnaces—Blast leakage; Robinson tuyere. *756
Copper in British East Africa. 417
Copper, Katanga deposits. 727, 1049, 344
Copper King mine, Idaho. 105
Copper Knob mine, N. C. 548
Copper, Lake, Judicial definition; electrolytic copper. 842, 1022
Copper, Lake, Refining. 1020
Copper-leaching process, Jumau. 132
Copper market. 91, 237, 628, 969
Copper-melting furnaces, Charging machine. *867
Copper mine, Pahaquarry, N. J. 1181, 1074
Copper-mining and smelting, Ducktown dist. *1237
Copper—Nacozari mining dist. *657, 1161, *1006
Copper, Nevada, Nickel and platinum. 72
Copper, North Carolina production. 485
Copper-ore contracts, etc. Smelter's standpoint. *76, 189, 317
Copper ore, Fortuna mine, Bingham. *1191
Copper ore, Table for value of. 291
Copper, Permanganate method for. 1155
Copper, Philippines. 706
Copper Plate group, Mex. *660
Copper plates, Gold accumulation on. 709
Copper, Port Arthur dist., discovery. 1070
Copper-precipitating plant, Copper Queen's. *853
Copper process, Laszczynski. 1218
Copper Producers' Association. 1262
Copper Queen, Ariz. *38, 247, 271, 423, *532, 782, 1177
—Precipitating plant. *853
—General account. 1242
Copper Queen No. 2, Greenwater. 101
Copper Range Consol., Mich. 49, 249, 392, 1072, 1124, 1179
Copper River dist., Alaska. 680
Copper, Russian electrolytic. 1121
Copper smelters, American, List of. 1020
Copper smelting and A. S. & R. Co. 1266
Copper-smelting plant, 100-ton, Construction of. *847
Copper-smelting suits, Calif. 1149
(See also "Smelter-smoke.")
Copper-smelting works, Cananea, Growth. [illegible]
Copper statistics—Tariff classification. 1110
Copper, The stock of. 1262
Copper, Transvaal. 579
Copper, U. S. consumption, 1907. 187
Copperas production, U. S., 1907. 292
Corey, A. A. 1068
Corkill, E. T. Provincial mine. 712
Cornish tin mining. 181
Cornwall, Inspector's report. 148
Corocoro mines, Bolivia. 338, 339
Coronado mine, Colo. 1026
Coronet Phosphate Co. 346
Corrigan, McKinney & Co. [illegible]
Corrosion, Relative, of wrought iron and steel tubing. [illegible]
Corundum, Drawback on. 1269
Corundum, South Australia. 134
[illegible]
Cost, Cyaniding, Guanajuato Devel. Co. *1001
Cost, lead mining and smelting, Spain. 329
Cost of longwall in Eng. *961, *1104, 1110
Cost of producing copper in Ariz. *37
—World—Various districts. 165
—Of mining quartz pyrite gold deposits. 512
—And profits on Witwatersrand. 565
—Lead and zinc ores, Mo. 605
[illegible]
Costs and profits, Transvaal. 1217
[illegible]
Costs, Haulage, etc.—Flat seams. *135, *284
Costs of producing copper, Official reports. 555, 584
Costs, Operating, Homestake slime pit. 386
Costs—Power systems, Joplin dist. 328
Costs, Tin-mining, Cornwall. 181
Costs, Working, in Transvaal. 801
Cottrell fume-condensing system. *375
—Notes on use by Selby Co. 242, 296, 343, 389, 487, 536, *604
Cowper-Coles, S. Testing galvanized iron. 36
Cox, A. J. Philippine coals. 1058
Coxe, E. H. 342
Cox, S. Herbert. 342
Crabbe, J. D., Death of. [illegible]
Cracker Jack mine, Ore., Platinum. 1003
Crackerjack mine, Idaho. 104, 1123
Crackerjack mine, Nev. 980, 1180
Cragg location, Ont. 201
Cranes, Traveling, Beams, etc., for. 1170
[illegible]
[illegible]
Creede-Quinteil, Colo. 439
Creel, Enrique C. 852
Crerar, George. 342
[illegible]
[illegible]
[illegible]
Cripple Creek, Labor History. †344
Cripple Creek deep-drainage tunnel. 543, 684, 978, 1178, 1206
Cripple Creek tax dispute. 1178, 1273
Cripple Creek treatment charges. 195
Crist, Wm. A., Death of. 1271
Critchton, A. B. 388
[illegible] Gold M. & M. Co. 975
Crooked Cañon, Calif., New camp at. 1122
Crosshead, Safety, Berry's. *41
[illegible]
Crown, Lawrence co., S. D. [illegible]
Crown, Pennington co., S. D. 444, 740
Crown Deep, Transvaal. 540, 992
[illegible]
Crown Point mine, Johnnie, Nev. 1229, 1277
[illegible]
Crown Reserve, Ont. 153, 251, 394, 518, 595, 636, *856, 1076
[illegible]
Crushing plant, Goldfield Consol.'s. *467
[illegible]
Cullinan diamond. 736
Culm, Recovering from; fighting fires. 235
[illegible]
Cumberland, Eng., hematite mines. *357
[illegible]
Cummins, H. Oren. 921
Cunningham, W. H. 634
[illegible]
Cuprite sulphur group, Nev. 250, 443, 639, 1028, *1126, 1176
Curb, Construction of, England. *674
Curious conflict of rights. 913
[illegible]
Curve problems, Discussion of. *230
Cushman, Alliston S. 474
Cyanamide mill, Niagara falls. 339
Cyanidation, Deterrents in. 726
[illegible]
[illegible]
Cyanidation of silver ores, Pachuca. *647, *550
[illegible]
Cyanide-amalgamation mill, St. Geo. 1145
[illegible]
Cyanide plants, Small. 457
[illegible]
Cyanide practice, Mex., Caldecott on. 654
[illegible]
Cyanide process, All-slime, La Unión. *991, 1017
"Cyanide Processes." E. B. Wilson. †732
[illegible]
[illegible]
[illegible] deposition, etc. 707, 854
[illegible]

D

[illegible]
Dacotah Heights mine, Mich. 198
Dagner condensers. *265
Daisy Florence, Nev. 1272, 1276
Dall mine, Wis. 982, 1030
[illegible]
Daly Cop. Co., Mont. 593
Daly, Marcus. 130
Daly Reduction Co. *754, *804
[illegible]
[illegible]
[illegible]
Davis, W. M. *1159
Darwin camp, Calif. 422, 1223
Davis-Daly, Mont. 106, 347, 439, 489, [illegible]
Davis, H. P. Position of Cobalt. *855
Davis, J. A. Concentration experiments. *904
Davis mine, Reclaiming caved ground. *411
[illegible]
Dawson Fuel Co.'s coal washery. *182
Dawson Mg. Co. *660, 833
De Bavay process. 778, 897
[illegible]
[illegible]
Deacon mill, Joplin dist. *126
Dead River Gold Mg. Co. 1244
Debris question, Calif. 100, 146, 181, 244, 364, 438, 635, 776, 780, 922, 975, 1221
(See also "Dredging.")
Deeds, Mineral-land. 571
Defty, W. E. [illegible]
Degrees, New precedent, conferring [illegible]
Degrees, Technical. [illegible]
Deister No. 3 concentrating table. *610
Delaney, Eugene A. 541
Delaware & Hudson Co. [illegible] 785, 1011
[illegible] 90, 444, 582, 584, 740, 1229
[illegible]
—Electric power. 1011
[illegible]
Delprat and Potter flotation processes. Development, etc. 175, 778
Demand and supply. 289
Demidoff placers, Russia. 701
[illegible]
Dennison, W. A., Death of. 1068
Denny, G. A. and H. S. 588, 1068
[illegible]
Desborough, Arthur. 860, 864
Deseronto Iron Co. 1031
Deterrents in cyanidation. [illegible]
Detola gold mine, Ont. [illegible]
[illegible]
Deutschland mine, Silesia. *888
[illegible]
Diamond, Cullinan. 736
[illegible]
Diamond production, South Africa [illegible]
Diamonds, German S. W. Africa. 1199
Diamonds, N. S. W. [illegible]
[illegible]
Dificultad mine, Mex. *521, 524
[illegible]
[illegible] Notes on. [illegible]
[illegible] 913, 1118
Dividends, Transvaal mines. [illegible]
Diving in coal mine water. [illegible]
Dixon, G. R. Cost of longwall in Eng. [illegible]
[illegible]
Dock, Lake Superior iron-ore [illegible]
Dodge, F. H. [illegible]
[illegible]
Dominican Republic, Minerals. 5, 16, 42, 43, 70, 115, 228
[illegible]

PAGE
Dominion Copper Co. 555, 556
Dominion Iron & Steel Co. 51, 180, 344, 689
Door, Mine, Pocahontas automatic. *862
Door opener. *532
Dorr classifiers, Pachuca. *325, 650, 730
Dos Abril, Mex. 350
Dos Bocas oil-well fire. 252
Dos Estrellas mine, Mex. *1247
—Electric locomotive. *466
Douglas, Dr., on colliery accidents. 1167
Douglas, Jas. Copper Queen mine. 38
Douglas smelting works, Fundicion. *413
Douglas, Theodore. 779
Doveton, Godfrey D. 388, 588, 1119
Dowling, W. R. Cleaning filter cloths. 410
Downing, T. F. Southern anthracite field. *475, 680
Draeger breathing apparatus used. 858, *1061
Draper, Marshall D. 44, 1174
Dredge decision, Important—Risdon. 1021
Dredge, Hunter, Oroville, Calif. *417
Dredge mining—Talks on law. 364
Dredge prospecting for phosphate rock. 1148
Dredge—Safety mining caisson. 907
Dredging and hydraulic mining, Calif. 100, 146, 181, 194, 244, 438, 635, 735, 771, 776, 780, 826, 874, 922, 975, 1024, *1087, 1175, 1216, 1221, 1223
Dredging, Gold, Calif.—Hydraulic nozzles; rotary screens; general news. 1160
Dredging for platinum, Urals, Russia. *701
Dredging, Gold, By-profits. 119
Dredging, Gold, French Guiana. 654, 115
Drift mining in Calif. 457
Drifts, Small, Speed in. 773, *757, 918, 971, 1066, 1111
—Monthly advance, drift mining. 1112
Drill, Diamond, prospecting, Mapimi, Mex. *313
Drill, Hand, in prospecting placer deposits. *1141
Drill holes, Records of. 385
Drill, "Pioneer" diamond. 428
Drill, Scott gasolene rock. *1008
Drill size limitation, etc., Ind. 638, 690, 828, 976
Drill, Steam churn, hot and cold climates. *218
Drill steel on Rand. 324, 822
Drill, Stope, competition, Transvaal. 164, 324, 822, 818
Drills, Drilling, notes, etc. 32, 324, 332, 480, 526, 540, 672, 676, 818, 900, 914, 953, 968, 1145
Drills, Keystone gasolene-driven. *959
Drills, Machine, for stoping—Reply by Weston—Leyner and Murphy drills. 484
Drills on Rand, Multiple arrangement. 538
Drilling coal measures, Cost of. 968
Drilling—Depth of Rand bore holes. 914
Drilling in Hot Time lateral. *757, 773, 918, 971, 1066, 1111, 1112
Drilling—Prospecting coal seams—Cores. 968
Drilling time items—Well boring. 968
Drilling, Underground, to prove lower coal seam. 581
Dron, Alexander, Death of. 1119
Drucker, A. E. 193
Drummond, T. J. 1068
Drummond mine, Ont. 350, 518, *856
Dry-air blast, Gayley. 91, 144, 656, 725
—At Warwick furnace. *810, 820, 725
Dry blast, Gayley's invention of. 1200
Dry walling, South America. 338
Du Pont blasting gelatin. 1206
Du Pont de Nemours Powder Co. 42, 283, 1121
Du Pont Powder Co. 546
Dublin & Central Ireland Elec. Power Co. 724
Ducktown dist., Mining and smelting. *1237
Ducktown Sulphur, Cop. & Iron Co. *1237
Dudley, P. H., on dry blast. 91
Dudweiler coal-mine explosion. 445, 485
Duluth & Iron Range R. R. dock. 1049
Duluth steel plant and belt ry. *322
Dump, Car, Daly Reduc. Co.'s. *754
Dumper, Cylindrical, Carmaux mines. *575
Dumping waste with loco-train. *711
Duncan, M. M. 97
Dunderland Iron Ore Co., Ltd. 439, 590
Durango Iron Works. 1230
Durazno Mines Co. 1127, 1230
Dust, Coal. See "Coal."
Dwight, Arthur S. 188, 243
Dynamite concession, Mexican. 950
Dynamite, Du Pont "Red Cross." 283
Dynamite, Properties of. 42
Dynamite, Thawing. 427, 480

E

Easements, Law of. 570
East Batan Coal Mines. 153
East Butte, Mont. 151, 687, 1273
East Pool mine, Cornwall *213
East Rand Prop. mines. 46, 540, 662, 1056
Eastman, H. C. 1174
Easzy Bird mine, Calif. 637, 1177
Eckel, E. C., Ala. iron ores. 1045

PAGE
Eckstein properties, Transvaal. 482, 540
Eclipse Gold Mg. Co. 1272
Eden mine, Mex. *401, 1031
Edgar Zinc Co. 178
Education of coal miners. 723
Education, Technical, Canadian. 636
Edwards, C. W., land, Mo. 738
Eichhorn trigonometric slide rule. 856
Eight-hour bill, Transvaal. 958
Eight-hour day, British coal mines. 92
El Bote mine, Mex. *116, *401, *405, 1031
El Cobre, Mining costs. 415
El Cristo mine, Mex. *34
El Cubo mill, Mex. *116
El Doctor mine, Mex. *665
El Dorado Gold Dredging Co. 683
El Globo mine, Mex. 660, *662
El Oro, Mexico Mines of—Report. 764
El Oro Mg. & Ry. Co.—Report. 924
El Oro, Mex., Mining costs. 515
El Oro, Mex., slime filtration. *458
El Oro, New Esperanza mill. *760
El Paso Consol. G. M. Co. 636, 1224
El Plomo, Mex. *71
El Rayo gold mine, Santa Barbara. *78, 741
El Tigre mine, Mex. 52, 549
Electric current safe in coal mines?—Precautions; British and other foreign investigations; appliances to prevent fire-damp ignition. 29
Electric currents, Heating of conductors by. 177
Electric fume condensation. See "Cottrell."
Electric furnaces in Germany. 963
Electric fuse spitting device, Selective. *528
Electric haulage, mining flat seams. *135, *284
Electric hoist, Vulcan built, of Carbon Hill Coal Co. *31
Electric lighting and idleness. 778
Electric locomotives; Baldwin-Westinghouse. *26, *466
Electric locomotives — Underground haulage. 859
Electric power development, Coal mines. 1011
Electric power for cement plants. 80
Electric power for Transvaal mines. 868, 1025
Electric power, Joplin dist. 327
Electric precipitation, Mex. 668
Electric smelting. See "Heroult," "Iron-ore."
Electric stamp-mill drives, Rand. 1269
Electrical equipment, Butte-Balaklava. *714
Electrical shock, Treatment for. 1114
Electrical Zinc and Lead Co. 125
Electricity; explosions—Foreign experts' report. 861
Electricity in Australian collieries—Safety commission's report. 966
Electricity in collieries—Notes. 32, 288, 334, 428, 676, 818, 968, 1015, 1062, 1108
Electricity in modern coal mining. 1106
Electricity, Mine accidents due to. 726
Electrolysis, Copper, Temperature effect. 755
Electrolytic determination, Bismuth. 115
Electrolytic determination of metals. New apparatus for. 315
Electrolytic determination, Zinc. 372
Electrolytic process, Laszczynski. 1218
Elevator, Boulder and gravel, Ruble. *902
Elevator, Bucket, San Prospero mill. *949
Elevators, Tailings, on Rand. *539
Eleven O'Clock mine, Joplin dist. 327, 328
Elizabeth tunnel, Calif. 1199
Elk Consol., Nev. 487, 594, 687, 1180
Elk Creek, Colo., ore discovery. 441
Elkhorn Coal & Coke Co. *862
Elkhorn Electro-Metal Co. 198
Elkins Coal & Coke Co. 426
Elkton Consol., Colo., 543, 924, 1224
Ellis, E. E. 486
Elliston, Ind., Coal under. 878
Elm River mine, Mich. 346, 1027
Elmore process. 839
—Patent decision, etc. 321, 636, 778, 973, 1121
—Notes. 144, 828
—At Broken Hill. 1169, 896
Ely companies—As to consolidation. 677
Emerald Coal Co. 444, 640, 1075
Emerald group, Colo. 782
Emma Gordon mine, Okla. *910
Emma mine, Utah. 629, 445
Emmons on Pilares geology *659
Empire mine, Wis. 786
Empson, J. B. 325, 667
Engine notes. 90, 186, 534, 676, 1108
Engine systems, Joplin dist. 327
Engines, Hoisting, Largest on Rand. 1056
Engines, Steam winding, English coal mines. 1013
Engines, Traction, Fundicion. *413
Engineer, Mining, Duties of. 866
Engineer, Mining, Human side of work. 131, 141
Engineer, Mining, Professional ethics for. 717, 725
Engineer—Technical degrees. 141
Engineers, A. I. Mg. See "American."
Engineers' lease, Goldfield. 245, 250, 300, 343, 347, 393, 488, 739, 780, 879, 980, 1069

PAGE
ENGINEERING AND MINING JOURNAL—Forthcoming statistical number. 1017
England. See "United Kingdom."
Enterprise mine, Platteville, Wis. 1230
Epperson, J. Coal, Indiana. 723
Equitable gas burner. 569
Erich, Claus. 474
Erich, Walter L. 921
Ericson, E. J. Lead determination. 178
Erie Coal Co. 90
Escobar mine, Mex. *525
Esperanza, Ariz. 737
Esperanza Co., Mex. 117, 515
—The new mill. *760
Ethics, Professional, for mining engineer. 717, 725, 866
Evans, James P. 44
Evans, P. Loss by fire. 39
Eveland, A. J. Calculating matte value. 291
Evinvale, S. D. 302
Evje nickel works. 410
Examinations, Miners'—Suggestions. 337
Examining, etc., a hydraulic mine. 1257
Exchequer Mg. Co., Calif. 782
Expert testimony. 718
Explosion. See also "Coal dust," "Gases," "Accident," and proper names, etc.
Explosion, Cardiff mine, Facts on. 93
Explosion, Rikovski mine, Russia. 107
Explosions and barometric pressure. 11, 14, 461, 482
Explosions, Carl Scholz on. 968
Explosions, Coal dust in. *9
Explosions—Coal-dust treatment. 814, 819
Explosions, Gas, by electricity, Preventing. 29
Explosions, Mine, Dust as factor in. 1107, 1109
Explosions, Mine, Prevention—Foreign experts' report. 860, 864, 590, 736
Explosions, Recent, Notes on. 332
Explosive. See also "Blasting," "Dynamite," "Gelatin," "Powder," etc.
Explosives, Nitroglycerin, Mercury detection in. 823
Explosives, Ohio law on. 823, 50, 762
Explosives, Properties of. 42
Explosives, Testing, in Silesia. *888
Explosives—Various State laws. 1088
Eyesight of coal miners. 1012

F

Fairmont Coal Co. explosion. 332, 1168
Fairview Mg. Co. 194
Falkenback, F. J., Death of. 541
False bottom for shaft sinking. *221
Fan driven by water underground. *1211
Fan, Sirocco. 1059
Fan, Sirocco—Hamstead colliery fire. *5, *1060
Farr, Milton H. 869
Farrel, J. H. Geological mine maps. 385
Farrell Cop. Co. 492
Fault systems of Nevada. *1157, *1203
Favorite Gold & Cop. Co. 833
Favorite mine, Colo. 249, 783, 877
Fearby, G. R., Death of. 486
Federal Lead Co. 605, 606
Federal Mg. & Smg. Co. 49, 140, 389, 545, 783, 874, 878, 1024
Feed, Gravity-bin, Joplin dist. *127
Feeds Zinc-dust. *79
Fergie, C. H. 1119
Fergusonite. 960
Ferrier, W. F. 1023
Ferrites, Compounds of an iron acid. 420
Ferro-boron—Prize offered. 193
Ferro-silicon. 1214
Fields quartz property, Calif. 592
Fieschi, F. New coke ovens. *378
Fifty Consol. Gold Mines Corp. 1178
Filling. See also "Flushing."
Filling methods, Carmaux mines. *574
Filter-press practice, Merrill, Esperanza mill. *760
Filters, Butters, Goldfield Consol.'s. *472
Filters, Ridgway, Veta Colorada. *121, 280
Filters, Slime, Cloths of, Hydrochloric acid for cleaning. 410
Filtration of slimes, El Oro. *458
Findley Consol.'s hoist discussed. 239, 338, 433
Fink furnace. 976
Finlay, J. R. Cost of producing copper in Arizona. *37
—World—Various districts. 165
—Of mining quartz pyrite gold. 512
—Costs and profits, Witwatersrand. 565
—Lead and zinc ores, Mo. *605
Finn, Nicholas, Death of. 634
Fire-damp, Tests for. 480, 627
Fire disaster, Underground—Hamstead. *1060, *5, 1108
Fire fighting, Jersey D. L. & W. coal mine. *86
Fire fighting with breathing apparatus. 858
Fire, Loss of property by. 39

PAGE
Fire precautions, South Staffordshire. *675
Fire protection—Various State laws. 1088
Fires, Culm, Fighting with sand. 235
Fires, Forest. 536, 349, 485, 489, 546
Fires, Mine—Notes. 32, 334, 769, 1015
Fires, Spontaneous. 1108
Fireclay and coal, Origin. 27, 238
Firedamp. See "Gas."
Firmstone, F. Iron blast furnaces. 507, *511
Fitch, Walter. 825, 1174, 1271
Five Pines group, Calif. 146
Flat River district, Mo. *605
Fleming, J. B. 680
Fletcher, Hugh. 437
Fletcher Smelting Co. 389
Fleuss diving apparatus. 8
Flint Hill tin mine, S. C. 1029
Flint, Senator, on conservation. 1265
Flint, Uses of. 824
Flood-gold. 558
Florence, Goldfield, Nev. 50, 101, 147, 245, 250, 300, 343, 347, 393, 443, 487, 488, 547, 589, 639, 687, 739, 780, 879, 922, 980, 1069, 1073, *1096, 1180, 1223, 1272, 1276
Florence Consol., Nev. 488, 639, 687, 784, 979, 1073, 1228
Florence Gem; Florence Annex No. 2. 50, 245, 488, 639, 739, 1180
Florence Mack mine, Calif. 1120
Florence Wheeler, Nev. 980
Florencia property, Mex. 350, 595
Flores mill, Guanajuato. *615
Florida phosphates. 434
Flotation—Broken Hill metallurgy. 893, 1169
Flotation—Improved Macquisten table. *23
Flotation process litigation. 778, 973, 636, 1121
Flotation processes, Delprat and Potter. 175
Flotation processes, Principles of. 839
Flotation process, Elmore oil, decision. 321, 636
Flow sheet, Goldfield Consol. *473
Flue-gas analysis, Value of. 858
Fluorine mine, Colo. 344, 392, 924
Flushing, Advantages of, in mining. *1
Flushing, Carmaux mines. *577
Flushing coal mines with ashes. 581
Flushing system, Gute Hoffnung mine. 283
Flushing system, Silesian collieries. *889
Flushing mines, Austria, Germany. 428, 480
Fontanet explosion. 546
Foote, A., B. Dumping waste. *711
Forbes, D. L. H. Slime filtration, El Oro. *458
Forest lands—Justice to miner. 189
Forest reserves, Mining claims on. 1050
Forest reserves, Prospecting on. 915, 1065
Forest resources, Conservation of. 339, 1172, 1217
Forestry bureau and smelting trust. 827
Formosa, North, gold and silver. 201
Fortuna mine, Bingham, Ore occurrence. *1191
Foster, J. 437
Foster-Cobalt mine, Ont. 518, 636, *856, 982, 1030, 1230
Foundations, Compressed-air plant. 480
Foundry, Copper for the. *225
Four Metals Mg. Co., Calif. 248, 490, 591, 737, 782, 874, 1120
Four Metals, Ariz. 196, 247, 298
Frames, Joplin dist. *127
France, Carmaux coal mines. *574
France, Coal-mining. 1209, 1252
France, Iron and steel. 39, 680
France, R. Lee, Death of. 974
Frances-Mohawk, Nev. 101, 488, 975
Francis mine, S. D. 1127
Francklyn & Ferguson. 128
Franco-American Phosphate Co. 1075
Franco-British Exposition, Mining exhibit. 626
Frank Augustus Mg. Co. 1123
Franklin mine, Mich. 557, 684, 979, 1179, 1180, 1227
Franklin, Jr., mine, Mich. 1070
Franz, W. C. 437
Frary, F. C. Apparatus for electrolytic determination of metals. 314
—Method for zinc. 872
Fraser, Lee. 486
Freight, George's Creek coal. 482
Freight rates, anthracite and bituminous coal. 678
Freight rates at Butte. 195, 389, [illegible]
Freight rates, Joint, Indiana. 788
Freight rates on ore, Utah. 1273
Fremont Milling & Devel. Co. 422, 637, 782, 876
French colonies, Mineral production. 1173
French Guiana. See "Guiana."
French Rand mine, Transvaal. 922
Fresno Cop. Co. 1071
Frick, H. C., Coke Co. 688
Friederichshütte, Silesia. *267
Frisco mine, Idaho. 140, 389
Frontier mine, Wis. 51
Frost location, Ont. 595
Fuel tests, Geol. Surv. †96, 720, 723, 862
Full Moon mine, Idaho. 439
Fuller's earth, U. S. production. 168
Fulton, C. H. Silver cupellation. 326
Fulton Iron Works, San Francisco. 780
Fume, Smelter. See "Smelter."
Fumerton property, Idaho. 592
Fundicion, Douglas smelting works. *413
Furman, J. H. 734
Furnace. See also "Electric," "Heroult," Iron-ore," etc.
Furnace, Blast, Copper—Alumina in slags. 270, 483, 730, 1111, 1264
Furnace, Blast, Long rest for. 1173
Furnace, Blast, Iron, Shape of. *507, 631
Furnace bullion, Handling, Selby smelter. *83
Furnace, Copper, Regenerative reverberatory, Oil-burning. *898
Furnace, Copper-smelting, 100-ton. *847
Furnace, Cupola—Door precaution. 85
Furnace, Fink. 976
Furnace hoist, Automatic, German. 801
Furnace—Operating Anaconda converter. *747
Furnace, Smokeless—Gov't advice. 428
Furnace temperatures, High, Finding. 662, 900
Furnace, Warwick, Gayley blast at. *810, 820, 725
Furnaces at Gary. 1254
Furnaces—Basic refractory brick. 802
Furnaces, Blast, Peñoles Co.'s. *373
Furnaces, Brass, etc.—Notes. 220, 228, 280, 282, 292, 340, 620, 719
Furnaces, Cananea Consol.'s. *954
Furnaces, Copper-melting, Charging machine. *867
Furnaces, Hollow iron blocks in. 280
Furnaces, Iron, Ala.—Average burden, etc. *1048, *1083
Furnaces, Lead and copper—Blast-leakage loss; Robinson tuyere. *756
Furnaces, Lead and zinc, Silesia. *265
Furnaces, Lead, Crucible of, Removing accretions with bomb. *763
Furnaces, Reverberatory, Ironing. 1169
Furnaceville Iron Co. *1150
Furness, Sir Christopher. 1225
Furness, Dwight. 1230
Fuse, Effect of compression on burning of. 823
Fuse, Inserting—Loading blast hole. *433
Fuse, Safety, in French mines. 186
Fuse spitting device, Selective electric. *528
Fuse, "Star" electric safety. *1014
Futers, T. C. "Mech. Engineering of Collieries." †1219

G

Gadsen furnace, Ala. *1085
Galdeana mine, Mex. *35
Galena, Transvaal. 579
Galena, Value in Wales. 709
Galloway, W. "Colliery Explosions." †341
Galvanized iron, Testing. 36
Galvanizing wire, Effect of. 480
Gambell, A. D., Death of. 634
Gardiner, B. L. Treating concentrates, Bellevue Ltd. mine. 716
Gardner, F. A. 541
Garfield Smelting Co. 488, 635, 735, 772, 781, 1054
Garner, M. G. 640
Garnet, Statistics. 1020
Gary, Judge, on steel coöperation. 1213
—On the tariff. 1263, 1269
Gary, New Steel Corp. plant at. 1253
Gas analysis, Chemicals for. 434
Gas analysis will answer question. 1169
Gas engines, Note on. 1108
Gas escape from gravel, Preventing. 461, 482
Gas explosion by electricity, Preventing. 29
Gas, Flue, analysis, Value of. 858
Gas from nitrous compounds. 724
Gas, Natural, California. 731
Gas, Natural, Use in Joplin dist.—Boiler firing, burners, gas engines, etc. *568
Gas power, Joplin dist. 327
Gas power plants, Blast-furnace. 1064
[illegible]
[illegible]
Gases, Disposal of, Selby, Calif. *604
Gases from coal—Tests. 720
Gases, Mine—Notes. 288, 480, 534, 627, 769, 861, 914, 968, 1108, 1252
Gases, Specific heat, high temp. 919
[illegible]
Gates, H. V. 871
Gateways, English collieries. [illegible]
[illegible]
[illegible]
—At Warwick furnace. *810, 820, 725
Gayley's invention of dry blast. 1200
[illegible]
[illegible]
Gelatin, Blasting, DuPont. 1206
Gelsenkirchen experiments. *9
[illegible]
Gem mines, Calif., Purchase of. 197, 685
Gems, California production. 731
Gems, India, production. 972
Gems, N. S. W. and Queensland. 115
General Development Co. 637
[illegible]
Geological mappings of mines. 385
Geological Survey. See "Survey."
[illegible]
[illegible]
[illegible]
"Georgia, Water Powers of." †632
German-American Coke & Gas Co. 1231
German Mining Society. 410
German Southwest Africa, Diamonds. 1199
[illegible]
[illegible]
Germany and U. S., Commerce between. 714
Germany, Colliery fatalities. 1210
Germany, Electric furnaces in. 963
Germany, Iron and steel. 39, 1064
Germany, Lead production. 436
Germany, Magnesite production. 803
Germany—Silesian coal mining. *887
Giant Mg. Co., Calif. 487
Gibb, Allan. 634
Giberson, Allen. 389
Gibraltar Investment Co. 393
Gibson Cop. Co., Ariz. 423
Gibson, G. H. Mfrs.' catalogs. 484
Gibson, W. "Geol. of Coal," etc. †777
Gilbert, G. K. 1087, 1159
Gilbert mine, Calif. 298
[illegible]
Gilt-Edge Maid, S. D. 349, 740, 832, 1075
Girault, Edmundo. 193, *325
Giroux Consol. 152, 393, 639, 740, 1273
Globe, Mich. See "Copper Range."
Globe, S. D. 595
Globe & Phoenix mine, Rhodesia. 959
Gobbi ranch, Calif. 1226
Goddard, J. N. Removing accretions in crucible of lead-furnaces. *763
Godiva mine, Utah. 152, 195, 349
Goerz group, Transvaal. 82
Gohring, W. B. 825
Golconda—Improved Macquisten tube. *23
Gold. See also "Cyanidation."
Gold accumulation on copper plates. 709
Gold amalgam absorption by copper [illegible]
Gold and copper field, Cobar. *957
Gold and tellurium alloys. 567
Gold, Arizona mines' production. 423
Gold, Australasia. 143, 481, 604, 719, 913, 1021, 1160, 1214
Gold Bar mine, Bullfrog. 487, 1126
Gold, Borneo. 339
Gold, Brazilian bullion exports. 303
Gold, Brit. Col., report. 142
[illegible]
Gold-bullion receipts, Seattle. 891
[illegible]
Gold, Calif., production. 579, 683, 731
Gold chlorination—Chlorine gas. 824, 971
Gold, Coeur d'Alene, north side. *68
Gold Crown Mg. Co. 300
Gold deposits, Quartz pyrite, Mining cost. 512
[illegible]
Gold, Dominican republic. 16
Gold dredging. See also "Dredging."
Gold dredging, French Guiana. 654, 115
[illegible]
Gold, Flood. 558
Gold, Formosa, North, production. 201
Gold, French colonies. 1173
Gold, Has value of, depreciated?—World's production and commodity prices; Norton's views; Cairnes' analysis; pig-iron com- [illegible]
[illegible]
Gold Hunter mine, Idaho. 140, 389
[illegible]
Gold, India. 620, 871, 907, 972, 1057, 1221
Gold King, Colo. 545, 592, 1072
[illegible]
Gold, Madagascar. 850, 1173
Gold mine, English. 98
[illegible]
[illegible]
[illegible]
Gold ore, Low-grade, treatment record. 430
Gold ore treatment, Hog Mtn. 725
Gold Pass camp, N. M. 1181
Gold, Philippines. [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Gold-silver bullion, Refining. 733
Gold, South Carolina mines. 1212
[illegible]
[illegible]

PAGE
Gold, Transvaal statistics. 335, 631, 813, 1022, 1041
Gold—Treating concentrates, Bellvue Ltd. 716
Gold Valley camp, Calif. 589
Gold, West Africa. 623, 906, 1173, 1190
Golden Chest mines, Idaho. *65, 69, 249, 389, *1146
Golden Crest, S. D. 740, 1029
Golden Metal, S. D. 302
Golden mine, Calif. 387
Golden Placer, S. D. 444, 595
Golden Reward, S. D. 200, 349, 833, 1030, 1126
Golden Ridge M. & M. Co. 1177
Golden Rose mine, Calif. 685
Golden Slipper, S. D. 302
Golden West, S. D. 152, 251
Golden Winnie, Idaho. *67, 830, 1147
Goldfield Blue Bell, Berlin, Nev. 1126
Goldfield Cl Mill, Nev. 972
Goldfield Consol. 101, 147, 296, 301, 343, 389, 589, 735, 739, 980, 1024, 1073, 1180
—The 600-ton mill. *467, *416, *610, 680
Goldfield leasers' society. 1176
Goldfield Merger, Nev. 300
Goldfield, New, Scientific search for. *1157, *1203
Goldfield type of ore occurrence. *1096
Gonsolus, F. H. Tamping bars; explosives. 42
Goodman, M. Mineral resources, Philippines. 706
Goodwin, Nat C., Co. 1272
Gowland, Wm. 828
Grabill, C. A. Ore contracts, smelter's standpoint. *73, 189, 317
Grace, Eugene G. 921
Grace Zinc Co. 609, 610
Gradenwitz, A. Washing and leaching apparatus. *227
Grammer, F. L. 507, 510
Gran Luz claim, Mex. *661
Granbery, J. H. 193
Granby Co., Mo. 300, 739, 927
Granby Consol., Canada. 93, 741
—Costs. 166, 556, 741
—Report. 770
Grand Central, Mex. 252
Granite-Allie mine, Idaho. 249, 878
Granite Bi-Metallic Co. 831
Graphic, N. M., ore deposits. *366
Graphite—Market, producers, etc. 434, 733
Graser, F. A. Electrolytic chlorine. 971
Grasselli Chemical Co. 445, 981
Grasty, J. S. Ala. iron ores. 1045
Graul, Carl. 588
Gray Copper Co., Idaho. 439
Gray Eagle. See "Grey Eagle."
Gray, F. W. Fighting fire with breathing apparatus. 858
Gray Wing mine, Calif. 771
Grayson and Glew signalling device. 1170
Great Boulder Perseverance report; treatment. *224
Great Boulder Prop., Electric signals. *1170
Great Britain. See "United Kingdom," "Wales."
Great Cobar copper mines, N. S. W. *957
Great Cobar—Machine sampling. 113, 142, 238, 291, 338, 431, 631, 776, 917, *951, 1018, 1111
Great Eastern, Hornsilver. 50
Great Eastern quicksilver mine, Calif. 1161, 1178
Great Northern Silver Mines, Ltd. 1127
Great Southern Mica Mg. Co. 1181
Great Western, Hornsilver, Nev. 50, 348, 639, 784, 831, 1028
Great Western, Round Mtn., Nev. 50, 348
Great Western Power Co. 8, 1161
Grecian chrome-iron ore. 294
Greece, Magnesite. 730, 962, 201, 1217
Greece, Mineral production. 1217
Green-Meehan mine, Ont. *856, 1030, 1127, 1182
Green River Coal & Coke Co. 392
Greenawalt chlorination mill. 923
Greene, W. C. 243
Greene-Cananea Cop. Co. 52, 188, 929
Greene concession, Mex. 741
Greene Consol. 556
Greene Federal smelter. 1229
Greene Gold-Silver Co. *159, 252, 350, 494, 786, 913, 929, 1230
Greenfield, A. D. 638
Greenwater camp, Calif. 101
Grey Eagle mine, Mabert, Calif. 248
Grimshaw, R. Mine mules and their care. 25
Gross & Dixon gold mine. 832
Grossman swinging staging. *217
Grothe, A., and air agitation. *647, 652, *901, 1116
Grove, C. D. 1023
Grover & Smith mine, Ont. 201
"Grub-stake" contracts, Law of. 461
Grundy county, Ill., mining methods. *19
Guadalupe mill, Pachuca, Mex. *559
Guadalupe mine, near Inde, Mex. *116
Guanajuato Amal. G. M. Co. 116, *615, *669, 807

PAGE
Guanajuato Consol. 116, 303, *669
Guanajuato Devel. Co. *670, *808, 1278
—Cyanide mills. *947, *997
Guanajuato, great silver camp of Mex. *669
Guanajuato-Jalisco Devel. Co. 1230
Guanajuato labor and supplies. *1245
Guanajuato, Mex., Ancient plants. 681
Guanajuato mills, List of. 929
Guanajuato Reduc. & M. Co. *116, 252, *615, *669, *806
Guanajuato, Working mines of. *806
Guerra al Tirano mine, Mex. 163
Guerrero mill, Mex. *647
Guess, George A. 1222
Guess, H. A. 295, 437, *760, 1155
Guggenheim, D., Statements. 43, 1266
Guiana, British, production. 726, 1010, 1173
Guiana, French, Gold production. 1173
Guiana, French, Mining; dredging. 115, 654
Guides, Shaft, Steel. *1010
Guiterman, F., Letter of. 960, 969
Gute Hoffnung mine—Flushing, etc. 283, 169
Gwin mine, Calif. 635
Gwynn gas burner. 569
Gypsum, Price of. 95

H

Haanel, Eugene. 419, 1068, 1225
Haas, F. Treating coal dust. 814, 819
Habets, A. Grecian chrome-iron ore. 294
Hacienda. See "La Unión," "Bubu
ron," "San Francisco."
Hague, James D., Death of. 295
Hahns Peak, Colo. *809, 1070
Haile gold mine, S. C. 393, 1212
Hailey-Ola coal-mine fire. 485, 493
Haileybury Silver Co. 302
Half Moon mine, Colo. 543
Hall, B. M. and M. R. "Water Powers of Ga." †632
Hall, H. Dust treatment; timber ignition. 620, 1108
Hall-Rees diving apparatus. 8
Hallidie Machinery Co. *31
Halse, E. Spanish-American Mining Dictionary. †632
—Absorption of gold amalgam. 996
Hamilton, R. K. 1174
Hammon, W. P. 194, 1120, 1175
Hammond, John Hayes. 243, 1088
—Professional ethics for mining engineer. 717, 725, 867
Hamstead colliery fire. *1060, 1108
Hamstead colliery, Rescue work. *5
Hanchett, L. Cactus Club, Newhouse mines. *1189, 1216
Hancock jig, Palmerton, Penn. 175
Hancock mine, Mich. 49, 639, 979
Hannes, W. F. 779
Hanson, Eagleton, Death of. 541
Hantke Co., Poland. 1173
Hardy, J. Gordon. 1174
Hargreaves, E. C. 543
Harmon, Floyd. 145, 869
Harmsworths purchase coal mines. 344
Harney Peak Tin Mg. Co. 740
Hancock, H. Lipson. 165
Harris Copper Co. 549
Harris, F. S., Death of. 243
Harris, Lord, Remarks of. 1176
Harrison County Coal Co. 880
Harrison, Geo. 50, 762, 823
Harrison, W. F., on Indiana mines. 489
Hart camp, Calif. 296, 298
Hart, Dewitt C., Death of. 1023
Hartlepool co-partnership experiment. 1225
Hartshorne, Chas., Death of. 921
Hasegawa, H. 1119
Hatch, F. H. 515
Hatchettolite. 960
Haulage. See also "Rope," "Electricity," "Locomotive," "Railway," etc.
Haulage—Mine-curve problems. *230
Haulage, Mule and motor—Flat coal seams, heavy cover. *135, *284
Haulage notes. 90, 334, 428, 485, 627, 818, 1062, 1100
Haulage, Underground, in coal mines. 859
Haultain, H. E. T. 779
Havard, F. T. Basic refractory brick. 802
Hawley, F. G. Permanganate method for copper. 1155
Haworth, John E., Death of. 869
Haws Coal Co. 548
Hawthorne, J. Temagami - Cobalt Mines, Ltd. 586, 628, 631, 773
Hay, J. K. Loading blast holes. 971, 1066, 1111
Haywood Coal Mg. Co. 153, 981
Hazel Goldfield. 1125, 1180, 1228, 1272
Headgear, Steel, South Rand. 540
Headwaters Mg. Co., Philippines. 595
Hearst Oil Concessions, Mex. 1076
Heathcote Syndicate, Ltd. 1019
Heathcote's automatic ore sampler. *181
Heating of conductors by electric currents. 177

PAGE
Hebburn colliery, Australia. 966
Heberlein, Max, Death of. 1068
Heckman, J. R. Local sulphur in coal seams. 14
Hecla mine, Idaho. 140, 150, 389, 491, *528, 878, 1072, 1123
Hedges mines, Calif. 147
Hematites, Magdalena, N. M. *366
Heiner, H. H. 921
Heinrich, C. Alumina in slags. 273
(For rest of discussion see "Alumina.")
Heinze, F. Augustus. 923, 1127
Heise, F. "Lehrbuch der Bergbaukunde." †96
Helen mine, Ont. 689
Helen quicksilver mine, Calif. 440
Helena mine, Colo. 48, 346, 638, 1026
Helmet. See "Breathing."
Hematite iron ore, Duty on. 128
Hematite mines, Cumberland, Eng. *357
Henderson, C. W. 921
Henderson, Peter. 193
Hennig concentrating tables. *134
—Testing plant and met. laboratory. *1198
Henry Adney mine, Colo. 1027
Hepburn law, Decision on. 582, 584
Heraeus, W. C. 99, 193
Herbst, F. "Lehrbuch der Bergbaukunde." †96
Hercules mine, Idaho. 48, 140, 297, 389
Heroult elec. smelter, Calif. 164, 591
Hersey, Milton L. 541
Herzig, C. S. 145
Hewitt, John. 1124
Hidden Treasure mine, Calif. 100
Hidden Treasure mine, Nev. 739
Higgins, Edwin. 1147
—Iron operations, Birmingham dist. *1043
—Northeastern Alabama. *1083
—Stripping Clinton iron ore, N. Y. *1150
—Mining and smelting, Ducktown dist. *1237
Hill, F. A. Colliery disasters. 18
Hill Pub. Co.'s catalog. †920
Hill, R. T. Prospecting in Nev. 1053
—Goldfield type of ore occurrence. *1096
—Scientific search for new Goldfield. *1157
—Camp Alunite, Nev. *1203, 1216
"Himalaya Mtns., Sketch of." †920
Hind, H. Y., Death of. 437
Hinds Consol., Santa Barbara. *210, 211, 741
Hinton, J. Steam winding engines, Eng. 1013
Hirsch, L., & Co. 681
Hiscox, Gardner D., Death of. 588
Hixon, Hiram W. 974
—The origin of coal. 238
Hoban, John J. 245
Hobson, Francis B. *1000
Hocking, J. Loading blast holes. 1066
(For rest of discussion see "Newhouse.")
Hodbarrow mine, Eng. *357, 361
Hoffman, F. L. Fatal coal-mine accidents. 1207, 1216
Hofman, H. O. Experimental slags. 272
(For discussion see "Slags.")
Hog Mtn. gold-ore treatment. 725
Hogenraad on borax in assaying. 656
Hogg, J. B. 588
Hoist, Electric, Vulcan built, of Carbon Hill Coal Co. *31
Hoist, German automatic furnace. 801
Hoist house, Butte-Balaklava. *714
Hoist, Single - drum, Over - balance weight. 239, 338, 433
Hoists, Malacate, Zacatecas. 401, *405
Hoisting. See also "Rope," "Engine," etc.
Hoisting, Burra Burra mine, Tenn. *1239
Hoisting coal, South Staffordshire. *673
Hoisting development — Whiting's Koepe method. 1014
Hoisting engines, Compressed-air. 532
Hoisting engines, Steam, English collieries. 1013
Hoisting laws, various States. 1088
Hoisting methods, Carmaux mines. *575
Hoisting methods, Joplin. 609
Hoisting methods, Peñoles Co.'s. *311
Hoisting notes. 26, 32, 90, 288, 428, 480, 534, 627, 676, 759, 818, 1015
Hoisting, Rapid. 1010
Hoisting record, Superior Coal Co.'s. 726
Hoisting-rope connection, Sancy shaft. *185
Hoisting safety devices. *41, *94, *124, 676
Holden Gold & Cop. Co. 833
Holguin-Santiago Mine Co. 741
Holman air-cushion stamp. *213
Holmes, Joseph A. 243
Homestake, S. D. 493
—Cyanide practice. 292, 294, 386, 548
—Cost of mining. 514
—Report. 654
Homestake South Extension. 152, 595, 1075
Hood, Protective, Anaconda. *708
Hook, Hoisting, Sancy shaft. *185
Hook, Safety sinking, Prisk's. *94
Hooper, H. E. Alumina in slags. 1111
(For rest of discussion see "Alumina.")
Hopper for unloading cars. *1009

PAGE

Horseback in western Chihuahua *159
Horses, Pit, Parade of. 1166
Hose protection 480, 627
Hosler, R. N. Is electric current safe in coal mines? 29
Hoster, M. T. The James slimer. *1149
Hot Time lateral, Newhouse tunnel *757, 773, 918, 971, 1066, 1111, 1112
Houghton Co., Mich., mining accidents. 827
Howard, Wm. 99
Howatson filter 707, 854
Howe, A. S. Rights of junior locators 775, 822
Howe, H. M. Shape of iron blast furnace. *507, 631
—Relative corrosion of wrought-iron and steel tubing 563, 821
—Carbon and properties of cast iron. *943
Hoyle, Charles. *760
Hoyt, J. R. 44
Huasteca Petroleum Co. 52
Hubbard-Elliott mines, Alaska. 680, 681
Huckleberry mine, Colo. 248, 441, 638
Hudson Coal & Mg. Asso. Strike 390, 430, 439, 495, 638, 882, 1072, 1078, 1128
Huelva, Spain, pyrite deposits. 283
Human side of mining engineer's work. 131, 141
Humas, Jas. 1119
Humboldt Mg. Co. *807, 808
Humphreys, A. N., Jr. 779
Hunter dredge, Oroville, Calif. *417
Hunter, Harvey R. 1023
Huntington-Heberlein process. *267, 269, 970
Hutchings, W. H. Tapping mine water. 239
Hutchins, J. P. Steam churn drill. Hot and cold climates. *218
—Hand drill in prospecting placers. *1141
Hutchinson, L. L. 486
Hutchinson location, Ont. 201
Hutton, F. R. "Steam Power Plants" †1219
Hydraulic air compression. *228, 733, *716
Hydraulic mining. See also "Debris," etc.
Hydraulic mine, Examining and fitting up. 1257
Hydraulic mining in Calif., Revival. 1087
Hydraulic mining—Talks on law. 364
Hydraulic wedges and cartridges. 186, 1211
Hydrochloric acid for cleaning cloths of slime filters 410
Hydrocyanic acid poisoning. 407
Hydrogen, Preparing, on large scale. 812
Hygrometers in sprinkled mines. 627
Hymalulu, S. D. 740, 1277

I

Ibex, Colo. Little Jonny. 48, 299, 344, 346, 545
Ibex mine, Utah. 200
Ida M. & M. Co. 104
Idaho. See also "Coeur d'Alene."
Idaho gold, Atlanta dist. *176
Idaho-Knickerbocker Mines Co. 1072
Idaho-Maryland mine, Calif. 422, 487, 591, 1223
Idaho Mascot claims. 104
Idaho mine, Calif. 591
Idaho mine-safety laws. 1090
Idaho Sm. & Ref. Co. 249, 299, 923
Ideal mine, S. D. 1029
Idora mine, Idaho. 1027
Iles, M. W. Slags. 272
(For discussion see "Slags.")
Ilgner hoist at Pachuca. *1051
Illinois coal-mine accidents. 958
Illinois coal-miners' certificates. 102
Illinois coal, Modification by low-temp. distillation 1014
Illinois coal—Notes. 1015
Illinois Gold M. & M. Co. 545
Illinois Steel Co. 91
Illinois Zinc Co. 442
Illumination in mines. [illegible]
Imperial Cop. Co., Ariz. 247, 423, [illegible]
Imperial Mg. Co., Idaho. 197, 488
Imperial, S. D. 548, 832
Improvement, Signs of. [illegible]
Incline, Self-acting, or jig 428
Independent Fertilizer Co. 1063, 1116, 1127
Index card for drilling record. *[illegible]
India, Colliery fatalities. 1209
India, Gold. 620, 871, 907, 972, 1057, 1221
India, Gold mining costs 515, [illegible]
India, Mineral production in 1907. 972
Indian "campoodie" lands, Nev. 1175
Indian Creek, Calif. [illegible]
Indian Hill mine, Calif. 1087
Indiana coal miners' pension fund. 1099
Indiana coal miners' strikes, etc. 430, 390, 439, 495, 550, 590, 638, 738, 882, 978, 1072, 1078, 1128
Indiana, Coal trade and mining conditions [illegible]
Indiana coal, W. F. Harrison on. 489
Indiana coke tests 197, 489

PAGE

Indiana Coal Dredging Co. [illegible]
Indiana, Iron ore 1227
Indiana laws. 46, 105, 195, 245, 249, 638, 690, 788, 828, 976, 1124, 1232
Indiana Southern Coal Co. [illegible]
Indiana Steel Co. [illegible]
Indiana Steel Co.'s plant at Gary. [illegible]
Indo-China production. [illegible]
Infusorial earth, Market for. [illegible]
Ingalls, W. R. Improved [illegible] tube. [illegible]
—Lead and Zinc in the U. S. [illegible]
—[illegible] and Potter processes [illegible]
—Cost of silver-lead smelting. 31, [illegible]
—Zinc ores, [illegible]
—The Mineral Industry. [illegible]
—[illegible] of gold deposits? *1037, 1168
—Prevention of mine accidents. [illegible]
Inland Oil Co. [illegible]
Inspection laws, Various States. [illegible]
Inspectors, Mine, [illegible]
Institute of Metals [illegible]
Institution of Mg. Engineers [illegible]
[illegible]
Institution of Mg. & Met. 148
Insular Coal Co., Philippines. 595, 785
International Congress, Applied Chem. 145
International Miners' Congress. 40
International Nickel Co. 70, 933, 1256
International Oil and Gas Co. 1278
International shaft, Colo. 686
International [illegible] Makers' Asso. 240
Interstate mine, Idaho. 249
[illegible] Mg. Co. [illegible]
Iowa Coal Operators' Asso. [illegible]
Iowa Girl mine, Colo. 48
Iowa [illegible]
Iron and [illegible] compounds [illegible] 420
Iron and copper-furnace slags. [illegible]
Iron and laterization. 128
Iron and steel depression in Europe. [illegible]
Iron and steel, Foreign trade in. 1110
Iron and Steel Institute. 541, 828, 1222
Iron and steel tariff. 1054, 1063, 1117, 1220, 1261, 1263, 1267, 1268
Iron and zinc, S. W. Virginia. *908
Iron, Austria. 1260
Iron blast furnace, Shape of. *507, 631
Iron, Canada, industry and resources. 419
Iron, Canadian bounties, and on steel 489
Iron, Canadian production. 39, 387, 300, [illegible]
Iron, Cast, Properties of, and carbon. *943
"Iron, Chemical Analysis of." †1115
Iron, Chinese deposits. 410
Iron, French production. 39, 680
Iron [illegible]
Iron [illegible] 39, 448, 1064
Iron, Hematite mines, Cumberland. [illegible]
Iron, Japan, and steel. 42, 1095
Iron, Japan, ore and pyrites. 94
Iron Knob deposits, Australia. 40
Iron [illegible] mine, Idaho [illegible]
Iron mines, Sandford lake, N. Y. 548
Iron mining—Lake Sup. Mg. Inst. 97
Iron Mountain Tunnel Co. 1125
Iron, Norway, ore statistics. 1234
Iron operations, Birmingham dist. *1043
—Northeastern Alabama. *1083
Iron ore and pig—Recent sales. 865
Iron ore, Chrome, etc., Greece. 294, 1217
Iron ore, Clinton, in N. Y., Stripping. *1150
Iron ore deposits, Pyritic origin of. 408, 630
Iron ore, Dominican republic. 228
Iron ore fields, U. S., Largest. [illegible]
Iron ore, Greene county, Ind. [illegible]
Iron ore, Hematite, Duty on. 128
Iron ore, Laurentian mtns. [illegible]
Iron-ore resources, U. S. 339, 1168, 1172, [illegible]
Iron-ore smelter, Heroult. 164, [illegible]
Iron-ore smelting, Elec., Swedish pro[illegible]
Iron-ore statistics, Mich. counties. 804, [illegible]
[illegible] 1184, [illegible]
[illegible]
Iron ore in Gt. Britain. [illegible]
Iron ores, Clinton, in Ala. [illegible]
"Iron Ores, Fossil, of Ga." [illegible]
Iron Ores, Iron Springs Dist., Utah. [illegible]
Iron ores, Sandy, treatment. [illegible]
Iron ores—Silica and alumina separation. 168
Iron ores, Stone valley, Penn. [illegible]
Iron, Philippines. 466, [illegible]
Iron [illegible] pared by years. *1039, [illegible]
[illegible]
Iron production in "hard" times. [illegible]
Iron, Russia, and ore and steel. 1206, 1079
[illegible] 1026, 1072, 1123
[illegible]
Iron, Sweden, and steel. 776, 1022
Iron, United Kingdom. 39, 996, 1266
[illegible]
[illegible]
[illegible]
[illegible]

PAGE

Iron, Wrought, and steel tubing, Relative corrosion. 563, [illegible]
Iron pyrites, Large bodies of [illegible] underhand 365
Iron pyrites, U. S. production [illegible]
Ironaton, Ala., Operations at. *[illegible]
Isaacs, John D. 707
Isle Royale, Mich. 593, 557, 830, [illegible]
It copper mine, Alaska. 103, 1177
Ivory Hill mine, Penn. [illegible]

J

[illegible] 851
[illegible] Canadian Mg. Inst. [illegible]
James, Enoch, Death of. 1174
James, G. A. Pinchcock for burettes. *1155
James slimer, The. *1149
[illegible] Coal & Coke Co. [illegible]
January Mg. Co. 1024, 1116
Japan, Coal, Takashimi field. 288
Japan, Iron and steel imports. 42
Japan, Iron ore and pyrites [illegible]
Japan mineral production. 1095
Japan mining regulations. 32
Jasper County Light & Fuel Co. *[illegible]
Java, Petroleum production. 213
Jay, C. H. Cyanide chemist's [illegible]
Jeans, James S. 342
Jed Coal & Coke Co. [illegible]
[illegible], Nev. [illegible]
[illegible], W. H. [illegible]
Jeffries & Sutherland land, Wis. 302
Jeffrey coal washery, Dawson [illegible] Co.'s. *182
Jeffrey [illegible]wall machine *[illegible]
Jenner-Quemahoning Coal Co. 548
Jennie Gold Mg. Co. 688
Jennie June mine, Colo. 877
Jennie Sample Consol. 636, 1025
Jennings, E. P. Westby-Sorensen process. 418
Jennings, Sydney J. 1271
Jennison, W. F. 243
Jersey coal mine, Fighting fire. *86
Jesus Maria and Flores mills, Guanajuato. *[illegible]
Jesus Maria, Guanajuato. *116, *671, 807, *808
Jesus Maria mine, Sinaloa. 1278
Jig construction, Joplin dist. *126
Jig, Hancock, Palmerton, Penn. [illegible]
Jig or self-acting incline. [illegible]
Jigs, Coal-washing, Stewart; Luhrig. *[illegible]
Jigs, Pulsator, Richards. *621
Jim Butler mine, Nev. 493, 548, 980
[illegible] Mg. Co. [illegible]
[illegible] land, Mo. [illegible]
Johnnie Consol., Nev. 348
Johns-Manville "Leak-No." 1206
Johnson Coal Mg. Co. 1029
Johnson, H., on use of powder. 1222
Johnson, H. [illegible]
Johnson, J. W., & H. C. Enos [illegible]
[illegible], Nev. [illegible]
Johnson, P. Sampling. 114, *951, 142, 238, 291, 338, 431, 631, 776, 917, 1018, 1111
Johnson, Ralph, Death of. 437
[illegible] Notes on Rand [illegible] 324, 526, 902, 1010
Jones, Edwin H., Death of. 1174
Jones, F. A. Sylvanite, N. M. *1101
[illegible] *[illegible]
Joplin dist., Mill construction. *125, *993
Joplin dist. mines, Power systems. 327
Joplin district, Pumping problems. *214
[illegible]
Joplin dist., Use of natural gas. *568
Joplin dist., Zinc mining. 383
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Juarez mine, Santa Eulalia. *35
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

K

Kara Bournou mine, Turkey. 85, *601, 1225
[illegible] chromium [illegible]
[illegible] *[illegible]
Katanga railroad building [illegible] 727, [illegible]
[illegible]
[illegible]

PAGE

Keane Wonder, Nev. 101, 199, 301, 443, 487, 1069, 1074
Keating Gold Mg. Co. 1276
Keighley, Thos. A. 588
Keith, W. S. 388, 825, 1271
Keller, H. A. Copper River dist. 680
Kelley slag and matte casting machine. *610
Kelly, N. M., ore deposits. *366
Kendall mine, Nev. 301
Kenosha mine, Calif. 544
Kenvir Coal Co. 493
Kepner, T. E. R. R. grants on mineral lands. 1113
Kern County G. M. Co. 545
Kern River Power Co. 1069
Kerr, James, Death of. 921
Kerr, John, Death of. 437
Kerr Lake Crown Reserve. 153, 251, 394, 518, 595, 636, 856, 1076
Kerr Lake mine, Ont. 636, 786, *856, *973
Kerr, Mark B. 342
Kerry Mg. Co., Ont. 1278
Keuffel, W. J. D., Death of. 734
Kewanas property, Nev. 347
Kewanee dist., Calif. 147, 874
Keweenaw mine, Mich. 49, 105, 299, 546, 686, 830, 979, 1179
Key West mine, Nev. 23
Keyes, C. R. Lead and zinc, Miss. valley. 1004, 1017
Keystone gasolene-driven drills. *959
Keystone-Holy Terror, S. D. 688, 1075
Keystone mine, Calif. 780, 876
Kidder's Architect's, etc., Pocket Book. †96
Kimber, W. E., on drill steel. 540, 672
King, Cardenio F. 728
King David Mg. Co. 393, 444, 640, 928
King Edward mine, Ont. *856, 1076
King, Peter. 828
King Philip mine, Mich. 593, 783
King, S. B. Multiple arrangement of drills on Rand. 538
Kingston Coal Co. 968
Kinta, Société des Etains de. 372
Kinzie, Robert. 512
Kirby, Edmund B. 437
—Human side of engineering. 131, 147
Kirby, J. 243
Kirkwood gas burner. 568
Klau quicksilver mine, Calif. 735
Kleinfontein mill. 407
Kleinfontein mine, Underground conveyers. 715
—Hoisting engines. 1056
Klepetko, F. 130
Klondike High Level Gravels, Gold Values. †241
Klondike vein, Coeur d'Alene. *68
Knickerbocker Portland Cement Co. 688
Knight, C. W. Montreal river and Temagami reserve. 712
Knight, E. C. 634
Knight, Jesse. 152, 445, 628, 682, 734, 874
—Companies' statements. 438, 875
Knight, J. Will. 734
Knights Deep, Transvaal. 410, 1176, 1190
Knowles, S. A., et al. Tunneling. *757, 773, 918, 971, 1066, 1111, 1112
Knowlton, J. W. Coke mfr., northern West Va. 426
Knox, H. H. 1121
Knoxville & Sevierville R. R. 107
Koch, W. E. Alumina in slags. 730
(For rest of discussion see "Alumina.")
Koepe system hoisting—Whiting's method. 1014
Kokshan, Wong. 99
Kolar goldfields, Mining costs. 515, 566
Koniah, Asia Minor, mercury mines. *601, 85
Koppel improved mine car. *532
Koppers, H 634
Korean mining laws. 395
Kraemer, Edward L. 1174
Kuehn, A. F. 779
Kuhn's coal-cutting machine. 688
Kümmel, H. B. N. J. Report. †732
Kunz, Geo. F. 825
Kyshtim Corp., Ltd. 1121

L

La Abundancia. See "Abundancia."
La Fortuna, Mex. 252, 1076
La France Cop. Co. 347
La Gloria, Mex., sampling device. *122
La Reina mine, Mex. 201
La Republica, Chihuahua. *161, 162, 201, 252
La Rose mine, Ont. 51, 302, 394, 518, 689, *855, *856, 881, 929, 1030, 1277
La Union, Hacienda de, Metallurgical practice. *989, 1017, 561, *653, 1246
La Union mines, near Parral, Mex. *116
Labor affairs, Coal-mining. 148, 253, 335, 344, 390, 430, 439, 481, 495, 550, 590, 595, 635, 638, 738, 820, 828, 882, 978, 1024, 1069, 1072, 1078, 1128

PAGE

Labor and accidents, B. C. coal mines. 89
Labor and wages. Santa Eulalia. *34
Labor and colliery disasters. 18
Labor at Mysore, Costs. 515
Labor—Colliery boys' wages. 769
Labor costs on Rand. 566
Labor, Eight-hour, British collieries. 92
Labor, Eight-hour, Transvaal 958
Labor History, Cripple Creek. †341
Labor, Mexican. *666, *671, 752
Labor, Mine, and supplies in Mex. *1245
Labor—Safety of coal mines. 337
Lac La Rouge dist. discoveries. 252
Lackawanna Steel Co. 1227
Ladd, J. B. Charging machine. *867
Ladders, Mine—Note. 382
Laguna mine, Nev. 443, 594, 784, 1028, 1125, 1180, 1228
Laird, Geo. A. 145
Lake City Colo., copper-ore strike. 1070
"Lake copper," Judicial definition. 842, 1022
Lake Creek district, Wyo. 36
Lake mine, Mich. 346, 638, 686, 783, 979
Lake iron-ore traffic. 142, 620, 868, 1184 1232
Lake ore carriers, Size of. 1173
Lake Superior cop. companies' production costs. 557
Lake Superior iron-ore dock, An. 1049
Lake Superior Mining Institute 97
Lamar Oil and Gas Co. 1178
Lamb, M. R. Horseback, western Chihuahua. *159
—San Rafael mill. *325, 730
—Hacienda Buburon. *663
—Ancient plants, Guanajuato. 681
—Notes on air agitation. *901, 1116
—Labor and supplies in Mex. *1245
Lamp oils—Missouri law. 1091
Lamp tests—Miners' eyesight. 1012
Lamps, Acetylene, in mines. 967
Lamps, Arc—Note. 1062
Lamps, Notes on. 186, 480, 627, 769, 861, 968, 1015, 1252
Lamps Safety—Legal decision. 536
Lampe estate, Mineral Point, Wis. 982
Lane, J. F. 869
Land, Mineral, decisions, Justice to miner in. 189
Land, Mineral in New York. 1114
Lands, Forest. 827, 915, 1050, 1065
Lands, Mineral, R. R. grants on. 1113, 923, 474
Lands, Phosphate, Western, Withdrawal. 1214
Lands, Public, Conservation of. 339, 1172, 1217
Landecker Mg. Co. 146
Landers, W. H. 1023
Landings, Safety device for. *124
Landrum, C. W. 295
Lanyon zinc smelter, Kan. 783
Larder Lake district. 297
Larder Lake Prop. Goldfields. 1031
Las Chispas mines, Sonora, Mex. *1006, 1161
Las Vegas, Nev., and vicinity. *1204
Laschinger, E. T. 662
Lash electric steel-making process. 419
Last Chance mine, Coeur d'Alene. 140
Laszczynski copper process. 1218
Lateritic decomposition. 128
Lathe, Frank E., Medal for. 93
Laughlin, G. McC., Death of. 1222
Laurentian mine, Ont. 494
Law, Hepburn. 582, 584
Law, Ill. coal-miners' certificates. 102
Law—Locating on railroad ground. 434
Law, Mining, Short talks on. 81, 117, 168, 212, 281, 363, 460, 527, 570, 775, 822, 851
Law, Ohio blasting. 50, 762, 823
Law, Ontario—Mining flotations. 1195, 1225, 1273
Law—Safety-lamp decision, W. Va. 536
Laws, Accident, various States—Summary. 1088
Laws—Electricity in coal mining. 1106
Laws, Indiana. 46, 195, 245, 249, 638, 690, 788, 828, 976, 1099, 1124, 1232
Laws, Mining Uniformity in—Pittsburg conference. 1054
Laws, Mexican, Proposed, etc. 240, 246, 252, 303, 385, 390, 484, 655, 677, 679, 680, 833, 865, 1025, 1230
Laws, Oklahoma mining; colliery. 728, 729
Laws, Penn.—Miners' certificates. 787
Laws—W. Va. regulations. 776
Lawrence, H. B., sampling works. 881
Lawson, Thos. W. 772
Lawson mine, Cobalt, Ont. 51
Lea-Degen turbine pump. *1005
Leach, F. A. Refining gold-silver bullion. 733
Leaching apparatus. Freygang's. *227
Leaching copper, Jumau process. 132
Lead, Altar dist., Mex. *71
Lead and ore tariff. 1024, 1069, 1070, 1118, 1221, 1262, 1268
Lead and spelter market. 40
"Lead and Zinc in the U. S." †129
Lead and zinc mining, Iowa. 805
Lead and zinc, Miss. valley, Distribution. 1004, 1017

PAGE

Lead and zinc ores in Missouri—Methods and costs. *605
Lead and zinc smelting, Silesia. *265
Lead, Antimonial, production, U. S. 620
Lead assay, Chromate-oxalate. 77, 324
Lead, Australasia 143, 1021
Lead, Broken Hill—Mines; metallurgy. *793, 893
Lead, Coeur d'Alene, north side. *65
Lead Crown group, Calif. 737
Lead, Determination of, in spelter and ore. 178
Lead-furnace crucible, Removing accretions. *763
Lead furnaces—Robinson tuyere. *756
Lead, Mechernich, Prussia, mining. *169
Lead, Miami dist., Okla. *910
Lead mining and smelting cost, Spain. 329
Lead-ore contracts, smelter's standpoint. *74, 189, 317
Lead ore, Purchasers of. 778
Lead, Philippines. 706
Lead production, Germany. 436
Lead — Selby — Handling bullion; bag-house; gas disposal. *83, *451, *604
Lead-silver mines, Santa Barbara. *207
Lead-silver smelting, Cost of. 315, 585
Lead, etc., smelting charges. 827, 960, 969
Lead, United States consumption. 863
Lead, Volumetric estimation. 77
Lead, Western mines—Notes. 24, 31, 85, 175, 239, 240, 269 275
Lead, World, in 1906. 128
Leak-No. 1206
Leas, F. A. Regenerative reverberatory copper furnace. *898
Leases, Canceling—Legal decision. 1223
Leases, Law of. 571
Leavitt, T. J. 145
Lecompton mine, Calif. 194, 591, 637, 977
Lees, W. H., Death of. 44
Lefevre, Henry F. 974
Leggett, T. H. Rand costs. 565, 566
Lehigh University, Conferring degrees. 188
Lehigh Valley Coal Co. *3, 485, 493, 723
—Report. 719
Lehigh & Wilkes-Barre Coal Co. 107, 334
"Lehrbuch der Bergbaukunde." †96
Leighton, M. C. Misleading estimates. 866
Leith, C. K. Iron Ores, Utah. †632
Lemon mill, Manhattan, Nev. *1002
Lena Goldfields, Ltd. 246, 1025
Leonard land, Mo. 593
Leones group, Mex. *71, 72
Levels, Laying out, Broken Hill. *801
Lewis, Thomas L. 1174
Lewis, W. T. 588
Lexington mine, Mont. 347
Leyner drill discussed. 484
—Use in Hot Time lateral. *757, 773, 918, 971, 1066, 1111, 1112
Leyson, Geo. 869, 1222
Liberty Bell, Colo., Mining costs. 515
Licenses, Law of. 570
Liens, Law of. 851
Liévin coal-dust tests. *10
—Shaft sinking—Cementation. *221
Lighting system, A separate. 1062
"Lime and Cement Resources, Mo." †920
Lime cartridges. 186
Lime grains, Size for cyaniding, etc. 294, 292
Limestone, Birmingham dist. *1047, *1085
Linares Lead Mg. Co., Ltd. 329
Lindeman, E. Iron ore, Canada. 419
Lining. See "Furnace," "Converter."
Lining-up timbers in inclined shafts. *612
Linton, Robert. 243
Lion Hill Consol., Utah. 981
Lippincott, J. B. Fast tunnel driving. 1199
Litchfield Fdy. & Machine Co. 726
Little, Arthur D., laboratory. 817, 858, 862
Little Cahaba Coal Co. 737
Little Florence, Goldfield. 101, 147, 245, 250, 487, 492, 593, 780, 879, 922, 980, *1096, 1180
Little Grizzly mine, Colo. 1020, 1169
Little Jonny. See "Ibex."
Little Nipissing mine, Ont. 445, 786, 833, *856, 929, 1030
Little Princess mine, Joplin dist. 328
Liveing's electrical indicator. 627
Livermore, T. L. Calumet & Hecla cop. 1022
Lloyd, G. C. 1222
Lloyd, R. L. 243
Loading a blast hole. *433
Loading blast holes. 918, *757, 773, 971, 1066, 1111
"Locality," Meaning of—Mine taxation. 636
Locations, Law of. 81, 117, 168, 212, 281, 363, 434, 460, 527, 570, 775, 822, 851
Locators, Junior, Rights of. 775, 822
Lockhart, Thos. G. 101, 147, 487, 780, 922, 1223
Locomotive. See also "Electricity."
Locomotive, Electric, Dos Estrellas. *466
Locomotive, Oil-burning, in coal mine. 428
Locomotive train, Dumping waste with. *711
Locomotives, Baldwin-Westinghouse. *26
Locomotives—Underground haulage. 859

Page
Lode locations, Law of. 212, 281, 365
Lodi, Nev., Smeltery for. 50
Loftus-Davis Federated Mines Co. 101
Lomb, Henry, Death of. 44
Lonaconing mine, Colo. 592
Lone Star mine, Calif. 737
Lone Star group, N. M. 174
Long & Derry, Colo. 491
Longwall, in Eng., Cost of. *964, *1101, 1110
Longwall methods of mining coal seam. *19
Longwall system, Seaton-Delaval. *765
Longyear, J. M. 1012
Loon lake, Ont., discovery. 252
Loranskite. 1100
Lord, Chas. K., Death of. 588
Loreto mill, Mex. *651
Losses, mining flat coal seams. *138, *284
Louttit, Henry. *1164
Low, A. H. Lead assay. 77, 324
Low, A. P. 869
Lower Mammoth mine, Utah. 548, 740
Lubricant, Rope. 334
Lucky Boy mine, Nev. 975, 1126
Lucky Strike, S. D. 200, 640
Lucky Tiger Gold Mg. Co. 52, 549
Luella Coal & Coke Co. 1030
Luhrig jigs—Coal washing. *182, 424
Luipaardsvlei Estate. 436, 466, 582, 662, 759, 1217
Lustre Mg. & Smg. Co. 252
Luther, Edwin C. 588
Lutosa, J. Manganese, Morro de Mina. *1196
Lydia Glenorchy mine, Rhodesia. 457
Lynch, G. E. Coal-cutting machinery **operation.** 530, 1112
Lyon, Chas. E., Death of. 115
Lyon, Dorsey A. 971
Lyon, Frederick. 44
Lysle, Addison J., Death of. 1174

M

McBryde, Patrick, Death of. 1271
McCaffrey, Richard S. 825
McCallie, S. W. Ga. Fossil Iron Ores. †920
McCaskey, H. D. Metal prod., N. C. 485
McCluskey, R. 342
McConnell, R. G. Klondike Gravels. [illegible]
McCormack, J. C., Co. 875
Macoun, J. A. 976
McCreedy tin mine. 992
McCullough, E. "Reinforced Concrete." †241
Macdonald, B. Cyanide Correspondence Club. 681
McElroy, L. A. 634
McFarlane, G. C. Sinking winze with long holes. *713
—Hydraulic air compressor. *716
McKay, Alexander. 541
Mackay, John W.—Statue. *119
Mackey mine, Colo. 248
McKenna, C. F. A. I. Chem. Eng. 133
Mackenzie, J. H. *467
McKinley Darragh, Ont. 445, 518, 636, *856, 1278
McKinnon, W. S., Death of. 1068
McKirahan, Samuel. 1271
Maclaurin, R. C. 1023
McNamara lead mine, Blair, Nev. 1228
MacNamara mine, Tonopah. 151, 251, 301, 444, 493, 547, 594, 739, 832, 871, 1277
Masquisten, De Bavay vs. 778
Masquisten tube, Improved. *23
McVicker, John. 1271
Macadam, California production. 731
Mace, Henry. 1068
Machine drills for stoping. Reply. 484
Maconi, Mex. *665
Madagascar production. 850, 1173
Madem claim, Wyo. 36
Magdalena, N. M., ore deposits. *366
Magistral mine, Jalisco, Mex. 982
Magistral Ameca Mg. Co. 1182
Magistral mine, Zacatecas, Mex. *401
Magnalium, aluminum-magnesium alloy. 526
Magnesite brick. 1087
Magnesite, Calcined, Sellers of. 293
Magnesite, California. 242, 387, 731
Magnesite, Calif.; duty asked. 589
Magnesite industry, Greece. 80, 962, 201, 1217
Magnesite in the U. S. [illegible]
Magnesite—Use for linings; analyses; sources, production by [illegible] 80
Magnesite, Use and value. [illegible]
Magnesium in brass. 1022
Magnesium, Market for. 824
Magnetic oxide in slags. 1264
(For related discussion see "Alumina.")
Magnolia Lead & Zinc Co. 680
Magnus, Benjamin. 342
Mainhart, George. 115
Majestic, Utah. 45, 152, 780, [illegible]
Majestic mine, Joplin dist. 328
Mala Noche mine, Mex. *163, *165
Malaya, Mining lode tin in. 371
Mammoth Channel Mg. Co. [illegible]
Mammoth Cop. Mg. Co. [illegible] 487, 490, 782
Mammoth mine, Tintic, Utah. [illegible]
Mancayan copper mines. 706
[illegible]
[illegible]
Manganese and chromium detection. 322
Manganese deposits, Morro [illegible] Brazil. *[illegible]
Manganese in Calif. 387
Manganese ore, Brazilian exports. 303
Manganese ore in Tex. and Market. 919
[illegible]
[illegible]
[illegible]
Manganese, Russia, during 1907. 764
Manhattan Consol. G. M. Co., Colo. 45
Manhattan mine, Leadville, Colo. 638, 783
Manhattan, Nevada. *1002
[illegible] 199, 348, 739
[illegible] W. G. [illegible]
Manning, J. F. 245
Mansfeld slag, Analysis of. 274
[illegible] Cop. Co. [illegible]
(For discussion see "Slags.")
Maps, Mine—Missouri law. 1090
Mappings, Geological, of mine workings. [illegible]
Marble dust or flour, Market for. 1114
Marcel Mines Co., Ont. 1076
Margaret mine, Colo. 249, 441
Marianna explosion. 1109, 1129, 1168, 1171, 1263
—Facts concerning. *1162
Mariposa, S. D. 251, 1277
Mariposa Consolidated & Mg. Co., S. D. 422, 737
Mark[illegible], John. [illegible]
Marsh, Alfred, Death of. 1068
Martin Coke Works, Penn. 1029
Martin, G. A. Sylvanite, N. M. 962
Martin, H. Stuart. 388, 482
Martin's Mining Law. 775, 822
Mary McKinney mine, Colo. 104, 195, 1224
Marysville Gold Dredging Co. 146, 1087
Masonic Golden Cycle Mg. Co. 1274
Mass Consol., Mich. 346, 557, 686
Massachusetts Inst. of Tech. 1023
Mastin land, Joplin dist. *215
Matchless mine, Colo. 1123, 1176
Mathewson, E. P. Smelters at Anaconda. 130
—Machine sampling. 338, 631, [illegible]
(For rest of discussion see "Sampling.")
—[illegible] Note. 75
Matte value, Table for calculating. 291
Matton, J. Lead production, German. 436
May, Chas. A. 869
Maumee mine, Colo. 638
May Day Mg. Co. 45, 195, 343
Mayer, L. W. Advantages of flushing. [illegible]
—Longwall methods of mining. *19
—Lead mining, Mechernich. *169
—Flushing Gute Hoffnung mine. 283
—Hematite mines, Cumberland. *357
—[illegible] *[illegible]
—South Staffordshire [illegible] *[illegible]
—Methods, Seaton-Delaval colliery. *765
—[illegible] *[illegible]
—Illumination in mines. 967
Mayflower vein, Bingham. *1193
Maynard Coal Co. 928
Maynard, G. W. N. W. Altar mines. *71
—Analysis of Roman bronze. 386
Maypole colliery explosion. 485, 494
Mazuma Hills mine, Nev. 443, 785, 1228
Meade, E. S. Price maintenance. 289
Meade, R. K. "Small Chemical Laboratories." †732
Meadow Run Coal & Land Co. 981
"Mechanical Engineering of Collieries." †1219
"Mechanical Engineering of Steam Power Plants." [illegible]
Mechernich, Prussia, Lead mining. *169, 283
[illegible]
Meljnan, F. Grecian magnesite. 730, 962
Meissner, Carl. 860, 864
[illegible]
[illegible]
Mercury. See also "Quicksilver."
Mercury detection in nitroglycerin [illegible]
Mercury mines, Koniah, Asia Minor. 601, 85
[illegible] W. Death of. [illegible]
Merrill, C. W. Operating costs, Home[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] H. W[illegible] [illegible]
"Metallurgy, Practical." T. Turner. †632
Metric system, Philippine Islands. 1202
[illegible] tion of bismuth. 115
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] 677, 679, 680, 833, 865, 1025, 1230
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] vested capital. 770, 808
Mexico Consol. 1230
Mexico, Cyanide Correspondence Club. 681
Mexico, Cyanide practice, Caldecott on. 654
Mexico—Hacienda La Unión. *993, 1017
Mexico, Metal production of. 655
Mexico, Mine labor and supplies in. *1245
[illegible]
Mexico, Mining in—Comment on articles. 677
[illegible]
Mexico—Nacozari; Las Chispas. *657, *1006, 1161
[illegible]
[illegible]
"Mexico, Official Mg. Directory." †920
[illegible]
Mexico, Present condition of mining in. 655
[illegible]
[illegible]
Mexico. By C. T. Rice—Santa Eulalia dist. *33
[illegible]
[illegible]
[illegible]
—Silicious silver mines, Parral. *276
—Peñoles Co., Mapimi. *309, *373
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
—Cyanidation, silver ores, Pachuca. *647
—Guanajuato, the great silver camp. *669
[illegible]
[illegible]
—Cyanide mills, Guanajuato Devel. Co. *947, *997
[illegible] western Chihuahua. *159
[illegible]
[illegible]
—Ancient plants, Guanajuato. 681
[illegible]
[illegible]
Meyer & Charlton mine. 539
Meyer, Franz. 1068
Miami Co., Ariz. 298, 637, 737
Miami lead and zinc dist., Okla. *910
Mica, Marketing of. 293
Mica, Brazilian exports. 303
Mica, North Carolina. 94
Michigan copper companies' production [illegible]
[illegible]
[illegible] 639, 878
Microlite. 1100
Middle Fork mine, Calif. 637
Midland Dist. Miners' Relief Asso. 334
Midnight mine, Idaho. 249
Miles, J. B. Blast-furnace practice. 725
[illegible]
Mill construction in Joplin dist. *125, *993
Mill sites, Law of. 212
Miller, J. P. 342
Miller, W. G. Geology of Cobalt. 711, †777
Millionaire mine, Colo. 636
Mina del Agua, Mex. *208
Mina Gruto de Monte Cristo. 1278
Minas Pedrazzini Company. *1006, 1161
[illegible]
[illegible]
[illegible] Ont. 875
[illegible]
[illegible]
[illegible]
[illegible]
"Mineral Industry." Vol. XVI. 383, †870
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

PAGE

Misleading estimates. 727, 866, 1066
Mississippi valley, Lead and zinc. 1004, 1017
Missoula Copper. 1027
Missouri, Lead and zinc ores. Methods and costs. *605
"Missouri, Lime and Cement Resources." †920
Missouri mine-safety laws. 1090
Missouri, Randolph co., Coal mining. *6
Mitchell, John, on colliery accidents. 1167
Mitts, W. J. 682
Mobile Portland Cement Co. 47
Moctezuma Cop. Co. 52, 303, 549, *657, *660, *661, 1161, *1006, 833, 982
—General account. 1242
Moddersfontein. 180
"Modern Practice in Mining"—Coal. †1219
Moffat, A. D. 779, 781
Mohawk Combination lease, Nev. 49, 106, 301
Mohawk Jumbo, Nev. 296, 300, 393, 492, 826, 1073
Mohawk Mg. Co., Nev. 297, 589, 975, *1097, 1098, 1120
Mohawk Mg. Co., Mich. 43, 49, 557
Mohr on origin of coal. 239
Molds, Bullion, Selby smelter. *83
Molybdenite and chalcoprite separation. 824
Molybdenum and its minerals. 1055
Molybdenum ore, Market for. 293, 778
Monaci, F. P. Turkish quicksilver mining. 85
Monahan, L. C. 193
Monarch, Atlanta, Idaho. 177
Monarch, Coeur d'Alene. 197, 878, 1275
Monazite in the Carolinas. 725
Monazite-sand exports, Brazil. 303
Mond, Robert. 974
Monel metal. 1256, 933
Monitor, Ida., Mont. 249, 784
Monmouth M. & L. Co.—Fluorine mine. 344, 391, 924
Mono Baltic Co., Colo. 1178
Monongah explosion, Notes on. 332, 1168
Monongahela Riv. Consol. C. & C. Co. 200, 444, 928, 1059
Mono-rail system, Proposed, Kleinfontein mine. 715
Monroe-Tener iron mine. 97
Monster mine, Calif. 1223
Montana Coal Fields, Geol. Surv. †1115
Montana Consol. Mg. Co. 492, 784
Montana Gold Mtn. Mg. Co. 151, 439, 683
Montana & Mex. Mg. Co. 807
Montana Mine Owners' Asso. 195, 389
Montana mine-safety laws. 1091
Montana mineral production, 1907. 1224
Montana, Sapphire production. 736
Montana-Standard (See also "Standard.") Ida. 442, 927
Montana State School of Mines. 542
Montana-Tonopah. 151, 493, 547, 594, 832, 871, 1181, 1224
Monte Cristo group, Nev. 1228
Monte Cristo, Mina Gruto de. 1278
Montezuma Lead Co. *207, *469
Montgomery-Goldfinch, Colo. 545
Montgomery Mountain mine, Nev. 1180
Montgomery, Samuel B. 1271
Montgomery-Shoshone, Nev. 251, 301, 981, 1074, 1180
Montreal river area. 712, 1070
"Moody's Manual of R. Rs.," etc. †632
Moore, E. D. 49
Moorhead, W. J., Death of. 634
Morcom, Eli, Death of 1119
Morenci, Ariz. 271
Morgan, Donald R., Death of. 295
Morin, L. Shaft sinking by cementation. *221
Morning mine, Coeur d'Alene. 48, 140
Morro de Mina, Brazil, Manganese. *1196
Morro Velho mine, Brazil. 98, 1010
Morrow, H. B. 541
Morse, Willard S. 682
Mortar block, Concrete, Goldfield Consol. *469
Morton, W. J., and Temagami-Cobalt Mines, Ltd. 631, 628, 773
Moruya mine, Australia. 1161
Morydena mine, Calif. 829
Moses mine, Mo. 593
Mott, Leslie C. 779
Motor. See "Electric," "Locomotive."
Mounier prop. *1260
Mt. Bischoff mine, Tas. 144
Mt. Lyell mine, Tas. 144
—Costs; report. 166, 372
Mt. Morgan G. M. Co., Ltd. 339
—Ore treatment. 1161
Mt. Royal, Ont. 1182
Mt. Tritle Cop. Co. 737
Mountain Cop. Co., Calif. 1149, 1272
Muffle making, Silesia. *267
Mule haulage, flat seams. *138, *287
Mules, Mine, and their care. 25, 859
Multiple drill arrangement on Rand. 538
Mungall, Wm. 342
Murphy drill discussed. 484
Murphy land, Kan. 783
Murray, M. D. 682
Murray tunnel project. 1120
Murray, W. F. Coal washery, Colo. *1248
Murray, W. T. How to sell a mine. 585
Mushett lease, Laguna mine, Nev. 594, 784, 1028, 1180
Myslowitz colliery, Silesia. *890
Mysore, Gold-mining costs. 515, 566

N

Nacozari Consol. Cop. Co. 303, *659, 1127
Nacozari mining dist., Sonora, Mex. *657, 1161, *1006
Nancy Helen mine, Ont. 518, 786, *856, 929
Napias Placer Mg. Co. 491
Naramore, Chester. 921
Narcissa, Okl., ore strike. 349
Narvaez, F. Metallurgical practice, Hacienda de la Union. *989, 1017
Nash, F. W. 780
Natal, Colliery fatalities. 1209
National Asso. of Cement Users. 1271
National Bank mine, Nev. 443
National camp, Nev. 785
National Conservation Commission, etc. 336, 339, 583, 1168, 1172, 1217, 1265
—Geol. Surv. estimates. 727, 866, 1066, 1172
National Mex. M. & D. Co. *71
National Mg. & Invest. Co. 492
Natoma Devel.; Natoma Consol. 683, 1175, 1216, 1223
Natural gas. See "Gas."
Natural resources, Conservation of. 336, 339, 583, 288, 1168, 1172, 1217, 1265
—Water powers. 727, 866, 1066, 1172
Nautanen Kopperfaelt. *867
Nayal mill, Mex. *947
Neill process. 419
Nelms, H. J. Coal mining by retreating room-and-pillar system. *17, *1251
—Electricity in coal mining. 1106
Nevada Commonwealth mines. 1069
Nevada Consol. 301, 548, 677, 981, 1116
—Reports. 972, 1095
Nevada county exhibit, San Francisco. 100
Nevada-Douglas Cop. Co. 785, 831, 975
Nevada Eagles. 1125, 1175
Nevada-Empress mine. 347
Nevada Gold Dredging Co. 119
Nevada Hills mine, Nev. 1074
Nevada Mining Companies, Todd's Handbook. †241
Nevada mineral output, Half year. 923
Nevada, Nickel-copper-platinum ore. 72
Nevada, Nickel ore. 23
Nevada, Oil prospects. 1110, 245, 826, 1120, 1175, 1272
Nevada, Prospectors and prospecting. 1053, *1096, *1157, *1203, 1216
Nevada United Mines. 785
Nevada Univ.—Statue of Mackay. *119
Nevada Wonder. 831, 1126
Nevley Thomas mine, Calif. 544
New Caledonia production. 803, 1173
New Campbellton coal mines. 344
New Castle, Colo., gold strike. 344, 390
New Chum Ry. Co. 143
New Connellsville C. & C. Co. 832
New Departure Mg. Co. 784
New England Ariz. G. & C. Co. 490
New England & Clifton Cop. Co. 423
New Idria mine, Calif. 1161
New Jersey, Manganiferous zinc ores. 293
New Jersey State Geologist's Report. †732
New Jersey Zinc Co. 175, 1220
New Liverpool Salt Co. 913
New Mex. mining accidents. 90, 1207
New Mex., Rich coalfields. 1251
New Mex., School of Mines. 388
New Modderfontein. 82, 711, 801, 842, 1217
New Monarch Mg. Co. 248, 299
New Rand, Ltd. 992
New River C. & C. Co. 200
New Salt Syndicate. 564
New South Wales. See also "Australasia," "Australia."
New South Wales elec. commission. 966
New South Wales Geol. Surv. †1115
New South Wales mineral output. 719
New South Wales, Tin. 144, 582
New State mine, Okla. *912
New Year Gold Mg. Co. 1125
New York & Ariz. G. & C. Co. 298
New York mine-safety laws. 1093
New York, Mineral land in. 1114
New York, Mining and Quarry Industry. *241
New York State, Stripping Clinton iron ore in. *1150
New Zealand mining, etc. 143, 481, 668, 730, 913, 1160
New Zealand, Coal. 724
New Zealand, Colliery fatalities. 1210
New Zealand Crown Mines, Ltd. 1225
New Zealand Geol. Surv. bulletin. †1115
Newark Mill & Mg. Co. 1181
Newcomb, Clive B. 99, 193
Newcomer, J. B., Death of. 1068
Newfoundland, Tilt cove, Pyritic smelting. *462, 482
Newhouse M. & S. Corp. 444
–Cactus Club. *1189, 1216
Newhouse, Samuel. 488, 975, 976, 980
Newhouse tunnel, Colo. 147, 636, 1024
—Advancing Hot Time lateral. *757, 773, 918, 971, 1066, 1111, 1112, 1273, 1275
Newland, D. H., Mining etc., Industry, N. Y. †241
Newman, W. G. 393
Nicholls, F. S. Pyritic smelting, Tilt cove. *462, 482
Nichols, W. G. 145
Nickel Co., International. 70
Nickel discoveries in Canada. 252, 297
Nickel ore, Calif. 589
Nickel ore in Nevada. 23, 72
Nickel ore, New Caledonia. 1173
Nickel production, Evje works. 410
Nicolardot, P. "Metaux Secondaries et Terres Rares." †1219
Nigel Co., Transvaal. 540
Niobium. 960
Nipissing mine, Ont. 51, 201, 252, 302, 394, 518, 595, 636, 741, 786, *855, *856, 1076
Niter deposits Calif. 876
Nitrate Chilean, statistics. 217
Nitric acid from air. 892
Nitroglycerin compounds — Mercury detection. 823
Nitrous compounds, Fumes from. 724
Norambagua mine, Calif. 544, 591, 637, 737
Norman iron mine. 97
North American Asbestos Co. 394
North American hydraulic mine. 146, 244
North Atlantic Collieries. 394
North Broken Hill Co. 753, *793, 893
—Report. 867
North Butte, Mont. 43, 546, 555, 556, 1073
North Butte Extension. 49, 151, 542, 593, 739, 826, 879, 923, 1069, 1120, 1176
North Butte Mountain, Mont. 593
North Carolina, Mica. 94
North Carolina, Metal production. 485
"North Carolina, Mining Industry of." †632
North Carolina, Minor minerals. 321
North Dak. Coal Fields, Geol. Surv. †1115
North Lake Mg. Co. 346, 546
North Star, Grass Valley, Calif. 683, 1156, 1223
—Dumping waste with loco. train. *711
North Star mine, Colo. 102
North State Mg. Co. 548
North Utah Mg. Co. 542, 640, 781
North Witwatersrand G. M., Ltd. 340
Northern Calif. Power Co. 871, 1161
Northern Colo. Coal Co. 592
Northern Colo. Coal Operators' Asso. 779
Northern Colo. M. & M. Co. 1026
Northern Light & Power Co. 871
Northern Pyrites Co. 394
Northwestern Improvement Co., Mont. 1073, 1125, 1227
Northwestern Improvement Co., Wash. 680
Norton, J. P., Gold situation. *1037
Norway, Iron-ore statistics. 1234
Nova Scotia coal mine, Operating a. *624
Nova Scotia mine, Ont. 518, 786, *856, 1076, 1230
Nova Scotia Steel & Coal Co. *424, 1031
—Report. 242
—Fighting fire. 858
Nova Scotia Technical College. 486
Nundydroog mine, India. 516, 566
Nymo mine, Mo. 327
Nystrom, E. "Peat and Lignite." †341

O

O'Brien mine, Ont. 252, 518, 689, *855, *856
O'Hara mine, Calif. 296, 345, 1083
O'Reilly, Rev. H. F., Death of. 1068
Oaxaca Sm. & Ref. Co. 303, 595
Ocampo, Mex. 160
Occidental mine, N. S. W. 957
Ocher, Yellow, in Calif. 387
Octave Mg. Co., Ariz. 196, 423, 490, 1177
Odin, W. F. 541
Offerhaus, C. Operation of Anaconda copper converter. *747
Ohio-Beaver Creek, S. D. 1127
Ohio blasting laws. 50, 762, 823
Ohio Cop. Co. 343, 389, 394, 485, 736, 781, 923, 1127, 1191, *1194
Ohio-Kentucky Mg. Co. 101
Oil. See also "Petroleum," "Shale," "Lamps."
Oil-burning copper furnace. *898
Oil-burning locomotive in coal mine. 428
Oil, Cylinder, Test for. 164
Oil field, Caddo. 1266
Oil, Fuel, system, Alaska Treadwell's. 713
Oil, Insulating. 32, 334
Oil lands—Mining-law talks. 363
Oil, Mine-lamp—Missouri law 1091
Oil pipe line, Rifled, Calif. 707
Oil process. See "Elmore," "Flotation," etc.
Oil prospects, Nev. 1110, 245, 826, 1120, 1175, 1272
Oil-residue output, Calif. 713
Oil well, Burning, Vera Cruz. 445, 494, 681, 689

PAGE

Oil wells, Chihuahua, Mex. 852
Oils, Lubricating. Notes. 769
Oilfield, New, California. 1195
Ojibway Mg. Co. 105, 198, 392, 831, 978, 1072, 1124, 1179, 1227, 1275
Ojuela mine, Mapimi, Mex. *309
Oke, A. L. New sampling device. *122
Oklahoma Geological Survey. 137, 486
Oklahoma, Miami lead and zinc dist. *910
Oklahoma mining laws; colliery. 728, 729
Old Bullion mine, Calif. 829
Old Dominion, Ariz. 271, 423, 1177
Old Town, Colo., etc. 757, 773, 918, 926, 971, 1066, 1111, 1112
Olinghouse mine, etc. 923, [illegible]
Oliver Iron Mg. Co. 97, 392, 681, 979
Olympia Co., Ont. 929
Ontario metal and mineral production. 900, 1202
Ontario minerals—Tyrrell's prize offer. 193, 321
Ontario mining flotations—Law. 1195, 1225, [illegible]
Ontario Silver Mg. Co., Utah. 781
Ooregum mine, Mysore. 516, 566
Opal, Australia. 115
Opex Consol., Utah. 874
Ophir claim, Mont. 1176
Ophir mine, Colo. 636, 1025
Ophir mine, Comstock. 94, 173, 301, 780
Options, Law of. 571
Orange Blossom mine, Calif. 103
Orangite. 1241
Ore bins, Goldfield Consol.'s. *470
Ore classes, Copper—Mining costs. 167
Ore concentration, Experimental work. *904
Ore Concentration Co. 636, 1121, 1169
(See also "British Ore Concentration Syndicate.")
Ore contracts from smelter's standpoint. *73, 180, 317
Ore deposits, Discovery of. 1215
Ore deposits, Magdalena, N. M. *366
Ore dressing by adhesion of liquid films. 839
Ore sampling. See also "Sampler," "Sampling."
Ore sampling and buying, Joplin. *190
Ore shoots at Butte, Mont. 226
Ore sorting, Cabrestante mine, Mex. *464
Ore stealing in Mexico. 666
Ore weighing in stamp mills. *804
Oreano property, Idaho. 927
Orford Cop. Co.'s Monel metal. 1256, [illegible]
Oriental Consol., Korea. 912
Original Consol., Mont. [illegible]
Oriskany Ore & Iron Corp. [illegible]
Ore Belle Mines Co. 103, 780, 782
Oro Fino, S. D. [illegible]
Orofino Co., Idaho. 830
Oro Hondo, S. D. 640
Orongo Circle mill No. 5. *993, [illegible]
Oroville, Calif., Hunter dredge. *417
Oroville, Dredging suits at. 100, 146, 438, 635, 922, 975, [illegible]
Orphan Copper Co. 728
Orsat apparatus. [illegible]
Osceola Consol., Mich. 43, 299, 442, 557, 736, 773, 842, 879, [illegible]
Oso Negro mine Mex. 303, *661
Otisse mine, Ont. 689, 881
Oven, Coke. See "Coke."
Overcasts in coal mines. *1106
Overholt Coal Co. 1030
Overton, A. J. 734
Ovitz, F. K. Volatile matter in coal. 720
Oxford Oil and Gas Co. 394
Ozark Lead Co. *214
Ozark uplift, The. 1004, 1017
Ozokerite, Market for. [illegible]

P

Pachuca. See also "Agitation."
Pachuca and Real del Monte silver dist. *[illegible]
Pachuca, Cyanidation of silver ores. *647, [illegible]
Pachuca, Features of mining. *[illegible]
Pachuca, Metallurgical processes. [illegible]
Pachuca, San Rafael mill. *325, [illegible]
Pacific Coast Borax Co. [illegible]
Packard, G. A. Mex. mining law. [illegible]
Page, W. N. Dust as factor in explosions. 1107, 1109
Paint material, Palagonite, Calif. [illegible]
Paints, Protective, for iron, To test. 471
Painter, Robt. K. 634
Palagonite paint material, Calif. [illegible]
Palmarejo Co., Mex. 163, 1278
Palmer, C. E. *672, [illegible]
Palmilla mine, Mex. *276, 278, 280, 485, [illegible]
Pan amalgamation mill, El Oro. *105
Pan-American Scientific Congress. [illegible]
Panel work. Mining flat seam. [illegible]
Panhandle smelter, Idaho. [illegible]
Panic and gold reserves. [illegible]
Paracale Miners' Asso. [illegible]
Parguy, E. W. [illegible]
Park, J. Cromwell subdivision, N. J. [illegible]
Parker, J. L. [illegible]
Parker, Richard A. 825
Parker's turquoise mine, N. M. *843
Parkhead colliery, Eng. [illegible]
Parkside mine, Eng. *358
Parr's tests, Ill. coal. 1014
Parral, Mex., Silicious silver mines. *276, [illegible]
Parroquia mine, Mex. *403, *404, 406
Parrot, Mont. 43, 106
Parshall, Horace F. 188
[illegible] anna explosion. *1162
Patents, New. 191, 435, 633, 872, 1067, 1270
Patents, Mining, Law of. 572
[illegible]
[illegible]
Paul, Jas. W. 921, 1068
Paul, W. H. 342
Paymaster mine, Idaho. 249
Payne, Henry Mace. 1068
—Coal-dust explosions. *9
Peacock Coal & Mg. Co. 827, 1124, 1179
Pearce, S. L. Mexico's proposed mining law. [illegible]
Pearson Co., Vera Cruz. 445, 494, 681, 689
"Peat and Lignite." †341
[illegible] 26
Peat bogs, Growth of. [illegible]
[illegible] 724, [illegible]
[illegible] 976
[illegible]
[illegible] Chester. [illegible]
Peckham on dust explosions. [illegible]
Pedrazzini Company's mines. 1006, 1161
[illegible]
Pelouze on the ferrites. 420
Penn-Arizona Cop. Co. 247
Penn Iron Mg. Co. 347
Pennsylvania mining fatalities. 428, 1207
Pennsylvania Coal & Coke Co. 393, 430, 928
Pennsylvania coal-land taxation. 40, 50, 148, 152, 1229
Pennsylvania Dredging Co. 100, 146, 438, 975
Pennsylvania laws—Certificates. 787
Pennsylvania mine, S. D. 444, 740
Pennsylvania R. R. Co. [illegible]
[illegible] smelter. *309, [illegible]
Pension fund, Indiana coal miners'. [illegible]
Penwood Coal Co. [illegible]
Peon or Mexican Indian. 775, *672
Peregrina mill, Mex. *947, *[illegible]
[illegible] Vt. 753
Permanganate method for copper. 1155
[illegible]
Perry coal mine, Colo. 102
Peters, E. D. Copper smelting. 270
[illegible]
Peters, Theodore, Death of. 682
Peterson mill, Manhattan, Nev. *1002
Petroleum. See also "Oil," "Shale."
Petroleum and coal, Equivalency of. 1218
Petroleum, California, notes. 100, 850, 1195
Petroleum, California production. 731
Petroleum, Mexico. 52, 303, 1076
Petroleum, Java production. 213
Petroleum near Colorado Springs. [illegible]
Petroleum, Penn., McBride field. [illegible]
Pettibone, Geo. A., Death of. [illegible]
Pettit mine, Idaho. [illegible]
Peyton Chemical Co. [illegible]
—Regen. reverb. copper furnace. *898
Pharmacist mine, Colo. 592, 877
Phelps, Dodge & Co. form corporation. 1242
[illegible] 584, 688, 785
[illegible] 678
[illegible] 868
Philippine coals. [illegible]
[illegible] 466
Philippine Is. notes. 153, 594, 785, 1182, 1202, [illegible]
Philippine mineral land laws. 364, [illegible]
Philippines, Metallic mineral resources. [illegible]
[illegible]
[illegible] drawal. 1214
[illegible]
[illegible] 1148
Phosphate rock, United Kingdom. [illegible]
Phosphates, Florida. [illegible]
[illegible] 300
Pick & Drill Mg. Co. 737
[illegible]
[illegible]
[illegible]
Pierson, I. K., Death of. 388
[illegible]
[illegible]
[illegible]
[illegible]
Pillar removal, Cumberland hematite mines. *357
Pillars in coal mines, Ashes for. 581
[illegible]
[illegible]
[illegible]
[illegible]
Pillars, Robbing, Seaton-Delaval mine. *768
Pillars, South Staffordshire. *673
[illegible]
Pinchcock for burettes. *[illegible]
[illegible] 915, 1050, [illegible]
[illegible]
[illegible] 1245
Pioneer City Mining Institute. 1174
Pinos Altos, Mex. *160
[illegible] 1152
[illegible]
Pipe lines for hydraulic mine. 1259
Piping notes. 90, 186, 235, 627, 724, 1166
Pishel, M. A. Test for coking coals. 479
Pitcairn Coal Co. 623, [illegible]
[illegible]
[illegible]
[illegible] 928
—Explosion. 1109, 1129, *1162, 1168, [illegible] 1263
Pittsburg Coal Co. 43, 332
Pittsburg coal trade and prices. 970
Pittsburg Consol. 640
Pittsburg Lead Co. [illegible]
Pittsburg & Mont. 300, [illegible]
[illegible] 392
[illegible]
Placer claims, Law of. 212, [illegible]
Placer deposits, Hand drill in prospecting. *1141
Placers, Arctic and tropic—Drilling. *[illegible]
Plaster of Paris flux for scrap. [illegible]
Platinum, Colombia. 14, [illegible]
Platinum, Cracker Jack mine, Ore. [illegible]
Platinum, Crude, Market for. 434
Platinum dredging, Russia. [illegible]
Platinum dredging, Urals, Russia. *701
Platinum-nickel-copper ore, Nev. [illegible]
Platteville Separator Co. [illegible]
Pliny on ancient mining. 707
Pluma, S. D. 251
[illegible]
Pneumoelectric coal puncher. *580, 1112
Pocahontas automatic mine door. *[illegible]
Pocahontas Consol. Collieries Co. [illegible]
Pocock, Cecil. [illegible]
Poderosa Mines, Chile. [illegible]
Poisoning, Carbonic-acid, in explosions. [illegible]
Polaris mines, Mont. 106
Pollard, Joy, Death of. 145
Pollyton property, Wyo. [illegible]
Pomeroy, W. E. [illegible]
Pomeroy, Wm. A. 295, [illegible]
Ponies, Pit, Parade of. [illegible]
Poole, G. Method for working thick coal seam. *[illegible]
"Poor's Manual of Railroads." [illegible]
Porter, H. C. Volatile matter in coal. [illegible]
Porter, J. B. Electric power, cement plants. [illegible]
Portis gold mine, N. C. 832, [illegible]
Portland G. M. Co., Colo. 102, [illegible] 781
Portland, S. D. [illegible]
Portuguese East Africa notes. [illegible]
Porvenir tunnel, Mex. *[illegible]
Postlethwaite dredge patent. 1021
[illegible]
[illegible] 99
Potter flotation process, Development, etc. 175, [illegible]
Pourcel, Alexander. [illegible]
Poutiloff Bucyrus dredges. *[illegible]
Powder. See also [illegible]
[illegible] 1222
[illegible]
Power companies, Calif. 8, 871, [illegible]
[illegible]
Pratt Consol. Coal Co. 977, [illegible]
Pratt, J. H. Minerals, N. C. 94
[illegible]
[illegible]
[illegible] 1118
[illegible]
[illegible] 1057, 1148, [illegible]
[illegible]
[illegible] Mg. Co. [illegible]
[illegible]
[illegible]
[illegible] *1037, 1168
[illegible]
[illegible] 237
[illegible]
[illegible]
[illegible]
[illegible] Co. 1071, 1178
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] 814, [illegible]
Profit sharing, Comstock mines. [illegible]
Progreso mill, Mex. [illegible]
Prop, Adjustable. *[illegible]
[illegible]

PAGE

Prospecting placers, Hand drill in. *1141
Prospector and his motor car. 336
Prospectors and prospecting in Nev. 1053, *1096, *1157, *1203, 1216
Prosser, H. A. Charging machine. *867
Providence mine, Joplin dist. 328
Provincial mine, Ont. 518, 711, *856
Prudential Mg. Co. 737
Prussia, Colliery fatalities. 1210
Pulaski Iron Co. *908
Pulsator jigs and classifiers, Richards. *621
Pulsifer, H. B. Platinum, Cracker Jack mine. 1003
Pultz, John Leggett. 243
Pump notes. 32, 90, 235, 334, 534, 818
Pump, Turbine, Lea-Degen. *1005
Pumps, Centrifugal, Question on. 1218
Pumps, Elec. sinking, at Pachuca *1051
Pumping problems, Joplin district. *214
Punchers, Coal. 530, *580, 1112
Purington, C. W. 342
—Flood-gold. 558
Puritan Coal Co. 1075
Puritan, S. D. 200
Puxico Mg. Co. 492
Pyrite deposits, Huelva, Spain. 283
Pyrite, Magdalena, N. M. *369, *370
Pyritic origin of iron-ore deposits. 408, 630
Pritic smelting, Tilt cove, N. F. *462, 482
Pyrochlore. 960
Pyrometry. 662, 900

Q

Q. & C. electric signalling switch. *340, 775
Quartz, flint and sand uses. 824
Quartz pyrite gold deposits, Mining cost. 512
Quebec, Asbestos in. 461
Queen Esther, S. D. 688, 1030
Queen Mascot, Nev. 301
Queensland. See "Australasia," "Australia."
Queensland miners' death rate. 900
Quemahoning Coal Co. 548
Questions and answers. 95, 293, 434, 732, 778, 824, 919, 1020, 1114, 1218
Quicksilver, California production. 731
Quicksilver mines, Calif. 1161, 1178, 544, 1120
Quicksilver mining, Turkish. 85, *601, 1225
Quicksilver, Russia, in 1907. 119
Quincy Mg. Co. 151, 557, 638, 738, 1073, 1179
Quincy Mg. & Water Co. 194

R

Radbod colliery explosion, Germany. 1116
Rail mill at Gary. 1254
Rails, Steel—Cost, tariff, etc. 1267, 1269
Railroad ground, Locating on. 434
Railroad in Mexico, New. 756
Railroad grants on mineral lands. 474, 1113, 923
Railroad pass, Nev. *1205
Railroads and Hepburn law. 582, 584
Railways, Narrow-gage for mines and smelting works; carrying capacity of rails. 1052
Rainy Lake dist., Ont. 1076
Ramsay, Jas. D. 779
Rand. See also "Transvaal."
Rand, Costs and profits. 565, 801, 1217
Rand extension—Brakpan strike. 290, 294
Rand, Greater efficiency on. 1050
Rand Mines, Ltd. 1121
Rand mining, Notes on. 324, 526, 902, 1010, 1244
Rand, Multiple drill arrangement on. 538
Rand, New mining and milling practice. 323, 822
Rand, Stope drills on. 164, 324, 822, 484, 818
Rand, Tailings elevators on. *539
Randfontein group. 180
Randolph Co., Mo., Coal mining. *6
Ransome, F. L. Copper Queen mine. *38
—"Coeur d'Alene District." †732
—Goldfield ores. 1096, 1157, 1204
Rare metals. 907, 916, 960, 1055, 1100, 1241
"Rares, Terres, Industrie des." †1219
Rasmussen, Peter M. 194
Rastall, B. McK. Labor History, Cripple Creek. †341
Raton coalfield. 1251
Raven, Mont. 593, 976, 979
Rawhide Coalition, Nev. 785, 980, 1074
Rawhide Consol., Nev. 785
Rawhide mine, Calif. 48
Rawhide, Nev., fire. 594
Rawhide Queen, Nev. 1228
Ray Consol., Ariz. 1026
Rayas mine, Mex. *670, *806
Raymond, R. W. "Lead and Zinc" reviewed. †129
—Gayley's invention of dry blast. 1200
Ready Bullion mine, Alaska. 512
Real del Monte silver district. *519

PAGE

Real del Monte y Pachuca Co. *647
Recknagel on tin in Transvaal. 579
Red Cross dynamite. 283
Red Dog mine, Joplin dist. 328
Red Metal, Mont. 43, 492, 547, 1028
Red Mtn. dist., Nev. 199, 684
Red Mtn. Ry. & Mg. Co. 543
Red Rock Mg. Co. 786, *856, 929, 1182
Red Mtns., Birmingham dist. *1044, 1046
Red Top, Nev. 300, 347, 492, 594, 739, 1073
Redenbaugh, Chas., Death of. 921
Reder placer, S. D. 740
Redding Gold & Cop. Co. 194
Redmayne, R. A. S. "Modern Practice"—Coal. †1219
Redmayne on cost of boring. 968
Reel, Locomotive traction. *26
Reese, J. W. 634
Refractory brick, Basic, Use of. 802
Reid, J. T. Mining engineers' duties. 866
Reiner Gravel Mg. Co. 1123
Reins Cop. Co. 250, 392
Reliance, S. D. 493
Reno group, Idaho. 1275
Renwick, A. K 588
Republic Iron & Steel Co. 240, 637, 1029, *1047
—Report. 485
Republic mine, Wash. 200, 1181
Republica, Mex. See "La Republica."
Republican Fraction. 1024
Rescue. See also "Breathing."
Rescue—Anaconda protective hood. *708
Rescue apparatus, New. 8
Rescue work, Homstead colliery. *5, *1060, 1108
Rescue work in England. 620
Rescue work; stations—Notes. 534, 769, 818, 1015
Reservoirs for hydraulic mines. 1258
Retreating system, Coal mining on. *17, *1251
Rex mine, Idaho. 783, 877
Reynolds ground, S. D. 688
Rhode Island mine, Mich. 684, 738, 1070
Rhodes, J. W., Death of. 99
Rhodesia, First half of 1908. 240
Rhodesian gold mine, Low-grade. 463, 430
Rhodesian mine—Globe & Phoenix. *959
Rhodesian production. 672, 726, 1008
Rhodesian railway. 727, 1049, 344
Rice, C. T. Mining and transportation, Santa Eulalia. *33
—El Rayo gold mine, Santa Barbara. *78
—Veta Colorada cyanide mill. *120
—Silver-lead mines, Santa Barbara. *207
—Silicious silver mines, Parral. *276
—Mines of Peñoles Co., Mapimi. *309
—Smelter of Peñoles Co. *373
—Zacatecas, a famous silver camp. *401
—Ore sorting, Cabrestante mine, Mex. *464
—Pachuca and Real del Monte. *519
—Metallurgical processes, Pachuca. *559
—Jesus Maria and Flores mills, Guanajuato. *615
—Cyanidation of silver ores, Pachuca. *647
—Guanajuato, the great silver camp. *669
—New Esperanza mill, El Oro. *760
—Working mines, Guanajuato. *806
—Cyanide mills, Guanajuato Devel. Co. *947, *997
Rice, George Graham. 1272
Rice, Geo. S. 243
—Cardiff mine explosion. 93
Richards, J. W. 1271
Richards, Robert H. 145
—Pulsator jigs and classifiers. *621
Richards, Thos. M., Death of. 588
Richardson, A. Rapid hoisting. 1010
Richardson mine, Ont. 1182
Richmond-Eureka mine, Nev. 101, 320
Richmond Foundry & Iron Wks. 922
Rickard, T. A. Pyrite smelting. 483
—"Guide to Technical Writing." †732
Ricke, R. Zirconia. 909
Ricketts, A. H. Short talks on mining law 81, 117, 168, 212, 281, 363, 434, 460, 527, 570, 775, 822, 851
Ricketts, D. L. *184
Ricketts & Banks. 629, 631, 773
Rickey, Thos. B. 488, 826, 871, 1069
Ridgway filters, Veta Colorada. *121, 280
Ridley, Fredk. W. 1271
Right of Way, Ont. 252, 518, 595, 636, 786, *856, 1277
Rikovski coal-mine explosion. 107
Riley, Geo., Death of. 44
Rinard, James M. 1023
Ringarooma mine. 144
Rio Plata Co., Mex. 164, 395, 445, 786, 1031, 1076, 1182
Rio Tinto mines, Mex. 741, 1230
Rio Tinto, Ltd. 283, 386
—Half yearly report. 897
Risdon dredge decision. 1021
Ritchie, S. J., Death of. 634
Riter, G. W. Cost of silver-lead smelting. 585
Ritter, Etienne A. 825
River & Rail Coal Co. 1183
Roach, A. P. 634
Roachburn colliery, England, accident. 1166
Roasting blende ores, Silesia. *265

PAGE

Robert Emmet group, Mont. 492
Roberts, Capt. Enoch, Death of. 588
Roberts gas burner. 568
Roberts & Schaefer Co. *1249
Robeson, J. H. 1271
Robins, Thomas. 590
Robinson, C. Peon or Mex. Indian. 775
Robinson Gold Mg. Co. 240, 340, 323, 324, 822, *539, 565, 813
Robinson Deep. 240, 340, 323, 822, 1010, 1176, 1190
Robinson tuyere. *756
Rochford Mg. Co. 595
Rock, Crushed, Handling, San Francisco bay. *1153
Rock Mtn. Gold M. & M. Co. 1276
Rocker for washing auriferous gravel. 433
Rocky Mtn. Club of N. Y. 437
Roel, F. Proposed Mex. mining law. 680
Roelofs, R. Overbalance weight. 338, 433
Rogers, Allen H. 779
—How to sell a mine. 537, 585
Rogers, Lewis H. 300
Rogers Syndicate, Nev. 50, 147, 245, 250
Rogovin, I. I. Quicksilver, Russia. 119
—Manganese, Russia. 764
Roller journals with two recesses. 724
Room-and-pillar. See also "Pillars."
Room-and-pillar system, Retreating, Coal mining by. *17, *1251
Room-and-pillar-work—Jeffrey machine. *24
Roosevelt Mg. Co., Wis. 982
Roosevelt tunnel, Colo. 543, 684, 978, 1178, 1206
Rope compounds. 94
Rope, Hoisting, connection, Sancy shaft. *185
Rope, Notes on. 26, 32, 186, 334, 480, 534, 627, 676, 818, 1015, 1062
—Electric testing. 1108
Rope, Wire, carrier, Samarcand. 914
Rope, Wire, Carrying over mountain trail. *672, 775
Rosario mine, Mex. 1278
Rosario Mg. & Smg. Co. 252
Rose Deep, Transvaal. 386, 539
Rose-Nash lease, Nev. 980
Rose, T. K. Gold-tellurium alloys. 567
Ross, F. A. Remarakable car-dump. *754
—Weighing ore in stamp mills. *804
Ross, Geo. E. 99
Ross, James G. 974
Ross mine, S. C. 1212
Round Mtn. Combination. 832
Round Mtn. Hyd. Mg. Co. 50, 101, 1181
Round Mtn. Reduc. Co. 199, 548
Rowland, N. H. Colliery law, Okla. 729
Royal Flush mine, Gold Mtn., Nev. 1228
Royal Flush mine, Hahn's Peak. 1070, *809
Royal Mines, Argentine, Penn. 43
Royal Tiger mine, Nev. 547
Ruble boulder and gravel elevator. *902
Ruby group, Lookout dist. 1179
Ruby Mg. Co. 441
Ruby mine, Wash. 51
Ruby mines, Burma. 1022, 614, 972
Rudd, C. D. 590
Ruhl, O. Mill construction, Joplin. *125
—Miami district. *910
—Orongo Circle mill No. 5. *993
Ruizena group, Mex. *71, 72
Rush Coal Co. 105
Rush creek, Calif., gold discovery. 780
Russell, B. E. Nacozari dist., Sonora. *657, 1161, *1006
—Las Chispas mines. *1006, 1161
Russia, Asbestos, Urals. 140
Russia, Coal—Wages; production. 724, 1184
Russia, Iron, ore and steel. 1206, 1079
Russia, Manganese during 1907. 764
Russia—Platinum dredging, Urals. *701
Russia, Quicksilver, in 1907. 119
Russian copper and gold. 1121
Russian Mg. Corp., Ltd. 246, 1025
Russian tax on gold. 809
Rust-preventing mixture. 139
Rutledge, J. J. Coal mining, Mo. *6
—Stoping in mining iron pyrites. 365
—Reclaiming caved ground after squeeze. *411
—Iron ore, Stone valley, Penn. 726
Ryan, Wm. D. 1222

S

Sacramento, Dredging troubles. 776, 780, 922
Sacramento mine, Utah. 394
Saddle Mtn. Mg. Co., Ariz. 423
Safe Investment, S. D. 688
Safety arrangements, Carmaux mines. 575, *576
Safety cage device, Carbonic-acid. 676
Safety device for landings. *124
Safety devices, Hoisting. *41, *94
Safety laws, State—Summary. 1088
Safety of coal mines. 337
Saginaw, S. D. 740, 832, 1029, 1126
Sahuayacancito. Mex. 162
St. George amalgamation-cyanide mill. 1145
St. Ives Leasing Co. 784
St. Joe Lead Co., Mo. 605, *763

PAGE
St. Joe Mg. Co., Utah. 102
St. John del Rey. 98, 99, 1010
St. John's Quicksilver Mg. Co. 1226
St. Louis Sm. & Ref. Co. 606
St. Mary's Mineral Land Co. 1070
Sales, R. H. Ore shoots at Butte. 226
Salt and Salton Sea dispute. 913
Salt, Dominican Republic. 43
Salt Lake & Calif. Cop. Co. 487
Salt Lake Stock & Mg. Exch. 488, 975
Salt, Rock, Purifying by fusion. 564
Sam Christian gold mine. 832
Samarskite. 1100
Samples, Metallics in. 1020
Sampler, Ore, Automatic, Heathcote's. *181
Sampling and buying ore, Joplin. *190
Sampling device, La Gloria, Mex. *122
Sampling in West Australia 340
Sampling Ore, by machine. 113, 142, 238, 291, 338, 431, 631, 776, 917, *951, 1111
Sampling, Machine, Principles of. *951, 1018
Sampling mill, Goldfield Consol. *469
San Antonio Co., Colo. 46, 1121
San Antonio Cop. Co. 982
San Bernabe mine, Mex. *402, 403, 405
San Diego mine and mill, Mex. *209, 211
San Francisco bay, Handling crushed rock. *1153
San Francisco del Oro Mg. Co. 828, 833, 1076
San Francisco mills, Mex. *560, *652, 846, 989
San Ignacio shaft, Mex. *521, 524, 525
San José Reduction Co. *660
San Mauricio mine, Philippines. 1182
San Pablo Quarry Co. *1153
San Prospero mill, Mex. *947
San Rafael mill, Pachuca, Mex. *325, 730, 654, 668
San Rafael mine Pachuca, *520, 523, 524, *1051
San Rafael mine, Zacatecas. *404, 406
San Roberto mine, Mex. *401, 1031
San Toy Mg. Co., Mex. *83
Sancy shaft—Rope connection. *185
Sand, Black, Cracker Jack Mine. 1003
Sand, Black, Humboldt co., Calif. 1223
Sand, California. 269, 731
Sand, Silica, Uses of. 824
Sandford lake, N. Y., iron mines. 548
Sandwell Park colliery, Eng. *673
Sandy-ore treatment, west Mesabi. 97
Sangre de Cristo mill, Mex. *161, 164
Santa Ana Mg. Co. 1069
Santa Ana Tin Mg. Co. 487
Santa Barbara, El Rayo mine. *78
Santa Barbara silver-lead mines. *207, *464
Santa Eulalia, Mining and transportation. *33
Santa Gertrudis mine, Mex. *520, 523, 524
Santo Domingo mine, Santa Eulalia, Mex. *34
Santo Domingo, San Pedro dist., Mex. 252
Santo Domingo placers, Mex. 201
Santo Domingo minerals. 5, 16, 42, 43, 70, 115, 228
Sapphire, Queensland. 115
Sapphires, Montana production. 736
Saratoga mine, Colo. 45, 147, 150
Sault Ste. Marie canal traffic. 142, 620, 868
Savanna Cop. Co., N. M. 1229
Scaife, H. L. Mines of S. C. 1212
Scales car, Daly Reduc. Co.'s. *804
Schall, Wm. P., Death of. 1068
Scheelite, Coeur d'Alene. *1146
Schmitt, C. O. Steel shaft guides. *1010
Scholz, C., on explosions. 968
Scholz, O. W. Narrow gage railways 1052
Schools, P. C. [illegible]
Schuhmann, G. Tube corrosion. 821, [illegible]
Schwab, C. M., on the tariff 1262, 1263, 1267
Schwab interests, Greenwater. 101
Schwartz, Geo. W., Death of. 1023
Scientific search for new Goldfield *1157, *1203
Scotch shale-oil industry. 656
Scott, A. P. 1174
Scott gasolene rock drill. *1008
Scranton Miners' Institute. 974, [illegible]
Screens, Joplin dist. *127
Scrivener, J. B. Malay tin mining [illegible]
Seale, Herbert P., Death of. 1119
Seams, Coal, Flat, Mining [illegible]
Seaton-Delaval colliery methods. *765
Seattle gold-bullion receipts. 391
Selby smelting works. Handling blast-furnace bullion [illegible]
—The bag house [illegible]
—Cottrell fume condensing system of. 242, 296, 343, *375, 389, 487, [illegible]
—Disposal of gases at Selby. *604
Sell a mine, How to [illegible]
Selukwe mine, Rhodesia [illegible]
Senator Mines Co. [illegible]
Seneca mine, Mich. 1124
Separation, Magnetic, Zinc, Santa Barbara. [illegible]
Settling Cox, Orongo Circle mill No. 5. *996
Settling tank, Joplin dist. *127
Seven Troughs Coalition, Nev. 1074
Seward Peninsula, Drilling. *218
Seward Peninsula, Gold placers. †241
[illegible]
Shaft depth, Determining. 1114
[illegible]
Shaft sinking on Rand—Brakpan mines. 417
Shaft-sinking safety devices. *41, *94
[illegible]
Shaft sinking system, Pachuca. *1051
Shafts, Colliery—Concrete lining, etc. 235
Shafts, Inclined, Lining-up timbers in. *612
[illegible]
[illegible]
Shaleen miners'-certificate case. 787
Shannon Cop. Co. 37, 423, 556
Sharpless, F. F. Koniah mercury mines. *601
[illegible] stake. 292, 294
[illegible]
Shattuck-Arizona. 47, 391, 423, 1274
Shaw, S. F. 44
Shedlock briquet process. 382
Shelby, C. F. Alumina in copper blast-furnace slags. 270, 483, 730, 1111, 1264
[illegible]
Shelby, Mrs. C. F., Death of. 342
[illegible]
Sherrod, V. B. *615
Shields, W. J. First-aid corps. 1222
Shirley Hill Coal Co. 1227
Shockley, W. H. 1222
—Monthly advance in drift mining. 1112
Shoe-plate, Cast-iron battery-post. *649
Shoes, Stamp, Wear of chrome-steel. 681
[illegible]
Short talks on mining law. 81, 117, 168, 212, 281, 363, 460, 527, 570, 775, 822, 851
Shorthand by machinery. 77
Shortwall coal cutter Jeffrey. *24
Shouvaloff estate Russia. *702, *704
Shovel, Power, for underground work. *1056
Shutz Mg. Co. 299
[illegible] 1222
Siebe, Gorman & Co.'s apparatus. 8
[illegible] 968
Sierra Buttes mine, Calif. 1122
Sierra Madre Land & Lumber Co. 786
Signaling, Electric, Gt. Boulder Prop. *1170
Signaling, Mine, by compressed air. *857
[illegible]
Signals—Various State laws. 1088
Silesia, Advanced coal-mining methods. *887
Silesia, Lead and zinc smelting. *265
Silica in copper-furnace slags. 275
Silica separation in iron ores. 168
Silicates, Certain, Properties of. 906
Silver. See also "Cyanidation," etc.
Silver, Arizona mines' production. 423
Silver, Australasia. 143, 1021
Silver Bar mine, Ont. 1076
Silver, California production. [illegible]
Silver Cliff, Idaho. 783
[illegible]
Silver Cross mine, Ont. 1031
[illegible]
[illegible]
Silver, Formosa, North, production. 201
Silver in Lake Sup. copper mines. 919
[illegible]
[illegible] 923, 1127, 1273
Silver King Consol. 45, 101
Silver King group, Alta, Utah. 152
Silver Lake, Calif., strike. 683
[illegible]
[illegible]
Silver-lead-zinc mines, Broken Hill. [illegible]
Silver Leaf mine, Ont. 201, 518, 689, *856
Silver Line group, N. M. 1070
Silver mines, Transvaal. 82
Silver, Mint purchase resumption. 913
Silver, North Carolina production. 485
Silver, Ontario production. *856, 900, 1202
Silver ores, Cyanidation, Pachuca. *647, *519, *559
Silver Peak Valcalda mines. 975, 980
Silver, Philippines. 466, 706
[illegible]
Silver, Price of. 384, 1063
Silver, Price of, and Mex. mining. 655
Silver Queen, Cobalt. 153, 252, 518, [illegible]
[illegible]
Silver Shield, Utah. 740
Silver shipments to the East—Question. 1218
[illegible]
Skip changing, Burra Burra shaft. *1237
[illegible]
[illegible] in. 270, [illegible] 1264
[illegible]
Slices, Mining in [illegible]
[illegible]
Slimer, The James. [illegible]
[illegible]
Slining, Byron G. 1271
[illegible]
Sluices for hydraulic mines. 1259
Smelter. See also "Furnace," and [illegible]
[illegible]
[illegible] tem at Selby plant, etc. 242, 296, 343, *375, 389, 487, 1272
—Mountain Cop. Co's smelter. 1149, 1272
Smelter smoke, Anaconda. 1224, 1261, 1273
Smelter, Anti, fight in Calif. 603
Smelters' troubles, Calif. 536
[illegible]
Smelting competition. 1263, 1266
Smelting practice, American supremacy in. [illegible]
Smelting, Silver-lead, Cost of. 315, 585
Smelting situation, Colo. 827, 830, 960, 969
Smith, Alfred, Death of. 634
Smith, F. W. [illegible] mining in Mex. 655
Smith, Geo. O. Misleading estimates. 866
Smith, J. J. Hoist weight. 239, 338, 433
Smith, John S. 243
[illegible]
Smith, L. S. "Water Power of Wis." †1115
[illegible]
Smoke and gas formation, Coal. 721
[illegible]
Smuggler mine, Colo. 636, 1072
[illegible] Death of. 1068
[illegible]
[illegible]
Soapstone Vermont. 753
Social life of miners. 1216
Société des Travaux Publics, etc. 962
Société Hellenique des Mines. 730, 294, 962
Socrates quicksilver mine, Calif. 580
[illegible]
[illegible]
Sonora mine, Idaho. 249
[illegible]
Sorting ore, Cabrestante mine, Mex. *464
[illegible] "Rand," "Rhodesia," "Natal," etc.
South Africa, Diamond production. [illegible]
[illegible]
South Butte Mg. Co. 1273
South Carolina, The mines of. 1212
[illegible]

PAGE
Squeeze, Procedure during. 818, 914
Squeeze, Reclaiming caved ground after. *411
Stag Cañon Fuel Co. 1242, 1243
Staging, Swinging, Grossman. *217
Stamp, Air-cushion, Holman. *213
Stamp batteries, Veta Colorada. *120
Stamp capacity, Effect of discharge level and water supply on. 386
Standard mine, San Bernardino co., Calif. 100
Standard & Mammoth, Coeur d'Alene. 140
Standard mine, Idaho. 878
Standard, Montana, Idaho. 442, 927
Standard Mg. Co., Ont. 543
Standard Oil Co. 296
—Business—Archbold's testimony. 1116
Stanford, Leland, University. 779
Stanley Consol. Co. 140, 297, 442
Stanley, G. H. Cyaniding. Mex. 846
"Star" electric safety fuse. *1014
Star mine, Idaho. 878
Star of the West, Colo. 441, 545, 783
State Bank & Trust Co., Nev. 101, 297, 487, 826, 871, 1069
Station Grounds property, Ont. 1076
"Steam Power Plants, Mech. Eng. of." †1219
Steam, Superheated, Use of. 627
Steel. See also under "Iron."
Steel and wrought-iron tubing. Relative corrosion 563, 821
Steel bands used for belts. 382
Steel construction. 1156
Steel Corporation plant at Gary. *1253
Steel co-operation, Judge Gary on. 1213
Steel Drill—Notes. 324, 822, 526, 540, 672
Steel furnaces, Electric, Germany. 963
Steel, German statistics. 39, 448
Steel making, Dry-air blast. 91
Steel making, Lash electric process. 419
Steel making with surface-blown converter. 1244
Steel prices. 237, 240, 289, 1213
Steel production, Carnegie on. 1054, 1063, 1261, 1263, 1269
Steel production, U. S. 39, 422
Steel production, World. 39
Steel shaft guides. *1010
Steel tariff. 1054, 1063, 1117, 1220, 1261, 1263, 1267, 1268, 1269
Steel timbering at Sandwell. *674
Steiffer Mg. Co. 100, 876, 975
Stein, G. Properties of silicates. 906
Stephens-Adamson conveying machinery. *1153
Steptoe mill. 152
Steptoe smelter. See "Nevada Consol."
Stevenson, Chas. H. 825
Stewart Mg. Co., Idaho. 48, 491
Sticht on blast pressure. 730
Stillwagon Mg. Co. 589
Stints, System of, etc. 773, *757 918, 971, 1066, 1111, 1112
Stirling, James. 921
Stocker, J. Elmore process, Broken Hill. 1169
"Stoichiometry." †241
Stokes, R. "Mines and Minerals, Brit. Empire." †96
Stone, Building, California, 1907. 269, 731
Stone Cañon coal mines, Calif. 155, 1120
Stone, Lithographic, in Calif. 387
Stonestreet, Geo. D. 779
Stoping. See also "Pillars," "Drill."
Stoping, Back vs. underhand, mining large bodies of iron pyrites. 365
Stoping methods, Broken Hill; open stope. *796
Stören, R. Ore dressing by adhesion of liquid films. *839
—Laboratory burner for volatile fuel. *867
Stoughton, Bradley. 1023
—Relative corrosion of wrought-iron and steel tubing. 563, 821
Stoughton, S. F. 44
Stow, A. H. Mining flat coal seams under heavy cover. *135
—Losses in mining flat seam. *284
—Pocohontas auto. mine door. *862
Stradley, Ayer. 869
Stratton's Independence, Ltd. 102, 195, 344, 346, 924
Strauss, Lester W. 921
Stray dog mine, Nev. 739
Strickland, W. R. 295
Strike. See "Labor," etc.
Stripping Clinton iron ore, N. Y. State. *1150
Stromberg-Carlson mine telephone. *722
Strong mine, Colo. 195
Sturgeon lake gold region. 828
Sturgis, F. B., and Comstock reforms 94, 172, 188
Sturm on blindness of mules. 25
Subsidence of waste-filled stopes. 365
Success mine, Idaho. 140, 389
Suffolk colliery, Penn. 1229
Sullivan drill. 914
Sullivan, George. 32
Sulman & Pickard 778
Sulman, H. L. Slime deposition, etc. 707, 854
Sulphide Corp. and others, Broken Hill. 896, 1169
Sulphide ores, Mixed, Treatment of. 1218

PAGE
Sulphur, Cuprite, Nev 250, 443, 639, 1028, 1126, 1176
Sulphur, Dominican Republic. 70
Sulphur, Local, in certain coal seams. 14
Sulphur, Mexican discovery. 1278
Sulphur near Liberty, Tex. 981
Sulphur production, United States. 243
Sulphuric acid—Anaconda smelter. 1261, 1224, 1273
Sulphuric acid contract, Tennessee. 1063, 1116, 1127
Sulphuric-acid making, Ducktown. *1237
Sulphuric-acid recovery, Silesia. *266
Sulphuric-acid, Waste, Treating. 115
Sulphuric anhydride, Determination of, in sulphuric acid. 407
Sulzer centrifugal pump. *1051
Summit mine, Ind. 105, 249
Sump, Sinking a. 235
Sunday Creek Co., Ohio. 493
Sunday tunnel, Colo. 346
Superheaters, Result with. 818
Superior Coal Co.'s hoisting record. 726
Superior mine, Mich. 249, 392, 738, 1124, 1227, 1275
Superior & Pittsburg. 47, 247, 391, 423, 782
Supplies, Mining. 93
Supplies, Mining, in Mexico. *1245
Support, Mine, Adjustable. *1260
Surprise mine, Idaho. 546, 878
Survey, Geological.
—Bureau of Mines 915, 1268
—Electrical accident investigation. 726
—Explosion prevention—Foreign experts. 860, 864, 590, 736
—Fire, Suffers from. 1262
—Fuel investigation. †96, 720, 723, 862
—Misleading estimates—Water power. 727, 866, 1066
—Virginia Geol. Survey. 777
—Canadian Geol. Surv. work. 46
"Surveying, Underground, Manual of." †1115
Susquehanna Coal Co. 199, 240
Swaziland Mg. & Commercial Chamber. 662
Sweden, Iron and steel in. 776
Sweden, Mineral and metal production. 1022
Sweeny mine, Calif. 592, 876
Switch, Pull, Electric-signaling, Q. & C. *340, 775
Sybil mine, Calif. 829
Sydney mine, Calif. 101
Sylvanite camp, N. M. 962, *1101
—Notes. 829, 1029, 1224
Sylvester Gravel Mg. Co. 826
Symmes, H. G. 869
Symons, B. "Genesis of Rocks and Ores." †777

T

Taatz, Alw., dredges. *703, 705
Table, Concentrating, Deister. *610
Table, Concentrating, glass, experimental. *904
Table, Slime concentrating, James. *1149
Tables, Cement, Pinguico mill. 947, *997
Tables, Concentrating, Hennig. *134, *1198
Tabotacachi dist., Mex. *661
Taffanel's coal-dust tests. *9
Taft, W. H. Tariff revision. 1213
Tailings elevators on Rand. *539
Tailings, Old, cyanidation, Pachuca. *559
Tajo mine, Mex. *279, *280
Talc and soapstone, Vermont. 753
Talc, North Carolina. 321
Tale of woe. 863
Talley, J. Smith, Death of. 1119
Tamarack, Mich. 557
Tamarack & Chesapeake. 140
Tamping converter lining. *749
Tamping bars, Steel, Use of. 42
Tamping, Notes on. See "Blasting."
Tanganyika Concessions, Ltd. 344, 1049
Tank, Settling, Joplin dist. *127
Tanks, Blaisdell Coscotitlan Syndicate's. *563
Tanks, Brown. *325, *471, *653, 668, *901, *991, 1116
Tantalum and its minerals. 1100
Tapping mine water under pressure. 239
Tariff agitation, Calif. 1024
Tariff, C. M. Schwab on the. 1262, 1263, 1267, 1269
Tariff—Collecting foreign statistics. 863
Tariff—Copper statistics. 1110
Tariff hearings, The. 1021, 1117, 1171, 1220, 1261, 1263, 1267, 1268
Tariff on hematite iron ore. 128
Tariff on metals, American 778
Tariff on zinc and lead ores. 383, 1021, 1024, 1069, 1070, 1118, 1221, 1262, 1268
Tariff revision, W. H. Taft on. 1213
Tariff, Steel, Carnegie on. 1054, 1063, 1261, 1263
Tasmania gold mine. *181
Tasmania, Tin. 144
Tasmanian production. 412, 913, 1160
Tasmanian Smelting Co. 143
Tax dispute, Cripple Creek. 1178, 1273
Taxation, Coal, Indiana. 245, 249

PAGE
Taxation of non-producing mines. 636
Taxes, Mine, in California. 1156
Taxing unmined coal, Penn. 40, 50, 148, 152, 1229
Taylor & Brunton sampler; machine sampling. 100, 200, 346, 917, *951, 1018, 1111
Tays, E. A. H. Mining, Mex., past and present. *665
Teale, Joseph W. 342
Tecolotes mines, Mex. *209, *211, 494
Tecopa Consol., Calif. 100, 391, 829
Telephone, Mine, and advantages. *722
Tellurium and gold alloys. 567
Tellurium ores, N. M. 785, 962, 1029, *1101
Temagami-Cobalt Mines, Ltd. 586, 628, 631, 773
Temagami reserve area. 712
Temiskaming Deposits. 711, †777
Temiskaming mine, Ont. 549, 518, 636, 689, *856, 929, 1031, 1076, 1127, 1230
Temiskaming & Hudson Bay Ont. 518, 636, 689, *856, 982
Temiskaming & N. Ont. Ry. 489, *856, 875
Temperature, Legal, in stopes, Victoria. 1152
Temperature of coal piles. 862, 817
Temperatures, Furnace, High, Estimation of. 662
Temperatures, High, Estimation of. 900
Temple mine, Idaho. 299
Templeman, Hon. Wm. 1119, 1174
Ten Mile dist., Colo. 275
Tennessee C., I. & R. R. Co. 440, 485, 637, 681, 737, 925, 977, 1071, 1116, 1122, 1226
—Iron operations. *1043
Tennessee Cop. Co. 165, 271, 275, 556, 880
—Timbering inclined shafts. *612
—Acid contract. 1063, 1116, 1127
—Mining and smelting. *1237
Terne plate. 1020
Terrible-Dunderberg mine, Colo. 1178
Terrill, Arthur C. 588
Testing plant, Hennig. *1198, *134
Teziutlan, Mex. *672, 775, 929
Thalmann, Ernest. 1271
"Thermochemistry." †241
Thew power shovel, Underground. *1056
Thies, Ernest, Death of. 388
Thomae, W. F. A. 709
Thomsen, J. "Thermochemistry." †241
Thompson, A. M. Nickel-copper-platinum ore, Nev. 72
Thompson Falls Power Line. 878
Thompson, Jas. R. 779
Thomson, J. J. 636
Thomson, T. N. Corrosion tests. 563, 821
Thorium and its minerals. 1241
Thorne, Stuart M. 869
Thornton, W. D. 1054
Ticon mine, Mont. 347
Tiffany, J. E. Mine-curve problems. *230
Tiffany & Co. 980
Tiger mine, Coeur d'Alene. 140
Tiger-Poorman, Idaho. 545
Tightner mine, Calif. 100, 296, 345, 1244
Tigre mine, Mex. 52, 549
Tilt cove, N. F., Pyritic smelting. *462, 482
Timber. See also "Forest."
Timber and mineral-land decisions, Justice to miner in. 189
Timber cap, Reinforced. *427
Timber, Treating. 32, 428, 440, 534, 1066
Timbers, Drawing, thick coal seam. *15
Timbers in inclined shafts, Lining-up. *612
Timbers 30-ft., Handling. *675
Timbering—Adjustable support. *1260
Timbering, Broken Hill. *794, *799
Timbering, Carmaux coal mines. *577
Timbering—Fighting Jersey mine fire. *88
Timbering notes. 90, 186, 235, 288, 480, 491, 534, 627, 724, 818, 1252
Timbering Seaton-Delaval colliery. *766
Timbering, Southern anthracite field. *477
Timbering, Steel, at Sandwell. *674
Timbering with longwall methods. *23
Timby, T. G. Separation of silica and alumina in iron ores. 168
Timiskaming. See "Temiskaming."
Tin, Australasia. 144, 412, 582, 913
Tin, Cornish mining. 181
Tin, Lode, mining in Malaya. 371
Tin-mining conditions, Malaya. 970
Tin ore, Calif. 589
Tin, Philippines. 707
Tin, South Carolina. 1212
Tin, Transvaal. 579, 992
Tintic Smelting Co. 195, 245, 635, 781
Tinton, S. D. 302, 548, 640
Tip-Top Heath, Ariz. 737
Tipple, Daly Reduction Co., Ltd.'s. *754
Tipplers, Rotary, Use of. 1166
Tod, George, Death of. 1068
Todd, L. C. 921
Todd's Handbook, Nevada Mining Companies. †241
Tom Head mines, Calif. 244, 343, 876, 1071
Tom White channel, Calif. 977
Tombstone, Ariz., Ores of. 269
Tombstone Consol., Ariz. 247, 423
Tonge, Jas. "Coal." †777
Tonopah, Nev., Notes from. 871

PAGE

Tonopah-Belmont. 50, 444, 493, 547, 594, 688, 739, 785, 871, 980, 1074, 1126, 1181, 1224, 1229, 1277
Tonopah Extension mine, Nev. 871, 928
Tonopah Midway. 493
Tonopah Mg. Co. 106, 152, 251, 493, 547, 589, 594, 871
Toronto exhibition, Minerals at. 846
Torreon, Cia. Met. de. 201, *209, *211
Tourenie Mg. Co. 595
Tovey, L. Platinum dredging, Urals. *701
Town Topics Gold Mg. Co. 248
Townsend, A. R. Rocker for washing auriferous gravel. 433
– Official reports of costs of producing copper. 555, 584
Track curve problems. Discussion *230
Track, Mine, Cost, etc. *135, *284
Tracks, Mine, Grade of. 1100
Tracks, Narrow gage. 1052
Tramway, San Toy mine, Mex. *33
Transvaal. See also "Rand."
Transvaal, Base metals. 579
Transvaal, Chinese miners in. 1114
Transvaal, Costs and profits. 1217, 323, 565, 801, 822
Transvaal, First six months of 1908. 240
Transvaal gold mining. 335, 631, 813, 1022
Transvaal Gold Mining Estates. 436
Transvaal gold statistics. 813, 1041
Transvaal mine dividends, etc. 436, 842
Transvaal mines, Electric power for. 868, 1025
Transvaal mining notes. 82, 180, 240, 340, 417, 436, 539, 540, 662, 736, 771, 842, 892, 906, 913, 953, 958, 992, 1055, 1244, 1269
Transvaal rope regulations. 334
Transvaal, Safety cage device. 676
Transvaal silver mines. 82
Transvaal, Stope-drills in. 164, 324, 484, 538, 818
Trask, E. C. 1174
Treadwell mines, Alaska. 512, 681, 711, 713, 755
Trego vs. Roosevelt Mg. Co. 982
Treloar, Samuel. 1174
Tremont-Devou Mg. Co. 1276
Trenton, Mont. 43
Trespass, Law of. 460
Tretheway, W. S., Death of. 825
Trethewey mine, Ont. 549, 518, 636, 833, 856, 1076
Treweek, N. 101
Trezona, Capt. Chas. 99
Trigonometric slide rule, Eichhorn. 856
Trilby mine, Colo. 344
Trimore mine, Mo. 593
Trimountain. See "Copper Range Consol."
Trinidad asphalt exports. 752, 755, 756, 857
Trinity Cop. Co. 772, 197, 591
Trout Lake smeltery, Ont. 595
Truax group, S. D. 640
Truck, Molten bullion, Selby smelter. *84
Truckee River Genl. Elec. Co. 199, 1120
Trumbull, L. W. "Underground Surveying." *1115
Truss work, Steel. 1156
Tube-mill liner, Barry, Life of. 842
Tube mills, Goldfield Consol.'s. 471, *472
Tubbing in deep shafts, Cement for. 427
Tucker, W. P. Douglas smelter, Fundicion. *415
Tumbaga mine, Philippines. 1182
Tungsten, California mining. *573, 460, 731
Tungsten, Colo. 293, 636, 738, 830, 1071, 1123, 1176, 1178, 1275
Tungsten-ore deposits, Coeur d'Alene. *1146, 67, *68, 830
Tungsten, Nev. 740, 1228
Tungsten ores—Market; production. 95, 293
Tungsten, S. D. 640, 1127
Tunnel driving, Fast—Elizabeth tunnel. 1199
Tunnel, Newhouse, Hot Time lateral. *757, 773, 918, 971, 1066, 1111, 1112
Tunnel, Roosevelt drainage. 543, 684, 978, 1178, 1206
Tunnel sites, Law of. 212
Tunnels, Drain, of hydraulic mine. 1259
Tunneling machines in Colo. 297
Tuolumne Cop. Mg. Co. 300, 389, 442, 546, 784, 924, 1180
Tuomey, M. South Carolina mines. 1212
Turf mines, Rand. 148, 436
Turinski Platinum Mg. Co. *705
Turkish quicksilver mining. 85, *601, 1225
Turn sheets, Bridging—Note. 1009
Turner, H. I. Loading blast holes. [illegible]
Turner, T. "Practical Metallurgy." [illegible]
Turquoise at Sylvanite, N. M. [illegible]
Turquoise mining, Burro mtns., N. M. *843
Tuyere, Robinson. *756
Twenty One mine, Calif. 248
Tyee Cop. Co. [illegible]
Typewriter, Shorthand [illegible]
Tyrrell, J. B. [illegible]

U

Ulcoat mine, Eng. [illegible]
Uncle Sam Consol., Utah [illegible]
Underwater land, Joplin dist. [illegible]
Unger, John S. 1068
Union Basin Mg. Co. [illegible]
Union coal mine, Ind. 442
Union, La. See "La Union."
Union Oil Co. 850, 1272
Union Soapstone Co. [illegible]
United Coal Co. 152
United Coke & Gas Co. 684
United Colo. Mines Co. 926
United Globe, Ariz. 423
United Gold & Cop. Co. 146
United Golden Chest mines. *65, 69, 249, 389, *1146
United Kingdom.
—Accidents, Mining. 139, 426, 627, 676, 1108, 1210
—Coal mining, Seaton-Delaval mine. *765
—Coal mining, South Staffordshire. [illegible]
—Colliery Commission — Explosions; electricity; dust. 30, 186, 817, 968
—Cornwall, Inspector's report. 148
—[illegible] northern field. *964, *1104, 1110
—Eight-hour day, coal mines. 92
—Gold mine, English. 98
[illegible]
[illegible]
—Iron, iron ore and steel. 39, 996, 1266
—Mines and Minerals, Brit. Emp. [illegible]
—Patents, New. 191, 435, 633, 872, [illegible]
[illegible]
—Scotch shale-oil industry. 656
—Steam winding [illegible] 1013
—Tin mining, Cornish. 181
—Value, galena and blende, Wales. 709
—Work of British Mint. 115
United Mine Workers. 148, 335, 828, 928
United Oil Co. 439
United Placers Co. 1124
United States.
—[illegible] 293
—Antimonial-lead production. 620
—[illegible] 753, 842
—Asbestos production. 97
—Barytes, Crude, production. 755
—Bauxite production. 868
—Bismuth statistics. 824, 842
—[illegible] production. [illegible]
—Coal consumption, mines and railroads. 428
—Coalfields, Area of. [illegible]
—Coke exports to Mexico. [illegible]
—Copper consumption in 1907. 187
—Copperas production, 1907. 292
—Fuller's earth production. 168
—Germany, Commerce with. 714
—Iron and steel, 1907. [illegible]
—Iron and steel, Finished, production [illegible]
—Iron production, 1908. [illegible]
—Iron-pyrites production. [illegible]
—Lead consumption. 863
—Magnesite and chromite production 803
—Sulphur production. 242
—Tungsten production. 293
United States C. & C. Co. *26
United States Coal & Oil Co. 236
United States Diamond Mg. Co. 440
United States Gold Corp. 248, 877
United States Red. & Ref. Co. 827, [illegible]
United States Smg. Ref. & Mg. Co. 101, 194, 317, 320, 343, 438, 880, [illegible]
—[illegible] *1009
United States Steel Corp. 45, *97, 240, 289, 305, 865, 1116
—Duluth steel plant. *322
—[illegible] 864, 883
—Scientific research bureau. 1064
—New plant at Gary. [illegible]
United States Zinc Corp. 200
United Verde, Ariz. 247, 423
[illegible]
[illegible]
[illegible]
Unloading cars, Hopper for. *1009
Urals, Dredging for platinum. *701
Urquhart, M. J., Death of. 388
[illegible]
[illegible]
[illegible] Notes. 488, 635, 735, 781, 874, 923, 1030, 1176, 1263
[illegible]
[illegible]
[illegible]
Utah Cop. Co. 45, 147, 245, 349, 389, [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Utah Yerington, Nev. 1228

V

[illegible]
Valley Construction Co. [illegible]
Valparaiso mine, Calif. [illegible]
[illegible]
Van Nostrand township, Ont. 350
[illegible]
Van Zwaluenburg. Machine sampling. 1018
[illegible]
[illegible]
Vancouver Island coal output. 419
Vandalia Coal Mg. Co. 546, 592, 1027
Vantage Extraction Co. 1228
Varnishes for cyanide tanks. 842, 871
Veins, Law of. 212, 281, 363
Velardeña mine, Mex. 1278
Ventilating notes. 32, 288, 314, 333, [illegible]
Ventilating—Water power underground. [illegible]
Ventilation—Coal-dust prevention. 1107, 1109
Ventilation—Jersey mine fire. *88
Ventilation, Mine, Improved methods. 1059
Ventilation—Mining flat coal seams. *284
Ventilation reversal, Hamstead colliery [illegible]
Vermont, Talc and soapstone. 753
Vessels, Lake ore, Size of. 1173
Veta Colorada cyanide mill and mines. [illegible]
Veta Grande mine, Mex. *402, 403, *405
[illegible]
[illegible] 631, 776, 917, *951, 1018, 1111
Victor Copper Mg. Co. 591
Victor Fuel Co., Colo. *1248
Victoria. See also "Australasia," etc.
Victoria Falls Power Co. 868, 1025, 1121
Victoria mine, Mich. 1179, 1227
Victoria mine, Ont. 786, 1031
[illegible]
Victorian Syndicate, Ltd. 1019
[illegible]
Vigo county, Ind., coal survey. 442
[illegible]
Village Main Reef. 484
Vindicator Consol., Colo. 195, 781
Virginia-Carolina Chem. Co. 1116
[illegible]
Virginia Iron, Coal & Coke Co. *908
Virginia Polytechnic Inst. 486
Virginia, S. W., Iron and zinc. *908
[illegible]
Vogeltruis Consol. Deep, Transvaal. 992
Volatile matter in coal, Nature of. 720
Von Hammerstein, A. 1222
Von Pohl, Baron Herbert. 1271
Vulcan Iron Wks.—Electric hoist. *31
Vulcan mine, Queensland. 144

W

Waddell, Geo. F. [illegible]
Wages. See also "Labor."
Wages at Guanajuato. *671
Wagner, J. L. Coal puncher. 1112, *580
[illegible]
Waihi Co., N. Z. 143, 481, 842
[illegible]
Wake-Up-Charley location, N. M. *1102, 1224
Wales, Coal in. 724
Wales, Value of galena and blende. 709
[illegible]
Walker, G. B. Rescue work in Eng. 620
Walker, S. F. Heating, electrical con- [illegible]
[illegible]
[illegible]
Wallaroo & Moonta costs. 165
Walsh, G. E. Elec. power, coal mines. 1011
Walsh, M. J., Death of. 1068
Walsh, T. F. Discovery of Camp Bird. 223
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Warren Realty & Devel. Co. 391
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

PAGE
Water catching in English colliery shafts. *673
Water hoisting by tank. 724
Water-jet spray for coal dust. *89
Water, Mine, Tapping under pressure. 239
Water power in U. S.—Note. 1197
"Water Power of Wisconsin." †1115
Water-power plants, Calif. 8, 871, 1161
"Water Powers of Georgia." †632
Water problems, Joplin dist. *214
Water resources, Conservation of. 1172, 1217
—Misleading power estimates. 727, 866, 1066
Waters-Pierce Oil Co. 1116
Watering. See also "Coal dust."
Watering mines dangerous. 1107, 1109
Watson, Eric E. 634
Watson, T. L. 777
Watson, W. J., and Tyee smelter. 93
Watterson Gold Mg. Co. 161
Watteyne, Victor. 13, 486, 860, 864
Watts mine, Ont. 518, 741
Way, E. J. Underground conveyers, Kleinfontein mine. 715
Weber, Henry. 101
Webster, B. Copper River dist. 680
Weighing ore in stamp mills. *804
Weight, Over-balance, for hoist. 239, 338, 433
Weihe, Wm., Death of. 486
Weitzell, R. S. 342
Well, Boring—Time items. 968
Wells, J. S. C. Ferrites, compounds of an iron acid. 420
Wells, Robert G. 1174
Werf Conrad dredges. *702
Wernher, Sir Julius. 439, 489
West African gold. 623, 906, 1173, 1190
West Australia. See "Australasia," "Australia."
West Coast Co., Ore. 199
West Coast M. & S. Co., Mex. 1278
West End, Tonopah. 301, 493, 594, 832
West Rand Consol., Transvaal. 992
West Va. coal, Machine-mined. 724
"West Va., Map of." †920
West Va. mine regulations. 776
West Va. Mining Asso. 588, 682
—Meeting. 770
—Coal-dust explosions. 814, 819, 1107
West Va., Northern, Coke mfr. 426
West Va., Supp. Coal Report. †920
Westby-Sorensen process. 418
Western Eng. & Const. Co. 1021
Western Md. C. & C. Co. 592
Western Metals Co. 1176
Western Precip. Co. See "Cottrell."
Western University of Penn. 869
Western Utah Cop. Co. 438
Westinghouse air signaling system. *857
Westinghouse mica property, S. D. 548
Westmoreland Coal Co. 688
Weston, E. M. New mining and milling practice on Rand. *323, 822
—Machine drills for stoping—Reply. 484
—Multiple drill arrangement on Rand. 538
—Tailings elevators on Rand. *539
Weston bucket shackle; Berry crosshead. *41
Wetzig, B. Huelva pyrite deposits. 283
Weymouth, W. S. 869
Wharton, S. L., Death of. 44
Wheal Kitty & Penhalls. *94
White, Geo. M. 193
White, I. C. "Map of W. Va." †920
White Silver Mg. Co. 543
Whitehead, Cabell, Death of. 682, 734
Whiteside Exploration Co. 785
Whiting's hoisting method. 1014
Whitman, P. R. 1222
Whitman & Little. 349

PAGE
Whitman Mg. Co. 239
Whittall Bros. *601
Wickett, Morley. 636
Wicks, John, Death of. 825
Wiley, H. W. "Agricultural Analysis." †1219
Wiley, W. Murdock. 99
Wilkes, Capt. John, Death of 243
Wilkinson, Gen. Sir H., Death of. 1174
Wilkinson, W. F. 629, 773
Willard, E. T. Ind. coal mines. 297
Williams, Albert. 921
Williams, Gerard W. 44
—Engineers' prospects, Australia. 42
—Silver-lead-zinc mines, Broken Hill. *793
—Metallurgy of Broken Hill. 893, 1169
—Cobar field. 957
Williams, R. Y. Method for Pittsburg seam. *330
Willow Branch mine, Okla. 1074
Wilson, E. B. "Cyanide Processes." †732
Wilson, F. F., Jr. Prospecting for phosphate rock. 1148
Wilson group, Ariz. 247
Wilson, J. B. Bridging turn sheets. 1009
Wimmer Coal Co. 442
Winchell, Horace V. 243, 1271
Winding. See "Hoisting," "Rope," "Engine," etc.
Wingfield, Geo. 101, 147, 1120
Winslow mine, Ind. 1179
Wintering & Osgood, Calif. 438
Winze, Sinking, with long holes. *713
Wiper, Wm. C. 388
Wires, Heating of, by electric currents. 177
"Wisconsin, Water Power of." †1115
Wisconsin Zinc Co. 153, 158, 51, 1075
Withrow, J. R. Copper electrolysis. 755
Witwatersrand. See "Rand," "Transvaal."
Wolf Creek Mg. Co. 639
Wolf flotation process. 778
Wolfel, Paul L. 44
Wolfsheart Co., Mo. 151
Wolftone Co. 640, 830
Wolverine, Mich. 557
Wolverine & Arizona. 47
Wonder, Nev. 739, 831, 1126
Wong Kokshan. 99
Wood, G. R. Electrical accidents. 726
Wood mine, Sylvanite, N. M. 1224
Wood, Thos. L. 869
Woodbridge, D. E. Duluth steel plant and belt railway. *322
Woodbridge, T. R. Machine sampling. 917, 1019, 1111
(For rest of discussion see "Sampling.")
Woodward Iron Co. 103, 1048
Wooldridge Co., Tenn. 785
Worcester, S. A. Over-balance weight. 239, 338, 433
World productions. See countries, metals, etc.
Worrel, S. H. 779
"Writing, Technical, Guide." T. A. Rickard. †732
Wulfenite. 1055
Wyandot Co., Mich. 783, 830, 927, 1072, 1124, 1179
Wyoming coalfield, largest in U. S. 1105
Wyoming mine, Colo. 441
Wysor, H. "Metallurgy." †732
Wyssotzki, N. K. Platinum, Russia. *701

Y

Yak tunnel, Colo. 299, 390, 441, 545, 684, 783
Yale, C. G. Calif. gold and silver production. 579

PAGE
Yampa mine and smelter, Utah. 200, 542, 781, 1273
Yaqui war, The. 123
Yeandle, M. H. 145
Yellow Aster mine, Calif. 244, 438
Yellow Dog mine, Joplin dist. 327
Yellow Jacket mine, Calif. 925
Yellow Tiger mine, Nev. 487, 594, 687, 1180
Yolande Coal & Coke Co. 977
Yoquivo mine, Mex. 201
Young, S. "Stoichiometry." †241
Young, W. P. Variable color, coke ashes. 533
Youngstown industrial cars. *1050
Yttrotantalite. 1100
Yukon-Alaska-Pacific Expo. 922
Yukon Basin Gold Dredging Co. 494
Yukon Gold Co. 52

Z

Zaaiplaats State tin mine. 579
Zacatecas, famous silver camp, Mex. *401
Zalinsky, Maj. E. L. 295
Zalinski, E. R. Turquoise mining, Burro mtns. *843
—Ore occurrence, Fortuna mine. *1191
Zehner, W. D., Death of. 145
Zimmermann, Col. W. H., Death of. 1119
Zinc and alumina in slags. 270, 483, 730, 1111, 1264
Zinc and lead, Miss. valley, Distribution. 1004, 1017
Zinc and lead smelting, Silesia. *265
Zinc, Australasia, in 1908. 143
Zinc-box precipitation, Veta Colorada. *122
Zinc, Broken Hill—Mines; metallurgy. *793, 893, 1169
Zinc—Cadmium as by-product. 92, 538
Zinc-concentrate exports, N. S. W. 620
Zinc Corporation. 144, 713, 896, 1169
Zinc-dust precipitation, El Rayo. *79
Zinc, Electrolytic determination. 372, 314
Zinc—Galena and blende value, Wales. 709
Zinc in S. W. Virginia. *908
Zinc, Iowa mining. 805
Zinc, Joplin dist.—Pumping; power; natural gas. *214, 327, *568
"Zinc, Lead and, in the U. S." †129
Zinc, Miami dist., Okla. *910
Zinc-mill construction, Joplin dist. *125, *993
Zinc mining, Joplin dist.—Ore tariff, etc. 383
Zinc—Mixed sulphide-ore treatment. 1218
Zinc-ore, Joplin—Sampling; buying. *190
Zinc ore, Prayers for. 1118
Zinc-ore prices—Effect on production. 970
Zinc-ore separation, Magnetic, Santa Barbara. 211
Zinc ore, Sussex Co., N. J. 979
Zinc-ore tariff. 383, 1021, 1024, 1069, 1118, 1221
Zinc ores—Lead determination. 178
Zinc ores, Magdalena, N. M. *366
Zinc ores, Missouri—Methods and costs. *605
Zinc ores, Nomenclature of. 822
Zinc oxide and the ferrites. 420
Zinc oxide in slags. 271
Zinc resources—To what extent known? 1017
Zinc smelters in Canada. 919
Zinc smelting at Port Pirie. 912
Zinc—Testing galvanized iron. 36
Zinn-Florence, Nev. 488, 547, 639, 687, 1125
Zirconia as a refractory material. 909
Zug, Charles G., Death of. 342

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, JULY 4, 1908. NO. 1.

The Advantages of Flushing in Coal Mining

Introduction of Filling into Mines Is an American Idea Much Favored in Europe. The System Is Necessary at Some Mines with Bad Top

BY LUCIUS W. MAYER*

The practice of back filling waste material into underground workings by means of water, is called "flushing" in America. This idea of so conducting material is of American origin, having been first introduced in Pennsylvania about 17 years ago. James B. Davis of the Dodson colliery first worked on the scheme in 1891 at the property of the Dodson Company in Plymouth, Penn., near Wilkesbarre. Up to the year 1907, there had been no decided change in the original method of filling, and the company was still drawing from its waste culm pile to fill the mine chambers. At the Black Diamond colliery, which was under the management of the Jno. C. Haddock Coal Company, similar operations have been in vogue for some time. The Lehigh Valley Coal Company as well as the Pennsylvania & Reading Coal & Iron Company have not been slow in adopting the idea at a number of points in the State.

Information on the subject does not evince the idea that the flushing system is used elsewhere in the United States than in the State of Pennsylvania. Not many years after the announcement of results at the Dodson colliery, German engineers investigated the field where the process was in successful operation, and have since illustrated their approval of the practice by its universal introduction along most elaborate lines in Germany, where it continues to gain favor constantly.

Value of the System has been Proved

The value of the flushing system as used in Pennsylvania has been proved beyond question. At the Dodson colliery, it is questionable whether the property could be successfully worked were it not for filling the excavated areas. This is not alone accountable to the squeeze which was impending, but also to the nature of cover which overlies the thick seams, and the fact that the coal lies to a great extent directly under the main town. A similar condition existed at Shenandoah City, Penn., where chambers of large extent have been filled to maintain surface structures.

In Upper Silesia, Germany, where the system was first introduced in Europe, damage suits were numerous as a result of surface depression caused by the underground excavations. The seams in this field (often attaining 25 ft.) are very thick, consequently the subsidence was severe, and any economic system of mitigating this condition was welcome. The water-filling method has become popular in Silesia because of the extremely favorable results attained with it. Any material in the district (such as gravel, clay, crushed slag, cinders, etc.) which can be moved with water and passed through ordinary sized pipes, is introduced into the workings. Since the adoption of the method, surface damage suits have practically disappeared.

Pillar coal hitherto unminable because of permanent pillar requirements, is now available, and timber costs have been considerably reduced. Surface troubles have been greatly alleviated, and work under- [illegible] safer conditions.

It might be pointed out at the beginning, that the general system as operated in America is rather more with a view of maintaining ground, i.e., reinforcement of the pillars, than as a means of extracting [illegible] in place. In Europe, the incipient idea is

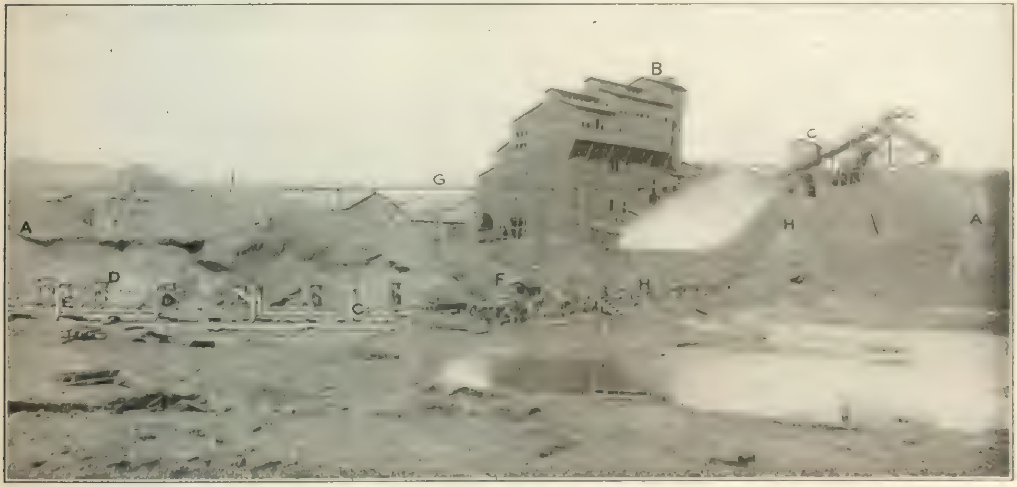


FIG. 1. [illegible]

---

*Mining engineer, 193 Pearl street, New York City.

to effect a complete removal of the deposit; the preliminary layout of the mines is planned with this prospect in view, whether the mining system is pillar work or modified longwall. In justice to the originators of the flushing system, it is only fair that a description be first offered of the practice at certain points in Pennsylvania, but it must be admitted that in Europe the practice has received much more attention and use than in America. This applies in Europe to metalliferous mines as well as coal mines.

Flushing at the Dodson Colliery

Fig. 1 illustrates the general surface arrangements at the Dodson colliery at Plymouth Penn. The culm dump is represented by *a* and shows in the foreground, although much of the material has since been transferred to the mine workings. The old breaker is marked *b*.

The culm dump in the figure is composed of material which was mined many years ago. This contains a good quantity of coal which in former days was not marketable. *c* is the small washery which now rehandles the dump as a whole, and extracts the good product as it is received from the conveyer *d*. This latter is a conveyer of the push-plate type. The trough at *d* in Figs. 1 and 2 shows the chain and push plates leading up to the engine *f* Fig. 1, at which point the material is directed at right angles to a second conveyer *h* delivering to the washery. The two conveyers measure 680 ft. in length. Fig. 2 shows a section of the conveyer in detail, and the method used for feeding same. The troughs were of No. 10 sheet lining in 4-ft. lengths, the shape being half hexagons. The frame sections were 12 ft. in length. As the culm bank is consumed the conveyer is moved up accordingly.

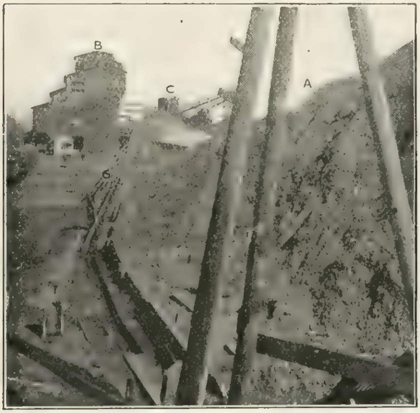


FIG. 2 FILLING ON ITS WAY TO BORE-HOLE

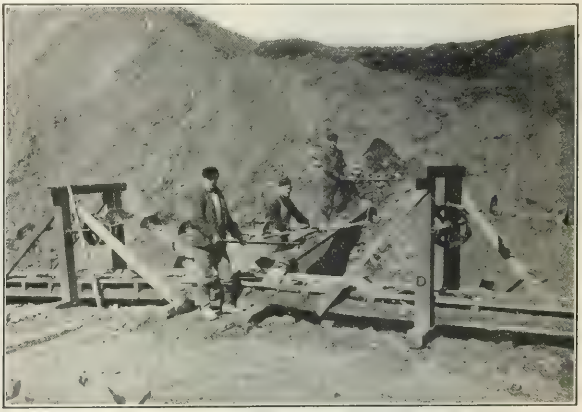


FIG. 3. LOADING CONVEYER

At *c* Fig. 1, the filling is joined by the waste coming from the main washery, and a supply of water, and is thus conducted down the launder *g* of Figs. 1 and 3. The material leaving the washeries will all pass through a ⅜-in. ring. The flume is about 650 ft. long and is lined with terra cotta-pipe sections. This flume leads to the bore-hole well, into which the culm may be seen discharging in Fig. 4. Over the hole a tripod is seen. The function of this apparatus is to support rods which are at times brought into play when the hole becomes jammed. The cover which fits over the well casing is marked *k*.

The bore-hole is 8 in. in diameter and 600 ft. in depth; it is lined with 5-in. wrought-iron pipe, the space between the outer periphery of the pipe and the hole being filled with mud. The system of pipe connections underground where the pipe line starts off from the vertical, is shown in Fig. 5. This is the 360-ft. level. The three valves shown control the direction of flow at this point. Upper valve *l* is a drain cock; if *m* is shut off and *l* opened, a drain of the system is effected. It is important that the system be drained at times when operations cease, or if flushing is to be discontinued at a lower level, and an upper level is to be started. The arm *o* in Fig. 5 is part of the casting and extending out serves as a bearing against the timber prop, noticed in the illustration.

Pipe Lines Underground

The pipes are laid along the gangways and branch off by means of elbows and tees leading into the mine chambers; 4- and 5-in. pipes are used underground. Experiments were carried on some time ago at the Dodson colliery to test the various pipe materials. It was found that wrought iron gave the best service; that the steel pipe tried, was too soft, and that cast iron wore rough inside. At the time of my visit, culm was passing through about 1500 ft. of pipe and there was considerable up-grade in the course of the line. Three hundred and fifty tons of culm was being flushed per 18 hours and the water flow was given at 485 gal. per min., or approximately 5 to 5.5 lb. of water per lb. of culm.

The Mine Workings

The Dodson mine comprised seven seams of coal showing a variety of thicknesses ranging from 5 to 23 ft. The method of working was by the bord-and-pillar system though not with the utmost regularity, the pillars necessarily varying in size in different parts of the mine. The seams pitch slightly, although at some points they are quite horizontal. Where there is grade to the workings, the pipe enters the chambers from the upper end, the culm thus banking up to the roof at the lower end, where a barrier has been set to hold the culm intact and allow the water to pass on. Where the floor is level, the pipe is carried into the chamber to its full length, and the discharge end is set close to the roof. As the chamber fills, lengths of pipe are gradually withdrawn. It seems difficult to conceive how a chamber having a level floor and roof can be completely filled in this way, and it would appear that where a close contact is effected between the filling and the roof under such conditions it must be due to the bend of the roof between pillars.

Barriers

Previous to the introduction of the filling into the chambers, the areas are isolated by timber walls which serve to control the inflow of culm. The hight of barriers varies with the thickness of seam. Fig. 6 shows the form generally used. Vertical round posts are set off at 4- to 6-ft. intervals across the mouth of the chamber. These posts are 6 to 12 in. in diameter and are set into hitches previously cut in the floor and roof to receive them.

Where the pitch of the seam is slight,

relatively little pressure must be sustained by the barriers, but in the more inclined seams it often becomes necessary to reinforce these posts by additional timbers, or by placing a rock-wall on either side of the timber barrier wall. In order to allow the water to drain off from the mass of the culm as it comes to rest, small holes are bored in the planks making up the wall. This same form of barrier may be varied by using round timber throughout instead of plank.

Referring to Fig. 7, this shows a form of barrier maintained by planks which become imbedded in the filling material; these planks are attached to the barrier wall, and the entire arrangement is self-sustaining. The wall is formed of 2x12-in. planks, 12 ft. long, designated by *a* in the figures. Planks *b b* are engaged into this wall at right angles to it, and at a vertical interval of 12 in. The filling backs against the wall *a*, and at the same time accumulates about the *b b* planks. The imbedded planks and the wall are secured by means of 2x2 or 2x4-in. cleats *c c c*. The wall may be built to any desired hight. The sticks *d d* are simply placed to hold the *b b b* planks apart while the filling accumulates.

The advantage of such a type of barrier is its flexibility, and hitches do not have to be cut in the roof and floor as in the post type. A comparative estimate of cost for the two types, including installation, shows that up to about 8 ft. hight, the sectional style is the cheaper of the two.

Fig. 8 illustrates a typical area in the William A mine of the Lehigh Valley Coal Company in Pittston, Pennsylvania. It is noted that the area to be filled is equipped with barriers and that the filling is sent in from the upper gallery. The general method underground is quite the same as at the Dodson colliery. The filling material, culm, came direct from the washery and there was but one lift in the bore-hole. At this lift there was a large L fixture which changed the direction of culm flow from the vertical, and the pipe line was started off at an upgrade so that an accumulation was always present at the L to act as a cushion to the down-flowing stream. The culm particles were considerably larger than the average at Dodson, quite an amount of material as large as 2 in. being noted. This is not unusual, for large sized gravel is being flushed at another point in the district, where the material is only small enough to pass through the 4-in. pipe.

At the Hazleton No. 2 mine there is arranged an L at the bottom of the bore-hole line, of design shown in Fig. 9. To effect a tight connection, grout was forced up into the space between the pipe and the walls of the bore hole. The fixture is supported by a base marked *r*. Wooden pipe of the design shown in Fig 9 was used at this mine and served well to counteract the corrosive effect of the mine waters on ordinary metal pipes.

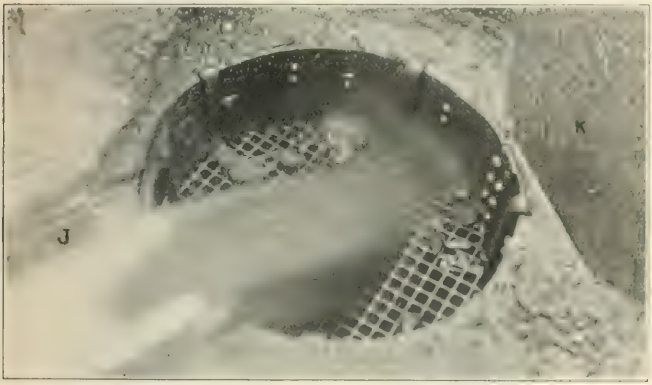


FIG. 4. BORE-HOLE WELL RECEIVING FILLING ON SURFACE

EUROPEAN FLUSHING [illegible]

The Myslowitz colliery at Myslowitz, Upper Silesia, is reputed to be the first European mine to introduce the flushing system known in Germany as "spielversatz." This colliery is one of the larger operations of the foremost German coalfield. The idea of introducing filling with water soon traveled westward and southward, and it was not long before it was practiced in Westphalia, several districts in France, and also in Austria on an elaborate scale.

The replacement of coal seams with filling had long been realized a necessity in many parts of Europe, and its introduction became so urgent a requirement, that manual labor was pressed into service for the purpose of transferring great volumes of dry material from banks on the [illegible] and placing it in the [illegible]bers. In fact, at the present time, in various parts of Europe, dry filling is lowered into mines and shoveled into place behind the coal face; in spite of the expense of hand-loading at the bank and similarly unloading at the face, the practice has been found economical in the long run.

Water flushing is gradually replacing all other methods of filling transference, and it has been universally found that this method far surpasses the dry method from many standpoints, not alone in the matter of manipulation cost, but more particularly in the matter of efficiency in fulfilling the purpose of the filling.

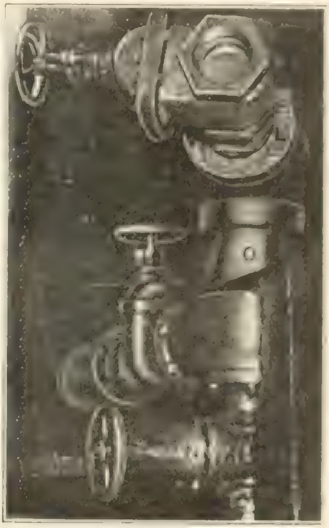


FIG. 5. PIPES ENTERING [illegible] AT BORE HOLE

[illegible] conductor, must not be minimized, and where this water must be raised from the [illegible] gree, before being allowed to enter the pumps. These items, in addition to plant requirements on the surface to control the [illegible] bore hole or shaft, must be considered, in comparing the flushing system with [illegible]

Most interesting operations carried on in southern France will be described in detail later on. Suffice it to say that at Carmaux, dry filling has for a long time been practiced, but is now being replaced [illegible] system has met with distinct favor already, it having been found that the shrinkage in volume of material hydraulically filled is markedly less than where the [illegible] of course, infers amelioration of the objectional surface subsidence feature.

Flushing in Metal Mines

Not alone has flushing been adopted in coal mines of Europe, but in Germany I observed a lead mine where mill tailings were being flushed to great advantage, and at another point, also to be described, an iron mine had introduced a chamber-and-pillar system of mining, in which was involved the flushing of sand, in virtue of which pillar removal was made possible.

In Cumberland, England, flushing of sand into an iron mine to assist a contemplated scheme for the removal of large pillars was under consideration. The deposit was a high grade of ore, and at this particular mine the caving system (so prevalently practiced in Cumberland), involving lowering of the surface, was not adoptable. I have no record of any other mine in England where steps have been made to introduce filling by flushing, but various English engineers have visited the Silesian field in Germany, with a view of investigating the flushing practice there.

The difficulties involved at times in obtaining water for the purposes herein described, as well as the disposal of same from the workings in a clarified state, has suggested possibilities in the direction of utilizing air under pressure as a motive medium for the stowage material. An experimental plant was recently constructed near Kattowitz, Upper Silesia, to experiment with the idea of introducing filling from the surface to the mine chambers, with compressed air as a conductive force. At the time of my visit in Silesia, during September, 1907, the experiments had not been brought to a conclusion, but sufficient work had been carried on to predict a fair future for the process, in view of the encouraging results thus far attained.

Air as a Conductor

The material which had been experimented with was a crushed dolomite rock, and I was advised that material as large as 1 in. had been satisfactorily manipulated. Pipes were about 10 cm. in diameter. Following the phenomena of acceleration and velocity of air and solids in pipes, it was found best to make the pipe line which conducted the material in its vertical course down the shaft, of spiral design. It was inferred from the information available that only a light air pressure was necessary, and that the pipe lines underground could be varied at will in direction, to make turns or follow undulations of the floor. The information was evinced, that by this air-filling system, more or less of a dust nuisance was created in the mine chambers as the material discharged from the pipe line, and that the process involved a higher cost than flushing, where water was readily available.

It would appear that with any system not involving water, it would be difficult to create a very intimate contact between the particles making up the filling medium. It has been suggested that this involves a condition allowing of excessive shrinkage of the packing and consequent subsidence of the overlying strata. It is my opinion, however, that with the air system less shrinkage is likely than where the stowing is introduced by shoveling, although unless the air pressure under which the particles are introduced is strong, the margin may be very small in this regard.

At the Park Pit, Skelton Cumberland, a method of building dry rock-walls in certain parts of the mine has been introduced, and within these walls which are about 1 to 2 ft. thick and built more or less on the pig-stye order, small stuff is packed. The walls are built up to the back, and similarly the loose material is piled up within the skeleton walls. As the loose stuff is placed, sprays of water are added thereto, and the whole tamped as the building up progresses. In this way quite a consistent pack is accomplished, and no more water is introduced than can be absorbed by the filling, so that no water-disposal troubles enter into the problem. The operations on these lines were not very extensive, and were intended merely to counteract surface subsidence at certain points where buildings were located.

At Lens, Pas de Calais, which is in northern France, an inclined seam is back-filled by *remblayage par embouage,* as flushing is called in France. Here, however, the filling material, which is a shale, is lowered to a certain gallery in the mine in cars, where it is dumped into storage receptacles, and on leaving same

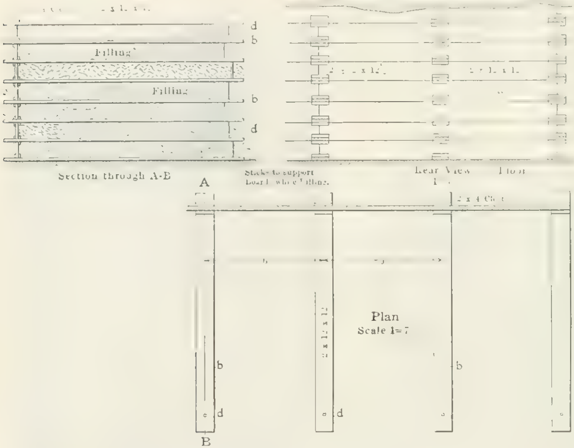


FIG. 7. SECTIONAL TIMBER BARRIER WALL PROPOSED FOR USE WITH FILLING

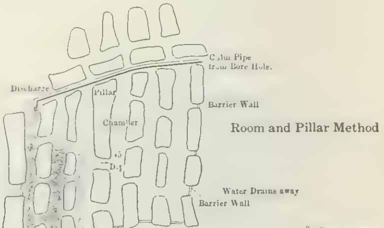


FIG. 8. TYPICAL AREA IN A FLUSHING OPERATION IN PENN.

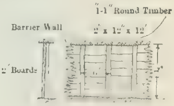


FIG. 6. BARRIER WALL

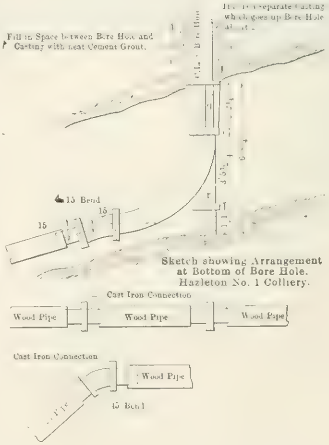

This is a separate Casting which goes up Bore Hole
Fill in Space between Bore Hole and Casting with neat Cement Grout.
15 Bend
15
15
Sketch showing Arrangement at Bottom of Bore Hole. Hazleton No. 1 Colliery.
Cast Iron Connection
Wood Pipe
Wood Pipe
Wood Pipe
Cast Iron Connection
Wood Pipe
15 Bend

FIG. 9. DETAILS OF PIPE CONNECTIONS

comes in contact with the water which conducts it to the chambers where the filling is going on. The material at this place attains a maximum of 1 in. in size, and it is said that the ratio of liquid to solid is 4:1. It was found here that a mixture of the shale with sand gave better results as regards consistency and its relation to shrinkage.

In the mine at Pas de Calais, as in certain mines of Westphalia, canvas brattices are used underground to hold the filling intact, instead of the timber barrier form previously described and more universally adopted. A light framework is first constructed of timber at the point where it is desired to bank the filling, and the canvas is hung snugly on this framework. The canvas itself acts as a filter, and the water passing through same, proceeds directly to the pumps.

Rescue Work at Hamstead Colliery

By D. J. Pierce*

The rescue operations incident to the Hamstead mine disaster near Birmingham, England, were marked by unusually heroic incidents. The coal at Hamstead lies at considerable depth and the pressure upon the seams has caused frequent trouble through the generation of heat. The last and most disastrous fire occurred in such a position as to entrap 30 men in the workings. The main shaft, nearest the location of the fire, was temporarily out of use owing to the breakdown of an engine, and only a smaller ventilating shaft was available for use. After several unavailing efforts to reach the entombed miners, it was decided to reverse the ventilation of the mine.

Ventilation Was Reversed

As is usual in English mines, the pit where the disaster occurred had two vertical shafts, one down-cast and the other up-cast, the ventilating fan being connected by an air drift to the up-cast shaft and drawing the air into the down-cast shaft through the workings and up the up-cast shaft. In order to draw the air down the up-cast shaft an entirely new fan installation was required since the fan in use could not be moved.

A 60-in. Sirocco turbine fan, delivering 80,000 cu. ft. of air per min. was requisitioned from a neighboring colliery, and hundreds of men set to work to build an air drift from the down-cast shaft to the suction. This air drift was 150 ft. long and 7 ft. in diameter. Thousands of tons of earth had to be excavated for the new air duct, but this, and the building of the brick drift was begun on Friday and finished Sunday afternoon. The bricklayers and laborers worked night and day, with only occasional moments of rest to eat. When the brickwork of the old shaft was reached, it was found to be almost as solid as iron, but the tired laborers attacked it with pick-axes and finally succeeded in connecting up the fan with the down-cast shaft.

An Almost Impossible Feat

To excavate for and build an air drift 50 yd. long and 7 ft. in diameter, install a fan and connect the fan by steam mains from its engine to the boiler house, in a space of two days seems an almost impossible feat, but this was what was actually accomplished. The report of the superintendent on the work says: "Owing to the comparative simplicity and lightness of the fan and the installation work, it was possible to erect it and finish off the duct, shaft, fan, and engine foundation, and have everything in going order in 48 hours from the time the fan and engine were unloaded from the trucks."

[illegible]

When the walls of the down-cast shaft were penetrated, it was found to be filled with dense clouds of smoke, but after the [illegible] it was so clear that the rescuers descending the up-cast shaft were followed by the air current instead of being obliged to meet it charged with smoke. Although the rescuers were too late to save the lives of 26 of the men entrapped by the fire, the records made during the efforts at rescue will stand unbroken for a long time, according to the experts whose views are quoted in English journals.

[illegible] manufacturing iron is in Hokkaido, along the railway line, a short distance north [illegible]

Coal in the Dominican Republic

The extensive valley lying between the central range, or Gran Cordillera, and the Cordillera Setentrional, or Monte Cristi chain, abounds in coal deposits, those of the Pacificador district being the best known. According to a recent British consular report, the coal of the first mines discovered around Samana bay was of such a character as to lead to a general belief that the coal deposits in the Republic were still in the period of formation, and consequently that it was useless as fuel; this, however, was apparently a mistake, as large quantities of excellent coal, ready to be used as fuel, are to be found. Anthracite coal, stated to be as good as the best grades on the market, has been found in the Tamboril, province of Santiago, in the valley above mentioned. Both lignite and anthracite deposits are found in Altamura, Puerto Plata district, on the spurs of the Monte Cristi chain, and samples of anthracite from San Cristobal in the province of Santo Domingo have been tested with, it is said, excellent results. Other coal deposits have also been found in the Azua province.

In a report from the United States consul-general at Marseille, it is stated that the French bauxite deposits, which were the first to be discovered, continue to be the most important in the world, both in extent and value. The first valuable beds were found in the neighborhood [illegible] Marseille, which accounts for its name. At present the chief sources of supply are in the department of Var, a few miles [illegible]

---

*Tribune building, New York City.

Coal Mining Methods in Randolph County, Mo.

Plans for Shaft Sinking and Entry Driving with Especial Reference to the Location and Firing of Holes; Dimensions of Pillars and Rooms

BY J. J. RUTLEDGE

In the present condition of the coal trade in the middle West, any coal seam of less than 4 ft. in thickness, of average quality, and lying under a weak tender roof, presents serious problems in the mining and marketing of the coal. Such a bed is found in Randolph county in northern Missouri and some of the details of the practice in working this deposit by hand and machine may prove of interest to coal men.

As a general rule, one of the greatest problems in working thin seams by the pillar-and-room method is to furnish new working places fast enough to take the place of the older rooms as they are worked up and exhausted. The rooms are usually advanced proportionally faster than the entries are driven, and miners are compelled to wait until additional entry can be provided before they can secure new working places. Part of this trouble is due to the scarcity of good entry-men or the disposition to shoot the coal off the solid instead of cutting the entries; another cause arises from working entries single shift. One mine foreman gave as the results of his experience the rule that, in Kansas and Missouri, every seventh man at work in the coal in a given mine, should be an entry-man, in order to keep a sufficient number of working places open to produce a uniform daily output of coal.

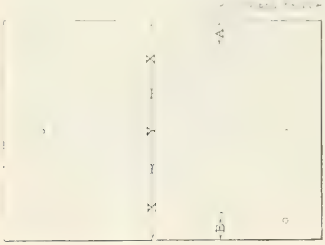


FIG. 1. PLACING SHOTS IN SHAFT BOTTOM

SHAFT SINKING

Some methods of mining, by hand and machine, in the northern Missouri coalfield, are illustrated in the following notes: The coal seam mined varies from 3 to 4 ft. in thickness, is uniformly horizontal, and lies 60 to 170 ft. from the surface. One of the shafts is 174 ft. in depth and the time consumed in sinking it was two months; during one-third of this time there were three shifts employed, and during the remaining two-thirds, two shifts. There were 4 men on every shift, one of whom led the shift, or acted as foreman. The cost, including labor and all supplies, was $18 per ft. Measured in the clear, the shaft was 7½x16 ft. and was timbered with 4x10-in. yellow pine.

All work was done by hand; hand steel, or "jumpers" of 1-in. octagon steel, were used in hard ground, while in soft ground the ordinary coal miner's "churn drill" was employed. As there was considerable shale, the churn drill was used about two-thirds of the time. The ground passed through was composed of hard limestone layers, varying in thickness from 4 to 6 ft. and rather soft dark-colored shales. Some 20 to 30 ft. of drift was encountered near the surface.

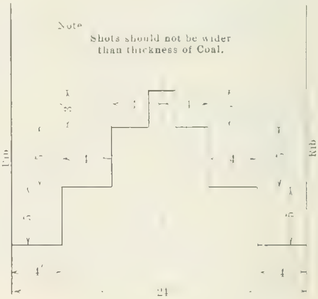


FIG. 2. PLAN SHOWING SHOTS 5 FT. LONG AND ROOM 24 FT. WIDE

PLACING SHOTS IN A SHAFT BOTTOM

In beginning to sink the sump, "holes" *A* and *B*, Fig. 1, are started at about ⅓ of the length of the shaft from one end. These holes are drilled at an angle of 45 deg. with the horizontal and are pointed toward the center of the shaft. The holes are 5 ft. in depth and so drilled that the distance x is ⅓ of the entire breadth of the shaft.

Two men can usually drill four 4-ft. holes in 8 hours and then fire them. Four sticks of 60 per cent. dynamite are generally used in each hole. These holes being fired give a sump 3 ft. in depth. There are 8 holes in all, 2 sump holes and 6 end holes. The entire 8 are drilled at the same time, and the sump holes are fired first. The end holes are 3 ft. in depth, nearly vertical, and so placed as to trim ends and corners after the sump holes have been fired. The plan is to give a 3-ft. cut at each firing and to complete sinking 3 ft. every 24 hours. When 3 shifts are employed, No. 1 shift drills the 8 holes; No. 2 shoots the holes, and No. 3 does the timbering. The sinkers receive $2.80 per 8 hour shift.

The ordinary jumper drill and 8 lb. hammer are used, double handed. Timber is lined by 4 plumb lines, one in each corner and after all muck has been sent up and the bottom squared up carefully, a set of timbers is placed on the shaft bottom and carefully leveled by a spirit level. Then each set is wedged by driving pine wedges against the outside of the side pieces.

The end pieces are usually forced in place, between the ends of the sides, by jacks, and the joint is a very strong one.

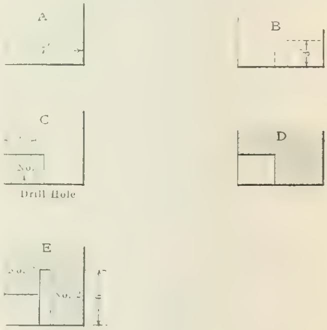


FIG. 3. METHOD OF DRIVING 7-FT. ENTRY BY HAND

A one-half inch notch in the ends of end and side pieces gives a substantial joint and one not pushed out of place.

SOLID SHOOTING

In solid shooting as ordinarily practiced, the miner looks for "chances," that is, he selects those points along the coal face in his room where coal can be "shot off the solid" without any shearing or undermining. As the physical quality of the coal in any given seam is always changing more or less, and slips, in coal and roof are frequent, the miner cannot always gage his powder correctly to meet these changes. Sometimes he uses too small a quantity of powder and the shots "stick" and must be worked off by vigorous use of the pick during the time or the day following when the miner should be loading his coal. At other times he uses too much powder and the coal is blown to small pieces and scattered all over the working place, knocking out props and injuring the roof. The next day the miner must spend some time in resetting his props and has no coal to load. For the above reasons, the foreman of the mine in which this method of producing coal is employed cannot with confidence expect a uniform daily output from his mine unless he employs a larger force of men than would be necessary to produce his regular daily output if all his men had coal to load.

---

*Mining engineer and geologist, 213 Courtl[illegible] street, Baltimore, Md.

IMPROVED METHOD OF SOLID SHOOTING

The plan shown in Fig. 2 illustrates the improved method of solid shooting in a room 24 ft. wide, and in a 12-ft. entry. The room pillars are 6 ft. thick and the room face is shown after the place has been turned. It is only necessary for the miner to cut 1 ft. per day, in the room, in order to have his shots in good shape.

In the 12-ft. entry, the cutting is made 4 ft. from the rib, which gives 3 shots across the width of entry, each 4 ft. wide. After the first shot, 3 ft. long, is fired, a second 3-ft. cutting is then put in by the miner and the second shot, which is 4 ft. wide and 6 ft. long is set off. Following this, the miner puts in another 3-ft. cut and a third hole is fired. The entry advances 3 ft. per day when in the hands of a good miner. It is said that this plan yields 20 per cent. more lump than the common method of shooting coal off the solid indiscriminately and without any freeing of the shots by cutting. Each shot, 6 ft. long, 4 ft. wide and 4 ft. high [illegible] short tons of coal. By this plan the room man often averages 4½ to 5 tons per shift, while 3 tons is the average where no cutting is done. The entry man averages 3 as against 2 tons by the ordinary plan. This is by "miners weight."

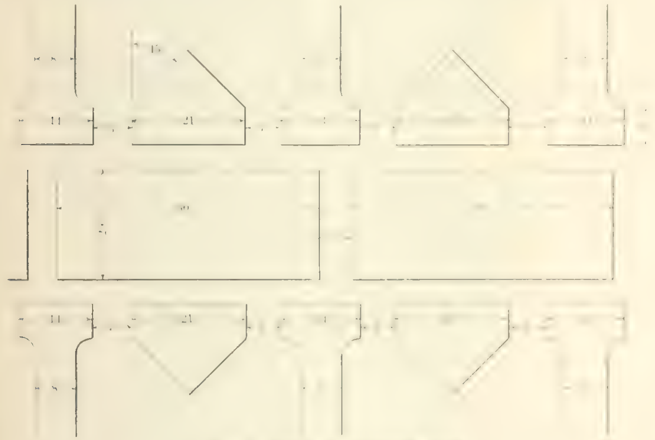
Method of Driving a 7-ft. [illegible]
HAND-MINING

The coal varies in thickness from 3½ to 4 ft. The entry is 7 ft. wide and at the commencement of work, has a square face as shown in Fig. 3 (*a*). A cutting 3 ft. deep, about 1 ft. wide and the thickness of the coal in hight is then put in by means of the miners' pick. When this cutting is completed a drill hole is put in and the shot marked No. 1 in Fig. 3 (*c*) is fired. This leaves the face of the entry as shown in Fig. 3 (*d*); another 3-ft. cutting is now put in, as shown in Fig. 3 (*e*). After this work has been performed, the miner has a shot 6 ft. long, and about 3 ft. wide, as shown marked No. 2 in Fig. 3 (*c*). After this No. 2 shot has been fired, an additional 3-ft. cutting is put in and a 6-ft. shot is made at No. 3 in Fig. 3 (*e*). When the work is properly performed and discretion is exercised in the amount of powder used to shoot the shots, the entries furnish good coal, the tender roof is not unduly shattered, and an advance of 3 ft. per day is made.

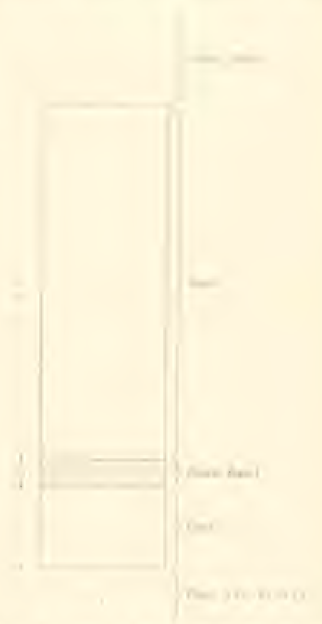
In following this plan, many thin seams [illegible] worked by vertical shearing either by hand or machine, combined with solid [illegible] cutting in coal or clay. This is more especially true of seams having a rather thick dirt band in the lower part of the seam, at which band the coal parts after being undermined, allowing the lower coal to fall, causing trouble in blasting the coal down. The undermining, when done in the clay, as it is often carried on, generally causes trouble in loading dirty coal.

[illegible]

[illegible] tries are driven 9 and 12 ft. wide, as the [illegible] Cross-entries are turned at distances of [illegible] width. Close timbering is necessary on main and cross-entries. The rooms are turned, as shown in Fig. 4, with room pillars 8 ft. in thickness and a triangular stump pillar 21 ft. wide and carried back to the distance of 21 ft. from the entry to a point, the widening being on an angle of 45 deg. with the center line of the roadway. Each room pillar where it is fronted on the entry, is 14 ft. in width, and all room necks are 7 ft. wide and 7 ft. deep. As the coal is thin for machine mining, the self-propelling Sullivan machine elec[illegible]



[illegible]



[illegible]

machine weighs about 3000 lb., and runs from right to left across the face of the room. The practice is to run the ma[illegible] means of the right-hand road, then it is [illegible] to the head of the left-hand room road, cutting a 6-ft. undercut in the clay. The [illegible] erally all in the clay under the coal. Rooms are usually turned by a machine, running the two room necks together on [illegible] the rib side of each room road, a room 40 ft. in width is made. This gives an economical working face for the self-[illegible] from the working faces expeditiously.

Some 40-ft. rooms are undercut in 45 min., but usually the time required to undercut a room face is about one hour. The cutter bar is 6 ft. long and 18 in. wide. Entry pillars are about 50 ft. long and 20 ft. thick, with 7-ft. crosscuts.

Owing to the difficulties in handling the clay from the undercutting and the necessity of waiting for places, the average per shift is only about three 40-ft. rooms, or 120 ft. of lineal undercutting. As a rule, two men could load out the coal in a 4-ft. room in 1½ shifts. From each room cutting about 38 tons of coal, miner's weight, was loaded out, the two tons probably going to the bands and impurities in the coal. An average daily output per man in the rooms is 5½ tons in entries, and five tons to each cut.

It is thought advisable to have all the pillars of 20-ft. width instead of one being 21 and the other 14 ft. The room pillar should be 10 ft. instead of 8 ft. thick, and room necks should be 12 ft. deep and 7 ft. wide, instead of being only 7 ft. deep as at present. The Sullivan machine used, required a distance of 6 ft. between the face of the coal and the last row of props. In one mine the room roads were 5 ft. from the rib with one row of props between. There were on an average, in this mine, three 4½-ft. props used to each ton of coal produced. The clay under the coal varies in thickness from 6 to 10 in. Under the clay is a hard limestone and in best practice, the props are footed on this limestone.

Goodman electric mining machines are also used. These undercut to a depth of 6 ft. and are used to cut the entries, and generally work on the night shift. Goodman haulage motors are used and one Morgan-Gardner haulage motor.

New Rescue Apparatus for Mines

The Institution of Mining Engineers, which has its headquarters at Newcastle-on-Tyne, England, its members being chiefly men connected with coal and iron mining, held its annual general meeting in London during the first week in June. The mornings were devoted to the reading and discussion of papers, while the afternoons were spent in visiting works and the mining and metallurgical exhibits of the Franco-British exhibition now being held in London. Among the works visited were those of Siebe, Gorman & Company, who construct diving apparatus for the British navy, and who in recent years have given special attention to the manufacture of apparatus for rescue work in mines. Appliances are made for use under water as well as in poisonous atmospheres. The apparatus for both purposes is of a simple, reliable and inexpensive nature, and considering their great value as a means of saving life, they ought to be found in every mine that is liable to an explosion or to being flooded.

The demonstration given at Siebe & Gorman's works included four separate exhibits. The ordinary diving dress, as used for marine work, was first shown. The diver is here supplied with air from an air pump at the surface and is in communication with the surface through a telephone. The second exhibit was a self-contained diving apparatus, in which a supply of oxygen is carried by the diver in steel cylinders. This apparatus is more likely to be of use in mines than the ordinary diving dress, because the diver can move about more freely. This self-contained apparatus is the invention of Mr. Fleuss, who proved its successful application when, a quarter of a century ago, he saved the workings of the Severn tunnel, when they were accidentally flooded by an irruption of water. A feature of the apparatus is that the supply of oxygen is automatic. Pure oxygen is not, however, supplied to the diver, but a mixture of 40 per cent. of pure oxygen and 60 per cent. of air. By this means the danger of oxygen-poisoning at ordinary depths is avoided. Of course, much more of this mixture is needed than if pure oxygen were supplied, but the extra weight of steel cylinders is of little importance, as the diver must be artificially weighted in any case, to enable him to sink. The most recent form of the Fleuss apparatus was publicly shown for the first time, a diver giving a practical demonstration in a large tank.

While this apparatus may, no doubt, be usefully employed at a mine for getting at drowned-out pumps, or closing water-tight doors, and similar work, it does not compare in value with the appliances made for enabling men to descend into mines filled with smoke or poisonous gases. Here human life is usually at stake and with this apparatus available, the lives of many men entombed by falls of ground may be saved. The dress is somewhat similar to that used under water, but is lighter. The Hall-Rees light diving dress and smoke helmet, designed by two naval officers, was designed more particularly for rescuing men from a submerged submarine, but it can also be used as a smoke helmet. It is very light and can be put on without assistance in 30 seconds. The oxalate, or air purifier, is carried in a case fixed to the front of the man's jacket, and the vitiated air passing through the oxalate is re-oxygenated and used over and over again. It is made for a service of two hours.

The improved Fleuss apparatus was also shown and a demonstration given of its use in an experimental gallery filled with poisonous gases. In this apparatus the oxygen supply is carried in a cylinder, or in two cylinders, on the man's back and there is a breathing bag in front. Attached to the bag is a pressure gage enabling the man to see exactly what quantity of oxygen remains in his cylinders and warning him when to return. The dress is light and allows free movement of the body, and a man equipped with the apparatus can crawl through a small opening without any danger of the apparatus being damaged, the bulkier part of the apparatus being fixed in the small of the back, so that if a man can get his head and shoulders through an opening, he knows this his oxygen cylinders will go through safely.

Those who are interested in this subject will find much detailed information in the *Transactions* of the Institution of Mining Engineers, as well as in the report of the Royal Commission on Mines. The subject is of the highest importance and all managers, who have human lives dependent on them, ought to inform themselves of the work that has been done in connection with rescue appliances for mines. Science has given the miner a weapon which enables him to defy water, smoke and firedamp, and there can be no excuse for failing to provide the appliances which may save life, or at all events mitigate the horrors of a mine disaster.

A California Power Plant

SPECIAL CORRESPONDENCE

The Great Western Power Company has commenced work on its extensive dam at the intake of the Big Bend tunnel in Butte county, Cal. Electric cars run through the tunnel from the power plant at the lower end to the dam at the upper, conveying material. The tunnel is 3 miles long and 18 ft. high in the clear, lined with cement. This same company has commenced work also on its transformation sub-station in East Oakland. This is at Sessions basin on the edge of the deep water in Oakland harbor. On this same property will be erected a steam-power plant to develop 25,000 h.p. by the use of fuel oil, as an auxiliary. The transmission lines are now in course of construction, and between 30 and 40 miles of them have been finished. Stretches have been completed above Oroville, in Sacramento county. The transmission cables are carried on steel towers 30 ft. in hight, and it is expected that the first installation will have been completed by October. At this time the delivery of 65,000 h.p. of electrical energy will begin. The transmission line, when completed, will pass through Butte, Sutter, Sacramento, Yolo, Contra Costa and Alameda counties, crossing the San Joaquin river at Antioch. It is generally understood that much of the power generated at the Big Bend electric plant will eventually be used on the lines of the Western Pacific Railroad.

Coal Dust as a Factor in Mine Explosions

Liability of Coal Dust to Explosion Increases Almost Directly with Its Percentage of Volatile Combustible Matter. Size Also of Importance

BY HENRY M. PAYNE

Shortly after the completion of my investigation of the Monongah explosion, your president asked me to address you at this meeting, and as the intervening time seemed ample for preparation, I consented. I almost immediately began a series of foreign correspondence for the purpose of securing all possible reports and data which would enable me to present to you at this time, a resumé of the coal-dust problem in its highest development, but I had no conception of the mass of material which must be assimilated, or of the labor entailed in its compilation.

For any apparent omissions or incomplete developments I do not plead procrastination, but rather the fact that the preparation of the material embodied, required the translation of over 80 books and reports in French and German, and over 1000 letters and magazine articles in these and other languages, a complete or even comprehensive summary of which would assume the dimensions of a book of considerable magnitude.

Coal dust is first mentioned as a dangerous element in 1803, next in 1828, and again in 1844 and 1845. All these cases were in England. In 1855, 1861, 1864, 1867, and 1875 we find records of experiments in France. Since that time, France, England, Germany, Prussia, Belgium, and the United States have all shown periods of active investigation, culminating in recent years in coal-dust commissions, bureaus or departments of mining, and the establishment of stations for technological research.

Upon certain basic principles, all scientists seem agreed. Coal dust has existed in coal mines from the earliest dates, and is a more or less unavoidable product. The quantity produced in our modern mines is comparably large, compared that produced in the earlier days, and consequently the dangers of coal mining are correspondingly increased. This increase is due principally to the large output of the present day, the greater depths reached, the more common use of explosives, extended haulage systems, large number of men employed, and high speeds used in transit. The amount of coal dust produced depends mainly on the nature of the coal. A coal easily friable may be so mined as to avoid much of the dust, by care and skill in mining, and attention to the condition of roadway and rolling stock.

Thus far, we find unanimity of opinion, but at this stage, investigators become distinctly segregated into two classes. The first of these maintain that a dust explosion is only possible in the presence of firedamp, while the latter assert that under certain conditions of fineness, suspension and temperature, any organic dust is explosive. In considering either of these classes we find striking illustrations, records, and experiments tending to support the claims of its adherents.

It appears to me that in weighing such arguments, the first point of differentiation is to establish a line of demarcation between combustion and explosion. All combustible material may be considered as explosive if the conditions under which combustion takes place, are such that disruption and consequent expansion, or decomposition, occur so nearly simultaneously, that the expansive force is manifested before the heat generated by the transfer of energy into kinetic form can be appreciably recognized. The one element upon which such manifestation de- [illegible] room for expansion. Hence the danger from any accumulation of dust increases rapidly with the distance in from the mouth of the mine, and it is probable that what have been described as dust explosions in coal tipples might more correctly be classified as combustions.

PERIMENTS

An illustration of this class of phenomena is had in the case of La Belle works several years ago, where a crusher was [illegible] least 20 per cent. of the crusher product will pass a No. 100 screen. The crusher [illegible] perfectly tight, the only opening being that [illegible] the point where the belt came through the wall, several thicknesses of common can- [illegible] accumulation of several inches of dust over surrounding timbers and canvas. The canvas was ignited by a hot bearing on the motor, and began to burn slowly. The attendant attempted to beat out the blaze with another piece of canvas which immediately threw large quantities of dust in suspension, over the blaze, which then shot up the chute 15 or 20 ft. As soon as the dust around the blaze had burned up, however, the fire went out altogether.

Next in importance to room for expansion is the degree of inflammability of the dust, the density of its suspension, and its fineness, or state of divisibility. Probably the most exhaustive series of tests yet made to determine the elements entering into, and controlling the inflammability of various dusts, are those made at the Gelsenkirchen station (as reported in various issues of the *Glueckauf*, and in the publications of that station) and those under the supervision of M. Taffanel at the Lievin station, and published as a report of the central committee of coal mines of France.

The results of the Gelsenkirchen experiments are shown in Fig. 1. Increasing rapidly as the percentage of volatile matter is augmented, the point of inflammability reaches the highest point on the curve at about 29 per cent. volatile, after which it drops off almost as uniformly as it rose until it passes beyond 50 per cent., farther than which we find no record.

The experiments of M. Taffanel, of the Lievin station are described in detail, and one cannot fail to be impressed with the extreme care and accuracy with which they were performed. In all cases dust, which would pass through a No. 200 screen of the finest bolting cloth, was used, and a uniform charge of one-half cartridge of dynamite gelatine weighing from 32 to 38g. was placed without ramming, in a cannon, made by boring a hole about 1¼ in. in diameter and 6 in. deep in the end of an old steel engine axle, which was placed on a truck at the end of the explosion cylinders.

A ventilation system being produced by [illegible] fan, the air and its load of dust circulated in a closed circuit, through the main cylinder and its return, corresponding precisely to a section of a main mine entry [illegible] diate break throughs. Preliminary tests having shown that high velocity of the air- [illegible]

Note: A paper read before the Coal Mining Institute of America, Greensburg, Penn., June 8, 1908.

*Professor of mining engineering, West Virginia University, Morgantown, West Virginia.

adopted for all the experiments, and all the samples tested were exploded both with and against the air-current, ignition being always greater when the shot was opposed to the direction of the air, or relatively toward the intake.

The density of the cloud is regulated by the amount of dust fed into the cylinders from the hopper. The lading process continues from 15 to 150 sec., depending on the density required. During this period the dust-laden air travels around the closed circuit from 5 to 50 times, the eddy thus created securing perfect homogeneity of the cloud.

The lowest density at which ignition was invariably produced, was 70g. of dust per cubic meter, and below a density of 46g. per cubic meter nothing but negative results could be obtained.

M. Taffanel draws the following conclusions with regard to the influences of the density of the cloud:

"There is one certain density for which the total combustion of the carbon and of the volatile matter, with exclusive formation of carbonic acid and watery vapor, should absorb exactly all the oxygen of the air; such a density would be particularly favorable to the propogation of flame * * * . Having noted the low percentage of ash and the high percentage of volatile matter, this density ought to lie below 111g. per cubic meter. But, when the density is raised above this value, the tests do not show any sign of stifling the flame through want of oxygen; on the contrary, the greater the density the greater the flame. Yet, we should not deduce from this that stifling the flame or arresting its propagation by excess of dust, is never produced * * * . The violent pressure of the gas, which promotes combustion in the tube, forces beyond this into the midst of the burning gas, the dust incompletely burned; this combustion is completed at the expense of oxygen taken from the atmosphere, producing at the extremity of the tube, a flame whose extent is proportioned to the weight of unconsumed dust projected.

"After the ignition of very dense clouds of dust, and especially when the density exceeds 250g. per cubic meter, there are found in the tube, deposits of unconsumed dust with indications of partial distillation. These are agglomerated in frothy fragments, * * * and have the appearance of coke crusts such as may be found on mine timbers after a dust explosion."

Many of these crusts were gathered after ignition and analyzed. The percentage of volatile combustible matter had decreased from 29.7 per cent. to 25.1 per cent. while the ash increased from 5.5 per cent. to 10.5 per cent. This increase in ash testifies to the partial combustion.

The result of all these tests leads us to believe that large quantities of dust are not necessary, when homogeneously suspended, to form a dangerously inflammable cloud, since these last experiments show us invariable ignition at a dust density of 70g. per cubic meter, while as a matter of fact it is not unusual to find a density of 100g. per cubic meter in any mine passage of an old mine, under high air-current velocities, leakage of compressed-air pipes, or extremely rapid haulage. Reference to Fig. 2 shows entirely different results as determined by M. Taffanel, from those shown in Fig. 1.

The Lievin tests failed to get an ignition with any of the dusts until passing 11 per cent. volatile matter by analysis, after which the point of ignition lowered rapidly as the percentage of volatile matter increased, and after reaching 17 per cent. the curve becomes almost a straight line, passing off at about 29 degrees, and very regular, up to 53 per cent. volatile matter, beyond which the experiments were not carried.

The reason for such a marked difference between Figs. 1 and 2 can only be conjectured. I am inclined to the opinion that the extreme uniformity of experimental conditions which governed the French investigation, such as uniform weight of explosive, uniform air-current and temperature, had much to do with bringing about the regularity of results, and I believe that the extreme fineness of the dust used had a pertinent bearing on the value of these results, to which latter feature I shall revert subsequently.

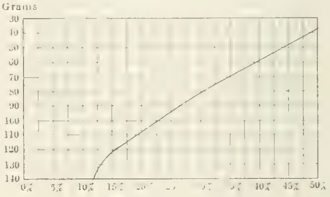


FIG. 2. TESTS AT LIEVIN

Professor Abel states that the proportion of firedamp required in a mine to bring dust into operation as a ready explosive material, is below the smallest amount which can be detected by the most experienced observer. The Prussian Firedamp Commission in 1885, concluded that a minute quantity of dust in the presence of an almost indistinguishable amount of firedamp would produce violent explosions, so that a dust not otherwise dangerous, may give rise to a disastrous explosion under these conditions.

Foster and Haldane state that while the possibility of a purely dust explosion is bound up with the presence of certain kinds of coal, and while on the other hand a comparatively high percentage of methane is necessary in order to form an explosive mixture with air, such as in most mines must be regarded as an exception, coal dust and methane coöperate; and it is, therefore, possible for explosive conditions to arise in almost any mine, since there is everywhere opportunity for the formation of coal dust.

In 1886 a Commission for the Investigation of English Mine Accidents, reported among other conclusions: "The occurrence of a blown-out shot where but a small percentage of firedamp exists in the air, in the presence of but slightly inflammable, or a wholly non-inflammable but very fine, dry, and porous dust, may cause an explosion, the flame of which may reach other distant accumulations of gas or deposits of inflammable dust." Henry Kinlock in an article in the *Colliery Engineer*, Vol. 9, p. 26, says that if dust were the principal agency in coal-mine explosions, every blown-out shot would be attended by a disastrous explosion.

We now come to the consideration of those investigators whose experiments and observations lead them to the conclusion that any organic dust is explosive under stated conditions: Richard K. Meade, editor of the *Chemical Engineer*, describes in detail the explosion which occurred at the Edison Portland Cement Company's plant some three or four years ago. At this plant, the coal was crushed between rollers, and the pulverized product blown out into settling chambers, the coarse product being returned for regrinding. A small fire started in an elevator leading from a drier used to dry the coal, and passed over into the settling chamber, in which there was at all times an atmosphere heavily charged with fine coal dust. The explosion which occurred wrecked the building, blowing off the steel sheets riveted to the steel framework.

Professor Peckham, of the University of Minnesota, describes in the March, April and May, 1908, issues of the same journal, the dust explosion in the Washburn Flouring Mills at Minneapolis, in 1878, and shows conclusively that sparks of fire generated between the millstones, ignited the flour dust in the conveyers and dust room, causing both to explode. To support this conclusion, he observes at length, that there were no explosive materials of any kind in or about the mill; that no electric phenomena had ever been abserved in connection with the mill; that while dust may be made so fine as to float in air, and water may float in air as a fog, yet neither is a gas, and flour dust is not a gas.

He then states the chemical analysis of wheat flour, and shows the various temperatures and conditions under which it emerges from the stones, and relates that if wheat flour were subjected to destructive distillation, hydrogen and carbureted hydrogen (methane) would be among the products of decomposition, and concludes that wheat-flour dust, when fine, dry, and hot enough, will explode.

To corroborate his position, he quotes the explosion in the soap works of the Kendall Manufacturing Company, at Providence, R. I., in 1890, after which he carried on a series of experiments with various kinds of flour, powdered sugar, planing-mill dust, powdered soap, powdered asphaltum, and similar substances every one of which will explode when extremely fine, properly suspended in a homogeneous cloud, and mixed with the requisite amount of air. In fact powdered soap, in contact with an open gas jet, gave evidence of a greater explosive force and more intense heat than could be produced from any of the other dusts named. (Within the last month our attention has been directed to an explosion of pulverized sugar in a sugar refinery in Paris, wherein 42 lives were lost and property worth $100,000 destroyed.)

Professor Peckham's work extended over so many years, and was so thorough, that I cannot do better than quote his own words in reference to recent coal-mine disasters in West Virginia and Pennsylvania: "It is not necessary to assume the presence of firedamp at all. Coal dust and air in proper proportions, ignited from a blast, are an ample and wholly adequate cause for all the phenomena that occurred. Years of immunity are no safeguard against a critical condition that may appear at any moment, and yet never come. * * * In a mine explosion, no one observes either cause or effect from the outside. The few who survive are usually remote from the initial steps in the phenomenon. * * * It is, therefore, only by analogy that it can be reasonably assumed that a slight accident or indiscretion, by which the initial explosion of a mixture of coal dust and air jars the dust into the air from an adjoining chamber, from which a succession of explosions follow * * * until the cumulative effect is irresistible and almost irretrievable disaster. * * * Immaculate cleanliness and eternal vigilance are the price of safety in all * * * mines where oxidizable dust is produced."

Henry Hall, in 1876 and again in 1890, stated that his experiments for the Royal Coal Dust Commission had not shown that gas is necessary before an explosion of dust can occur, but that coal dust from some seams is as sensitive to explosion as gunpowder itself, its sensitiveness being in direct proportion to its freedom from impurities. Doctor Foster, late Professor of Mining Engineering at the Royal School of Mines, London, says that it has been proved that the dust of certain coals, especially the bituminous coals rich in gas, may be the cause of explosions, when methane is completely absent.

Prof. T. H. Cockin, in his latest book on "Coal Mining," says: "That coal dust and air can cause all the effect of a violent explosion without the presence of gas is proved by the following:

"First, a violent explosion can readily be caused by the experimental [illegible] coal dust and air.

"Second, explosions of coal dust and air have taken place on [illegible] surface. (Note.—These latter are more properly designated as combustions.—H. M. P.)

"Third, violent explosions have taken place at collieries in which no gas has ever been detected, either before or after the explosion.

"Fourth, many recent explosions have originated in the main intakes, in which dust in its most dangerous form was most likely to be found, and in which it was impossible for large volumes of gas to have been present. The quantity of such dust in the air, necessary to give rise to an explosion depends upon various circumstances, but the dust must be intimately mixed with the air in the shape of a cloud, though the cloud need not necessarily be very dense."

Professor Abel (above referred to), chemist of the English War Department, writes: "A particular dust, though it may contain but a small proportion of combustible matter, may explode in a very mild or feeble character in the first instance, and be instantaneously increased in magnitude and violence by coal dust raised and brought into action by the first ignition."

As long ago as May, 1878, an editorial [illegible] said: "Indeed it would appear that coal dust itself, when mixed with certain proportions of air, renders the air explosive without the presence of any of the gases usually evolved in coal mines."

The most widely read, most frequently quoted and most distinctive conclusions ever placed on record, are those of the Royal Commission of England. Time and space forbid an extended excerpt, but it is interesting to note two of their specific deductions, viz.: "Coal dust alone, without the presence of any other gas at all, may cause a dangerous explosion if ignited by a blown-out shot or other violent inflammation. * * * Different dusts are inflammable and consequently dangerous in varying degrees; but it cannot be said with absolute certainty, that any dust is entirely free from risk."

[illegible] find the report of State Mine Inspector Griffiths, of Colorado, on the Crested Butte explosion, in which he deduces, among other conclusions, the following:

"1. That coal dust under certain conditions is explosive in the absence of methane.

"2. That a very little compression of the inflammable ingredients will bring them to an explosive point.

"3. That the dust particles give off their explosive constituents at a lower temperature than is generally admitted.

"4. That an explosion of coal dust can [illegible] firing."

[illegible] with which the exponents of either theory may attempt to justify their stand, and it is of interest to pass on to the much [illegible] frequency or added liability to the occurrence of such explosions. It has been commonly claimed that severe mine explosions are more frequent in cold than in warm weather because of the fact that the air entering the mine is very low in hygroscopic moisture and that on expanding in the mine atmosphere it takes up all the moisture, making the mine dry and dusty; from which argument we immediately develop the statement that the better the system of ventilation, the dryer the mine, and consequently the more explosive the dust.

James Ashworth, of England, in a series of articles published in 1903 and 1904, claims that the presence of moisture in the atmosphere is a marked aid to an explosion, and quotes instances where explosions have followed the wet portions of mines, and shunned the dry places. In summing up his paper on "Air Percussion and Time in Colliery Explosions," he states that the extension of an explosion is probably facilitated rather than retarded by watering and spraying.

The most available data on barometric influence upon mine explosions was published in *Coal*, January, 1908. The statistics upon which the article is based were prepared by D. E. Llewellyn, and show graphically that of all the mine explosions of which records were available between the years 1808 to 1894, in England and Wales, the month of June exceeded any other period of the year, in its disasters. Out of all these explosions, he takes the years 1856 to 1894 and shows that of the 17 explosions in that period, each of which involved more than 100 lives, none occurred in January, March, April, or May, and the months of June and July held equal place in percentage of explosions during those years.

J. T. Beard, in his recent work on "Mine Gases and Explosions," admirably sums up the relation between mine explosions and barometric changes as follows: "The attempt to show that the colder seasons of the year are more productive of mine explosions, has proved almost as futile as the endeavor to show a connection between such explosions and [illegible] of a sudden fall of barometric pressure [illegible] be followed, or it may be accompanied, by an outflow of gas from all standing [illegible] * * * Some assert that there is an increased transpiration of gas from the solid face of the coal due to the decreased atmospheric pressure, but the rate of transpiration is not appreciably af[illegible] eter, since the pressures under which [illegible] pressure, to be affected appreciably by such changes."

[illegible] many discussions, commercial, sociolog[illegible] amounts of dust made by different methods of mining, and on the merits of air and electricity from the standpoint of safety. I shall only refer, at this time, to the recently published tests made by the Fairmont Coal Company, and the Westmoreland Coal Company, as relating to the results obtained from various mining machines, which tests may be found in late numbers of *Mines and Minerals,* and to recent articles on the effect of electric currents on coal dust, published in the ENGINEERING AND MINING JOURNAL, from which latter articles we learn that it was only by the use of extremely small wires offering high resistance that temperatures were obtained which would produce explosions under the most favorable circumstances.

The experiments of Prof. B. H. Hite, chief chemist of the West Virginia Geological Survey, have shown that ignition of coal dust by ordinary electric discharge, is impracticable. The results of his present experiments to determine the "flashing point" of coal dust, i.e., the temperature at which finely powdered coal begins to give off a combustible gas, are awaited with interest, since they are being made upon hundreds of samples of coal, from every open mine in the State.

Before discussing the evolution of a coal-dust explosion, I desire to call your attention to some investigations I have been making at Morgantown, with a view to determining the degree of fineness which differentiates dust from slack. We note when reading any modern authority upon coal dust, that the finer the dust, the greater the explosion it will cause, and the lower the point of ignition.

Professor Abel says that the intensity of coal-dust ignition is largely influenced by the fineness of the dust. Mr. Kinlock, in an article in the *Colliery Engineer,* discussing the comparative rapidities of combustion and explosion, states that the rapidity depends principally on the fineness of the dust particles.

Especially relevant at this time is an editorial from *Mines and Minerals,* of July, 1899, from which I quote briefly as follows: "Contents of dust particles are proportional to the velocity of the air movement that suspends them. The minutest particles are the only ones that are suspended in air which has * * * only an eddy motion, as in a closed room where minute dust particles are seen dancing in the sunbeams. The gradation of dust particles with relation to the air movement by which they are suspended is especially important with regard to the inflammability of coal dust when suspended in the air of mines. * * * Large particles of coal burn slowly, as the oxygen required for their combustion can only be supplied by converging streams of air that lie in the radii of spheres whose contents are proportional to the contents of the coal particles; this means that a given sphere of air contains the weight of oxygen required for the perfect combustion of the coal. * * * Large particles of dust cannot produce an explosion because the period required for its complete combustion is too long. Very fine dust such as is suspended in nearly still air, may, however, cause an explosion because * * * the areas of the surfaces of small particles are much larger in proportion to their contents than those of large particles; * * * and because the combustion of the volatile matter disengaged by small particles (which is proportional to their surfaces divided by their contents) requires shorter periods than does the volatile matter disengaged by large particles, because the air and the gas are more intimately mixed, when ignition occurs."

From this it is evident that the only dust that can be consumed rapidly enough to raise the surrounding air to the temperature of flame, is the fine small dust found in nearly still air. Beard, Hall, Cockin, and other authorities unite in saying that fine dust is more dangerous than coarse. Sir William Galloway says that the size of the dust particles is of great importance.

With this irrefutable preponderance of testimony in mind, I began a series of experiments, with various sizes of dust, and velocities of air-current, upon as many different samples of coal as might be readily obtained, and in every instance I found a decided change in conditions between the dust which passes through a No. 80 screen, and that which passes through one of 100 meshes to the inch. The coarser dust acts like fine sand, or granulated sugar, rolling along easily, but held in suspension with difficulty. The finer screenings, however, act more like gaseous bodies, and remain suspended in the slightest circulation. It is evident, therefore, that between these two sizes, there is a sharp demarkation of more than a physical nature, and evidently bordering on or entering into a chemical transition.

We know that divided carbon, in the form of charcoals, has the power to absorb or occlude gases, and the testimony of W. E. Garforth before the Royal Dust Commission of England showed that fine coal dust consisted of hollow spores, which acted as reservoirs from which gas is being continuously dissipated in the air, and that each particle of dust is floating in its own balloon of gas.

Organic dust has an affinity for the oxygen of the air, and when brought into contact with the atmosphere, rapidly disintegrates under the combined influence of oxygen and atmospheric moisture. Doctor Bedson, of England, found that the hydrocarbon gases occluded in coal dust are not merely marsh gas, but hydrocarbons containing a large proportion of carbon, and they, therefore, form an explosive mixture requiring a larger volume of air than the marsh gas that comes off before the heavier hydrocarbons. These hydrocarbons are replaced principally by oxygen, and such dust ignites more easily than dust entirely devoid of air. Doctor Bedson's experiments, and those of Professor Hite referred to above, have shown that finely divided coal dust gives off gas at much lower temperature than has been suspected; in fact occlusion takes place at normal atmospheric temperatures much below those at which the usual analyses are made. Where we find instances of partially consumed dust, it is probable that the more volatile hydrocarbons have exhausted all the oxygen, and none is left for the closer burning carbon.

Another reason why the finer dust is susceptible of ignition, lies in the fact, as deduced by James Ashworth from the works of Doctor Bedson, that the lighter gases such as marsh gas and hydrogen are most readily removed, and the coal dust when extremely fine, allows the ready diffusion of the lighter gases into the air, while the denser gases remain for a time. These denser hydrocarbons are in time diffused and replaced by oxygen, and thus we have not only the fine dust lightly floating along in the ventilating current, but also the diffused hydrocarbons which are gradually collecting throughout the mine, or else being mixed with the dust in circulation, lurking in constant readiness for an initial force to give them combustible temperature.

I believe, therefore, that we are justified in stating that any pulverized coal coarser than that which will pass a No. 100 screen is properly classified as slack, liable only to explosion in the secondary sense, as when distilled by the heat or compression of a primary ignition; and that all sizes from No. 100 screenings and finer, may be appropriately designated as dust. This real dust is described by Doctor Mellor as being in a state of "chemical tension," i.e., bordering on dissolution or decomposition.

The effect of compression on such a dust cloud would be very different than that upon gas and air alone, for in the latter case no amount of compression would change the relative mixture of air and gas, while in the former case, it would increase the density of the cloud, which if ignited would create a greater amount of heat and gas in the same space. (Vide *Mines and Minerals,* December, 1907.)

One of the noteworthy features of a dust explosion is the fact that coke crusts are found wherever the coal dust is free from external impurities, but wherever clays or other dust from roof or floor become mixed with it, as along main haulways, these deposits are rare.

We have now in an individual sense, briefly; in a collective sense, at considerable length; but in neither sense, exhaustively, reviewed the various phases of coal-dust investigation. Doubtless we are now more fully cognizant than ever before, of the explosive potential of coal dust, but the problem still confronting us is how to master the evil genie, the confines of whose territory have so recently been established.

Striving toward this end, we find attention divided between three methods of elimination:

1. Removing the dust.
2. Watering the dust.
3. Using flameless powder.

All that needs to be said of the first is that good judgment and sound mining practice require that all available dust shall be loaded out of the rooms at frequent and stated periods.

Regarding the second, we are confronted with a variety of methods, experiences and opinions. Mel Butler, now superintendent of the Bix Six Coal Company, at Palmer, Washington, whose experience covers the Crested Butte explosion, and an extended service in charge of the Tercio mines in Las Animas county, Colo., writes me at length of his experiments with various methods of watering the dust, and sums up by saying: "I recommend spraying the water as fine as possible, and keeping someone always at it. Improvement can be noted at once. There will be no water on the roads from this method, but they will remain wet, and the air will be cool and damp. After three months the moisture was seen to climb up into the raise workings. In six months the air in the mine was clear and you could feel the dampness on the faces of the coal, and in some places, see the tiny globules of water. The dryness of the summer months can be overcome by using a fan. Fine spraying all along the entries and roadways is the only way to overcome dust, as it is the only way dust can be dampened; the fact of the water on the roadway helps very little. I know of an explosion from a blown-out shot where there was water the entire length of the gangway and no gas. Fine spraying and keeping everlastingly at it is the principal thing.

"Wetting the face of the room previous to firing is of no material benefit other than that it cools the air at that point. The dust should, of course, be loaded out, but *it is not this dust that carries the danger, but rather the fine dust in suspension* which will ignite instantaneously from the flame of the shot and communicate with that previously deposited on timbers, roofs, sides and in crosscuts.

"The point I make is to dampen the fine particles as they are blown in the air and cause them to settle at once, and settle damp—then it will be easy to keep them damp."

Bearing on this same phase of the spraying proposition, THE ENGINEERING AND MINING JOURNAL, in an editorial in May, 1904, said that the saturation of air in a mine where the main airway may be passing 200,000 cubic feet of air per minute, is practically out of the question. James Ashworth, of England, as has been quoted previously, claims that saturated air is no deterrent against the extension of an explosion, and maintains further that in deep, hot mines, men cannot work in a moist atmosphere, while in dry mines at the same temperature, they suffer but little inconvenience.

Many companies are now using a portable electric pump with hose attachment and are washing down the roof, sides and face of the working places. This doubtless washes down what dust may be then lodged on these surfaces, but unless continuously carried on throughout the mine, would be of small benefit, in entries and haulways.

We now pass to the third method of eliminating danger from dust, the use of "safety," or "flameless" powder. Reference to my Monongah report will show that my chief recommendation at that time was the use of such powder, and I still lay great stress on its importance.

A series of most exhaustive tests, equaled only by those of M. Taffanel, quoted above, have been made by the Department of Mines of Belgium under the direction of Victor Watteyne, and described in a number of brochures published by that department. These tests, however, instead of being directed toward the inflammability of various coals, were in the nature of a study of explosives, for the purpose of determining which, if any, were positively safe. I quote from Mr. Watteyne works: "Certain explosives, to which the admitted theories attributed a high degree of safety, have proved unworthy to appear on this list. * * * The safety of an explosive depends not only on its chemical constituents, but also on its method of composition. One recalls the noted example of Dahmenite "A," quoted by M. Heise, where the charge limit varied in great proportions with the grain. * * I have pointed out frequently during the past 10 years the importance of care in mining coals high in bitumen, calling attention to the very special danger from volatile dusts. * * * Much progress has been made in this regard; the employment of safety explosives which has become common in our mines, has been a great step forward. But the complete suppression of all explosives is quite preferable, and one cannot repeat too often, that safety from explosions can only be obtained at this price.

"Such a complete elimination of explosives seems impossible to realize, but it is possible in more cases than is generally admitted; several who have tried, have succeeded in it. * * * A very important cause of this preponderance of mine accidents caused by explosives is the pronounced influence which coal dust exercises in mine catastrophes, as the mines increase in depth and extent and are, therefore, drier and warmer, and demand more active ventilation. We have also determined from our point of view, that gaseous and dusty conditions forbid the use of slow explosives, * * * even in mines where the most minute investigations of the inspectors fail to show any trace of gas. * * * Whatever be the condition of ventilation in a mine, a certain quantity of firedamp can be disengaged within the confines of the mine, * * * and can be reached by the flames of a blown-out shot before the firedamp has time to become sufficiently diluted in the air.

"It is besides, well established at the present time that certain coal dusts are capable, of themselves alone, or assisted by quantities of firedamp not appreciable by test, of giving rise to grave explosions, and activity of ventilation favors the production and propagation of dusts. * * * Careful tamping of the wad reinforces materially the safety, but its influence varies greatly with the nature of the explosive. It is of minimum benefit with the ordinary charge, relatively weak for mixtures of nitroglycerin, and very high for a strong proportion of ammonium nitrate compounds."

The use of the lead block for testing the values of various explosives originated in Belgium, and has opened up a field of research in this country which is being entered by many of our large mining companies and by experts on explosives generally.

In conclusion, I propose briefly to sum up the decisions at which I have arrived through my own experiments and the compilation of the subject matter here presented.

1. Granting that secondary explosions may be propagated indefinitely by the larger sizes, only coal dust which will pass through a No. 100 screen is capable of initial, or primary, explosion.

2. Such dust after having been subjected to ordinary atmospheric air for only a few hours, becomes largely decomposed, and exists as a bubble of constituent gases, whose film is composed of undisintegrated carbon and impurities, which after combustion are known as ash.

3. Such dust, when suspended in a homogeneous cloud, with a moderate air velocity, is susceptible of ignition either through shock, compression, or sufficient heat to inaugurate combustion.

4. Such results will be classified as combustion or explosion, depending upon the volume of dust ignited, its supply of oxygen, and the space within which combustion takes place.

5. Where gas alone is ignited, and the mine is free from dust, a "high explosive" effect is obtained, and the explosion may be strictly local, due to the cooling effects of the walls.

6. The chief product of a dust explosion is carbon monoxide, whose expansion under combustion is greater than that of methane, and which receives its continu-

ous supply of oxygen by feeding toward the intake.

7. A dust explosion, while assisted by the intake air, must nevertheless follow those entries or airways furnishing the most material upon which to feed, and when this course follows the return airways, the conversion of the carbon monoxide to carbon dioxide renders the air extinctive, and prohibits further propagation. Evidence of such a condition will be found in the coke splashing, or crusts, formed by the deposit of red-hot cinders, carried by the air wave, and testifying to the incomplete combustion.

8. The initial explosion may and generally does, distil so large an amount of gas that complete combustion is impossible at the site of distillation, and this mass of gas and dust, in varying stages of ignition and combustion at a temperature greatly in excess of the point of ignition were sufficient oxygen present, will develop into local explosions at irregular intervals, wherever adequate atmospheric oxygen is available, such as at junctions of airways, widened passages for side tracks, or cavities where falls of roof rock have occurred, and are frequently called "flame areas."

9. When such an explosion, either primary or secondary, travels toward a dead end of an entry or passage, the compression generated by its expansion and momentum causes an almost incredible rise in temperature, sufficient to distil the various hydrocarbons from even the ribs of the coal itself, and supplementing it with a heat potential far in excess of its losses through radiation and expansion.

10. The liability of any coal dust to explosion increases almost directly with its percentage of volatile combustible matter, i.e., the quotient of its percentage of volatile matter divided by the sum of the percentages of volatile matter and fixed carbon.

11. While coal dust alone, under the conditions enumerated, is distinctively explosive, the presence of even the smallest amount of methane augments materially the susceptibility to ignition.

12. On account of the great elasticity of air, it is highly probable that no proper conception has yet been attained, of the almost incredible speed with which a dust explosion, through its gaseous products, may be extended to far distant portions of a mine, under the force of initial expansion, properly called the "percussive theory."

13. Changes in barometric pressure only affect the liability to explosion in so far as they allow, when the barometer is falling, a settling of any possible accumulation of methane from a dome in the roof rock, into the ventilating current; but such small quantities of gas are infinitely safer when diffused in the current of air than when concentrated in one place.

Moreover, even if we grant that a low barometer allows greater occlusion it also allows easier ventilation for the diffusion of such occlusion.

14. A mine may be overventilated until the air-current has such a velocity that it stirs up dust, and would feed any slight ignition which might take place and otherwise die out.

15. The difference in the amount of real dust made by either air punchers or electric-chain machines is so slight, and so variable, depending on the nature of the coal and the skill of the machine man, that it connot be said that either machine, as a class, creates more dust, one than the other.

16. The results of experiments with electric ignition of dust show that the danger from electric wiring is no greater than that of stirring up a cloud of dust from a broken air pipe or a loose connection.

17. Coal dust cannot be made wet, in the usual sense. The method used by superintendent Butler is indicative of the best results, but even then it is hypothetical if the most careful system of watering is not merely an infinitesimal portion of the "ounce of prevention," and it is an open question whether it is not positively detrimental.

18. While the abolition of all explosives, as recommended by the Belgian authorities, appears unnecessary and impracticable in this country, yet the greatest field of investigation now lies along that line, and only those explosives carefully tested, and known to be uniformly prepared, by well known and responsible manufacturers, should be used. The maintenance of a testing laboratory even though on a small scale, and the employment of a competent chemical engineer, should be undertaken at every coal operation of commercial importance.

Why Sulphur Abounds Locally in Certain Coal Seams

By J. R. Heckman*

In recent correspondence with a prominent coal operator the following statement was made: "As to the Bed 'E' coal, I think the greatest trouble with this fuel for coking purposes is the amount of sulphur contained. Bed 'E' does not run regular at any place. A first-class coal may be found at one place, while 50 ft. further on pockets high in sulphur will be encountered."

In assigning probable reasons in answer to the above, I submit the following remarks as relating generally to all coal seams, but especially to the Upper Freeport and Brookville seams in Pennsylvania. I have often noticed the same conditions above mentioned, and from careful investigation am certain that the overlying massive Mahoning sandstone is the cause of the pockety condition in which the sulphur is often found in Bed "E."

The various movements of the earth's crust have caused the sandstone to fracture, and where there is an insufficient slate, or shale cushion, more than the usual amount of sulphur in the coal may be expected; especially is this true at points near any prominent fracture. Where unusual conditions exist, a succession of rolls in the coal seam usually afford these conditions, and from the siltings into the fracture in the rolls, coal from such localities generally yields a higher percentage of ash. At such places the coal appears irregular, or "spotted" in quality.

A Geological Problem

To locate the fracture and its directions, is a problem for the geologist, and when this has been done it seems that the next correct move is for the engineer to arrange the plans for mining so as to leave a line of pillars, or rib, directly under the line of fracture. The following reasons may be attributed for this procedure: (1) These supports would often prevent disastrous rock falls; (2) the pillar, or rib, would contain the major portion of the sulphur pockets, and thus avoid much annoyance. The large amount of iron existing in the make-up of the Mahoning and the Clarion sandstones, is taken up by percolating waters, and uniting with the sulphur results in the pyrites.

A force sufficient to fracture the rocks is also capable of crushing the underlying coal, and provides places for the formation of pockets of sulphur and other siltings. A high percentage of iron in the coal, or the pyrites, gives a reddish ash, and an abundance of "clinker." Where the roof of a coal seam consists of a thin-bedded sandstone, a greater number of minor fractures regularly distributed are noticed; in this case the sulphur has the appearance of being finely diffused through the coal, and is difficult to eliminate.

It should be remembered that in any movement of earth crust, coal is the first to be affected and suffers most. I believe that the pockety condition of sulphur found in all of our coal seams has been assembled by the process above described, and also feel sure that the greatest amount of sulphur is found in coal seams of a friable nature; or that part of the bed which is the least able to withstand a crushing force.

---

*Mining engineer, Johnstown, Penn.

According to Consul Isaac A. Manning, the United States of Colombia exported $2,011,959 gold; $98,597 platinum; $45,223 mixed gold and platinum; $26,991 gold specie; and $42,084 silver specie in 1907.

According to a recent consular report, the Chinese government has granted a concession to work mines in Hainan, near Hongkong, where gold, tin, coal and iron are known to exist.

A Method for Working a Thick Coal Seam

Great Care Must Be Exercised in Drawing the Ribs and in Preventing the Dirt from Mixing with the Clean Coal

BY GRANVILLE POOLE*

Many are the difficulties to be overcome in working coal seams which are 15 ft. or more in thickness. There is greater danger of falls of roof due to the disadvantage, and sometimes the impossibility, of efficiently timbering and testing. There is again a much greater surface area of coal exposed in thick seams than in thin ones, giving rise to greater oxidation of the coal, and as a result, the liability to more fires due to spontaneous combustion.

It is not my object, primarily, to describe the difficulties to be overcome in getting the coal, but to give a practical instance of how a certain seam with which I am concerned is worked under most unfavorable conditions.

The coal seam contains a dirt parting of a friable nature, and unless great precautions are taken, it is liable to fall and mix up with the lower portion of the coal when that is being removed, leading to much waste. The coal is fiery; and necessarily such a bed must be worked "coming home" or retreating from the boundary toward the shaft.

Mine Is Divided Into Districts

The mine is divided into a number of districts which may be worked independently of each other; they are formed by driving branch roads from off the main entry, 45 yd. apart, to the boundary. "Barriers" or ribs of coal 6 yd. wide are left to separate neighboring districts, as shown in Fig. 2. The workings are divided in this manner so that in case of a serious fire, the burning area may be entirely and efficiently dammed off to prevent the flames spreading. Smaller areas of coal are then left unworked than would be the case if the workings were extended. Furthermore, the ribs of coal that are left prevent the thunderous falling in of the roof, which in some mines has such a fatal effect, causing the roadways to completely close, thus losing the timber and steel supports that have been used. In the South Staffordshire coalfield, these great falls are known as "bumps" and they are nearly always consequent upon the withdrawal of a large area of a thick coal seam. It is often possible to work over the same ground again after the lapse of a few years and remove all such ribs and pillars of coal as were of necessity left to support the roof in the first development, hence the usefulness of making and preserving accurate plans.

When the branch roads have reached the boundary, they are joined by a gate-road *a b* [illegible]. The men then go back 50 yd. from the ends of this road, and drive a second road or "split" across at *c d*. From this split, two roads are driven 15 yd. apart to the boundary, thus dividing the panel into three parts.

The gateway *c f* is now driven parallel to *a b* a distance of 10 yd. away. This road may be driven in each direction from the center roads as well as from the branch roads. The distance, 10 yd., which has been found by experience to be most suitable, is regarded by the nature of the roof as affected by surrounding workings.

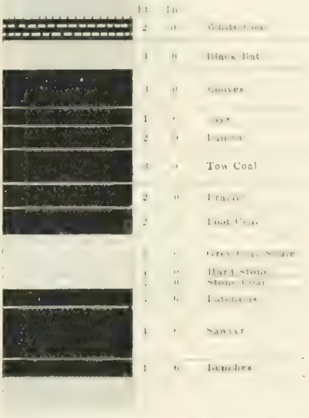


FIG. 1.—SHOWING SECTION OF THICK COAL SEAM

Method of Working

From the road *e f*, the whole of the coal below the dirt parting is swept out by stallwork to the boundary rib, this being simply longwall working; the working place is timbered up to the dirt. When the whole of this coal has been removed, the timber is withdrawn from the rear to the front, and the dirt is allowed to drop.

It is well known that a yard of dirt in the solid occupies considerably more than a cubic yard when fallen, but here comes the great advantage of this method of working, for the men just clear the dirt from around the loading places or "bolt holes" *e g n* and *f*, to enable them to get into the opening when the rest is leveled and pulled back. These places are called "bolt holes," because if anything happens in the opening, the men bolt through them with a slightly greater speed than that to which they are so accustomed.

Getting the Top Coals

The next operation is to get out the top coals; these are dropped, layer by layer and loaded out, the roof being timbered as well as possible. The difficulty of efficiently setting long trees on loose ground is overcome in the following manner. To measure the hight of the prop required, the miner usually sticks the end of a tape in a ball of soft clay and throws it up to the roof to which it clings. The loose dirt forming the floor is then prepared to receive a large sleeper or "foot lid," by being leveled and stamped down. A "top lid" is then fastened to the top of the tree by means of a stout nail. The prop is then placed on the end of the foot lid and at the required position in the roof; the bottom of the prop is then driven along the foot lid until it is tight and vertical.

The whole of the top coal, however, is not at first worked out; the rooves, black bat and white coal layers are left up as a roof and timbered to; it being considered the better plan to get out the whole of the coal below this horizon first, rather than interfere with the top coals, thus causing a fall of roof entailing the loss of much coal.

If the former method is adopted, the top coal in the majority of cases may also be dropped and removed. Suppose now that only the rooves and white coals are up: It has been found by experiment that it is not advisable to blast them down, even if they are hard after all the timber has been removed; such a shock is fatal and the sheet crashes in. It is best, therefore, to remove the timber gradually from the rear to the bolt holes, and if the coal does not come in immediately to let it work down naturally or "fret."

Drawing Timber

The timber drawer is usually an old-timer; he knows his work, which is of a dangerous character, thoroughly. He cautiously removes most of the long trees first, by knocking them out with a "jobber" (a long pole with an iron head), and if they do not come easily, he scrapes away some dirt from under the foot lid, and withdraws them with a "pillar" (a pole with a hook on the end). A sufficient number of trees are left in to protect the man in this operation, and these latter he extracts from a safe position.

[illegible]

---

*The University, University Road, Edgbaston, Birmingham, England.

moved in section one, a second relay of men is started to drive another cross-road at *k* and *b* and to sweep out the bottom coal in section two, in the same manner as in the first case, timbering up to the dirt.

In order to keep the roof steady, and in case there may be a fall of sheet in section one, small pillars of solid coal are left at *a g h* and *b*. These pillars—about 4 yd. square—are sometimes found unnecessary; in such cases they are extracted; however, it is always best to leave them until such time when they can be taken out with safety. Another practical point in connection with these small pillars is that the roof pressure is distributed much better if they are not left in regular order. There should be no prearranged position for them, but, as a general view, should appear as in the accompanying figure.

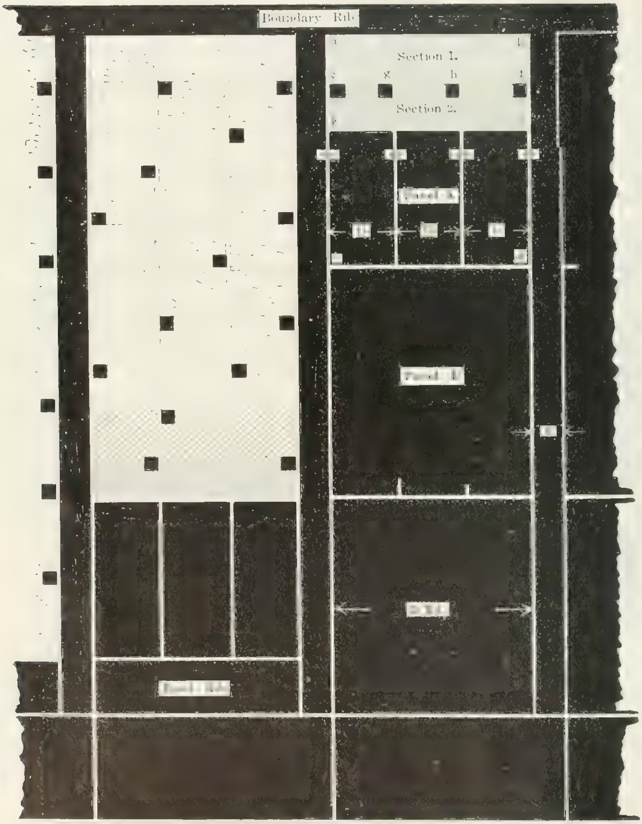


FIG. 2. SHOWING GENERAL PLAN OF DIVIDING MINE INTO DISTRICTS

Good timber chocks or cogs are sometimes built, instead of leaving pillars; these cogs form a good support if they are put in in time, for when a weight comes on, the timber just gives a bit and allows the roof to bend slightly, whereas the sides of a pillar grind off. This latter action, besides weakening the support, offers another disadvantage, in that heat is produced by friction which, if not prevented, may originate a fire.

In the same manner, while the top coal in section two is being taken out, a third section is being undermined, and so on. It will be seen that by adopting this method of working, practically the whole of the coal is taken out and very little dirt is loaded out. This compares most favorably with the general method of working thick seams known as "square work," and which was at first the method of working at this mine.

While panel A is being extracted panel B is being prepared, the size being the same, namely, 45x50 yd. In full working order about 40 men are required per panel. Under fortunate conditions, all the coal from the boundary to the main roads may be obtained by thus working in sections, but the coal being of a fiery nature, it sometimes happens that "fire-stink" is detected in the workings coming out of the goaf. The whole of the work is immediately dammed off by four dams, as shown in panel A in the sketch. If this were not done the gas would be so strong on the day after its appearance that the men would be unable to work. In such a case, a "fire rib" about 5 yd. thick should be left intact, forming a complete dam to the area on fire, and giving such roof support as would enable the workmen to commence a fresh section and carry on the work as commenced.

The illustration, Fig. 1, shows the main roads at the bottom; on the left is a district worked back to the main-road rib; in the center, the last panel of a district is about to be started; on the right is a district being opened out at the boundary rib, as I have already described; on the extreme right, roads are being driven out defining a fresh district.

Gold in the Dominican Republic

The British vice-consul at Santo Domingo reports that veins of auriferous quartz are found all along the central mountain chain, or Gran Cordillera, the richest lodes being always in metamorphic rocks, near the crystalline rocks. Alluvial gold exists along the upper Jaina river, in the province of Santo Domingo; it is coarse and of a deep yellow color, showing a high degree of purity; an assay of 12 oz., made at the United States mint in 1870, showed a fineness of 0.946. In the northern part of the island, that is, on the northern flank of the Cibao, alluvial gold is found in a number of places, especially in streams flowing from the Sierra de Cibao into the Yaque river. The Rio Verde and Sabaneta placers, in the Cibao region, have acquired quite a name, and it is reported that natives washing the gold-bearing sands in bateas, or common vats, have gathered as much as from 5 to 6 oz. a week.

The mines and placers known to exist in the province of Santiago are the Cerro de Piedra Blanca, in Paralimon; San José de las Matas, about one and a half miles from San José, which contains gold and iron oxide; El Pinar, San José de las Matas, on the road to Guava Cuano, containing quartz veins, talc, and gold-bearing schist; Loma de la Mina, in the vicinity of the Magu river, with decomposed gold-bearing porphyry; Las Guasimas and La Cajera in San José de las Matas, containing gold. The principal placers are along the Dicayagua, Bao and Yaque rivers.

In starting a fire under a boiler, the valve should be left open until the steam blows; this assures the expulsion of all air.

Coal Mining By the Retreating Room-and-Pillar System

By Harvey J. Nelms*

The accompanying plan of development shows the general method of driving rooms and extracting pillars on the retreating system of mining. The best general scheme is to have four main entries, two intakes, and two returns for air. One intake is used for haulage and the other as a manway. At the face, it is advisable to have three entries, using the middle one for intake air and haulage. Two butts driven together, with a motor road between every third pair of butts, constitutes the best butt entry system.

The mains should be driven on 50-ft. centers, with 60 ft. of solid coal left standing on each side of the outside entries so as to thoroughly protect the gangways. The mains should be driven perfectly straight as regards sights and should have no angles that can possibly be prevented. It is generally true that only two angles are necessary in developing a coalfield, which can be developed by the mains cutting through the center of the field; the angles necessary are 45 deg. for chutes, and 90 deg. for all entries turned off the mains; also 90 deg. for all rooms turned off the butts. The breakthroughs in the main, should be driven every 125 ft. and kept at a standard distance. Such crosscuts should be driven opposite one another for ventilating and drainage purposes.

Method of Turning Butt Entries

The butt entries should be turned so as to have [illegible] between two pairs of butts. The distance between centers of butts should also be 50 ft. for [illegible] purposes as [illegible] carry the entries under any kind of top if they are kept in a good condition. The first entry of the pair of butts should start out on a 45-deg. angle for a distance of 26.26 ft. when the 45 deg. is again turned, putting the entry square on the butt course. The parallel to this entry should be turned off at 90 deg., 68.57 ft. from the 45-deg. angle spad. The breakthrough opposite this parallel entry should be driven across the four mains for ventilating and drainage purposes. The small triangle at the base of each pair of butt entries is 18.57 ft. for base and altitude, and 26.26 ft. for hypotenuse. The [illegible] should be driven on through until it intersects with the [illegible] turned off for a parallel butt entry, as this makes an ideal haulage for both mules and locomotives. The haulage road for the mines, on this plan, is the third main, and the [illegible] are thoroughly demonstrated.

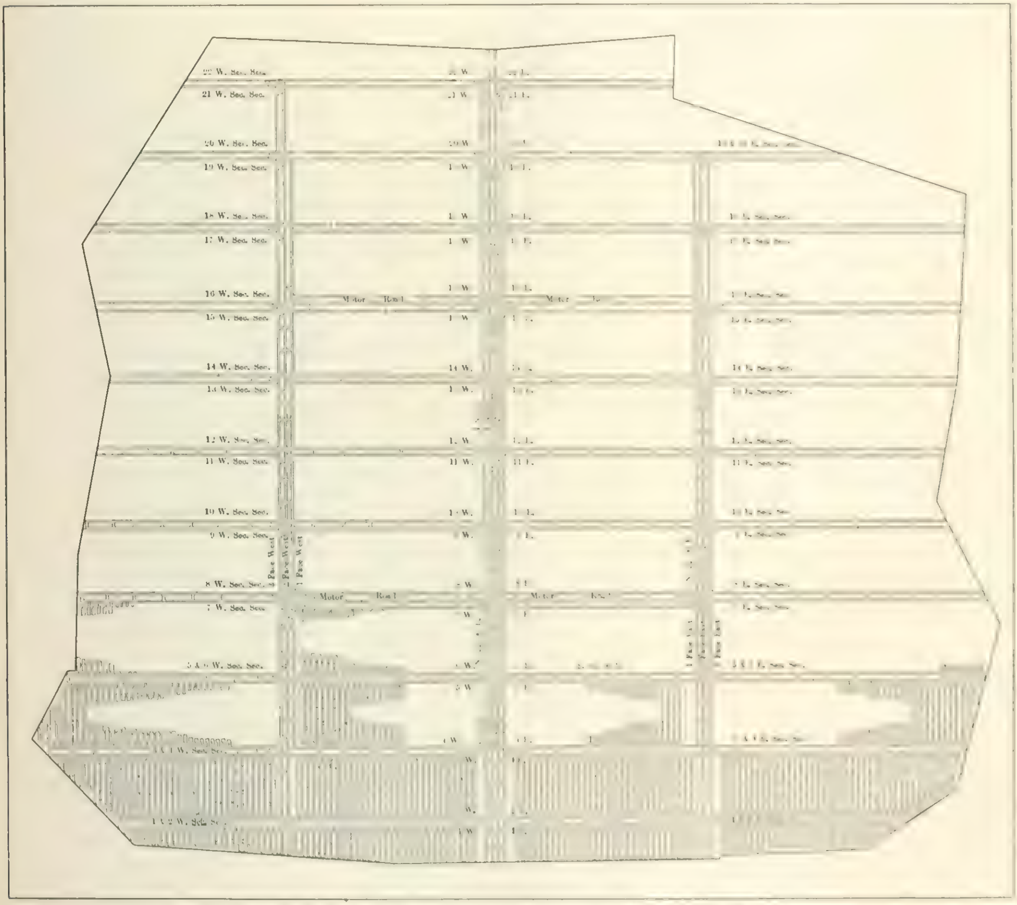


FIG. 1. GENERAL PLAN FOR MINING COAL ON RETREATING ROOM-AND-PILLAR SYSTEM

---

*Superintendent, Beech Bottom Coal Company, Wellsburgh, W. Va.

DEVELOPMENT SHOULD BE STARTED EARLY

If an operator were to open up his mines, and have his mains started by the time he starts on his tipple, he could be about ready to ship by the time the tipple is ready to run coal. The first pair of butts can be developed as soon as the mains are driven in 250 ft. After turning the first pair of butts, the work should be advanced night and day so that as soon as the plant starts to run coal, it will be possible to turn off rooms from the first pair of butt entries already being driven. It is asking too much of any operator to not run room coal until all of his entry work is finished, so the best plan is to turn the rooms and work on the advance, instead of retreating on his first pair of butts; this room coal will pay for the later entry development until the retreating system can be started. The illustration, Fig. 1, shows the development of a mine, from the advancing to the retreating system.

ROOMS DRIVEN, ON SIGHTS

The rooms should be turned 90 deg. off the butts and sights put up to drive them by. The chambers are worked 24 ft. wide with 15-ft. pillars. The plan of driving rooms on sights should be rigidly enforced as 75 per cent. of the coal lost to operators in western Pennsylvania is caused by rooms having too small pillars between them. This makes it impossible to either drive the rooms to their limit, or to extract all the room pillars after the chamber is finished.

The engineer in surveying his entries, should tie them together at every fourth breakthrough. As soon as the entries are driven, the engineer should establish a base survey inside his mines, and close this survey within a minute. When this is done, the transitman always has something to tie into in making inside surveys, and consequently it is easy to pick up mistakes.

THE ELECTRIC WIRING

The wiring of the mines for electricity should be rigidly attended to, and the feeders and main power lines should always be put in on an intake entry. When 500 volts are used, 12 in. should be kept between all wires. On butt entries, the positive drive (hot) should be on the inside of the negative (cold) line, and be next to the rib; the insulators of the positive line should be placed in holes drilled on a 45-deg. angle in the corner where the top intersects the rib so as to thoroughly isolate this line and put it where it will do the least danger. If this is done at the start, it will soon pay for the extra labor, as falls of slate or top will not bother the line. The locomotive power line should be strung so that the locomotive can do all its work by using one trolley pole.

The production of iron ore in Japan in 1906 was 40,766 tons; of iron pyrites, 42,155 tons.

Colliery Disasters

By F. A. Hill*

The technical and trade journals have recently published many articles dealing with the causes and remedies for the appalling coal-mine disasters that have occurred during the past year. There is no question that the losses of life from these disasters are out of proportion and vastly more than they should be. Investigations by juries, by committees and by mine inspectors have reported on causes. They include gas, coal dust and falls of roof; still, in a great majority of cases, the immediate cause of the disaster is the human factor. If there were no gas or dust, explosions would not occur.

Aided and abetted by the miner and sometimes by labor organizations, these disasters, in the minds of the public, are placed as the fault of the operator. Is it true? If the human factor was controlled, how often would we hear of an explosion?

LAWS ARE AIMED AT THE OPERATOR

It is well to have laws and enforce them; rigid laws to compel the operators to keep proper ventilation and provide safeguards. This, the great majority of coal operators would do regardless of any law except the economical one, because it pays to provide good and ample ventilation. Of the laws enacted, 99 per cent. are aimed at the operator; 1 per cent. at the man behind the gun. If the operator does not obey the law, he should be vigorously prosecuted and convicted. If he, for the sake of dollars, should jeopardize life he should be treated as any common murderer, but what about the miner? Of course in most of the explosions the guilty one has been killed; but what about those whose known carelessness is constantly in evidence? How many miners have been prosecuted or convicted for violating the rules governing the operation of coal mines? For every operator thus guilty, there are hundreds of employees, yet the laws invariably are aimed at the former.

All capable mining engineers know that it is possible to reduce these casualties if we could govern the forces that go to make up the vast majority of them. The engineer does govern those that are known: He controls air, dust, and provides safe methods of mining; but does he govern the human element? Are the conditions of the time such that he can do so? All over this great country we recognize the right of labor to organize themselves, to protect themselves in the enjoyment of a lucrative wage, and I uphold this right, and have for many years. What has it led to? Miners' unions are formed, but don't stop at the wage question and hours of work, but provide for many and divers conditions in such a way that the law of the union is superior to the law of the mine or the law of the land. A large part of the time of superintendents and foremen that should be used in looking after the safe operation of the mine, is spent with grievance committees.

LABOR CONDITIONS

We also welcome the foreigner to our shores, and put many of them into our mines until there is a veritable Babylon of tongues in our mining camps. Miners cannot read the rules that are promulgated for their safety, and the boss not being a linguist cannot instruct them regarding the peculiarities of the mine in which they work. Under union rules and union domination, there is no room for the old miner who has passed the zenith of his physical ability. There is no room for the man who, taking his apprentice with him, teaches the latter how to take care of his working place, how to mine, where and to what depth to place the drill hole, how to load and fire the shot and at the lunch hour discusses reasons for these things. He is eliminated for the reason that he cannot earn a day's wage by himself or with a helper of like capacity.

There is no discipline about those coal mines that are unionized, and there can be none until the laws of the mine are obeyed absolutely and men are summarily dealt with who disregard the laws of the mine, and until all the miners with all their hearts and souls recognize this law. Union papers give good and timely advice to miners as regards their safety; but they also contain reflections, insinuations and innuendos against the interpretation of the laws by our Supreme Court when the decisions are not upholding the so-called rights of the miner. I cannot recall any case where they advise the miner to obey the laws of the mine and render obedience to his superior officer.

SUGGESTED REMEDY

We should have laws that will make miners carry a clearance card showing their ability as miners, and the law should be so constructed that no superintendent could refuse to give a clearance card to any man who has been or is a competent miner, and obeyed the law of the mine. He should have a card stating his services, and his ability as a miner only. This is infinitely better than a certificate received by examination, as he will get a card by reason of his practical and not his theoretical knowledge, and because he has or has not shown by his work that he is or is not a competent miner.

I repeat, lack of discipline has more to do with coal-mine disasters than all the other causes combined. Operators should all stand together for absolute discipline in and around the mine, and until that is had, we may expect disasters brought about by disobedience to rules. Quick and sure punishment should come from infraction of laws, and the miner should see to this as much as the operator.

---

*Consulting engineer, Seattle, Washington.

Longwall Methods of Mining a Coal Seam

Discussion of an Advantageous System of Coal Mining, Little Used in the United States, but Which Should Be More Generally Adopted

BY LUCIUS W. MAYER*

The most striking feature of mining in the United States, is the infrequent use of the longwall system. This system refers chiefly to coal mining, although, as will be noted later, instances of its use are not unheard of in metal-mining operations abroad.

In general, there are three systems of mining coal; (1) room-and-pillar; (2) pillar-and-stall; (3) longwall mining. The first is by far the most generally employed in the United States, and is operated for every thickness of coal where men can work. The pillar-and-stall system is merely a modification of the room-and-pillar method, the room being approached from the haulage-way by a narrow opening called the stall. This opening may be from 7 to 8 ft. wide and 20 ft. long. In comparison to this, the ordinary room-and-pillar system, the rooms are turned off from the gangway their full width. It is evident that by the pillar-and-stall method, the chamber assumes its full width after passing the stall, which blocks out a pillar, left to protect the roof over the haulage-way from which the chamber has been turned off.

By the longwall system is inferred a method of mining, whereby complete extraction of the deposit is contemplated on the initial attack. There are two general systems of longwall in use, viz: advancing, and retreating, although there are modifications of the system now under discussion. Literature on the subject of longwall mining refers to it in a rather elementary and unsatisfactory manner, and in this country in particular the criticisms are more or less deprecatory.

Location of Longwall Operations

It appears that the advantages of the longwall system are not realized in the United States. Wherever it is used, it is frequently noted that the operation is under the espionage of men with foreign experience. In England the system is operated in more instances than all the other methods combined, and where in America it is used only under ideal conditions, in England the method is operated under widely diversified conditions of roof, floor, inclination and thicknesses of seams.

Longwall may be seen in the United States to fair advantage in northern Illinois, where it is used to a greater extent than elsewhere in America. In this district the seams average about 3 ft. in thickness. A few isolated camps in West Virginia and Kentucky are using the system. One determined effort to introduce longwall in West Virginia a few years ago, on a seam somewhat over 5 ft. in thickness, ended in the abandonment of the attempt, mainly because of the inaptitude of the labor for this particular kind of work. There are a few instances of longwall in Iowa and Kansas, though the operations might hardly be termed prodigious. Colorado is a scene of longwall operations at a place called Radiant, where for some time the system has met with but moderate success.

In Pennsylvania there are two instances of longwall. The Vintondale Coal Company employs the system in conjunction with underground mechanical conveyance, as does the Cambria Steel Company in one of its mines near Johnstown, Penn. In the far West, there are a few places where longwall is operated, as in the State of Washington. Whereas, in Pennsylvania, the seam thickness approximated 42 inches, and the work in the seam was carried on to this hight throughout, excepting roadways, in Washington the beds approximate 4 feet.

The whole of Europe has followed the English idea, and in France may be seen a modified system of longwall operated on thick seam. It is not uncommon to see the system used on seams up to a thickness of 10 ft., and the coal taken in one slice, although with complete stowage. Similarly, the system is used on beds as thick as 30 ft.; in such an instance, the work would be carried on in three slices.

Longwall in Metalliferous Mines

The most general use of longwall is in deposits lying close to the horizontal. Aside from the operations of longwall in coal seams of England, Scotland, France and Germany, may be noted a number of instances on the Continent where the method is used in metalliferous mines. The Mansfeld Copper Company, for example, have for a long time been longwalling the copper shale in Germany. In South Africa several of the banket mines have used the system, though I have not visited this field to verify information to this effect. I understand, however, that on the Black Reef the system has been used, though details on the subject are lacking.

In the United States the occurrence of horizontal deposits is unusual. Sheet ground of southeastern Missouri where the disseminated lead-ore deposits are quite consistent, presents the most consistently flat formation on the entire continent. The sheet ground of the Joplin district, and the Wisconsin fields, may also be mentioned. The possibilities of a modified longwall system for this ground, where the sheets are extensive, is not beyond reason.

Definition of Longwall

In longwall mining in its true form, it is desired to effect a uniform settlement of the roof, behind a continuous working face. To admit of safety at the breast, this settlement should be effected at a certain distance in the rear. There are certain economic conditions which govern the extent to which ground may be kept open between the face and the gob. The control of roof settlement does not figure alone in the safe keeping of the face, but very strongly in effecting the proper breaking of the material being mined.

On the proper control of the roof depends the success of the system. In coal mining, it is usual to undercut, and the weight of the overlying strata lends its assistance in the breaking down of the coal. If the face is not regular, the weight is not exerted uniformly, and the same may be true if the timbers behind the face are not withdrawn in a regular manner.

Longwall Advancing

In advancing longwall, after sufficient coal area has been left at the shaft for its maintenance, the seam may be removed in its entirety to the boundary in all directions. The face may thus take a circular shape, and this is a condition accruing in the Grundy county and Spring Valley fields of Illinois, which former district will be further cited.

It is observed that in advancing longwall, roadways must be maintained in fallen ground, so that the coal may be conducted to the shaft. In true longwall, the structure of these roads is quite devoid of solidity, having been passed through ground thoroughly divested of coal. Ground is maintained by means of walls, built either of rock refuse which may have been stratified with the coal, or else rock is shot down from the roof for wall-building purposes. In thin seams there is usually plenty of packing mate- [illegible] of 3-ft. thickness, 2 ft. would be brushed down from the roof in haulage-ways, and the pack walls would be maintained at approximately 5-ft. hight. An example of work of this nature may be illustrated by describing a mine in the Grundy county field, which presents a general idea of longwall as practiced in the United States.

---

*Mining engineer, 193 Pearl street, New York.

The mines are located in a practically flat country, the coal lying parallel to the surface topography. The district is situated about 60 miles west of Chicago, near a town called Coal City. The seam is a bituminous coal averaging 3 ft. in thickness; a typical section of strata overlying the coal would be about 7 ft. of surface soil, 16 ft. of sand, 10 ft. of blue lime, 12 ft. of cemented gravel, 22 ft. of sand shale, 30 ft. of shale, and a bottom of fairly hard fire-clay for a floor. The total depth of cover is usually in the neighborhood of 100 ft. Fig. 1 shows the workings of one of the Grundy county mines. The shaft, represented by *x*, is circular. Note the large amount of ground left to support this shaft.

The size of pillar left to support shafts depends so much on local conditions that no definite figures may be given for this feature. It is quite often found in longwall work of this nature that a figure adopted for size of pillar supporting the shaft is of diameter equivalent to the depth of the shaft. At a glance the difference in magnitude between coal- and metal-mining operations, is observed in this single feature, and the difficulty of comparison of such a system as this for the working of metalliferous beds, with coal as a predecessor, is apparent.

In Fig. 1, *a a a a* called "mothergateways" in England, are driven approximately 280 ft. apart, and practically at right angles to the main haulage road. Room roads *b b b* are spaced approximately 42 ft. apart, center to center. Where the cross-entries *c c c* are turned at 45 deg. from the main roads, the spacing of the room roads is approximately 60 ft., in order to make the 42 ft. of face measured perpendicularly. Entries are maintained 7x7 ft. outside of timbers, except the room roads, which are driven just sufficiently high to allow tramming. In some parts of the field soft ground is encountered, and sets of 12x12-in. timbers have been observed placed continuously and badly crushed, due to the movement of the ground. The maintenance of roadways in advancing longwall under such a condition as above set forth is, of course, an expensive item, and it is questionable whether the system pays when surrounded by such difficulties; however, ground of such a nature as this would be difficult of maintenance in any system of mining.

Referring to Fig. 2, the roof is propped within 2 or 3 ft. of the face. The use of undercutting machines, or running track parallel to the face is precluded by the soft nature of the roof. I have seen roofs so strong that it is quite possible to run several sets of track between the face and the gob, should such a course be desirable; props being set, the miner proceeds to undercut the face with a pick to a depth of 16 to 20 in., Fig. 3, *a*. This undercut is 7 to 10 in. high, and is not made in the coal, but below it in the floor. This procedure, however, is not always possible when the loss, due to the undercutting in the coal itself accrues.

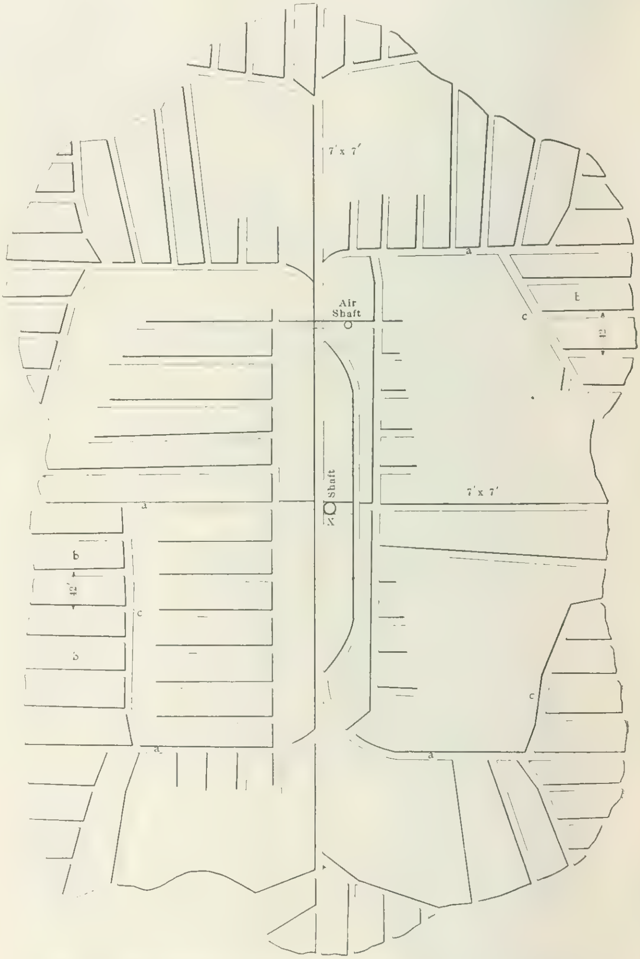


FIG. 1. MAP SHOWING WORKINGS OF LONGWALL COAL MINE IN GRUNDY COUNTY, ILLINOIS

The room track, Fig. 3, *b*, is brought up as close as possible to the face without interfering with the work. Coal between room roads, Fig. 1, *b b b b*, has to be carried along the face, where it is loaded into the cars, Fig. 3, *c*. At the face, Fig. 3, *d*, the back is the hight of the seam, viz: 3 ft., but in the entries the back is brushed down to make head room for the tramming Walls, Fig. 3, *e e e*, and Fig. 4, *e e*, are built up to the roof, which has been brushed down in the roadway to make a hight of 5 ft. However, these walls, as shown in the figure, are only built to a hight equal to the thickness of the seam, since there is no brushing done, excepting in the roadway.

Between the walls, Fig. 4 *f*, the small material and excess rock are thrown. Where there is an excess of this material, it is hoisted and disposed of on the surface. There is a considerable amount of small material which is useless for wall building. An examination shows that the amount of waste hoisted is 25 tons for every 100 tons of coal mined.

Cross-roads are usually driven about 200 to 300 ft. apart. The length of room roads, however, is more or less arbitrary, depending on the action of the roof and the facility with which roads can be maintained at length. When the maintenance becomes unduly difficult, a new cross-road is driven and the room roads behind abandoned. Arrangement is made with the contractors who mine the coal, to maintain a certain length of room road and cross-road; 60 ft. of the former and 300 ft. of the latter is a fair requirement, the work of maintaining further extensions devolving on the company. With the formation before cited, it is found that most of the loose settlement occurs during the first two months, this subsidence taking place in a gradual manner. The surface rights are leased with the understanding that subsidence will occur. Pillars are left in the usual manner, to support important buildings on the surface, but elsewhere the entire country is lowered.

In contrast to the operations above cited, which are considered typical of the longwall system in America, may be mentioned an instance of an advancing system in England, where the seam is 7 ft. in thickness, with but a 4-in. band of slate; the pack-wall material having been drawn entirely from the roof rock over this 7-ft. seam, is shot down in a systematic manner in the roadway and carefully built up in regular form by experienced wall-builders. This roof rock was an exceptionally strong sandstone.

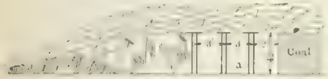


FIG. 2. SHOWS SUBSIDENCE OF ROOF BETWEEN ROOM-ROADS

Retreating Longwall

In general, retreating longwall infers the driving of entries to the boundaries and working home to the shaft. The roof is allowed to subside behind the area temporarily supported to maintain the working face. As in any system of longwall, more or less timber is required at the face depending on the nature of roof, which may or may not permit of economic maintenance of track between face and gob. A good condition, in any event, is when there is always sufficient space open between coal and gob to admit of a person walking continuously around the face. It is then assured that the ventilating currents have free sway and that the face is in good condition.

Comparison of Retreating and Advancing Longwall

In comparing the two systems, it may be said for the advancing system, that a quick cash return is available. Whereas, with the retreating system, particularly where seams are thin, and there is considerable rock waste to be mined in the roadways, this feature may involve considerable delay, since the headings are usually driven to the boundaries before mining proper is started. In advancing longwall, the haulage-ways are in ground which is artificially supported, whereas, in retreating work, the roadways are always in the solid, the fallen ground being left to rest behind for all time. This feature of the retreating system is a marked advantage. Following the subsidence of roof, shrinkage of the pack walls, and the upheaval of the floor, it often becomes necessary to brush down the roof, pull up floor and retimber to maintain the proper hight of roadways in the advancing system.

Since the roads are subject to these conditions, it is evident that constant attention is required, but the seriousness of this matter depends entirely on the nature of roof and floor, which subject will be discussed later. It would appear that with the advancing system, a strike or other cause precluding proper repairs to the roads, may under certain conditions render them impassable, and eventually these passageways would have to be reopened, perhaps at large expense.

It is remarkable to note in some formations how fallen ground will consolidate, and where one would anticipate the necessity of a complete forespiling system of timbering, it is often found quite practicable to support fallen ground with ordinary drift sets much in the same way as the original ground. Where the roads are in packed ground, in the event of a sudden squeeze or other accident, the roads may be rendered useless for escape, wherein lies a disadvantage of the advancing system. It may be said, however, with regard to such squeezes, that they are quite unlikely, since the longwall system involves at the outset a regular subsidence of the roof, anticipating control of both roof and floor. The effect of squeezes in room-and-pillar work is well known to be usually due to the carrying out of the bad policy of leaving pillars too small as compared to room area, which leads to difficulties accruing in the progress of pillar-withdrawal operations. The frequent occurrence of accidents, leading to the rapid destruction of pillars and the terrific efforts required as a rule to save this action, cites an advantage to the longwall system.

In advancing longwall, the roads probably require more timber in the long-run than in retreating, since they must be kept open in certain locations until the area is depleted to the boundary. The faster longwall can be driven, the better the roof conditions under which the men are working, for as the face advances, new roof is being constantly exposed. This point of speed also figures to an extent as regards timber, for the less time the roof is given to assert its weight on the supports, the more readily will their removal be effected.

Features of Longwall

In general, by using a longwall system, less coal is exposed to the action of the atmosphere. In room-and-pillar work, pillars may stand for years, before being removed, if they are removed at all. Not alone does the action of the air ameliorate the quality of the coal, but dangerous gases in longwall workings are seldom exposed. Retreating longwall in particular, favors good ventilation, especially at the face. Explosions due to accumulated gases in longwall workings are seldom heard of. In retreating work, this feature is emphasized because there is no reason to return through a fallen area, as in advancing longwall.

Accidents due to roof falls are less prevalent in longwall work than any other system of coal mining. This applies particularly to the United States, for there, as stated previously, only the thinnest seams are worked longwall and a low roof can always be more readily tested than a high one. In France, where the roof is of 10 ft. hight, over a longwall face, bad conditions were involved since this roof was of a scaling nature and the most thorough timbering was necessary. The coal was friable and even the face was timbered with plank excepting at those points where the men were picking the coal.

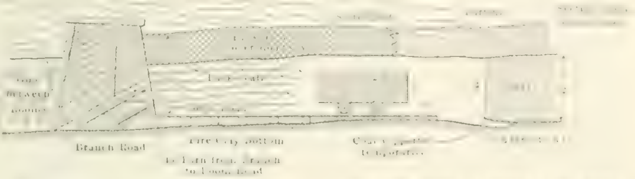


FIG. 3. WORKING LONGWALL IN ILLINOIS [illegible]

Experience has shown that where a large production is desired from a given area, the same may be accomplished in a shorter interval of time with longwall than by the room-and-pillar system. In general the production per man per shift in longwall is greater, and the cost of mining per ton, under certain conditions where both longwall and room-and-pillar had been operated, favored the former [illegible] extraction of the coal deposit.

[illegible] disfavor for the longwall system, despite the great success with which it has met in Great Britain, and the following that other nationalities abroad have given the Britishers. The prevailing opinion in the United States is that the system is impracticable where the seam is over 5 ft. in thickness, and it will be then also inferred for an advancing system particularly, that sufficient packing material is stratified with the coal to supply wall-building material. The maintenance of roads in advancing longwall is severely criticized as an item creating a large expense. This condition is quite true, but depends entirely on the nature of roof and floor, so that the inference is not at all general.

The main objection to retreating longwall relates to the tying up of capital for an undue period. This objection considers that in all cases the roads must be driven first to the boundary, as is true in the typical longwall system of this form. However, a combination system of both advancing and retreating longwall may be operated often, and this objection thus mitigated, where speedy monetary returns are so urgent.

Nature of Roof and Assistance of Roof Pressure

There appears to be considerable diversion in opinion among the authorities as to whether a hard or moderately soft roof is preferable to the longwall system. In this country the latter is favored decidedly, but I venture to state that there are roofs in England, which, though successfully manipulated behind a longwall face, would be considered in America wholly beyond the province of longwall mining.

It would be difficult to state whether an infinitely hard roof would be easier of control than an infinitely soft one; the latter is the one most frequently encountered over coal seams. In this connection a peculiar condition seems to exist the world over, that the roof over coal seams is considerably harder than the floor, and only in a few instances has it been noted that both the roof and floor were of the same material.

It is of prime importance that the face be maintained safely and with comparative ease, in order that the quickest progress may be made. A soft roof will require more attention and more timbering than a hard one. With a hard roof there is often considerable anxiety felt in obtaining the first break, which, however, when once accomplished, permits the roof subsidence behind the face to be readily kept under control. Large areas have been known to hang, which, when they have finally fallen, created more or less windage. Investigation of this subject has proved that this windage is never so strong as to be really dangerous. In the Bengal seams of India, which are thick, and mined from under sandstone roofs by a modified South Staffordshire method, heavy falls of roof have occurred covering large areas. Due notice of the impending fall is always given in the nature of local scaling off of roof rock, and the men have been known to remain in the mines, not far from the active areas, during the period of a fall without sustaining any injury.

It may seem an extreme statement to say that no roof is too hard for longwall, but from work observed, it would appear that no roof found over coal is so hard that longwall cannot be operated successfully, other things being equal.

Where a roof is so strong that it will not break within a reasonable area, one of the objects of longwall is defeated. The occurrence of the first break in the roof is a sign that the lateral compression in the overlying masses is relieved. Where there is no break there will be practically no weight on the face, and consequently no assistance of the roof in the breaking of the coal. It is not to be inferred that power is unnecessary in longwall mining, but even though a steady pressure of roof is obtained, and the coal be undercut, a certain amount of blasting is usually required to break down the coal at the desired moment.

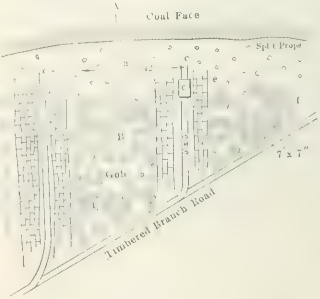


FIG. 4. SHOWS ARRANGEMENT OF PROPS AND TRACKS AT COAL FACE

While the condition of an infinitely strong roof is rarely heard of over coal measures, yet if such a condition was met, and although the assistance of roof pressure to break the coal at the face might be lost, the feature of a high extraction of the deposit would still be attainable, and there is no question but that the best way to mine wherever possible, is to make the first attack on the beds the last attack, wherever same can be accomplished in an economical manner.

Roof falls are not always accomplished by the dislocation of the main strata, but more often consist merely in the peeling off of roof strata below the outline of the dome formed in the caving. In longwall with a yielding roof, the ideal action is one of bending of the formation, which acts on the face cantilever-like. With a strong roof, which hangs, the peeling action above mentioned might occur locally and must be guarded against. If a fall included the main roof strata, no amount of artificial support could counteract it, but the peeling action of the strata below the dome line could be readily supported with props. In Europe it is generally advised that no matter how safe a roof may appear, it should be timbered thoroughly, for the mysterious actions of roofs have been the occasion of more fatalities than any other cause.

Surface Subsidence

Surface subsidence usually follows roof falls underground. The severity of this subsidence depends on the thickness of the seam, the nature of overlying strata and the depth of the seam below the surface. It is well to always anticipate disturbance of the surface, even though the area is completely packed. It has been shown, however, in this regard, that where packing material has been introduced by means of water, such an intimacy can be effected between the particles making up the filling material that surface depression is hardly noticeable, where formerly the introduction of the filling in a dry condition resulted in considerable shrinkage and marked surface disturbance. No matter in what manner an area is replaced by a packing material there will always be some shrinkage, for the replacement medium cannot be made as solid as the original material occupying this space.

With longwall where surface subsidence ensues, roof lowering is attended with considerably less disturbance on the surface than with pillar work, since the work underground is carried more regularly and the face advances with more accurate alinement and more gradual lowering of the roof. In longwall the roof is watched more carefully, for so much depends on its proper control. This feature should not be minimized in room-and-pillar work. In pillar robbing, however, it is not aimed so much to throw the weight of the roof on the coal, whereas in true longwall this feature is part and parcel of the system. In robbing a pillar, the timbers are usually left standing long enough to admit of as nearly complete removal of the coal as possible. While there is some regard paid to the future of neighboring pillars, if the work is carried on conscientiously, the roof is finally allowed to fall, if it will, in virtue of the removal of the timbers.

In America, while the filling system is used, as will be discussed in a future article in detail, it is rarely introduced in conjunction with the robbing system, but rather as an auxiliary support for the pillars which were not properly arranged in the original layout. In longwall, when the timbers are withdrawn, it is desired that the roof shall come gradually to rest on the packwalls, whereas in pillar-robbing work, the roof falls to the floor. True, with a soft floor in longwall the packs are often driven into the floor, but this action is not a sudden one, and the overlying strata when it does subside does so in a gradual manner.

Timbering

Every effort should be made to recover timber and where possible to reuse same. In longwall work, it is most important that all standing props be removed in a systematic manner as the working face advances. With certain roofs, a few standing props may interfere with regular roof subsidence. It is not unusual to see a small prop standing in a thin seam and the roof bending about it, finally reaching the floor. A roof formation of this kind would be considered favorable for the longwall system, in virtue of such a possibility.

Where the roof is hard and the floor comparatively soft, or *vice versa*, a much better condition for ideal longwall obtains than where both are hard. Where a hard roof has taken weight, with a hard floor under it, timber removal may become extremely difficult. The withdrawal of props in such an instance often entails blasting, or otherwise destroying same, to effect its dislocation. With a soft floor, the props might be forced well into it, and their recovery is not such a remote possibility. By tapering the props at one end, the action due to the fracture of timber has been ameliorated. By this tapering the compressive action of the roof, when taking weight, is localized in the tapered area of the prop, which is caused to bur. This burred part may then be sawed off and the prop reused, at a point where a shorter stick is required. Such a form of prop is greatly favored in certain parts of England. It is also found expedient in setting a straight prop, to pile an amount of small broken stone under it, which, when picked away will admit of readily removing the timber even though the roof has taken weight.

A closer study of the longwall system on the part of American engineers would no doubt evolve some interesting innovations in its application. Up to the present time, however, comparatively little thought has been given the subject in the United States, which is strange in a country where speedy and total extraction of deposits is generally looked to, and extreme means usually pressed into service to effect this result.

The control of a hoist should be such as to entail the least possible amount of physical exertion on the part of the engineer. He should be free from the constant demand upon his physical energy to operate and control the engine, so that his mental faculties may be properly concentrated upon his work. For this reason, hoisting engines should have easily operated steam valves, quick to open and close, steam-actuated reversing gear and powerful brakes capable of holding the engines under the most unfavorable circumstances.

Nickel Ore in Nevada

Special Correspondence

The principal development of nickel ore in Nevada has occurred at the Key West mine, in the southeastern part of the State, about five miles west of the Utah boundary. The ore is confined to rounded masses of diabase intruded into crystalline schists, the former being very much like the basic rock of Sudbury, Ontario. The diabase weathers rapidly, forming a greenish black, powdery mass. Chalcopyrite is the prevailing mineral, the ore averaging about 3.5 per cent. copper, 2.5 per cent. nickel, 1 to 3 oz. silver, and 0.25 to 0.30 oz. platinum per ton. It does not contain gold.

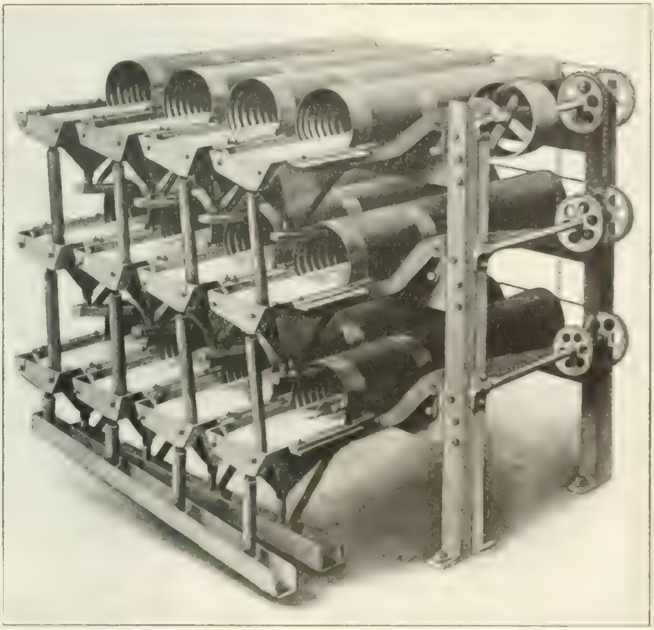
The first work on the property was an incline dipping 12 deg. into the outcrop of one of the lenses; a second incline, at right angles to the first, and starting about 150 ft. from it, was sunk at a dip of 30 deg., developing a body of ore which varied greatly as to outline and metal contents. At 300 ft. from the first incline a shaft was sunk 110 ft., encountering a mass of ore which was cut off by what seemed to be a fault but proved afterward to be only the smooth exterior of the mass. A second shaft was sunk 150 ft. from the first and encountered two additional lenses. A long crosscut was then driven to get under the first shaft, but after passing through the first lens it found nothing but the undisturbed crystalline schists.

There were two reasons why the property was not further developed at that time, viz., (1) the distance from transportation and the high cost of operating, and (2) the difficulty in disposing of a copper-nickel-platinum matte. The mine is now within a reasonable distance of the railroad, and it is rumored that a matting furnace is to be erected in the vicinity.

The Improved Macquisten Tube

By W. F. [illegible]

In an article in the Journal of October 26, 1907, I described the Macquisten tubes used for [illegible] process at Golconda, Nevada, and mentioned that it was planned to group the tubes in a more compact way. This has recently been done, as shown in the accompanying illustration. The apparatus is made two or three tiers high, and the floor space required is only 6x7 feet.



IMPROVED MACQUISTEN TUBES

Diamond drills have been installed on the property of the Mammoth Channel Mining Company at Magalla, Butte county, Cal., to test the gravel and find the exact depth of the channel. It is expected to reach the gravel at about 600 ft. depth. The drainage tunnel, now 1200 ft. long, is nearly completed.

A New Machine for Use in Room-and-Pillar Work

The economy and speed with which coal is mined by longwall machines has given rise to a large demand for an efficient machine operating on the longwall plan for room-and-pillar work. Special interest therefore attaches to the announcement that the Jeffrey Manufacturing Company has added to its line of electric coal cutters a new room-and-pillar machine, known as the Jeffrey 26-B Shortwall Coal Cutter, details of which are shown in the accompanying illustrations.

The difference between this and the many well-known breast machines, is largely in the method of cutting. The new type cuts across the face of the coal, starting at one side of the room and not stopping until it finishes the cut at the other side.

Method of Operation

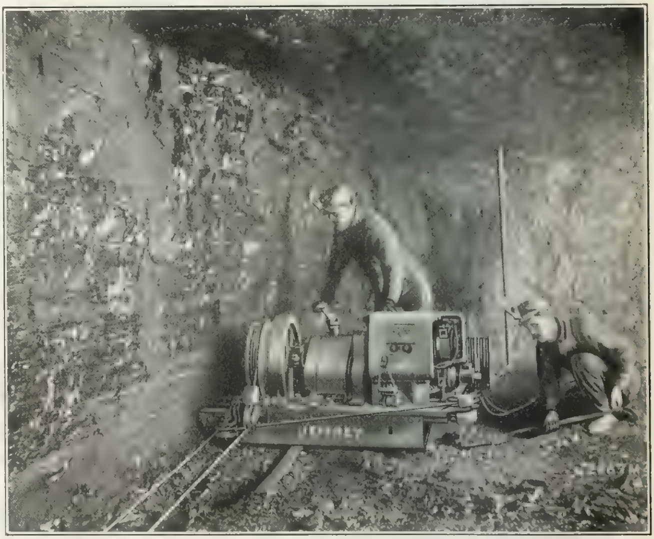
A ½-in. steel feed cable wound upon a power-driven drum at the front end of the machine pulls it across the face of the coal at a speed dependent upon, and suited to, the hardness of the cutting and the nature of the coal or clay in which the cutting is done. This drum when desired can be disengaged by means of a suitable clutch, so that the machine in finishing its cut at the left-hand rib may be angled for the purpose of maintaining a uniform width of room. Another cable, having no connection whatever with the power, is arranged to act as a guide to hold the machine to its work at a proper angle for its greatest cutting efficiency.

Suitable sheave wheels are provided at convenient points on the machine to guide the feed cable so that it can be led off in any direction, thereby enabling the machine to be loaded, unloaded, moved about and pulled out from under the coal by its own power; this is a desirable feature, and one which strongly appeals to machine runners. The gearing is arranged so that the feed drum may be operated at a sufficiently high speed to move the machine quickly about the working place. To take care of the heaviest service, an exceptionally powerful compound-wound motor is provided.

The operation of the machine may be briefly described as follows: It is brought into the room on a truck moved by its own power or hauled by a mule, depending on whether or not a self-propelling truck is used. A pipe jack is placed at the face of the coal at the right-hand rib and the feed cable attached. The motor is then started and the machine moved to the face of the coal. A simple guiding device, consisting of a piece of tee-rail and one jack, is then set up on the left-hand side of the machine and the sumping cut is started; the feed cable pulls the cutting frame in under the coal and the guiding device serves to hold the machine in line.

When the sumping cut is completed, a steel anchor hook is secured by a wedge in the left-hand rib near the face; to this hook are fastened one end of both guide and feed cables which lead across the face of the coal. The cable is then attached to a jack set at the right-hand rib in line with the rear drums, and the machine started across the room. In operation, the feed cable pulls the machine across the coal face, and the guide cable keeps it at the proper angle to the face of the coal.

A special flexible brand of wire with elliptic stranding is used for the feed and guide cables, eliminating any tendency to kink or curl up when the tension is released, and materially increasing the wearing surfaces of the cable. The elasticity of the cables equalizes the shocks and jars on the machine and gives the motor an even, steady load.



THE JEFFREY SHORTWALL MACHINE AT COAL FACE

Advantages Claimed for the Machine

When the machine reaches the left-hand rib, the pipe jack is moved to a position near the truck, the feed cable attached, the machine pulled out from under the coal and over to the truck where it is loaded by its own power and is ready to move to the next working place.

Among the advantages claimed for this machine are; (1) its construction is simple and strong throughout, and the power of its motor equipment is large, qualifying it to perform long and hard service and greatly reducing the danger of breakdown and cost of up-keep; (2) it cuts fast, and but little time is consumed preliminary to starting up and in removing the machine after the cut is finished; (3) it occupies little space and permits setting the props nearer to the face of the coal; (4) it consumes but a small amount of power per cubic inch of coal cut; (5) it is handled by its own power with rapidity and with little exertion on the part of the machine runners.

In addition to the machine described, the Jeffrey company also builds a side cutter for thin seam coal, the construction and operation of which is essentially the same, no advantageous features being sacrificed to obtain the reduced hight. Both machines cut directly on the floor of the seam.

The motors furnished with these machines are of the best modern and improved types. The frames are made of cast steel with laminated pole pieces. The armatures are drum wound with form-wound coils. The field coils are series wound with insulating compound and are inclosed in oil and moisture-proof covers. The commutator bars are of the best quality of hard-drawn copper, and are insulated with mica of the proper hardness to insure even wear and long life.

At Robinson and Kokomo, in Summit county, Colo., bodies of argentiferous galena, pyrite and blende, and above the water-level their oxidized products, occur at the contact between Carboniferous limestone and an overlying sandstone, or at the contact between the limestone and sheets or dikes of porphyry. These mines were discovered in 1880, and for a few years were worked on a considerable scale, several smelting works being erected in the district. The mines proved disappointing, however, and were soon for the most part abandoned, although work has been continued in the district to the present time.

Mine Mules and Their Care

By Robert Grimshaw*

It is generally stated by those who have to do with mines, that horses and mules which work a long time underground become blind when brought again into daylight. Veterinary surgeon Sturm, of Gergany, investigated not only this, but also the question of cruelty to such animals. In the latter particular, Dr. Sturm thinks that all reproaches are undeserved. He found that in almost all cases there was ample provision for inspecting the horses with regard to their health and freedom from the pest. It was observed, however, that there were a great many cases of eye-disease; 90 per cent. of these being of one eye, and 10 per cent. of both eyes. Where there was any indication of cruelty to animals, it was in the case of an animal that had bad sight. This difficulty does not prevent the animals from making the regular trips; but in sudden turnings, or by the sudden appearance of a bright light, they would often be shy and show themselves uncertain. This state of affairs too often led the driver to ill-treat them, as the reason for the lack of obedience was unknown.

Causes of Blindness

On first investigation, it was thought that most of the cases of blindness were caused by blows on the head in running against obstacles that could not be seen in the galleries; this opinion was soon changed and the many scars and cuts on the forehead and eyebrows of the horses were found to be the result, rather than the cause of the trouble with the eyes. In 80 per cent. of the cases the animals suffered from cloudiness and degeneration of the lens and the vitreous fluid of the eyes. This cloudiness (gray cataract), shows usually a gray-white or gray-black and sometimes even gray-green color, and is of various forms. There are grays and blues, also moss-shaped or root-shaped figures and branched patterns. In many cases there are smoky, beam-like cataracts, and within them, and beside them, scabby or black grainy, cloudy places in the lens. In some instances the cloudiness was caused by "synchysis scintillons" or liquefying of the vitreous substance. Especially where the head was suddenly raised, one would see in the background of the eye numerous glistening crystals, dancing about like snowflakes in the wind.

Cases of inflammation of the lids, cornea and iris are also to be found, but usually heal rapidly without any inflammation of neighboring portions. Also shrinking of the entire eyeball and general inflammation of the whole eye are often found. The more seldom cases of slight cloudiness of the cornea are mostly caused by examination with an ordinary mine lamp. The horses allow themselves to be inspected with such lights, while, bringing an electric lamp near, causes restlessness. The tests showed as a rule slight adjustability of the iris, and abnormal size of the pupil. Changeable light causes only slight pupillary reaction, even when the lamp is brought very near to the eye. As inflammation cannot be assigned as a reason for this, the diminished adjustability of the iris must be attributed to paralysis of the retina. In only two cases was the roundness of the pupil altered, where the lens was misplaced. Such a misplacement of the lens into the rear chamber of the eye was observed by Sturm for more than a year. The horse was brought to him for treatment, and alluded to as "the one with a little button." For about four months after the commencement of the trouble the lens got gradually more and more cloudy, so that a great white chalky button projected into the pupil. Only after a year was there any cloudiness of the other portions of the eye.

An Analysis of Common Eye Diseases

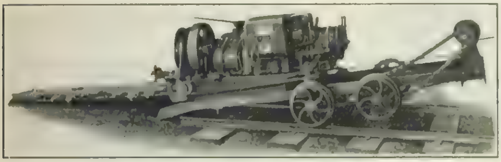
The question now is, what is the cause of these frequent abnormal diseases, especially of the lens and the vitreous medium? This is best answered by Sturm by giving particulars of one mine which he inspected. The horses on their way toward the shaft, hauled on an average, eight cars, each of 12.5 cwt.; the haulage distance was about 1600 m. or an English mile, up a grade of 1 in 500, and at a speed of 1 to 1¼ m. per sec., or say 2 to 2¾ miles per hour. Against this trip, there was a strong draft of fresh air coming in at the rate of 4 m. per sec., or say 7 to 7⅓ miles per hour, and at about the temperature outside the mine. The horses often came warm, or even hot, from the cross-galleries into the neighborhood of the shaft, and would then stand before a door opening, having a temperature of [illegible] F. When the door is opened and the train is hauled further, there is often, in winters a sudden cooling, to as low as the freezing point. The draft in this section is strong, so that a person must hold his hat. Even in the crosscuts it is difficult for a miner to keep his lamp burning, because of the draft. The return trip with the empty cars in the direction of the draft follows immediately; and usually the out-trip with loaded cars comes at once after the return with the empties.

Result of the Variation in Temperature

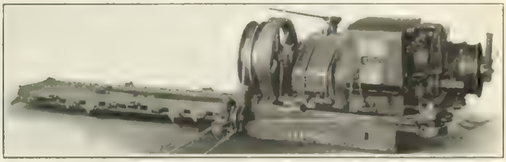
This variation of temperature, and the strong draft, are the principal causes of the inflammation of the eyes. It is a well-known fact that cold, as well as heat, can cause inflammation of the lens, as shown by Midnel. He was able, by placing an ice bag before the eye of a healthy animal, to cause an opaque cloudiness of the lens, which, on removing the ice bag, became clear again. On the other hand, glass workers who are subjected to intense heat from one side, are subject to gray cataract on that side. Therefore the above described disease of the lens and the vitreous medium are shown to be caused by disturbed circulation and nourishment.

As regards the paralysis of the retina, one must take into account that the animals (in contrast to the miners) are usually, and sometimes continually, away from the light. The mine lamps and the little electric incandescent lights only partially replace the sunlight; so that paralysis of the retina takes place.

In this connection, no reproach can be made to the management of the mines. These difficulties must be regarded as inseparable from the business. The matter might be bettered somewhat by bringing the fresh air from above toward, instead of from the [illegible] down, as is usually done in some mines. The stables underground are often better than those above; but for all that, the animals should perhaps have a change of work from darkness to daylight from time to time. In this way at least, the retina could be kept active, and thus be a less frequent cause of other troubles. Much cruelty to animals could also be prevented, if those that are considered as shy, or balky were oftener inspected. Once the reason for shying [illegible] hostler, much mishandling would be prevented.



General Method of Conveying and Unloading the Machine



Coal Cutter Ready for Operation

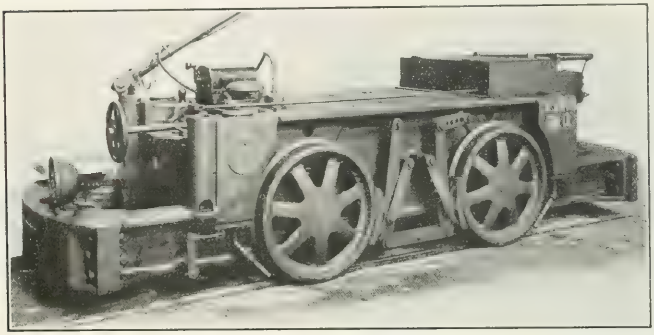
Jeffrey Shortwall Machine

---

*Engineer, Dresden (A.), Germany

Recent Electric Locomotives for Mine Haulage

The extensive use of electricity as a motive power in mine haulage, is proof of the fact that its employment has passed the experimental stage. The electric locomotive is compact and simple in construction, emits no smoke or gas, and does not impair the sanitary condition of the mine. The same source of power that drives the locomotive can also be used for operating fans, pumps, hoists and other machinery. By combining the power requirements in this way, the load fluctuations are reduced and the entire plant can be economically operated.



BALDWIN-WESTINGHOUSE MINE LOCOMOTIVE WITH TRACTION REEL ATTACHED

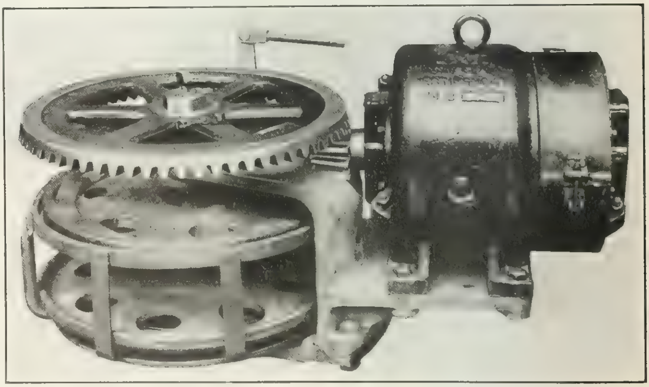
The accompanying illustrations represent locomotives for mine service recently built by the Baldwin Locomotive Works, and equipped with electrical apparatus supplied by the Westinghouse Electric and Manufacturing Company. The locomotive for the J. H. Sanford Coal Company is one of three recently supplied to this concern. These engines represent the type usually built for mine service, and are particularly interesting as they are equipped with traction reels. The gage of track is 3 ft. 6 in. and the approximate weight of each locomotive is 12,000 lb. The wheels are of chilled cast iron 28 in. in diameter and spaced 4 ft. 4 in. between centers. The journals are 3¼x4½ in. The frames are placed inside the wheels, and are of cast iron, with bumpers of the same material.

Locomotives Have Traction Reel Attached

This locomotive is equipped with two No. 60 motors, suitable for 500 volts pressure. The motors are inside hung, that is, suspended between the axles. They are rated at 15 h.p. each. Operating equipment is provided at one end of the locomotive only. A trolley-pole socket is cast in each frame at the operating end of the locomotive.

The traction reel is used for hauling loaded cars from the room face, the locomotive remaining on the main track with brakes set. The reel is mounted vertically on a crosstie at the rear end of the locomotive. It is driven by a Westinghouse K- 2 motor, which is mounted on a projection of the reel housing and operates the reel shaft through bevel gearing. The body of the reel is of cast iron and is wound with 300 ft. of ⅜-in. steel cable which can be readily payed out when it is desired to haul cars. The device is operated by an auxiliary controller, placed within easy reach of the motorman. The reel motor is covered by a hood which can be opened on top, thus giving ready access to the equipment.

The approximate over-all dimensions of this locomotive are: Width, 4 ft. 2½ in.; hight, 3 ft. 8 in.; length, 12 ft. 4 in. The equipment includes hand brakes of the screw type, and four sand boxes cast in the frames with spouts to all the wheels.



VERTICALLY MOUNTED TRACTION REEL TO BE ATTACHED TO LOCOMOTIVE

The United States Coal and Coke Company has recently received five Baldwin-Westinghouse locomotives, which are arranged to operate either individually or in tandem. Two of the machines are arranged as leading units, and three as trailers. The leading units are equipped with four motor controllers, so that one man can readily operate both locomotives. The brakes are operated by levers and when working in tandem they are connected by a chain which is guided around sheaves suitably mounted in the bumpers. The illustration shows a leading and trailing unit coupled together.

The track gage is 4 ft. and the weight of each locomotive is about 26,000 lb. The wheels are 30 in. in diameter, of cast iron with chilled treads and spaced 4 ft. 8 in. apart. The frames are placed inside the wheels and are supported on coiled springs placed over the boxes. The journals are 3¾x6 inches.

Each locomotive is equipped with two No. 115 motors, of 75 h.p. capacity. The motors are inside hung. The width of the locomotive is 4 ft. 6⅜ in., the hight, exclusive of trolley, 3 ft. 2 in., and the length 12 ft. 6 inches.

The two locomotives, when coupled together, represent a powerful motor having a total weight available for adhesion of 52,000 lb., and a normal capacity equal to 300 h.p.

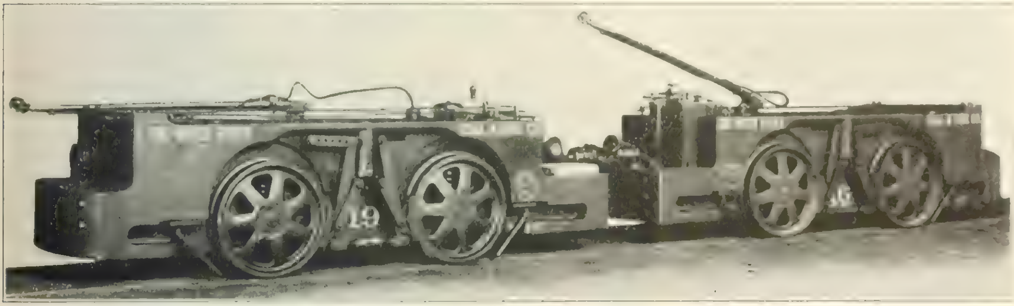
In winding shafts located near a breaker where the atmosphere is saturated with coal dust, the grease on the winding ropes collects the dust, and causes the ropes to become dry and gummy. Before examining such a cable, all the gummy grease should be removed; this can be done by applying coal oil to the rope.

The peat bogs of Germany cover nearly 11,583 square miles, while in Ireland the bogs cover one-tenth of the country. The depth of peat bogs usually varies from 5.4 to 7.6 yd., although Ireland has some bogs 16.3 yd. deep. It has been estimated that 1 square mile of bog 5.4 yd. deep contains 1,813,000 metric tons of dried peat.

The Origin of Coal

By H. M. Chance*

The zeal of the scientist seldom requires stimulation, but when a tonic is needed perhaps the most effective form in which it can be administered is as skepticism, for the fault finding of dissenters spurs the theorist to action as no other known force. It is with this thought and with the hope that by uncovering some of the absurdities and fallacies of the generally accepted theories of coal formation, impetus may be given to the elaboration of some more plausible theory, that this article is written. The writer has no new theory to advance, but desires to direct attention to some observed peculiarities of coal beds, and of the rocks with which they are associated, not satisfactorily explained by any heretofore proposed theories, in order to emphasize the inadequacy of such theories and clear the way for something better.



LOCOMOTIVES COUPLED TOGETHER AND USED AS A LEADING AND TRAILING UNIT

Are the Coals Vegetable Accumulations?

Referring first to coals of Carboniferous age, that is, to those lying between Devonian and Permian strata, the theory that they are vegetable accumulations of marsh or forest growths, requires the assumption of from 50 to 200 alternately subsiding and emerging oscillations, whereby the marshes or bogs or swamps were submerged and elevated above water-level. These oscillations are necessary to account for the different layers of the coal beds and their intercalary slate or bony partings, without taking into account those oscillations necessary for the accumulation of the material which now forms the intervening beds of slate, limestone, shale, sandstone, conglomerate and fireclay.

If this were the only argument to be offered in opposing this theory, it could be dismissed with scant consideration, for if one oscillation occurred during this period, there is no valid reason why we may not assume that five hundred or one thousand occurred; and in the absence of other objections the number and frequency of required oscillations could not be held to justify rejection of the theory, but as these and similar considerations constitute a connecting link in the chain of contradictory evidence, they cannot be ignored.

The fireclays underlying the coals have been the subject of much discussion, but without developing any satisfactory theory of origin. While these coals usually rest upon such a bed of clay, there are many exceptions to this rule, and these exceptions are most significant and may furnish a possible explanation of their origin or mode of deposition. In attempting to explain the origin of the underclays it has been assumed that they formed the soil which supported the vegetable growth from which the coal was made; this contention being supported by citations of the frequent occurrence of "roots" in the clay, while the character of the clay is explained by assuming that it was originally mud or clayey mud similar to that from which the shales and slates of the intervening measures were formed, and that the roots of the growing plants abstracted the alkalies and alkaline earths, converting them into a refractory clay.

This hypothesis, however, fails to explain why some of these fireclays contain nearly as much of the alkalies as the typical slates and shales, nor why the slate partings of coal beds were not likewise converted into fireclay, for they in turn must have formed the soil for the growth of vegetation from which the upper benches of the coals were formed. It is perhaps unnecessary to state that partings of typical slate from a fraction of an inch up to several inches in thickness occur in nearly all coals, have none of the characteristics of fireclay, nor do they show evidence of the presence of roots; while fireclay partings occur in some coals, they constitute an exception to the rule.

Again, it has been found that the different layers of a bed of fireclay may vary materially in composition; the top layer (that next to the coal) may contain as much iron and alkalies as a typical slate, the next layer may be quite low in iron and alkalies; the next underlying layer may contain a large percentage of these impurities, and the bottom layer may show a composition similar to that of the second layer. If these variations in composition be due to growing plants, it seems difficult to understand why the extractive power of the roots should vary so irregularly at different depths below the top of the soil in which they grew.

The Origin of Fireclay

If this theory be true, we should expect to find the soda, potash, lime, and iron extracted from the clay as a constituent part of the coal. In the case of a typical coal bed 4 ft. thick, carrying perhaps 8 per cent. of ash and resting upon a bed of fireclay 3 ft. thick, this theory requires that the plants from which the coal was formed have reduced the percentage of alkalies, from that of the slates (which may be taken at 4 per cent.) to that of fireclay (which may be assumed as 1 per cent.), involving the removal of about 13 lb. of alkalies from each square foot of the bed of clay. As each square foot of the overlying coal contains about 24 or 25 lb. of ash, this ash should contain about 50 per cent. of alkalies. It is, however, well known that the ash of most coals contains only a very small percentage of the alkalies.

If the coal flora was of such nature as to require for its normal growth, large quantities of the alkalies, then it would not flourish except upon such a soil; but here again our theory is contradicted by observation, for coal beds do not always become appreciably thinner where the underlying clay is replaced by sandstone, and it is quite improbable that the original sand beds contained a notable percentage of the alkalies.

It, therefore, may be as difficult plausibly to explain the origin of fireclay as of coal, and in attempting to do this it should be remembered that fireclays not overlaid by coal exist at many horizons in the coal measures, and extend over large areas.

---

*Consulting mining engineer, Drexel building, Philadelphia, Penn.

When we attempt mentally to picture the possibility of a marsh, bog or forest that over scores or hundreds of square miles has produced sufficient vegetable matter to form a layer of coal a few inches or perhaps a foot thick, and which must have a top surface of such nature that a layer of mud or clay a fraction of an inch or a few inches thick, may be deposited upon it, without filtering down into the vegetable matter (such mud or clay ultimately making a slate parting a fraction of an inch or a few inches thick), and when we try to picture a further growth of vegetable matter accumulating upon this mud or clay sufficient to form several inches or feet of coal, without disturbing this layer of mud or clay, without filling it with a mass of roots or causing it to become mixed with the vegetable matter above or below, our ingenuity and imaginative powers are severely taxed. And when upon further consideration, we realize that the conditions necessary to produce these results must be repeated not once or twice, but perhaps six or eight times to account for the formation of a single typical coal bed 5 or 6 ft. thick, we may perhaps be justified in rejecting the theory as utterly improbable.

I desire to direct attention especially to the fact that the separation of a slate "parting" from the coal bench above or below it, is frequently defined by an absolutely sharp line, i.e., there is an abrupt change from coal to slate, pure coal is in immediate contact with pure slate, no transition layers being present either above or below the slate parting.

Transportation of the Sandstone

Until a plausible explanation is also found of the methods and agencies by which the sandstones and conglomerates were transported and deposited, we cannot hope to paint a true picture of the conditions existing during the formation of the coals. Reference may especially be made to the Mahoning sandstone and other similar rocks. The Mahoning sandstone is easily identified in Pennsylvania, Ohio, and West Virginia, over an area measuring about 250 miles east and west, and by an equal distance north and south, throughout which it is continuous and persistent, either as a coarse- or fine-grained sandstone, or as a coarse conglomerate of quartz pebbles 1/4 to 1 or 2 inches in diameter, or occasionally as shale, shaly sandstone or sandy shale. It varies in thickness from about 20 to 100 ft. A few feet above it is the Upper Freeport coal bed (Bed *E*); within it, when split into two members, is a bed of coal, sometimes of workable thickness, and a few feet above it is the lowest persistent coal bed (usually quite thin) of the Middle Barren coal measures.

We do not know by what agencies the coarse sand and pebbles of which this rock are composed were transported and irregularly distributed over this area, nor from what source they were derived. The transportation of this material a distance of hundreds of miles from its source is difficult to explain, for the conditions of such transportation must of necessity not be incompatible with a long sequence of changes favorable to coal formation, followed by a long period in which similar conditions existed, but in which the coals were thinner and the sediments were fine muds or silts with some calcareous material.

If it be asserted that the quartz pebbles of this rock were transported hundreds of miles by rivers, we must assume hydraulic gradients for these streams and for their deltas which would leave along the course of their channels great boulder-filled cañons or valleys, which stretching for hundreds of miles through the coal measures and underlying formations, could not easily be overlooked; however, no such channels have been found.

Other Peculiar Conditions

While it seems unnecessary to present further evidence of the inadequacy of current theories of coal formation, if such be needed, attention may be directed to the frequent occurrence of limestones lying upon fireclay; to the carbonate of iron deposits; to the interesting lamination of some coals marked by minute layers of a material which (for want of a better name or perhaps because of ignorance of its true nature) is known as "mineral charcoal," or "mother-of-coal;" to the large quantity of pyrite in some coals; to the peculiar "rock-faults" which often have the appearance of stream channels eroded through the coal.

As the normal lignitic coals and lignites of Cretaceous and Tertiary age exhibit features similar to those already discussed, the same difficulties are experienced in attempting to explain their origin by current theories, and upon extending the discussion to certain abnormal coals found in the Mesozoic, Jurassic and at the base of the Cretaceous, further difficulties appear, especially in the case of some coals of rather extraordinary composition, which contain as much as from 7 to 9 per cent. of sulphur. The sulphur appears to be present in chemical combination with carbon or with some of the hydrocarbons. To explain the origin of such coals, it has been suggested that they are the remains of asphalt lakes, or of lakes of asphaltic oils. If this theory be true, some pertinent queries are immediately presented as to why these coals should be underlaid by beds of fireclay, and frequently should have an overlying slate roof, precisely similar to that of the normal coals of Carboniferous and Cretaceous age, and why the same, or a similar origin should not be assigned to all coal beds.

Crow's Nest Pass Coal Company

This company owns an extensive coal property in the Crow's Nest Pass district of British Columbia, operating coal mines and coke ovens at Fernie and Michel in that district. The report is for the year 1907. The capital stock at the close of the year was $3,716,280, having been increased by $216,280 during the year. Premiums received on new stock were $324,420, which amount was added to the reserve fund. That fund amounted to $2,124,420 at the close of the year.

The coal mined in 1907 was 981,939 tons, an increase of 175,038 tons over 1906. The coke made was 231,368 tons, an increase of 18,073 tons. The net profits for the year were $382,986, from which dividends of 10 per cent. were paid, amounting to $355,179; leaving a surplus of $27,807 for the year.

The president's report says: "But for a strike during April and the action of the smelters in raising wages, and so depriving us of our coke-oven men in midsummer, and then for the most part shutting down their mines and smelters for the last two months of the year because they could not operate under the new wage scale, the output would have overreached considerably the million-ton mark for the year.

"The costs of mining and coke-making during 1907 were increased greatly by reason of the advance in wages to miners, the irregular working of the men, the periodical scarcity of labor, the expense of securing new miners, the higher prices paid for all materials used, the heavy increase in freight rates, the larger cost of compensation for injuries to workmen and the extremely severe weather during the first three months of the year. Besides, a fluctuating demand for coal involved pressing the mines at times for tonnage, which had the inevitable influence of raising the cost. These conditions were the most unfavorable in the history of the company.

"During the year there has been spent on improvements the sum of $414,501 by the coal company; $21,735 by the Electric Light and Power Company, and $57,582 by the Morrissey, Fernie & Michel Railway Company (the last two being subsidiary companies of the coal company), or a total on improvements of $493,819.

"A new agreement between the company and its employees was reached on May 2, 1907, lasting until April 1, 1909. Increases in some of the mining rates, as well as to outside and inside labor, were accorded the men and a joint committee agreed upon to settle all disputes."

Is the Electric Current Safe in Coal Mines?

The Death Rate in Foreign Countries Has Been Reduced One-third as a Result of Investigations. Apparatus to Prevent Firedamp Ignition

BY RUSH N. HOSLER*

Electrical and mining engineers, as well as mine foremen and superintendents, while studying the practical adaptation of electric power to every kind of work, in and about the mines under their charge, have come face to face with one problem, which demands careful attention. It has been found that electrical-power transmission offers many advantages which no other power can furnish; but it must be acknowledged that electricity is also dangerous to some extent, in mines which give off explosive gases. The subject is broad, and one that has engaged the attention and best thought of the ablest scientists and practical mining men in every coal-producing country.

Coal mines may be divided into two classes, viz.: Those that do, and those that do not generate explosive gases. In treating these two classes of mines separately, I will first deal with electric power in non-gaseous mines. Notwithstanding the enactment and enforcement of laws defining the duties and responsibilities of persons engaged in work in and about the mines, we still find that accidents occur, and will continue to occur, as long as we mine coal. Such a thing as absolute safety is impossible; if absolute safety was to be attained we would have to stop all human activities. What we may call a safe agency, therefore, is a reasonable degree of safety, or accident reduced to its minimum.

The dangers resulting from the use of electric power in non-gaseous mines are as follows: (1) Shocks to men and animals; (2) fires caused by overheating of cables, resistances, motors, lamps, etc. Shocks may be received in many different ways, chiefly by coming in contact with uninsulated cables, or the opposite terminals of machines, or coming in contact with switches and parts of live machinery.

Some experts advise that we do not exceed a 300-volt current in our mines, claiming that a current above this may result in serious accidents to men and mules; the latter because of their shoes are most susceptible to shocks from a high-voltage current. I am inclined to believe, however, that any current above 100 volts may become dangerous; it is a well known fact, that a person having wet hands and wet feet, and standing on a rail or damp ground, can receive a worse shock from 100 or 150 volts, than a man can receive from a 500-volt circuit, when he has dry hands and feet and is on dry ground.

GUARDING AGAINST ELECTRIC SHOCKS

Most shocks that mules receive in the mines are largely due to carelessness on the part of some drivers and mule hustlers, who, trying to hurry at the end of a day's work, attempt to take the mules out alongside of an uninsulated wire, before the power is turned off. These shocks to mules may not always prove fatal, but often spoil a good animal.

To guard against shocks on motors, other than the totally inclosed types, all live parts should be netted or screened so that no one can receive a shock unless he first wilfully removes the protection. When installing electricity in mines we should guard against the high-current voltage and insist upon all machine terminals and switch fuses being provided with cover and these covers earthed and marked with white paint, so that there may be no doubt as to what they are for.

Electricity may cause fire in mines chiefly by: Motors overheating; heat caused by short-circuits; heat caused by bad connections; resistances becoming overheated; and from underground lighting systems.

The overheating of motors may arise from overload or some defect, but any real danger from this cause is not great; however, all inflammable material must be kept away from the machine, and it is best to have an ample supply of dry sand on hand. The circuit-breaker should be so adjusted that the motors cannot take enough current to overheat them to the danger point.

Short-circuits, in a properly installed plant, are liable to occur from defective design, bad insulation, something working loose, or some foreign substance coming in contact with parts of the machine.

Bad connections are things that should never exist, and do not exist around a plant that has been installed in a workmanlike manner and properly looked after.

Resistance must be kept well away from all woodwork, and if starting resistances only, they should be used with what is sometimes called a "fool-proof" switch, which will not allow the current to pass through the resistance after the motor has started up, unless the handle is deliberately held or tied in some improper way. A starting and regulating resistance should be so designed and proportioned that the full-load current will not overheat, then the machine circuit breakers will take care of the rest.

Risks of fire from underground lighting can best be guarded against by careful and constant investigation and by using the best materials throughout the system. The most important points, however, are to keep all lamps away from timbering, coal dust and especially cobwebs, and use a low candle-power light; good materials and fireproof cable are essential. It is, therefore, evident, that electricity can be used for any purpose in non-gaseous mines, without any abnormal degree of danger, if the proper precautions are observed in the installation.

USE OF ELECTRIC POWER IN GASEOUS MINES

The prevention of ignition of mine gases from electric machinery has been made the subject of exhaustive experimental investigation in Great Britain, France and Germany. This subject was studied in Prussia by a special commission as long ago as 1885. In 1890 a series of investigations were made on behalf of the French government, and in quite recent years, in Belgium, in Germany, and in Great Britain, investigations, searching and exhaustive, have been made by eminent specialists. Both direct- and alternating-current motors, starters, resistances, switches, cables, transformers and every other part or parts of machinery that go to make up an electrically-equipped mine were subjected to tests under conditions as nearly as possible like those met in actual service.

In the year 1902 the British Parliament authorized the appointment of a committee of experts to inquire into the use of electricity in mines. On October 16, 1902, the warrant naming and authorizing the committee to proceed was issued. After their preliminary meetings and organization they assembled many times—extending from November, 1902, to May the following year—for the purpose of hearing witnesses and taking evidence. Among the various witnesses the following [illegible] represented:

1. Scientific experts, electrical engineers and manufacturers of electrical appliances.
2. [illegible]
3. Miners' agents and miners.
4. [illegible] and representatives from insurance companies.

NOTE—Paper read before the Y. M. C. A. District Mining Institute, Philipsburg, Penn., May 7, 1908.

*Mining engineer, Morrisdale mines, Clearfield county, Penn.

REPORT OF THE BRITISH EXPERTS

The committee not only examined witnesses and took evidence, but also visited collieries in every district in England and Wales, for the purpose of making personal observation and experiments. In prefacing my remarks on the dangers of electricity in gaseous mines, I desire to quote from the report of this British Royal Commission:

"It is obvious that if an agent so potent as electricity is installed with insufficient skill, and handled with carelessness or ignorance, accidents may result, but if properly set up and used, it presents, we think, no features of such danger as would justify its prohibition. Gunpowder and nitro-explosives are dangerous, and yet they have to be made and stored in magazines, and even boys under proper supervision, handle guns and rifles safely. Explosives in mines may not only cause accidents to those engaged in using them, but might cause explosions of firedamp unless properly handled, and yet it is not too much to say that they present features of danger greater than any that are likely to be found in electricity if properly employed. Steam under high pressure is capable of producing terrible explosions, and yet it has been used for a century without any abnormally dangerous results. Our recent experience of motor cars has shown the danger than may attend them, yet no one has proposed their prohibition, only regulation. To use an electric light in a mine at first sight appears dangerous, for if broken it may ignite firedamp. Yet it must be remembered that any miner's safety lamp if broken would set fire to gas with even greater certainty. Electric winding machinery may perhaps alarm those unaccustomed to its use, but on the Continent we have evidence that it is used for winding men and coal from the pit with steadiness and safety. Many more instances may be given of the successful use of dangerous materials—masses of molten metal are used at white heat; corrosive acids and chemicals are manufactured in large quantities. And when all these cases are considered, it is not too much to say that the well regulated use of electricity will, in the future, present far less dangers than many other industrial agencies. On the other hand, these powerful agencies may be made to play a most important part in diminishing the severity of human toil."

History, in Continental Europe, has in a remarkable way, confirmed the views thus expressed by the above mentioned committee, and the mines there, today, are using large, high-tension installations successfully without accident, owing to the strict observance of proper precautions. I believe that full latitude can be given to the great development of electrical machinery in mines, but desire to emphasize the opinion that those who are to use it, and be exposed to the dangers that may arise from it, have a right not only to expect, but demand that every reasonable precaution to secure their safety should be taken. There are risks in every occupation, and do what we may, mining, like seafaring and railroading, will always present dangers that are probably greater than those of other occupations.

The dangers from the use of electricity in gaseous mines are all those encountered in non-gaseous mines, and enumerated in the first part of our paper, and ignition of explosive mine gases by sparking and overheating. What I have said relative to shocks to men and animals, and concerning fire caused by overheating of motors, cables, etc., is likewise applicable in reference to gaseous mines, and, therefore, I will not discuss them further.

Sparking may occur during the normal working of machinery on the brushes of direct-current motors, and on making or breaking contacts on machinery and switches, also by the insulation on motors, cables and switch mountings breaking down, or it may be caused by cables being either broken in two or pulled out from their connections. In Prussia and Belgium, specially prepared galleries have been constructed to carry on a series of investigations with electrical apparatus in gaseous mines, and at a testing station at Gelsenkirchen, experiments were carried on for over a period of three years. The first year they confined themselves to examining the behavior of motors and other appliances submitted by various makers. The second year endeavors were made to ascertain the most suitable devices for preventing firedamp ignition caused by sparking in electrical appliances, and to test the various forms proposed; and finally, the third year was devoted to testing motors constructed in accordance with the experience gained in the first two years. The result of these extended experiments and investigations not only at the above named place, but in every other European coal-producing country, have established beyond doubt the following facts: First, that electrical apparatus in gaseous mines not only may cause, but has caused the ignition of explosive gases; second, that electrical apparatus can be rendered safe in gaseous mines, without undue complications and an abnormal degree of danger, at a reasonable cost.

At the above mentioned testing station, the following apparatus to prevent sparking and firedamp ignition caused by sparking, was thoroughly tested; hermetical casings, wire gauze protectors, labyrinth casing, cooling-tube attachments to casings, casings with flange ventilators, annular-grid casings and oil-bath casings. Of the different casings tried, the following proved the most satisfactory and we will give a brief description of each: 1. Hermetical casing. 2. Casings in which ventilation was secured by means of wire gauze. 3. Annular-grid casings. 4. Oil-bath casings.

There should be no division of the space inside of the casings into large compartments and connected by small openings. The surfaces of any parts of the casings and covers or manholes should take the form of large, smooth flanges, without any packing of rubber, asbestos, or other weak material. For hermetical casing, all parts should be strong enough to stand a pressure of eight atmospheres. No holes for relieving pressure are permissible.

For casings with wire gauze ventilation, the wire gauze should be preferably of the normal dimensions used for safety lamps, viz., of 1/75-in. wire and about 940 meshes to the square inch. The best material is bronze or galvanized steel wire, and the gauze must be uniformly made, clean and free from defects. The total protecting surfaces—the sum of several layers of gauze—should be at least 38 sq.in. per 100 cu.in. of internal air space. At least two layers of gauze should be provided, these being set not less than 1/5 in., and not more than 4/5 in. apart. Large surfaces of gauze should be strengthened by ribs. The gauze should be mounted on a detachable cover, facilitating the supervision and changing of the sheets. No soldering is permissible on the gauze, but the latter must be fastened in rigid frames, or tightly screwed in place by means of such frames. Perforated sheet metal, or other similar material should be placed over the gauze to protect it from external injury.

ANNULAR-GRID CASINGS

For casings with annular-grid ventilation, sheet-metal rings of bronze, brass or tinned, or galvanized steel are used, with a cross-surface of 2 in., and a thickness of 1/50 in. mounted, with spacing pieces so as to be not more than 1/50 in. apart. Leakage must be prevented so that the only communication between the interior of the casings and the outer air is through the annular grids. The number of the rings should be as large as possible in order to minimize the internal pressure, and should be attached to a detachable cover to facilitate inspection and changing. Some form of external protection should be provided for these ventilators.

Sufficient oil should be poured into the oil-bath casing to properly cover all sparking parts; the necessary depth of oil in the casing should be ascertained by the maker of the apparatus, and its level marked on the casing. The shape of the casing should be such as to preclude any exposure of the sparking parts, owing to violent motion of the oil.

The foregoing points indicate the features that should be aimed at in making the different styles of casing, in order to enable the system adopted to afford sufficient protection against ignition of firedamp. Other measures are also recommended as contributing to greater safety, such as locking devices, which switch off the dangerous parts of the motor, etc., before the casing can be opened. The opening on the casings should also be sealed so that unauthorized persons cannot tamper with them. To prevent short-circuit sparking, no naked leads or terminals should be allowed outside the casing; the latter should be made very strong as a protection in the event of roof falls or the like. In actual workings, the casing must be kept in a proper state of efficiency, the wire gauze ventilators in particular needing supervision.

The gauze must be kept clean, and frequently examined for damage. With oil baths the depths of oil must be seen to at regular intervals, and suitable oil used. Insulation oil should be pure, unmixed mineral oil obtained by frictional distillation from petroleum, and not chemically treated, nor contain traces of either acid or alkali, and have a flash test not below 365 deg. F. Annular grids are free from any tendency to undergo injurious changes, but moisture and dust must be kept away as much as possible. The hermetical casing requires the smallest amount of attention.

With the use of these appliances, and the exercise of precaution, it seems that there is no longer any hindrance to utilizing the great advantages offered by the use of electricity in our mines, for the experiments, though tedious and ofttimes not free from dangers, have proved beyond doubt that electricity in gaseous mines can be used without any unreasonable degree of danger. One of the results of the British Royal Commission was the adoption of a code of rules, governing the installation and use of electricity in mines. These rules are now incorporated in the mining laws of Great Britain and are in force today.

I firmly believe that an electrical inspector for mines should be appointed. His duty would be similar to that of our other inspectors, only his whole time should be given to the inspection of electrical machinery. He should examine all electrical equipment of mines as to their probable dangers of ignition of gases, and see that electrical plants were installed in strict conformity to the rules that should be recommended and adopted. This electrical inspector should be a skilled electrician, and have a broad and extended experience with actual conditions that exist in the mines, and should report direct to the chief of the department of mines.

The testing stations in Belgium alone, through their recommendations, led to a reduction in the loss of life from 3.19 to 1.02, or 2.17 men per each 1000 men employed. The rate per 1000 men employed in the United States for an average of five years (1902-1906) was 3.39, or more than three times what it was in Belgium during the same period; nearly 2.7 times greater than it was in Great Britain, and 3.72 times greater than the death rate in France.

A Novel Electric Hoist

The following description deals with a hoist that contains many novel features. The machine was built by the Vulcan Iron Works of Wilkes-Barre, Penn., and installed for the Hallidie Machinery Company of Seattle, Washington, who are the engineers for the Carbon Hill Coal Company.

The hoist is of the self-contained type driven by two No. 83 Westinghouse railway type motors, operating at 550 volts direct current, each motor having a capacity of 110 h.p., half hour rating. The motors are secured to the bed plate by the nose-spring suspension, thereby eliminating the shock occasioned by starting heavy loads. The motors are both mounted on a heavy steel shaft. Between the motors is the main driving pinion, the whole being mounted upon three babbitt-lined pedestals. The motors are controlled by a type R-6 controller with a separate reverse handle, eight points forward and eight reverse.

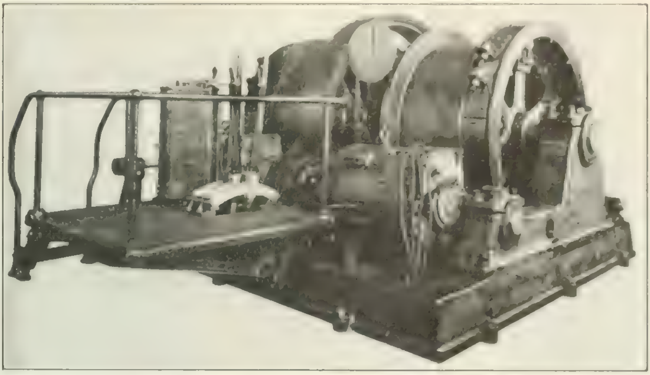
Each drum has a capacity for winding 1500 ft. of 1⅛-in. wire rope in three layers, the rope pull being about 10,000 lb. at 600 ft. per min. At the end of each drum is secured an asbestos lagged brake ring, this type of brake being able to withstand the heat of heavy braking, and outlasts a number of sets of wood lagging. One drum is keyed direct and the other runs loose on a heavy open-hearth steel shaft. Between the drums is mounted the main spur gear, which as well as the drum is split in halves, and planed and secured with turned steel bolts driven in reamed holes.

The drum is carried on three babbitt-lined pedestals, which are cast integral with the bearings which support the motor shaft, thereby securing a perfect alinement of gears and shafts [illegible]

The loose drum is driven by means of a jaw clutch, which is operated by a hand lever on the motorman's platform. On this platform are also mounted the independent hand brakes of the band type, each brake being able to hold the load on any point of a 30-deg. slope.

All gearing is made of open-hearth cast steel with machine-cut teeth, and all covered with metal guards, as shown in the illustration. The bed plate is of rectangular box section, being made up of five pieces secured with turned-steel bolts. The connections between pedestals and bed plate are also made by turned-steel bolts and dowel pins.

The hoist is sectionalized throughout, so that it may be taken through a tunnel 6 ft. square. The machine is to be located in a damp chamber, which is limited to 16 ft. wide and 18 ft. long, with a maximum head room of 8 ft. The hoist is to operate continuously, or 24 hours per day, stopping only long enough to reverse between hoists. The location of the cars in the slope is clearly shown by a positive-dial indicator placed in front of the drums.



A NEW TYPE OF ELECTRIC HOIST, SPECIALLY ADAPTED FOR MINE [illegible]

At Cerro Gordo, Cal., in a formation of slate overlying a compact, crystalline limestone, intersected by porphyries of various characters, veins of silver-lead ore occur in the limestone, or at the contact between the slate and limestone. The veins dip steeply. Their filling is quartzite, in which the ore is found in nests, pockets and irregularly shaped deposits. The ore was galena, anglesite and cerussite, large bunches of compact anglesite with a ker- [illegible] and was rich in both lead and silver. In 1874 the Union mine produced 12,171 tons of ore averaging 47 per cent. lead and 87 oz. silver per ton. With increasing depth, the galena ore predominated. The veins [illegible] ft. in places and pinching almost to nothing in other places. The Union mine was [illegible] worked very profitably.

Colliery Notes

In cases of accidental fires, collieries provided with rescue appliances are in a position to deal with the danger quickly and promptly and thus save thousands of dollars worth of property.

Changes made in the government mining regulations of Japan are considered extremely liberal, especially as regards foreigners. All mining machinery is to be admitted free of duty and the export duty on copper has been abandoned.

Locate a concrete mixer as near as possible to the place where the concrete is to be used; cement should be used as soon as possible after mixing, and should not receive too much handling or the mortar will separate from the coarser materials.

The velocity of the ventilating current at the working faces of a deep, dry coal mine should not exceed 300 ft. per min.; if the velocity of current is much over this limit, the mine air will become too dry and thus increase the danger of dust explosions.

While there is no doubt that blow-out shots are more likely to cause an explosion of coal dust under ordinary circumstances than a shot which does its work properly, it by no means follows that an ordinary shot is incapable of igniting coal dust.

A number of small valves give better results in a mine pump than does one large valve having the same area as the total area of the small valves; the smaller valves have a larger area of discharge and offer less obstruction to the pump discharge. They are also better adapted for work under great pressures.

The best method of cleaning hoisting ropes preparatory to an examination is to pass them through hot oil. Provide a V-shaped steel trough from 15 to 30 ft. long, with a steam space of 1¼ or 1½ in. around the bottom and sides. Fill this with oil, heat by means of the steam and pass the rope slowly through it.

In mine accidents where the patient is unconscious, lay him on his back or in the position where breathing is most easy; undo all tight clothing, around the neck, chest and waist. Give the victim the purest air available, raise his head somewhat if his face is flushed, but keep it low if the face is pale; give no stimulants by the mouth.

George Sullivan, an engineer at Baldwin mine, No. 4 of the Pittsburg Coal Company, though fatally scalded by the bursting of an 8-in. steam pipe, remained at the throttle of his engine until the cage containing 10 men was safely lowered 150 ft. to the bottom of the shaft. Many such acts of heroism have been accomplished by the men who produce our coal.

When putting down a drill hole, if it appears to be going crooked, it may sometimes be straightened by shortening the stroke or dulling the bit. If this is not effective, put a small piece of hardwood or iron in the hole, insert the drill and drill slowly; the drill will hit the hard substance and be deflected into line. In case this is not successful, the only remedy is to start a new hole.

In wet shafts, concrete makes a much better lining than wood, as the latter rots in a short time. Concrete for shaft linings should be made of portland cement and common boiler cinders; the strength and density of the mixture depends entirely upon the pressure to which it is to be subjected. Where the pressure is great, added strength may be gained by imbedding wire netting or twisted iron bars in the concrete lining.

Steam superheaters are important factors in ensuring economy. They are fixed near the fire and transfer heat from the gases, before they have passed over a large amount of heating surface, into steam, direct. They should be an integral part of a water-tube boiler, as they prevent wet steam when the boiler is worked under pressure, thus enabling an engine to do more work than it otherwise could accomplish.

Rock drills should be securely mounted. Where holes are drilled downward they should be kept partially filled with water; when holes are drilled upward, keep the drills dry for if wet drills are worked in dry holes, they will soon become dust-clogged. When cavities or seams in the rock are reached, work the bit with a short stroke until firm rock is again encountered. Holes which are to be drilled up should be started on a level if possible.

Creosoting of timber is done in the following manner: Place a quantity of wood in a large boiler, screw down the manhole door, extract all air from the boiler and pump creosote liquid into the boiler at a temperature of 120 deg. F. until a pressure of 100 lb. per sq.in. is reached. This liquid is obtained from coal tar and is made up of pitch, creosote, naptha and ammonia. The mixture enters into the heart of the wood and increases the life of the timber. Its one drawback is that it is inflammable.

The most efficient precautions to be taken to prevent gob fires in soft-coal mines have been found to be: (1), the exclusion of oxygen by closely built gate packs; (2) the keeping of a straight working face, and the avoidance of leaving ribs of coal or timber; (3) the clean stripping of all coal from the sides of a fault, which prevents grinding; (4) the removal of all débris; (5) the use of the panel system of mining which makes possible quick and complete isolation; (6) the use of the retreating system of mining, the gob being left behind; (7) the presence of a strong current of air in roadways and other places which show a tendency to heat.

Oil insulation for mine motors is regarded by many mining engineers as offering grave risks of fire; this fear is unfounded for no oil can possibly become a fuel unless heated to or above its flashing point, and this point is far above any temperative the switches, or even the transformers, should reach under ordinary conditions. No insulating oil should have a flash test of less than 365 deg. F., and the burning test should be at least 392 deg. F. It is unlikely that heat sufficient to raise the temperature of the oil to 360 deg. F. would ever occur. When heated to nearly the boiling point, oil should give off dense clouds of smoke; this is inconvenient and dangerous in a mine, and can be prevented by the use of a temperature indicator placed in the upper portion of the oil case.

Three compartment ventilating shafts of large area should be used for mines where the workings are extended. One compartment should be reserved for hoisting men in case of accident; the other two compartments should be used solely for ventilating purposes. Two moderate sized, reversible fans, independent of each other should be used with such a shaft and under such conditions. Each fan should ventilate independently its own portion of the mine. Place doors at the top and bottom of the shaft compartments so that if one fan has to suspend operations, by opening the doors a connection with the entire mine can be made and the work of ventilation can be carried on by the other fan. In cold weather this arrangement permits keeping wet shafts clear of ice, thus adding to the safety of the men and eliminating what is in many mines a difficult problem.

There should be a daily examination of all winding ropes by a competent person. A weekly examination is also advisable. The examiner should stand at the head of the shaft and the rope should be slowly raised or lowered through his hand, which should be protected by a thick glove or piece of waste; the rope should not move faster than 40 or 50 ft. per min. The observer should feel with his hand for broken wires and at the same time watch closely for other defects, such as excessive wear, loosening of the strands, straightening of the lay, kinking or severe corrosion. When anything abnormal is noticed, the rope should be stopped and the suspected portion thoroughly cleaned and examined. It is also advisable to watch the rope for a short time while it coils on the drum so that the position of possible punching or crushing can be located and examined. A monthly examination is also advisable as it allows the examiner to keep track of the normal wear of the rope and thus be in a position to calculate its remaining life and strength.

Mining and Transportation at Santa Eulalia

The Conditions Are Favorable, the Mines Are Dry, the Country Rock Requires Little Support and Labor Is Good and Not Expensive

BY CLAUDE T. RICE

The narrow-gage railroad, belonging to the Chihuahua Mining Company, reaches several of the mines both in the middle and western camps in the Santa Eulalia district, Chihuahua, Mexico. This road is 18 miles long and has a maximum curvature of 60 deg. and a maximum grade of 6 per cent. The difference of elevation between the mines and the lower terminal, Hacienda Robinson, is 1500 ft.; 22-ton locomotives are used and the ore is hauled in trains of 16 cars holding about four tons each.

The Chihuahua company hauls its own ores and that of the Potosi Mining Company to the *hacienda*, while it hauls ore from the Buena Tierra and the Gasolina mines to Santa Eulalia where the ore is loaded into ordinary narrow gage cars on the Mineral railroad and taken to the Mexican Central road at Chihuahua where it is loaded into standard-gage cars.

The Mina Vieja and several of the smaller properties pack their ore on muleback to Santa Eulalia. But the San Toy has obtained a cheap transportation by building an aërial tramway system from its properties to the bins on its standard gage branch, four miles long, which connects with the Mexican Central road at Alberto. This aërial tramway is composed of two parts with an angle station and bins between. The upper part between the Juarez and the Galdeana is a Leschen automatic-loading tramway, one mile long, while the lower tramway, four miles long, was made by the Trenton Iron Works. In the lower tramway there are three tension stations, while in the upper only one. On the loaded side the cable is 1⅞ in. diameter, while the cable on the unloaded size is 1 in. diameter. Wooden towers are used for the upper tramway, while steel towers are used for the lower tramway. The tramway cost $120,000 (gold) erected. The cost of transportation over the aërial tramway exclusive of depreciation of plant, but including repairs, is about 24c. per ton.

SAN TOY TRAMWAY, LOWER PART, SANTA EULALIA IN THE DISTANCE

WATER

The limestone is quite free from water so that the mines are not troubled with pumping; in fact, there is not a single mine pump in this district. The two deepest mines, the Santo Domingo and the Potosi, make only about 1000 gal. of water per day, and this is easily disposed of by bailing.

On account of the absence of water in the limestone (except in some large caves such as occasionally are cut in some of the mines), all water used in the district has to be pumped from Hacienda Robinson. This water is pumped by the Chihuahua Mining Company against a head of about 1500 ft. through a 4-in. pipe and delivered to the different mining companies. About 50,000 gal. per day are pumped.

HOISTS

The largest hoist in the district is that of the [illegible]. This is an Allis-Chalmers [illegible] having a conical drum, the large diameter of which is 13.5 ft. and the small diameter 8.5 ft. The Mina Vieja and the Velardeña mines are equipped with geared electric hoists [illegible] dynamo at the Gasolina mine. The smaller mines use Fairbanks-Morse gasolene hoists, there being more than 25 of these in the district. On account of [illegible] small amount of water required by gasolene engines, these are well adapted to the requirements of the small shafts in this district.

SHAFTS

The deepest shaft in the district is the Santo Domingo, which is 1850 ft. deep. The Potosi No. 1 and No. 2 are both 1700 ft. deep, and the Buena Tierra and the Gasolina shafts are 1400 ft. deep.

The Santo Domingo and Potosi No. 1 shafts have three compartments while most of the others have two compartments. The Gasolina, the San Antonio and the Mina Vieja (the old shaft) probably have the smallest two-compartment shafts in the world. These shafts are the same size, 3 ft. 4 in. by 5½ ft. in the clear, and were all sunk by the same man for working shafts. Skips are used in these shafts so that a considerable tonnage of ore can be hoisted. The Buena Tierra also uses skips which hold about 1½ tons.

The Potosi No. 1 and the Buena Tierra shafts are equipped with steel headframes; all the other shafts are equipped with wooden headframes. All the mines but the Santo Domingo use round rope; at that shaft flat ropes are used. Most of the mines use crossheads with the buckets, the ore from cars being dumped into pockets and loaded from the pockets into the buckets.

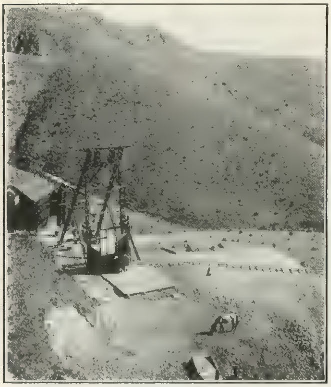
BREAKING GROUND

Most of the shaft sinking in the camp is done by hand and on contract, but some of the hand-sinking is by day's pay; in a few cases machines have been used. The shafts seldom require any support to hold the walls, and timbers are used only to hold the guides for the cages or the crossheads. Except where the rock is broken up slightly no lagging is used in the shafts.

The price paid per foot for sinking a 5x15-ft. shaft by hand is about $15, the contractors doing the timbering and furnishing all supplies except timbers. To sink the Juarez two-compartment shaft, 5x9 ft., by day's pay, it costs about $40 per meter, or $12.50 per ft. To sink the Potosi No. 2 two-compartment shaft, 5x10 ft. in size, which was sunk by machine, cost, including hoisting, timbering, timbers and all supplies, about $30 per foot.

The cost of driving a drift 6x6.5 ft., either by hand or with machines, is about $9 per ft., the contractor furnishing everything but the drills, and, if machines are used, the power. The cost of driving 1½-compartment raises is about the same.

The cost of mining I do not know; but much of the ore is mined on contract at 25c. per 14-cu.ft. car delivered at the shaft, the company furnishing drills, and if machines are used, power. This price applies only to the softest ores in which only a pick is required to loosen the ore. In other cases the ore is hard enough to require machines, and then, of course, the cost is many times as great.


EL CRISTO MINE

MEXICAN VILLAGE, SANTO DOMINGO MINE

WAGES

All men work 9-hr. shifts except the firemen and hoisting engineers, some of whom work 8 hours and some 12 hours. The wages in *pesos* are as follows: Men handling waste or packing ore up ladders (*peon* labor), $1.75-$2 per day; dry-waller (*trincherero*), $2-$2.25; carman (*carrero*), $2; miner (*barratero*), $2; trackman and timberman (*palero*), $3; machineman (*perforista*), $4; machineman's helper (*ayudante*), $2.50; topman (*contra*), $2.25-$2.50; hoisting engineer (*palanquero*), on first motion hoist, $6, on geared hoist, $4; fireman (*fogonero*), $2.25; skipman or man loading buckets at ore-pocket (*mantero*), $2-$2.25; nipper (*sora*), $1.50-$2; blacksmith (*herrero*), $2.50-$3.50; helper (*ayudante*), $2-$2.25; carpenter (*carpintero*), $3-$3.50 without tools, with tools, $4; shift boss (*poblador*), $3-$3.50; foreman (*maestro minero*), $5-$7; American foreman, $5 to $7 (gold).

Most of the companies have an American foreman, but the Chihuahua and Potosi mining companies, which are run by the same management have a Mexican general foreman all day-shift, under whom is a Mexican foreman and shift bosses on each shift. In fact at the mines under that management the superintendent, the assistant superintendent, the bookkeeper, the train master, the master mechanic and the timekeeper are the only Americans employed, all the others being Mexicans. Some of the companies employ American assayers; but others have Mexicans who are good at making fire-assays and for analyses for lead, zinc, iron and silica, but are not technical chemists.

The Mexicans are good miners in northern Mexico. Some of them are almost, if not quite, as good machinemen and timbermen as similar men in the United States. By selecting these it is possible to organize a good crew of men. The Mexican in Chihuahua is a good man with the single-jack, he has a fine nose for ore, is a good shoveler and when necessary will work in places where a white man would not, especially in places where the ore has to be packed out on the back. This is an advantage in prospecting work in irregular deposits like those at Santa Eulalia. The trouble with the Mexican is that he will "soldier," and it is always best to do as much work as possible on contract. As dry-wallers they are especially good, for the dry walls in the Santa Eulalia mines are some of the best, if not the best, that I have ever seen; but, of course, the flat pieces into which the limestone breaks are especially favorable for dry-walling.

The Mexican bosses are apt to stand in with their men if not watched; therefore, there must be one man about the mine who has had considerable practical experience so as to guard against this. If the superintendent is not a good miner himself then he should have a white foreman; otherwise a Mexican foreman is possibly cheaper.

It is well to provide houses for the miners so as to have them living near the mine, for thus a more permanent class of workmen is obtained than if they are encouraged to live in town. The Chihuahua and Potosi companies are the only large companies to provide dwellings for their Mexican miners, but they are repaid by the fact that many of the miners have worked for the company six or seven years.

In Chihuahua the mining companies are not troubled by many *fiestas;* in fact at Santa Eulalia only about seven holidays are lost in the year.

Prospecting

In prospecting in this district there is little to aid the work except that it is known that the orebodies occur usually along northerly and southerly fissures. The presence of limestone stained with iron and manganese oxides is a good indication of the vicinity of the ore, but even that is not a sure sign.

Owing to the fact that the mineralization does not extend into the surrounding limestone, it is quite possible to pass near an orebody without striking it. The vicinity of *antiguas* is a good place to prospect; in fact with the possible exception of the Potosi mine, discovered in 1902, all the deposits have been found near *antiguas*.

Mining Methods

Drilling is done either by hand or machine. Two Mexicans are used on a 2¼-in. air drill. The Potosi Mining Company is using two Waugh air-hammer drills and these are doing excellent work. This company has been using these two drills over three months, and not a cent has been required for repairs although the drills were run two shifts a day by Mexicans.

While machines are used in mining, much of the ore is so soft that a stick of powder would loosen tons of material. Consequently in many stopes most of the ore is mined by pick and shovel.

The old Mexicans followed the ore wherever it went, packing it out generally on their backs but sometimes using cars and even taking burros right into the stopes, the acme of Mexican mining. At first one may scorn the Mexican's methods of mining but a short time spent in the old stopes soon tempers the scorn with admiration. In view of the amount of ore that the Mexicans have mined from Santa Eulalia one cannot help respecting the way that they have followed these irregular deposits.

The American should not despise the Mexican method of packing ore out on his back when prospecting such irregular orebodies as those at Santa Eulalia. To mine them probably the best method consists in following the ore upward until the roof of the ore deposit is reached. Then the roof is picked and barred down or if necessary slabs are blasted down until a roof of solid limestone is obtained. Underhand stoping is then begun, the ore being blasted into the raises put up in the orebody. By this method large stopes over 300 ft. wide and 215 ft. high have been mined without timbers and without accident, for the limestone is very strong and does not air slack.

The ore is generally too weak for successful overhand stoping; that method was tried at the Santo Domingo and resulted in a large cave; at the Mina Vieja the method was abandoned on account of the high cost of timbering. The drawback of underhand stoping is the disposal of the waste; in case the orebody is not too vertical and especially if there are many *mantas* this can be piled in the stope. Otherwise a drift can be driven near the top of the orebody and the waste which occurs mainly on top of the ore can be trammed to a neighboring stope along the fissure and used for filling.

Disposal of the Ore

The Santa Eulalia ore is smelted crude, the only exception being that some of the heavy lead ore from the San Antonio mine is concentrated in jigs. The ore is sent to the smeltery at Torreon, belonging to the Compañia Metallurgica de Torreon, to El Paso, Aguas Calientes and to Monterey to the American Smelting and Refining Company. Several months ago the American Smelting and Refining Company completed a 500-ton smelter at Chihuahua, but as yet it has not been blown in. The coal and coke bins have been filled for some time, and now the company is shipping ore from its Santa Eulalia mines to this smeltery so that possibly before long the works may be running. At least it has served the purpose of keeping out, for the present, an independent smeltery. But it is hoped that some large independent smelting works will be built which will use the Santa Eulalia district as its source of lead ore. Such a project is feasible for much of the ore is mined by companies not over friendly to the American Smelting and Refining Company.

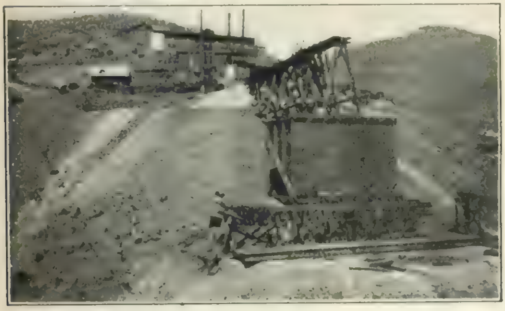
The output of the camp is at present about 900 tons of ore per day, but this is far below normal. The Potosi and Chihuahua Mining companies, the largest producers, are said to ship about 350 tons per day from the Galdeana and Juarez mines. The American Smelting and Refining Company is producing about 225 tons of ore per day, from the Gasolina, Mina Vieja, and San Antonio mines; while the Santa Eulalia Exploration Company is producing about 125 tons per day from the Buena Tierra mine.

The Santa Juliana, the San Antonio and Las Tres Mercedes also are producing small quantities of ore, as is also the Cristo mine.

Conclusions

Santa Eulalia promises to be of far more importance than it possesses at present; in fact it appears as though the camp has hardly begun to produce, although its records show a long and honorable past. At present there is too much of a tendency [illegible] ore as fast as it is developed.

[illegible] only at great depth is promising and the [illegible]



AUTOMATIC LOADING STATION, JUAREZ MINE

LOADING STATION, GALDEANA MINE

Potosi deposits should encourage the other companies in the district if they needed any encouragement. The depth of the limestone is unknown but nowhere in the vicinity is the base of the limestone shown so that it is safe to infer that this limestone extends considerably below the deepest workings. Already a thickness of about 2000 ft. of limestone has been shown in the district.

In conclusion I wish to thank B. L. Farrar, general superintendent of the Chihuahua and Potosi Mining companies and Donald Gillies, president of the San Toy Mining Company for the many kindnesses which they have shown me. I wish also to acknowledge the aid that I have received from the valuable compilation of papers gathered together by Jorge Griggs and entitled "Mines of Chihuahua".

In these articles no attempt has been made to describe the camp thoroughly but only to give the reader an idea of the ore occurrence. Therefore many promising properties have been no more than merely mentioned.

Testing Galvanized Iron

By Sherard Cowper-Coles*

It is a matter of considerable importance to engineers who use galvanized iron to know the amount of zinc that is applied per square foot of the surface. The thickness of zinc has hitherto been determined almost universally by the copper-sulphate test, known as Preece's test, which consists in placing the galvanized iron in a saturated solution of copper sulphate for one minute and continuing the immersions until it shows a red deposit of copper, which is a true indication that the zinc has been penetrated and the iron exposed. This test, when carefully carried out, is fairly reliable as regards hot-galvanized iron, but it is found quite useless for the more recent forms of galvanizing which are now being extensively used, i.e., electro-galvanizing and Sherardizing, for the following reasons:

On applying Preece's test to Sherardized and hot-galvanized articles coated with an equal thickness of zinc, the former require from three to four times the number of immersions which suffice to remove the zinc from the latter. When hot-galvanized articles are placed in a saturated solution of copper sulphate the copper is precipitated in a loose form, but when Sherardized, Cowperized or electro-zinced articles are similarly treated the copper adheres firmly to the zinc and no fresh surface is exposed, apparently, because the deposit of zinc applied by these processes has a fine matted surface.

The Ferric Sulphate Test

It would appear from these observations that the apparently great resistance to corrosion of Sherardized iron when subjected to Preece's test is due to the protection of the zinc by the deposited copper; so experiments were made with a solution of ferric sulphate, which dissolves zinc without forming a precipitate on the zinc coating. To test this, known areas of Sherardized and hot-galvanized plate were exposed to the action of ferric-sulphate solution for an equal period and the amount of ferrous salt formed by the reducing action of the zinc determined. The accompanying table shows the relative corrosion:

ZINC DISSOLVED IN FERRIC-SULPHATE SOLUTION.

No.	Sample.	Zinc per sq.ft., grams.	Zinc Dissolved, grams.
1.	Sherardized	26.908	0.080
2.	Sherardized	26.908	0.074
3.	Sherardized	22.93	0.057
4.	Hot-galvanized	22.12	0.058
5.	Sherardized	31.116	0.034

Sample No. 2 was moistened with water and allowed to dry; the oxide formed appears to protect the zinc and this protection is more marked if water is allowed to act for a longer period than was permissible in these experiments. It will be noticed that samples Nos. 1 and 2, which had a thicker coating than samples Nos. 3 and 4, dissolved to a greater extent than samples Nos. 3 and 4, which had practically the same weight of coating dissolved; sample No. 5 was Sherardized copper and, although the zinc coating was the heaviest yet the corrosion was in this case the least, probably due to the conversion of the greater portion of the zinc into brass. On testing this sample with copper-sulphate solution, as in the other cases, instead of a brown precipitate of copper a bright metallic deposit was obtained and no further action seemed to occur.

From the results of experiments, the copper-sulphate test has been found to be quite unsuitable for testing electro-zinced, Sherardized, or Cowperized surfaces; therefore, in future it will be necessary to substitute some other test, such as the ferric-sulphate test, or a modification of the copper-sulphate test.

---

*Metallurgical engineer, London, England.

Lake Creek, Wyoming, a New Mining District

By Wm. Benton*

Lake Creek, the new mining camp opened in Wyoming during the last year, is not in an unknown part of the State. It is traversed by a public road used by prospectors and freighters for the last 25 years. Very little prospecting would have disclosed large boulders of copper ore and many showings of visible gold especially on Joe Davis hill. In the northwest corner of the district is Lake mountain, rising several hundred feet above the surrounding country. This mountain is a core of basic rock; from this core to the southwest the rocks become more acidic, the region being intersected by numerous dikes and fissures. The most promising orebodies thus far discovered have been found at the intersection of these dikes and fissures. The ore carries gold in sulphides of iron and copper; the gold does not appear in the gangue.

The chief mineral belt is about two miles long, extending along Lake creek which drains the district. The principal mines in this part of the district are the Pollyton, Madem, Joe Davis, Joe Davis No. 3, Kansas, Kansas No. 2, Lake Creek, Lake Creek No. 2, Extension, and at the two ends, the Osceola and the Nugget.

The Madem claim is considered the best in camp. It has an adit 750 ft. long in which two distinct ore shoots have been discovered. The orebodies are several feet wide and 40 to 50 ft. long, yielding ore which after some sorting assays about $50 per ton. The breast is more than 200 ft. below the apex of the vein, and within 200 ft. it should cut a vein of gold ore opened at the surface by a shaft 12 ft. deep from which 60 sacks of ore were obtained averaging $30 per ton.

From the portal of the Madem tunnel 1000 ft. northwest is the Pollyton property on which a shaft now 25 ft. deep has been in ore all the way from the surface. The vein has been opened up for more than 100 ft. along the strike, and at all openings ore is found. This vein is opened several hundred feet farther west on the Osceola property, by a 50-ft. shaft showing the same class of ore and gangue material with somewhat more gold.

About one mile to the east of this zone is another zone, which promises large bodies of ore. The best known properties in this vicinity, are the Lake Creek claims, Nos. 2, 3, 4. Here a large replacement vein of quartz in porphyritic-diorite will produce good milling ore with perhaps some high-grade ore. In the southern part of this zone is situated the Kansas group. In a 50-ft. shaft and 40-ft. tunnel an ore shoot 7 ft. wide and more than 100 ft. long is shown. The copper is leached out of the ore thus far reached but sulphides of copper and iron, similar to the ores in other properties surrounding it are expected to be found lower down.

The Quartzite and Cora-Iva groups are situated in the southwest part of the district. Here large veins of quartz in schist will produce a good grade of milling ore, the surface showing being unusually extensive.

Along the west of this district flows Douglas creek, which has the richest placer mines in the State. A leasing company controls 2500 acres of the ground and is carrying on extensive dredging operations. The placer gravel is reported to average 30c. per cubic yard.

---

*Lake Creek, Idaho.

The Cost of Producing Copper in Arizona

The Low Cost Per Pound in the Four Chief Districts Is Due to Richness of Ore Rather Than to Favorable Conditions

BY JAMES RALPH FINLAY*

In 1907 Arizona became the leading producer of copper in the United States. Unlike Michigan and Montana, each of which has but a single district, Arizona contains the four important and distinct districts of Bisbee, Globe, Clifton and Jerome, all differing markedly in character and, therefore, in costs.

The external factors are uniform and unfavorable. The situation of the mines in an arid plateau poorly supplied with water, fuel, timber and population, with freight rates inevitably high, makes for high costs. Wages of white miners are $3.50 a shift of eight hours; Mexicans are paid $2.50 a shift. The summer heats are debilitating and the energy of the men is somewhat less than it would be farther north. This is true particularly in regard to metallurgical work.

SUMMARY OF OPERATIONS. ARIZONA COPPER COMPANY

	1904.		1905		1906	
Total ore (tons)	491,600		547,000		610,600	
Total copper (lb.)	28,732,800		30,080,000		29,756,000	
First-class ore (tons)	31,695		26,000		31,378	
Concentrating ore (tons)	460,000		521,000		578,517	
Copper per ton (lb.)	57.5		56.3		48.8	
Tons smelted	102,893		108,000		121,507	
Tons leached	80,100		90,000		80,000	
Copper from leaching (lb.)	2,824,000		2,470,000		2,126,000	
Copper per ton from leaching (lb.)	35.3		26.3		26.7	
		Per Ton.		Per Ton		Per Ton
Cost working mines (deadwork, ores purchased, leaching, etc.	285,056	$2.81	276,326	$2.46	373,560	$2.50
Smelting, refining and marketing	194,077	1.90	215,846	1.93	258,506	2.06
General	14,286	0.14	14,430	0.13	15,579	0.14
Interest and amortization	49,162	0.49	58,965	0.52	88,765	0.70
		$5.34		$5.04		$5.40
Cost per lb. at New York	9.3c		8.93c		11.07c	

The internal factors vary with each district. These will be described separately.

Clifton-Morenci District

The Clifton-Morenci district produces porphyry ore in which chalcocite is disseminated. In this respect the orebodies resemble the deposits of Bingham, Utah, and of Ely, Nev. The ores form large irregular bodies at depths of from 100 to 300 ft. below the surface. In this respect the ore is easy to mine. But there is a certain irregularity, not only in the orebodies as a whole, but also in their internal make-up. A certain amount of sorting may be done to advantage in the mines. The ore is fairly hard and firm and is taken out by square setting. Mexican miners with white bosses are employed.

Costs are not generally stated in detail, but the reports of the Shannon and Arizona copper companies make plain the following facts:

About 1 ft. of opening work is necessary to find and develop 15 tons of ore. The cost of this work is stated to be 21 to 33c. a ton (Shannon). Stoping costs are about $2 to $2.80 a ton. Details for one year are shown in an accompanying table.

The Arizona Copper Company gives its costs for mining, including deadwork, ores purchased, and leaching, as follows: 1904, $2.81; 1905, $2.46; 1906, $2.50. It seems fair to assume from this that the underground costs are substantially the same as the Shannon. The same may be said of the Detroit Copper Company.

Assuming that the cost of mining, including development, is $2.25 to $2.50 a ton, and that out of this cost about 50c. is due to timbering, it seems fair to say that the excess over Lake Superior costs is due to the external factors.

SHANNON COPPER COMPANY, MINING COSTS, 1904-5.

	Total Cost	Cost Per Ton
Assaying and sampling	$ 9,226.70	$0.048
Executive and office expense	10,519.33	0.055
Taxes, insurance and hospital	3,251.33	0.017
Incline	6,099.34	0.032
Extraction	176,124.71	0.932
Timbering and framing	94,769.75	0.501
Filling	10,749.47	0.066
Tramming	21,234.72	0.112
Tracklaying	9,193.13	0.048
Handling supplies	8,411.72	0.044
Miscellaneous	13,032.10	0.069
Total operating expense	$362,662.20	$1.92
Development	23,600.68	0.124
Exploration	17,600.68	0.093
Total mining cost	$403,872.65	$2.138

Ore received, 188,856 tons

The internal factors that govern the cost of treatment are the losses due to concentrating, the proportion of concentrates to the crude ore and the smelting qualities of the ore.

(1) The Shannon Copper Company reports for 1904 a saving of 75 per cent. on ore averaging 4.16 per cent.; in 1905, 73 per cent. on ore running 3.77 per cent., and in 1906, 69 per cent. on ore averaging 3.36 per cent. This saving is for both smelting and concentrating.

(2) The Shannon Copper Company smelted in 1905, [illegible] per cent. of its total output; in 1906, 44½ per cent.; in 1907, 56 per cent. The Arizona Copper Company smelted in 1904, 22 per cent. of its total output; in 1905, 20 per cent.; in 1906, 20 per cent.

The costs for concentrating, smelting, refining and marketing are not given in detail, but in the case of the Arizona Copper Company these costs lumped together were, in 1904, $1.90; in 1905, $1.93; in 1906, $2.06, the costs being based on the entire tonnage sent from the mine. If the cost of concentrating is 75c. a ton, including transportation from the mines, the cost for smelting, refining and marketing would appear to be about $6 per ton smelted. On this basis the cost to the Shannon company, on account of the larger proportion smelted, should be $1.80 higher than to the Arizona company. This seems to be approximately the case.

(3) Certain difficulties have been experienced in smelting on account of a deficiency of sulphur for matting purposes. This is particularly the case with the first-class ores. In the earlier days this difficulty [illegible] at present.

SUMMARY OF OPERATIONS, SHANNON COPPER COMPANY

	1903-4	1904-5	1905-6	1906-7
Smelting ore (tons)	66,005	53,440	69,342	
Mill ore (tons)	91,311	135,503	140,684	
Total	157,316	188,943	210,026	[illegible]
Per cent. copper smelted ore	5.28	4.70	4.37	
Per cent. copper mill	3.34	3.41	2.86	
Per cent. copper average	4.16	3.77	3.36	
Copper lb. saved per ton	62.34	55.03	46.41	47.6
Per cent. saving	75.0	73.0	69.0	
Feet devel. [illegible]		11,433	14,740	14,610
		Cost Per Ton.	Cost Per Ton	Cost Per Ton
Operating mines [illegible] and smelters		$6.04	[illegible]	[illegible]
Exploration [illegible]		0.21	[illegible]	0.34
Freight, refining, etc.		[illegible]	[illegible]	0.65
General expenses		[illegible]	0.28	0.30
		7.54	[illegible]	[illegible]
Outside development [illegible]		1.08	0.75	0.70
Total		[illegible]	[illegible]	[illegible]
Cost per lb. at New York		[illegible]	17.60	[illegible]

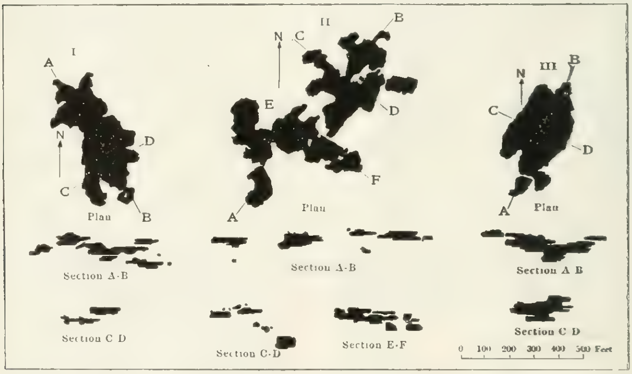
Stoping cost, per ton, [illegible]

Bisbee District

In the Bisbee, or Warren, district, the internal conditions are essentially different from those of Clifton. This fact is sufficiently reflected by the mining costs which are at Bisbee $6 a ton against $2.50 or less at Clifton. Dr. James Douglas describes the Copper Queen mine in a paper in Vol. XXIX, 1899, *Transactions* of the A. I. M. E. The ore yielded, "about 7 per cent. copper after a rough selection in the stopes where about one-half the total material broken is rejected. To supplement the deficiency in filling the stopes, barren ledge matter from exploratory drifts is used. Though the timbering of worked-out portions of the mine is thus enforced, so violent is the movement of the ground that the timbers are dislocated or crushed to chips. About 30 ft. board measure of timber (from Puget Sound) is buried in the mine to the ton of ore extracted." This is a terrific cost for timber, at an average price of $24 per M. delivered at the mine. We have on this basis 75c. a ton for timber alone. From 7 to 10 tons of ore are extracted per foot of opening work. A large part of the exploratory openings have to be closely timbered, and the cost for this work is high.

---

*Mining engineer, New York City



PLANS AND SECTIONS OF STOPES IN THE COPPER QUEEN MINE. FROM BULLETIN 21, U. S. GEOLOGICAL SURVEY, BY F. L. RANSOME

The reason for the conditions described will appear very plainly from a consideration of the structural relations of the orebodies. Dr. Douglas says: "With regard to ledge matter and the oxidized ore, my own opinion is that they are the product of replacement and local concentration; that where there is ledge matter today there was, originally, more or less compact iron pyrites carrying a small percentage of copper; and that during the process of alteration not only did the ferruginous solutions of alumina replace the pyrites, but the copper, by a process of segregation akin to crystallization, was concentrated and collected into areas of limited size, thus constituting the comparatively small bodies of oxidized ores which are disseminated irregularly through the very large masses of ledge matter. As the outline of the masses of ledge matter has never been traced, it is impossible to determine their actual size, but approximately there has been exposed above the 400-ft. level not less than 10,000,000 tons of ledge matter." Since at the time this was written not much over 1,000,000 tons of ore had been mined above the 400-ft. level, it is probable that Dr. Douglas believes that the ores now occupy approximately one-tenth of their original volume; the remaining nine-tenths being now "ledge matter," mainly ferruginous clay.

Nothing could be clearer than the above description as an explanation of the cost factors. All the altered residual masses must be explored; this means that the mine development, in addition to the shafts and drifts necessary to reach the ore, must search through 10 cu.ft. of difficult mining ground for every cubic foot to be extracted.

At various places in the mines large masses, like kernels, of original pyrites still exist, surrounded on all sides by the "ledge matter." Although workable ore is found along the periphery of these masses, the pyrite itself is not payable. No concentrating ore has yet been found in the district. All the ore raised from the mines must be smelted, consequently it must be selected as much as possible.

To sum up—there are in these mines three powerful factors that make for high costs: (1) A very large proportion of development work; (2) soft ground, requiring slow, cautious working and heavy timbering; (3) careful selection imposed by the necessity of smelting the whole product, thus imposing a high subsequent metallurgical cost. This is the most imperative factor of all, for it can be shown that in this case lower costs at the expense of lower-grade ores might result in frightful losses. To mine 4-per cent. ore for $3 a ton against 7-per cent. ore at $6 a ton, smelting costs remaining the same, would increase the cost of copper about 0.82c. a lb., or $16.40 a ton.

The Copper Queen mine, unfortunately, does not publish its reports, and the Calumet & Arizona, the only other important mine at Bisbee, does not give details. The figures from the Calumet & Arizona reports in an accompanying table throw some light on the subject.

OPERATIONS AND PRODUCTION, CALUMET & ARIZONA MINING COMPANY.

	Tons Ore	Tons Copper.	Price, Cents per Lb.	Feet Development Work.
1904....	205,807	15,819	12.562	27,485
1905....	202,952	15,886	14.982	25,577
1906....	236,565	18,735	17.96	14,818
	645,324	50,440		67,880

		Copper.	Silver, etc.
Value of product....	1904	$3,974,454	$195,926
	1905	4,744,328	178,843
	1906	6,725,663	238,464

Tons ore per foot of development work, 9.5.
Cost of copper in New York, 7.76c. per pound.

These figures include all construction work, of which there was considerable. The costs may be divided almost equally: Mining per ton of ore, $6.06; smelting, refining and marketing, $6.05; total, $12.11 per ton of wet ore.

Mining on the California Desert

SPECIAL CORRESPONDENCE

The desert mining sections in the southern portion of California are receiving considerable attention these days, and a great deal of development is taking place at many points. In the Coolgardie district, 20 miles north of Barstow, San Bernardino county, Henry Mountain, of New York, and others are shipping in dry washing and concentrating machinery for placer mining. Placer gold has been found there for many years, but it has been difficult to work the ground profitably. It is hoped that this new machinery will solve the problem. Rich gold strikes have recently been made near Wingate Pass in the Hidden Springs region of the same county, and a rush to the new field has set in. The ore is free gold, but little development has been done. The new field may be reached by wagon road from Panamint, or by way of either Daggett or Barstow. Twenty Nine Palms district in the same county is now attracting some attention. Virginia Dale district lies east, Piñon on the south and Morongo district on the west. A number of old arrastras have been found, which were doubtless used before California became a State of the Union. The principal claims are the Italie, the Gold Park Consolidated, the Mohawk-Nevada and the Barber. Some exceptionally high-grade ore is being taken from the first named mine, and the Gold Park property is also yielding well. A 10-stamp mill is about to be erected, and a pipe-line will bring water to the mines, which are in the foothills to the southwest of Twenty Nine Palms.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres and Treas. Robert McKean, Sec'y
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks, or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for June, 1908, was 41,000 copies

July 4................. 16,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials.
  Iron and Steel Production of the World 39
  The Loss of Property by Fire......... 39
  Valuing and Taxing Unmined Coal.... 40
  Lead and Spelter..................... 40
  What European Miners Want....... 40
Pig Iron Production in the United States in 1908........................... 40
•The Advantages of Flushing in Coal Mining............*Lucius W. Mayer* 1
•Rescue Work at Hempstead Colliery. *D. J. Pierce* 5
Coal in the Dominican Republic......... 5
•Coal Mining Methods in Randolph County, Mo...........*J. J. Rutledge* 6
New Rescue Apparatus for Mines....... 8
A California Power Plant............. 8
•Coal Dust as a Factor in Mine Explosions............*Henry M. Payne* 9
Why Sulphur Abounds Locally in Certain Coal Seams..........*J. R. Heckman* 14
•A Method of Working a Thick Coal Seam...............*Granville Poole* 15
Gold in the Dominican Republic..........15
•Coal Mining By the Retreating Room-and-Pillar System..*Harvey J. Nelms* 17
•Longwall Methods of Mining a Coal Seam.............*Lucius W. Mayer* 19
Nickel Ore in Nevada................. 23
•The Improved Macquisten Tube. *W. R. Ingalls* 23
•A New Machine for Use in Room-and-Pillar Work........................ 24
Mine Mules and Their Care *Robert Grimshaw* 25
•Recent Electric Locomotive for Mine Haulage 26
The Origin of Coal.........*H. M. Chance* 27
Crow's Nest Pass Coal Company........ 28
Is the Electric Current Safe in Coal Mines?..............*Rush N. Hosler* 29
•A Novel Electric Hoist............... 31
Colliery Notes....................... 32
•Mining and Transportation at Santa Eulalia............*Claude T. Rice* 33
Testing Galvanized or Zinced Iron *Sherard Cowper Coles* 36
Lake Creek, Wyoming, a New Mining District........................*Wm. Benton* 36
•The Cost of Producing Copper in Arizona. *James Ralph Finlay* 37
Mining on the California Desert........ 38
Correspondence:
  •Berry's Safety Crosshead for Sinking. *J. Berry* 41
  The Use of Steel Tamping Bars. *F. H. Gonsolus* 42
  Properties of Explosives. *F. H. Gonsolus* 42
  Prospects for Mining Engineers in Australia.......*Gerard W. Williams* 42
Annual Report of Production of Butte Mining Companies.................. 43
Chronology of Mining in June......... 43
American Smelting and Refining Company 43
Calumet & Hecla..................... 43
Personals, Obituaries, Societies and Technical Schools......................... 44
Special Correspondence.. 45
Mining News 47
•Illustrated.

Iron and Steel Production of the World

The pig-iron production of the world, which increased rapidly in 1905 and 1906, in 1907 showed a comparatively slight change from the previous year, the gain being only 2.7 per cent. The figures, as collected for *The Mineral Industry*, are given in the following table, reduced to metric tons for purposes of comparison:

PIG IRON PRODUCTION OF THE WORLD
Metric Tons.

	1906.	1907.	Changes.	
United States...	25,712,106	26,193,863	I.	481,757
Germany	12,478,067	13,045,960	I.	567,893
Great Britain....	10,210,178	10,082,638	D.	127,540
Three chief producers	48,400,351	49,322,461	I.	922,110
Canada...........	550,618	590,444	I.	39,826
Belgium..........	1,431,160	1,427,940	D.	3,220
France...........	3,319,032	3,588,949	I.	269,917
Other Europe....	4,723,700	5,125,220	I.	401,520
Other countries..	650,000	625,000	D.	25,000
Total.....	59,074,861	60,680,014	I.	1,605,153

As for several years past, the United States was far in advance in 1907, furnishing 43.2 per cent. of the pig iron of the world. Its production exceeded that of its two chief rivals, Germany and Great Britain, together by 3,065,265 tons. These three countries made together 81.3 per cent. of the total pig-iron production. Germany made the largest proportional gain, while Great Britain showed a small loss from the previous year. In other European countries there was a considerable gain, chiefly from France and Russia. Consumption of iron was, apparently, at a standstill, since such reports as are made indicate that unusually large stocks of unsold or unused iron were held by the producers at the close of the year, in almost all countries.

The production of the pig iron as reported in the table, required the movement of nearly 250,000,000 tons of material—ores, flux and fuel.

STEEL PRODUCTION OF THE WORLD.
Metric Tons.

	1906.	1907	Changes.	
United States....	23,772,506	23,733,391	D.	39,115
Germany	11,135,085	12,053,632	I.	918,547
Great Britain....	6,565,670	6,627,112	I.	61,442
Three chief producers....	41,473,261	42,414,135	I.	940,874
Canada	515,200	516,300	I.	1,100
Belgium	1,185,660	1,183,500	D.	2,160
France	2,371,377	2,677,805	I	306,428
Other Europe....	3,670,500	3,986,600	I	316,100
Other countries	420,000	405,000	I.	15,000
Total.	49,635,998	51,183,340	I	1,547,342

The steel production of the world showed a little larger proportionate gain than that of pig iron, the increase having been 3.1 per cent. This was due to the increasing proportion of pig which is converted into steel. The figures for this make of steel for two years are as shown in the accompanying table, the output of all countries being converted into metric tons, for purposes of comparison.

Here, as in pig iron, we find a great preponderance in the make of the three leading producers. The United States alone made 46.4 per cent. of all the steel; while the United States, Germany and Great Britain together furnished 82.9 per cent. of the total. Germany uses the highest proportion of pig in the making of steel, and Great Britain the least. The proportion of steel to pig-iron production, which was 92.4 in Germany, was 90.6 in the United States, and only 65.7 in Great Britain. Wrought iron is still an important part of British production; much more so than in any country except Belgium and Sweden.

Translated, these figures mean that the iron and steel industries in 1907 reached the top of the wave of prosperity, and that receding movement began. This change was more sudden and more sharply marked in the United States than elsewhere. The industries of Europe have felt it to a considerable degree, however, as a decline in their production has set in. Stocks are piling up, and there is a general hunt for foreign markets. It is now beyond doubt that both pig-iron and steel production will show a considerable drop in the current year, all over the world.

The Loss of Property by Fire

Attention has lately been directed in specific ways, largely through the instrumentality of President Roosevelt, to the alarming waste of the natural resources of the United States. In this connection it is well to consider more seriously the waste of property derived from our natural resources after the latter have been realized in marketable form. The waste in the utilization of fuel, food, and indeed in almost all commodities is something that almost passes belief. If these enormous wastes could be reduced only 20 per cent., or even only 10 per cent., the increase in the wealth of the nation would be so rapid that the whole world would marvel.

Among the great wastes is the unnecessary destruction of property by fire, to which the underwriters have been calling attention for years, without producing any great impression. Powell Evans has reverted to this important subject in an address delivered before the National Association of Manufacturers, at New York, May 20, 1908. He stated that the annual fire loss of the United States, on a 10 years' average, for the years up to the end of 1902 (prior to the great Baltimore and San Francisco fires) was $146,552,365; and up to 1908 was $198,181,188. In 1907 the fire loss was $215,671,250. Moreover, it is estimated that more than one-third of forest destruction arises from fire waste, largely preventable. The country now sees that too much timber is annually cut and used. Mr. Evans asks: "Why not lessen this by substantially banishing wood from building construction in our cities, the use of which constitutes a large part of the timber demands, and is at the same time a prime cause of conflagration? He points out that two admirable and practical causes can be effectively served by this one step of minimizing the use of wood in city building codes all over the United States, namely our timber supply will be preserved and our fire losses will be reduced.

Valuing and Taxing Unmined Coal

A case of some interest is on trial in the Lackawanna county court at Scranton, Penn., which involves the value of anthracite coal lands. It is the appeal of several coal companies from the assessments for taxation made on their lands by the county board. The valuations placed on the lands are very much greater than in previous years, and the companies claim that they are entirely too high. It appears that the county commissioners employed engineers to survey the companies' lands, ascertain the probable quantity of coal unmined, and place an approximate valuation upon the properties. So far as the approximate extent of coal lands and quantity of coal mined goes, the engineers seem to have been moderate; in fact their estimate of unmined coal is not seriously questioned in the appeal. The main point is in the valuation of the coal.

The engineers in their report, which was substantially adopted by the county board, placed the value of coal at $100 per foot-acre. That is, they put the value of coal in the ground at $100 per acre for each foot in thickness of the vein. Each foot-acre will contain approximately 1800 tons of coal, which would make the value of the gross quantity of coal in the ground about 5.5 per ton, with no allowance for waste or for unminable coal. This corresponds in some degree with the practice of those companies which make an allowance for amortization or depreciation in value of coal lands, the usual amount so allowed being 5c. per ton mined. On the other hand it does not correspond with recent sales of coal lands. The largest transactions reported in the anthracite coal country for several years were the purchases made by the Delaware & Hudson Company last year, which covered lands estimated to contain a little over 650,000,000 tons of coal. The total price paid for these lands was an average of 0.8c. per ton for the gross amount, or 1.23c. per ton of minable coal, an allowance of about one-third being made for waste or unminable coal. The actual selling price of these tracts, in a period of high prices, was only about one-sixth of the Lackawanna county assessors' figures.

This wide difference is only another instance of the lack of any just or uniform basis for the assessment of mining property. The Pennsylvania court is taking much testimony as to the real or supposed values; but that evidence so far does not seem to shed much light on the case. Nor is it probable that the decision of the court will be either final or specially enlightening.

Lead and Spelter

The past week has been one of the rare periods when lead and spelter have sold at the same price, spelter being commonly worth 0.5 to 1c. per lb. more than lead. At the nadir of the depression in 1907 spelter was at 3.97½c. and lead at 3.40c. Since then both metals have recovered substantially, but lead much more than spelter. This has been due particularly to improvement in business among the corroders, whose product is used for painting. Possibly the abundance of labor and lower wages have led many persons to take advantage of the opportunity to do necessary painting on and in buildings. At all events the stock of unsold lead, which was large at the beginning of the year, has dwindled to comfortable proportions.

On the other hand, spelter has all along been the weak sister among the metals, the demand from galvanizers and brassmakers having continued poor, while the trade in sheet zinc has been below the normal mark. A large stock of unsold metal has hung over the market ever since the first of the year, when it was about 33,000 tons. It has diminished somewhat, but still is large. In the trade it is believed to amount to 25,000 tons even now. Of course, no strength could be looked for in this market while this condition existed. Indeed, the wonder is that the price has been so well sustained. However, the stock has been in strong hands; but even they may become tired if they have to carry the load too long.

What European Miners Want!

The International Miners' Congress, at Paris, has declared itself in favor of the nationalization of mines; but only on condition that the labor unions of the miners be maintained. All workmen in the mines are to be Government employees, with the privilege of going on strike against the Government, and the power of dictating to the Government as to whom it shall and shall not employ and of excluding non-union men from Government employment.

Any comment upon these modest demands would be superfluous.

Pig Iron Production in the United States in 1908

The production of pig iron in the United States for the five months ended May 31 has been at the rate of a little less than 14,000,000 tons a year. Should there be no improvement during the later months, this would mean a decrease of about 11,500,000 tons from the make of 1907. There are already indications, however, that the reduction will hardly be as great as this; though there will be, undoubtedly, a heavy falling off in the total for this year, as compared with last. The decrease in steel-making pig has been slightly greater than in foundry and forge iron. As a result of this condition shipments of coke this year have fallen off more than one-half; while there has been little traffic in iron ore beyond the shifting of accumulated stocks.

H. Y. L. Brown, government geologist of South Australia, states that 21,000,000 tons of 66-per cent. iron ore and manganiferous iron are in sight in the deposits at Iron Knob, 40 miles from Port Augusta.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Berry's Safety Crosshead for Sinking

My attention has been called to E. M. Weston's article on, "Sinking Crossheads," in the JOURNAL of March 7, also to a paragraph in the editorial column of the same date, specially calling the attention of mining men to the simplicity of the device designed to prevent the crosshead as a guide to the bucket down to the last timbers from being left behind, and also to avoid "the danger of the bucket hanging to the Berry crosshead" when on the stops.

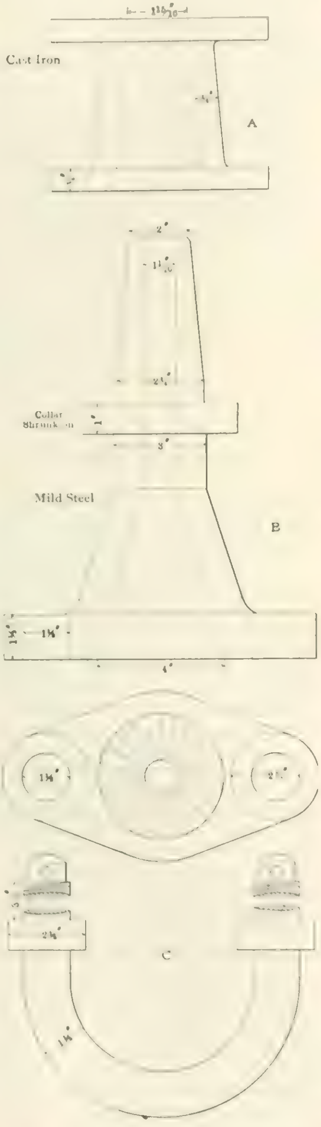
Since we are both trying to introduce the best devices for rapid work with increased safety, and Mr. Weston draws attention to what he considers a weak point in my device, I am taking this opportunity of drawing attention to what I consider the weak points in his arrangement.

With the arrangement illustrated the "adhesion" depends on how the taper fits and the force applied by the engine driver when picking up the crosshead. In practice a cone jammed into a taper socket (such as a twist drill in a drilling machine or a machine drill jumper with taper shank) has an unknown amount of adhesion. A bur or a piece of grit will upset the most nicely calculated taper grip; hence great care will be necessary to see that the tapers are not damaged. It would also be necessary to test periodically the adhesion hoisting the bucket up and lowering rapidly about 2000 ft. before bringing it to rest slowly, and then determining the amount of adhesion.

In practice all ropes tend to spin, and the crosshead rocks, upon the point of the cone as a pivot, the slack left between the guide and the runner. This rocking, vibration and twist would tend to release any adhesion left after the bucket had been dumped, unless the cone were jammed home so tight that the bucket would remain suspended, the engine driver running out slack rope at the stops.

Should an obstacle be met during a rapid descent, say, the head of a coach screw or bolt, the shock would release the bucket and leave the crosshead behind, as it is designed to do when arriving on the stops of the bottom timbers, without any indication of adhesion. To have to surmise after an accident that there had not been enough adhesion, would be a poor explanation.

The accident due to the bucket's being held up on my crosshead which occurred at one of the mines, was the result of [illegible] the gear fool-proof I coupled both sides with a connecting-rod as shown in the sketch, so that the levers operate both drawbars simultaneously even if only one side is provided with stops.



THE WESTON IMPROVED SHACKLE FOR HOISTING BUCKETS

ANOTHER DESIGN

The other design of my crosshead shown in the accompanying sketch has both hook levers connected to operate from one side. This device has fewer joints, pins, levers, etc., to get out of order, and the hooks can be given plenty of clearance when disengaged, so that it is impossible to hang up a bucket at the stops. Four of this design and two of the design referred to in Mr. Weston's article were in use at Simmer West and Jupiter shafts at a depth of nearly 4000 ft., or until sinking was finished in the vertical. These shafts hold the record for vertical shaft sinking at great depth. Simmer West in one month made 203 ft., and the Jupiter the highest average number of feet per month throughout a year. R. M. Catlin, at that time general manager of these mines and others of the Goldfield Deeps gave me a testimonial for the crossheads working in five shafts. The Transvaal government safety-catch commission took evidence on sinking with skips and cages versus buckets and two witnesses, R. M. Catlin and Leslie Simson, gave evidence in favor of buckets, when fitted with an approved crosshead similar to "Berry's." The findings of this commission contains valuable information on winding ropes and safety-catch tests and was published in book form last year.

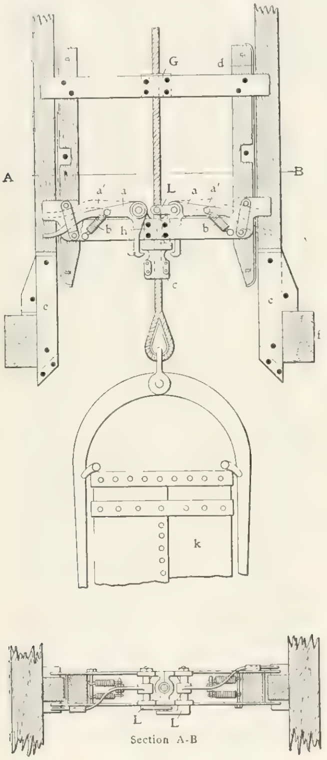
In view of these facts and the successful tests made with my crossheads by the government mining engineer and his assistants as far back as 1902, the crossheads still in use furnish sufficient proof that the device is most reliable under ordinary care.

The Brodigan improved shackle for hoisting buckets is an excellent fastening and admits of close connection to the crosshead to overcome the swinging of the bucket after entering the timbers. Sinkers as a rule, however, prefer to have some head room between the bucket and crosshead, which, although safe enough when working under a geared hoist is [illegible] hoist, since the engine driver may set up a series of jerks and shocks in the hauling [illegible] bucket striking the timbers and putting a severe strain on the bridle fastenings and crosshead.

I quite agree that a swivel should be use, no matter how short the connection to the crosshead, or whatever make of rope is used in sinking, and on no account should a ball-bearing swivel be used. An eye bolt could be substituted for the hook if a drop pin is used for changing buckets. In my crosshead two small projections are cast under the center brasses; these correspond with a slot in the rope clamp which prevents the bucket's acquiring a spin while traveling through the shaft.

J. Berry.

London, May 25, 1908.



a, lever engaged; *a'*, lever disengaged; *b*, spiral springs; *c*, rope clamp; *d*, sheathing; *e*, stops; *f*, bottom divider; *G*, top brasses; *h*, bottom brasses; *k*, sinking bucket; *L*, levers to connect the sides.

BERRY'S SAFETY CATCH FOR CROSSHEADS OF SINKING BUCKETS

According to Consul-General Henry B. Miller, Japan imported 488,434 tons of pig iron, steel and steel manufactures in 1906, of which the United States contributed 55,289 tons. These imports do not include large quantities imported for military and naval uses.

The Use of Steel Tamping Bars

I notice in the Journal of June 27, on page 1299, the following: "The use of steel tamping bars in coal mines should be prohibited, for if they strike a sulphur ball when a hole is being charged, they sometimes make a spark which lights the powder and causes an explosion. All tamping bars should be copper tipped." For the past four years the du Pont company has made a special study of accidental explosions in the United States. In addition to this we have records of accidents of the English government inspectors of explosives for a period of about 35 years. From these records we find a great many accidents have been caused in tamping holes when copper, brass and aluminum-tipped tamping rods have been used. We have come to the final conclusion that the only safe rod to tamp bore holes should be made of wood. Several of the largest coal companies in this country have also come to this conclusion, and prohibit the use of anything but wooden tamping rods in their mines.

F. H. Gonsolus,
Manager Technical Division,
E. I. du Pont de Nemours
Powder Company.

June 27, 1908.

Properties of Explosives

I notice in the Journal of June 6, 1908, on page 1144, the following quotation: "Dynamite containing less than 30 per cent. of nitroglycerin cannot be detonated."

I feel it my duty to call attention to the error of this statement. Dynamite has been successfully manufactured in grades as low as 12½ per cent. We sell today an enormous amount of dynamite containing less than 30 per cent. of nitroglycerin. One of our customers uses a carload every five days of a dynamite which carries only 15 per cent. of nitroglycerin. Also a great many of the coal mines use a dynamite carrying 20 per cent. The author who wrote this statement may possibly have been thinking of the old kieselguhr dynamite. In this the absorbant was the inert infusorial earth called kieselguhr. Dynamite manufactured with this absorbent was considered impossible to detonate when the percentage of nitroglycerin was below 40 per cent. The dynamites manufactured in this country today have a definite formula for each grade The absorbent can be considered a crude powder which adds to the strength of the explosive, and it is a great mistake to make a statement that dynamite carrying less than 30 per cent. nitroglycerin cannot be detonated.

In the Journal of June 13, 1908, on page 1201, appears the statement: "The various grades of dynamite are made by adding more or less nitroglycerin to the absorbent." While this is true in a general way, at the same time it is liable to lead people unfamiliar with the composition of explosives to have an erroneous opinion of their composition. The standards which are used to designate the strength of high explosives are the different grades of straight dynamite which contain the actual percentage of nitroglycerin given. The absorbent used with each grade of the different classes of dynamite is made up on a certain definite formula designed to balance the explosive reactions, give a maximum efficiency and make a minimum of deleterious fumes.

On page 1154 of the Journal of June 6, 1908, you make the following statement: "Contact with water lowers the efficiency of dynamite." The exception we take to this statement is that it is a little too broad. The gelatin dynamites are very nearly waterproof. In fact the higher grades will keep practically as well under water as they will in the air.

F. H. Gonsolus,
Manager Technical Division,
E. I. du Pont de Nemours
Powder Company.

June 13, 1908.

Prospects for Mining Engineers in Australia

I have received several letters from mining men in the United States asking as to chances in Australia. Readers of the Journal may be interested in the reply that I have made to these inquiries.

I do not think that Australia is a good field for young men from foreign countries, inasmuch as its several universities and mining schools are turning out a good many well-trained young men, who are taken on as "experience men" at the various mines. The local supply is in considerable excess of the demand. There are many mining men in the Commonwealth, who hail from the United States, especially in base-metal mining. When metals rule high in price there is a big demand for mining engineers and metallurgists, and an experienced man has a good chance, but at present conditions are bad and large numbers of good men are out of positions.

Gerard W. Williams.

Melbourne, Victoria, April 29, 1908.

According to a recent British consular report on the mineral resources of the Dominican Republic, platinum is found in Jarabacoa and Guanuma; quicksilver in Santiago, Banico, Azua, San Cristobal, and in the San Francisco hill near Santo Domingo City. Tin deposits are said to exist in Seybo and in the Higuei, province of Seybo.

Annual Report on Production of Butte Mining Companies

Special Correspondence

The annual reports of the mining companies, required by law to be filed with the county assessor, were made public last week, and show the earnings for 1907. In view of the fact that the price of copper has been low for some months, and also that the mines were shut down about three months during the period covered by the report, it is considered that the showing made by the different companies is very good. The North Butte and Red Metal companies, inasmuch as they sell their ores to the Washoe smelter on delivery, have not given any figures showing the cost of marketing. The Parrot company was the only one unable to show any net earnings. The accompanying table embodies the report of the various large producing companies.

REPORT OF BUTTE MINES FOR 1907.

	Anaconda	Boston & Montana.	Butte & Boston.	North Butte.	Washoe.	Red Metal.	Trenton.	Parrot.
Tons of ore extracted	976,685	824,120	193,830	284,003	[illegible]	234,960	[illegible]	57,964
Gross proceeds	$9,775,118 65	$7,511,479 99	$1,609,763 66	$3,224,763 01	$1,052,956 73	$1,980,249 34	$646,109 31	$457,479 86
Cost of mining	$3,905,222 28	$3,262,266 55	$639,379 71	$990,405 55	$487,268 56	$1,070,272 97	$303,987 68	$380,593 97
Freight on ore	$733,352 81	$101,455 75	$39,472 92	$55,305 36	$14,602 81	$53,628 53	[illegible]	$8,125 93
Cost of reduction	$2,957,965 15	$2,225,884 17	$444,020 91	$1,065,404 11	$221,881 11	$884,537 21	[illegible]	$156,416 42
Cost of marketing	$617,513.18	$788,998.27	$191,285 30		$83,028 19		[illegible]	[illegible]
Total cost	$8,214,053 42	$6,378,604 74	$1,314,158.84	$2,111,115 11	$806,860 67	$1,908,438 71	$574,939 97	[illegible]
Net earnings	$1,561,065 23	$1,132,875 25	$295,604 84	$1,113,647 99	$246,096 06	$71,810 63	[illegible]	

Chronology of Mining in June

June 1—The Amalgamated Copper Company reports to its stockholders a loss of $7,500,000 in net income for the year. One thousand coke ovens of the Stonega Coal and Coke Company resume operations after an idleness of several weeks.

June 2—United States Steel Corporation reduces the price of bar steel from $32 to $28 per ton.

June 3—A deputation from the Mexican Chamber of Mines calls upon Minister Molina and enters formal protest against the provision in the proposed new mining law restricting the ownership of Mexican mines by foreigners.

June 4—The price of bar iron is reduced $3 per ton.

June 5—Appraiser Starretts hands down a customs decision classing diamonds used in mining with precious stones.

June 9—Conference of steel manufacturers decides to cut prices of all steel-finished products excepts rails. A reduction in the price of ore is also agreed upon.

June 10—Mohawk Mining Company declares a dividend of $2.50 per share.

June 17—Plant of the Royal Mines at Argentine, Penn., is destroyed by dynamite explosion ascribed to labor troubles.

June 18—Bar iron sold on "open market" basis. Bar steel and merchant steel sold at lower prices.

June 19—The Colbran-Bostwick claim to $2,000,000 mining property is definitely settled, the decision involving liberal terms to former owners of the property. Two thousand miners in Colorado coal-fields quit work, affecting 30 mines.

June 20—Explosion in Elsworth No. 1 mine of the Pittsburg Coal Company, Monongahela City, Penn., kills several miners and injures others.

June 22—Eleven men killed in an explosion of firedamp in the Loire colliery at St. Etienne, France.

June 23—Fires ordered lighted in 1000 Rainey coke ovens in the Connellsville district.

American Smelting and Refining Company

As is well known, there have been many important changes in the administration of this company during the last six months. Apropos of these, Daniel Guggenheim is quoted as saying, upon his return from Europe:

"Before I left for Europe I set the ball rolling by reducing my own salary, and my brothers, who devote their entire time to the affairs of the company, also voluntarily reduced their salaries. Like all well-managed companies, we cleaned out our Augean stables last spring, and the cleaning process has now been completed. While our salary list alone is reduced by $750,000, I am informed that the efficiency of our labor has greatly improved, and this means another important saving in expenses."

The contract between the Guggenheim Exploration Company, and A. Chester Beatty expired June 1, and has not yet been renewed, but Mr. Guggenheim says that in all probability Mr. Beatty will remain in the Guggenheim employment and will be the manager of the Guggenheim Exploration Company.

Calumet & Hecla

In the trial of the case between A. S. Bigelow and the Calumet & Hecla, Alexander L. Agassiz, president of the latter company, recently testified that in his opinion the probable life of the conglomerate mine of the Calumet & Hecla is between 10 and 15 years. It is hoped that the company will develop a sufficient amount of copper in the properties recently purchased to replace the old mine. Mr. MacNaughton, general manager of the Calumet & Hecla, confirmed the estimate of President Agassiz as to the life of the conglomerate mine. He stated that in 1905 about 720 acres had been wholly worked out, leaving about 320 acres developed, 320 acres in which there is a fair prospect of finding copper, and 1960 acres known to be barren. The mineral land of the Calumet & Hecla consists of 2680 acres, of which 1960 are underlain by the Calumet & Hecla conglomerate, 2200 by the Osceola amygdaloid and 2500 by the Kearsarge lode.

Four shafts on the Calumet & Hecla conglomerate are to be abandoned during the coming year. Within two years Hecla No. 3 will be abandoned, and probably within three years Hecla No. 2 will be abandoned. In the 640 acres above referred to there still exists in the conglomerate formation between 20,000,000 and 25,000,000 tons of copper ore. The yield of the ore mined in 1906 was a very little over two per cent. The total value of the company's equipment is roughly between $15,000,000 and $16,000,000.

In the fiscal year ended April 30, 1906 the cost of mining and milling ore from the Osceola amygdaloid was as follows: Mining, 96.93c.; hoisting, 10.1c.; rock house, 13.36c.; transportation, 8.44c.; milling, 26.31c.; other costs, 1.8c.; total, $1.5694.

A recent British consular report states that the salt deposits in the mountains west of Neyba (Barahona), Dominican Republic, are supposed to be inexhaustible. The salt obtained is clear and transparent, and perfectly pure. There is at Caldera bay a natural salt-pond of considerable extent, where salt is also obtained from sea water by solar evaporation [illegible]

Personal

H. N. O. Spicer has returned to Denver, Colo., after a professional trip to Mexico, lasting three months.

S. F. Shaw has established an office as consulting engineer for mine and mill work at San Bernardino, California.

Hugh Sutherland has returned to Haileybury, Ont., from Rawhide, Nev., where he has been for several months.

P. G. Lidner, of New York, has gone to New Liskeard, Ont., in the Cobalt mining district, on professional business.

Frederick Kruse, of Central City, Colo., is examining mines in the Telluride, Colo., district in the interests of eastern investors.

Daniel Duryea, manager of the Empire Zinc Company in the Joplin district, has gone to Arkansas to examine some zinc mining claims.

C. Berthold Conlin has returned from an extended tour of Chihuahua, Mexico, in the interests of the Packard Mining and Milling Company.

Marshall D. Draper, of Denver, has been appointed superintendent of the Fifty Gold Mines Corporation at Black Hawk, Gilpin county, Colorado.

S. F. Stoughton has been appointed general manager of the Stoughton Mining and Milling Company at Breckenridge, Summit county, Colorado.

Harold Baxter and J. R. Hoyt have formed a partnership as consulting mining engineers, with offices in New York and Wendendale, Arizona.

Prof. H. B. Patton, of the Colorado School of Mines at Golden, Colo., has been examining mines near Black Hawk in Gilpin county, Colorado.

James P. Evans has been appointed superintendent of the Colorado Iron Works Company, Denver, Colo., to succeed J. H. Morcom, recently deceased.

Frederick Lyon, of Kennett, California, has been appointed assistant managing director for the United States Smelting, Refining and Mining Company.

Gerard W. Williams, who has been visiting the leading mining fields of Australia, is now engaged in some metallurgical research work at Melbourne, Victoria.

L. W. Trumbull, of Downieville, Cal., is in Montana making an examination of placer ground. He expects to make a visit to Denver before returning to California.

George G. Vivian, formerly of Georgetown, Colo., has been appointed superintendent of the smelter and milling plant of the Pittsburg & Montana Copper Company at Butte, Montana.

S. F. Bretherton, general manager of the Great Western Gold Company, Ingot, Cal., has returned to his office, San Francisco, after an extended trip of inspection of the company's mines and branch railroad in Shasta county.

Paul L. Wolfel, formerly chief engineer of the American Bridge Company, and lately consulting engineer for the American Bridge Company of New York, on July 1 became chief engineer of the McClintic-Marshall Construction Company, with headquarters in Pittsburg.

Captain William Allen has resigned his position as superintendent of the Newport iron mine near Ironwood, and has removed to Negaunee, Mich., Captain Allen has had charge of a number of mines in the Lake Superior region, beginning with the Humboldt, about 40 years ago.

Dr. George I. Adams, formerly in the United States Geological Survey and lately with the Corps of Engineers of Mines of Peru, has been appointed geologist in the Bureau of Mines of the Philippine Islands and sailed from San Francisco on the "Mongolia" June 30. His address will be Bureau of Mines, Manila, P. I.

Dr. E. M. Shepard, professor of mineralogy and geology and dean of Drury College, Springfield, Mo., has resigned from active service to accept the Carnegie pension for retired professors. Dr. Shepard has been a member of the Missouri Geological and Hydraulic surveys and has done much valuable work in the Ozark region.

Otto C. Burkhart has been appointed professor of mining in Virginia Polytechnic Institute at Blacksburg, Va. He will begin his work in July, and upon him will devolve the organization of the mining department. Mr. Burkhart is a graduate of Lehigh University, and besides much experience in mining and blast-furnace work, he has served on the staff of the ENGINEERING AND MINING JOURNAL, and as assistant professor at Lehigh University.

Obituary

William H. Lees, general manager of the Cuartas mine in the Ayutla district, near Guadalajara, Mexico, died at the mine June 19, of heart failure. He was a prominent member of the American colony of Guadalajara.

Henry Lomb, who died in Rochester, N. Y., June 13, aged 79 years, was one of the founders of the firm now known as the Bausch & Lomb Optical Company, and was one of the oldest and best known makers of surveying and optical instruments in this country.

George Riley, of Idaho Springs, Colo., died suddenly in Denver, June 23. He was born in Dover, N. J., in 1855, and went to Colorado in 1879, where he began mining in the Clear Creek district. He had been manager of the Franklin mine for several years, and was interested in several other mines. He was twice elected mayor of the city of Idaho Springs.

Samuel L. Wharton, who died in Spokane, Wash., June 25, aged 61 years, was born in Charleston, S. C., and had resided in Georgia and Texas, but for 18 years past had made his headquarters in Spokane. He was interested in several mines in Washington and Idaho; was vice-president and a large stockholder in the Reco Mining Company at Sandon, in the Slocan district in British Columbia; and owned several gold mines in the Dahlonega district in Georgia.

Societies and Technical Schools

Iron and Steel Institute, Great Britain—The autumn meeting, it is announced, will be held at Middlesbrough, England, Sept. 28-Oct. 1. A large number of papers will be presented.

Missouri School of Mines—The 1908 catalog of this school at Rolla, Mo., shows a total of 203 students. The school is well equipped with chemical and physical laboratories, and offers complete courses in mining, engineering and geology and in metallurgy.

Mine Inspectors' Institute of America—This association has been organized, at a meeting of State mine inspectors held at Indianapolis recently. The officers chosen were George Harrison, of Ohio, president; Thomas Moses, of Illinois, vice-president; Thomas Hudson, of Illinois, treasurer; James W. Paul, of West Virginia, secretary. The purpose of the organization is to hold meetings of the mine inspectors of the country to discuss means for the prevention of mine accidents.

Columbia University—The following courses counting toward the degrees of the schools of mines, engineering and chemistry, open without examination to all students who are qualified, are offered in the summer session of Columbia University, New York, July 7 to Aug. 14:

Civil Engineering—Hydraulics, five hours lectures per week; structures—reinforced concrete, five hours lectures per week.

Electrical Engineering—Electric train movement, six hours lectures per week.

Mechanical Engineering—Gas engines, six hours lectures, six hours laboratory per week.

Metallurgical Engineering—Metallography of iron, steel and industrial alloys, five hours lectures, five hours laboratory per week, Prof. William Campbell.

Also chemistry, mathematics, mechanics, mineralogy, physics, and shop work. All these courses will be of special interest to instructors in technical schools, to graduate students and to practicing engineers.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, Toronto and London

REVIEWS OF IMPORTANT EVENTS

Goldfield, Nevada

June 23—The Las Vegas & Tonopah railroad has announced a reduction in freight rates on ore beginning August 1, which will amount to practically $3.50 per ton on all Goldfield ores. This is a very great advantage to the small mines and leasers and will undoubtedly stimulate shipments which have been held back by high freight and treatment charges. A few more railroads and a few more mills and Goldfield will shake off the "highbinders" who have been making conditions such that anything under $50 was low-grade ore.

The Secretary of the Mine Operators' Association estimates that there are at least 1800 miners now employed in the camp. The monthly payroll amounts to $200,000 which is equivalent to a week's output from the mines. There are 18 shipping mines and leases in the camp at present.

Salt Lake City

June 27—Copper at 7.7c. per lb. is what the cost sheet of the Utah Copper Company shows for May. Although this information has not been confirmed by General Manager D. C. Jackling, the figures are known to be absolutely correct. During the month stated the mine produced 4,130,520 lb. of copper, as against 3,323,000 lb. in April. From the mine was despatched daily an average of 120 carloads, each containing 50 tons of ore, to the concentrating mills at Garfield and Copperton. Nine 500-ton sections of the latter were in continuous operation; the tenth is now in commission and the eleventh will be running early in July. So the company is rapidly approaching the basis for a 60,000,000-lb. annual copper production, provided, of course, that the present grade of ore is maintained at the mill. The Utah Copper Company is now operating on its own account in the Bingham camp at least 10 miles of standard-gage railroad and has additional trackage under construction as a preliminary to the opening of new levels for the steam shovels higher up on the mountain. The removal of overburden from the ore-deposits and its dumping about two miles away, will be an important item in next year's operating costs.

The Utah mine at Fish Springs has disbursed the usual monthly dividend at $3000. The May Day mine in Tintic is also on a dividend basis again, the May distribution was $8000.

Actual development of the Juab oil district in Juab county has been begun by the Juab Oil Company, in which officials of the Salt Lake route are interested. A drill rig capable of going to 2000 ft. depth has been installed.

Two of the Majestic Mines Company's mines have been placed in operation again; they being the Harrington & Hickory and the O. K. mines, the former being a lead-silver and the latter a copper producer. Both mines are located in Beaver county.

The hearing on the application of the Silver King Consolidated for an order of court permitting its engineers to enter certain workings of the Silver King Coalition mine, alleged to have entered disputed territory has been concluded. The case has been taken under advisement by Judge Marshall, of the Federal court. The Consolidated company has charged the defendant with having wrongfully extracted ore.

Butte

June 25—The Great Northern railway will probably be opened for traffic between Butte and Great Falls the latter part of this week. The Boston & Montana smelter, however, will not be ready to receive ores for another month. Mining operations in and around the city of Butte are still somewhat curtailed as a result of the shutdown of the Boston & Montana smelter and the difficulty experienced with gases in the Anaconda and St. Lawrence mines. These mines have been closed down for the past few days. The Anaconda company recently completed a new plant for the drying of the precipitates which are made at its plant in Meaderville. The precipitates have heretofore been sacked while wet and have failed to dry out satisfactorily before reaching the blast furnaces, and it is to obviate this difficulty that the plant was constructed.

Denver

June 30—As an echo of the recent conference at Washington of the governors of the various States, Governor Buchtel, of Colorado, made an address on June 24 before the Denver Real Estate Exchange, advocating the appointment of a forestry commission, with ample powers to preserve the timber resources of the State and the passing of such laws as will bring about proper working of the coal mines in Colorado.

Representatives of the various northern Colorado coal miners' unions have held a meeting, and formulated a new scale of wages, which will be submitted to the unions, and if accepted by them, will then be presented to the operators. It is believed by the miners that the new scale will be agreed to by the mine-owners. About 2500 miners are idle, though no strike has been formally called, and so far there has been no violence committed, nor bitter feelings manifested.

Regular passenger service on the new Denver-Boulder electric line was inaugurated June 26, on a temporary schedule of six trains each way per day, or a train every two hours. It is expected to double this service shortly, putting on 12 trains per day, and giving hourly cars between the places named.

The Wisconsin, formerly one of the heaviest producers of the Clear Creek district, is now being operated by lessees, and has re-entered the list of shippers.

A 4-ft. vein, yielding high assays in gold and silver, is reported to have been struck in driving the Saratoga lateral at a point 2300 ft. east of the Newhouse tunnel.

It is reported that the United States Geological Survey is to make an examination of the Breckenridge district, the work to begin in August.

On June 24, more than the average amount of ore was shipped by the mines of Cripple Creek, over 30 properties not on the various railroad lines being on the list of shippers, in addition to those mines loading directly into the cars. A large [illegible]

Upon inquiry of a broker in Colorado Springs we find that the [illegible] Gold Mining Company, and the Manhattan Consolidated Gold Mining Company, are both probably defunct, and there is, of course, [illegible] that "neither company is worth postage writing about it." The Secretary of State has no report from either company, as is required by law, and it is, therefore, probable that they are both dead. The properties of these companies are outside the producing area of the Cripple Creek district.

The mines of the Red Mountain district are busy getting to work, as the railroad which connects them with Silverton is now open and trains running, and great activity prevails. This may also be said of the whole San Juan region, where most of the big mines are at great elevations, and where the snow has now sufficiently disappeared to permit active work.

At present, the most important new mine in the Red Mountain district is the San Antonio, in which the miners have opened a body of copper ore 30 ft. long by 25 ft. in width, with every indication of being persistent in depth. This ore is chiefly enargite, and is similar in character to the ores of the Congress, Hudson and National Belle, which were heavy producers from about 1886 to 1893, when the drop in silver shut most of these silver-copper mines down. The ores were treated at the Silverton pyritic smelter, and had associated with them nearly enough pyrite to make them suitable for that process. The average yield in copper of the San Antonio ore is high, and this was the case also in the other mines mentioned.

Joplin, Mo.

June 29—Several more mines in the Joplin district have been closed down this week as has been the case every week this month. Mines that produce little or no lead ore cannot meet the expense of the added expenditure for drainage necessary to hold the rising water in check from the proceeds of their zinc ore at present prices, and the pumps are being drawn after a losing fight to keep at the business. With the drainage proposition as 15 to 1 compared to this time a year ago, the expense of drainage has become an important item, so many mines having to run pumps now that did not a year ago, and all of them having the above ratio of increase in pumping costs to contend with.

Indianapolis

June 29—In affirming a judgment for $1000 recovered by complainant against the Chandler Coal Company, the Indiana Supreme Court recently held that the coal mine act of 1905 is constitutional and valid. The particular features of the statute attacked by the defendant company, as making it unconstitutional, were that which excuses from its operation mines employing less than 10 men, and that which makes a mineowner who fails to light a shaft absolutely liable for the injuries of any miner who is injured by falling down the shaft in the dark. Complainant was trying to enter the elevator cage half-way down a mine shaft, where there was no light, when he missed the cage and fell to the bottom of the shaft.

The Indiana statute requires two lamps at each shaft, "except when electric lights are used," and it was urged that this was an unfair discrimination against mines lighted by other means than by electricity. But the court says that this language merely means that two lamps are to be used, except when the shaft is otherwise sufficiently lighted by electricity, so as to be safe without lamps.

The court also declares there is no unjust discrimination in the provision that the act shall only apply when 10 men or more are employed in a mine, because this makes it apply to every mine where a large force is worked, and takes away every mine out of its operation when the force is cut down.

This decision settles a point of interest to the miners employed in small mines. An effort will be made to have the next Legislature amend the statute so as to make it apply to all mines, on the ground that all miners in the State are entitled to equal protection whether working in a small or large mine.

Toronto

June 27—The work of the Canadian Geological Survey has been considerably delayed this season on account of lack of supplies. Appropriations were made last week which have enabled the Survey to put additional parties in the field. W. McInnes has gone to South Indian lake and the Churchill river to explore a tract of country likely to be opened up shortly by the Hudson Bay railway. He will endeavor also to examine reported coal and copper discoveries north of Prince Albert, Saskatchewan. W. H. Collins has left for the Montreal river to study the economic geology of the region near the head waters. M. E. Wilson is working in the district north of Lake Temiskaming in Quebec Province. W. A. Johnson is continuing topographical and geological work in Simcoe county, Ont. J. A. Dresser has gone to conduct a geological survey along the line of the Grand Trunk Pacific railway between the city of Quebec and the New Brunswick boundary. G. A. Young is making surveys covering the iron range near Bathurst, N. B. A party in charge of Dr. R. W. Ells is mapping the oil shales in Albert county, N. B. Dr. Ells himself is at present in Scotland investigating the oil shale industry. E. R. Faribault has started for Nova Scotia to continue the work of mapping the gold-bearing rocks, and Hugh Fletcher is working in Cumberland county, Nova Scotia.

London

June 13—The big amalgamation scheme to pool the Farrar interests in the East Rand has been carried, and the names of several familiar producers, such as Angelo, Dreifontein, Cason and Comet, will now disappear. As to the fairness of the scheme there has been much discussion. Many of the shareholders in the producing mines would, no doubt, have preferred to remain as they were. Their mines were earning good dividends and they had no wish to share them with those who held deep-level ground of doubtful value, however cheaply such ground might be sold. The owners of the deep-level claims are now released from an embarrassing position. The work done on their mines has been of a disappointing character, and sufficient funds to bring them to the producing stage were not available. The advantages claimed for the scheme were three: increase in life, increased facilities for maintaining a regular grade of ore, and reduction of working costs and administration. Two of these advantages could have been obtained equally well by amalgamating the outcrop mines, and if the scheme had stopped there, probably little opposition would have been raised. The increase of life depends on whether the deep ground is payable or not, and the sellers of the deep ground have not in this respect a strong case, the developments as mentioned above having so far proved disappointing.

Other objectors took another line in opposing the scheme, which "Pioneer" well summarized in the *Economist* of May 16. The objections are: (1) That in some amalgamations the buyers and sellers are the same persons. (2) That very few directors are independent. (3) That shareholders in Europe have not proper representation at company meetings held in Johannesburg. (4) That in every amalgamation impartial experts should be employed to hold the scales with an even hand, and that the report of these experts should be submitted to the shareholders, so that they may judge for themselves whether to vote for amalgamation or against it.

The result of the voting at the meetings of the companies interested goes to show that the promoters and directors control the situation, and that the average independent shareholder does not take the trouble to record a vote. Out of the 1,000,000 East Rand Proprietary Company's shares only 285,336 shares voted, of which 1032 were in opposition. Nearly three-quarters, therefore, of the shareholders failed to vote. In the subsidiary producing companies the East Rand Proprietary held such a preponderating interest that no combination of shareholders could have thrown out the scheme.

It is evident that shareholders are at the mercy of those who control the companies, and it seems a pity that there is no independent shareholders' association to examine and report on schemes of this nature. It is not a healthy condition of affairs that such large interests should be bought and sold when only about a quarter of the shareholders—as appears to have been the case in the East Rand Proprietary Company—record their votes. Directors who are personally interested in two companies which it proposed to amalgamate are placed in an unpleasant position, and ought to welcome such an association as relieving them to some extent of any suspicion of personal bias. Hostility to such an association could only come from those whose schemes would not bear investigation.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Bibb County

H. F. DeBardaleben has made all his arrangements to begin work on a new slope on his property in the Upper Cahaba coalfield. He is one of the promoters of the Alabama Fuel and Coal Company.

Jefferson County

All the coal mines in this county are being put back to work again as fast as they can be put in condition to operate.

Walker County

Several of the large mines in this county have arranged to resume operations in July. The demand for coal is increasing steadily.

Washington County

Mobile Portland Cement Company—This company has been incorporated to build and operate a large portland-cement plant; also incidentally to operate coal mines. The cement plant will be erected at St. Stephens, where shipments can be made by water. The capital stock authorized is $6,000,000 common and $3,000,000 preferred. The incorporators are P. J. Lyons, E. L. Russell, Mobile, Ala.; C. H. Treat, Washington; W. W. Finley, New York.

Arizona

Cochise County

Calumet & Arizona—The combined ore production from the mines is averaging about 1500 tons daily, of which 875 tons are from the Calumet & Arizona mines and 625 tons from the Superior & Pittsburg mines. The copper production at the smelter in Douglas will be well above 4,000,000 lb. for the month of June.

Superior & Pittsburg—The Hoatson is keeping up its shipments of 250 tons of ore daily. On the 1300-ft. level a crosscut has passed through 500 ft. of barren lime, but recently stringers of ore have come in, and the ground looks very promising. No. 1 raise which is coming up from the 1300 and is 125 ft. from the Queen side line, struck ore at the hight of 60 ft., and has already cut 20 ft. of 6 per cent. oxide ore. This proves that the large orebody on the 1200 extends 40 ft. below that level. The shaft, which is again being sunk, is 1470 ft. deep, going down at the rate of 1 to $1\frac{1}{2}$ ft. per day.

Shattuck-Arizona—There has been a recent strike of good ore on the 600-ft. level in this company's mine. The new ore, which has been drifted on about 35 ft. up to date, is carbonate and oxide, carrying about 7 per cent. copper, and is high in iron, making it a very good smelting ore.

Dean-Arizona—Diamond drilling is still in progress from the 1100-ft. level. Nothing is given out in regard to the success of this drilling, but it is believed that no ore of importance has been discovered.

Wolverine & Arizona—Near the center of the Warren claim in this company's mine a recent discovery of a body of lead-silver ore has created considerable interest in the Bisbee district. The ore itself is not of great importance, but taken with the favorable-looking ground around the new orebody, the outlook for future copper discoveries is considered very good.

Warren Realty and Development—The Warren shaft is down 650 ft. One shift of 10 men is at work, six men in the shaft and four on the surface.

Anderson-Apache Company—The company's mine is about six miles from Hachita, Grant county, New Mexico. Recently the announcement has been made that Geo. H. Neale, the mayor of Bisbee, is to become the president of the company. The purchase price of the property is $100,000, of which $20,000 has been paid. The outstanding stock is held almost entirely by Bisbee and Douglas men, and an additional 2000 shares of stock are to be put on the market in these two cities at $2.50 per share. The par value is $5 per share.

California

Amador County

Kennedy Mining and Milling Company—The tramway for hauling supplies from Martell station to this mine at Jackson has been put in operation.

Calaveras County

Cramer—G. Nuner has a force of men opening this mine at Stockton Hill and has cut gravel supposed to be the lost Cramer channel of Star & Madison workings.

South Carolina—This mine, J. W. Bernard, superintendent, is having a 100-ton mill test of its ore made. The mine is next to the Melones, and it is expected that a 10-stamp mill will be put up.

El Dorado County

Stony Bar—New machinery has just been installed in this mine four miles from Placerville, and [illegible] taken out.

[illegible]—This mine in [illegible] cañon, Greenwood district, is being operated with a full crew of men.

Inyo County

[illegible]—From this place in the southern and eastern end of the county freight teams are hauling supplies and men for the development of the newly discovered lead and silver prospects owned by W. W. Watterson and others, of Reno, Nevada. Contracts have been let to haul out 2000 tons of high-grade ore by teams to Bonnie Clair station.

Nevada County

Grey Eagle—This mine, in Washington district, has been bonded to Chas. A. Marriner and others, who will immediately begin work with 20 men. There is a mill and other necessary machinery on the property.

Iron Clad Mining Company—This mine at Rough & Ready, owned by Plymouth, Ohio, men, is soon to be reopened, and machinery will be contracted for within a month. H. M. Black is superintendent.

[illegible]—This mine at Nevada City, owned by Rosenfeld's Sons, of San Francisco, is shortly to be started up under lease to local men. The water is to be removed and the shaft retimbered.

Plumas County

Del Monte—J. D. Murray, of Bovard, Nev., has taken an option on this group, owned by John Rickard, and since setting men at work, has uncovered a favorable body of ore.

San Bernardino County

Dry Lake—The hoist at this mine, near Victorville, is now in operation and a small stamp mill will be installed at once. A. A. Preciado is manager.

[illegible] G. [illegible] Sloan has shipped two carloads of $50 ore from his lease on the Jumbo at Hart.

San Diego County

[illegible]—The mill at this company has commenced [illegible] from the Paling Brothers' lease.

Shasta County

[illegible] P. O.) the Victor company has installed a new hoist. The Midas is now down to the [illegible] level. Work is [illegible] on the Connor group of mines.

TRINITY COUNTY

Mary Blaine—At this property, New River, W. E. Sherwood, superintendent, work has been resumed.

Oriole—Eastern men have bonded this mine from Collins Brothers & Paulson, and will soon commence development work.

TUOLUMNE COUNTY

Big Four—At this mine, near Tuolumne, owned by Deming, Wilds & Savor, a strike of importance has been made. The ore is being sacked for shipment to the Selby smelter.

Rawhide—This famous old mine, owned by W. A. Neville, which has been idle for some time, is about to be started up again.

Colorado

GILPIN COUNTY

Black Hills & Denver Gold Mining Company—Ohio people are chiefly interested, and recently they had a meeting and decided to resume operations on their Boulder Park property. L. A. White, Tolland, Colo., is manager.

Dirigo Mining and Milling Company—Southern capitalists are interested in the purchase of the Douglas mill in Wide Awake district, and they are arranging for starting up the Dirigo mine.

Esculapian Gold Mining Company—At a depth of 150 ft. in the Star of the West group an 8-in. streak of gold, silver and copper ore has been opened up. Chicago people are interested, with Stephen Harper as superintendent.

Gilpin-Eldorado Mining Company—Pennsylvanians interested in the Eldorado mine in Spring gulch are arranging for the resumption of work by July.

Grand Union—Eastern and Denver capital is interested on South Boulder creek and will make arrangements at a later date for the installation of a compressor plant. O. Q. Beckworth, Rollinsville, Colo., is manager.

Iowa Girl—Sylvanite ore has been found in the tunnel of this property in Moon gulch, and assays run high in gold. W. S. Dexter, Rollinsville, Colo., is manager.

Leavenworth—This property in Russell district has been sold for $50,000 to F. P. Reed, of Denver.

Rockford—S. T. Harris, of Russell Gulch, has taken a lease and option on this mine and is installing machinery for active operations.

Troublesome—Milling ore from 5 to 8 ft. in width has been opened up west of the shaft at a depth of 165 ft., which shows well in gold and makes good concentrates worth $20 to the ton.

West Concrete—Maloney & Co., of Central City, have opened up some wire silver ore yielding high assays, besides some gold and lead.

Winning Mining Company—Denver and Pennsylvania capital has become interested in the organization of this company and in the purchase of the Hall mine in Russell district. A. G. Rummel, Russell Gulch, Colo., is to be manager.

LAKE COUNTY—LEADVILLE

Crecentia—Recently a controlling interest in this property, Rock Hill, was sold to Lou R. Johnston and associates, of Denver. Several improvements are now under way and when completed the underground force will be enlarged and 50 tons daily of low-grade sulphide and iron will be shipped.

Helena—In this mine, Iowa gulch, drifting from the 500-ft. level to the east a good body of lead ore has been encountered, the vein being 4 ft. wide, and as development proceeds it becomes larger; the ore carries 50 per cent. lead, some silver and a trace of gold.

International—The tonnage from this property, Robinson, is on the increase daily and is now close to 100 tons. A great deal of development work has been going on at the different levels and the ore zone has been opened in them all. This is a continuation of the old Robinson vein.

Little Jonny—On this mine, Breece hill, Hahnewald Brothers are leasing on No. 4 shaft at the 1200-ft. level, where they have a large body of sulphide ore. During the week in the center of this body appeared a streak 2 in. wide of ore running very high in gold, and so far they have taken out 300 lb. with the streak still in sight. It appears to be a concentration of the auriferous values in the heart of the sulphide body; the gold is all in the form of wire. The mine is producing in the neighborhood of 7000 tons per month and is employing about 400 men.

South Evans—The Luema Mining Company controls the Valley, Forest Rose and Dispute claims comprising 16 acres of patented ground. A new shaft was sunk on the Valley to a depth of 700 ft., and a good body of sulphide ore opened; the ore zone is being opened and at present daily shipments of 30 tons are being sent to the smelter. Other properties in the gulch, including the Fanny Rawlins, Favorite, Louise, etc., are shipping regularly.

TELLER COUNTY—CRIPPLE CREEK

Prince Albert—This company, owning 26 acres of ground on the extreme southeast slope of Beacon hill, adjoining the Gold Dollar Consolidated, will hereafter work directly the mine, which has heretofore been operated under the leasing system. The deepest shaft on the Prince Albert is only 275 ft., and work has never been done to any extent below the 200-ft. point. John Nicholls, formerly superintendent of the Midget, has been put in charge of the work by Henry Iland, president of the company. There is a vein which is exposed in the gulch which separates Grouse and Beacon hill, and it is proposed to drive an adit on this vein for a distance of 1200 ft. The tunnel will cut the Prince Albert claim at 600 ft. depth.

Republic Gold Mining Company—A two-years' lease, with royalty of 20 per cent. flat on all ores marketed, has been secured on the Beacon hill group of three claims owned by the Republic Gold Mining Company, by Dan Stewart and associates. Work on the Janet W. claim, on which the main shaft is situated, has commenced and development work on an extensive scale is projected. The property, containing about nine acres patented, lies south of El Paso Consolidated.

Idaho

SHOSHONE COUNTY

Tamarack & Chesapeake—Repairs to the compressor, which was damaged some time ago, have been completed and the plant is again in working order. Development will be pushed with as many men as the present power justifies, which means that three machines will be kept busy, and a crew of hand-drillers will be worked besides. A stockholders' meeting was held in Spokane a few days ago at which all the old directors were reelected.

Hercules—Work is progressing steadily, about 250 men being employed. They are engaged on the second, third and fourth levels. Last month was the record month for the Hercules in ore production; 23,000 tons of ore were shipped, of which 16,000 tons represented concentrates. The ore is going to the East Helena smelter of the American Smelting and Refining Company

Charles Dickens—More than 2500 tons of ore are now broken down, and the manager estimates that sufficient will be ready by the time the new concentrator is completed to keep the mill running one month. A crew of 25 men is now employed, mostly engaged in breaking ore.

Stewart—A report from Wardner states that this mine is to reopen again. Authority for the statement is not obtainable from the owners, but it is known that the management has been in consultation with the Cœur d'Alene Development Company, upon whose land the mill stands, for a release of injunction which will permit it to run.

Snowstorm—This mine has been forced to close on account of the floods which have prevented handling cars to haul the ore. The bins are full.

Morning—This property, owned by the

Federal Smelting and Refining Company, which opened up less than two weeks ago, is finding difficulty in securing sufficient experienced machine men. Small bodies of men are daily arriving, but the crew does not exceed 125 men. The company intends to put the mine on a full running basis as soon as possible.

Kansas

Zinc-lead District

Frank Hunt and associates have taken a lease on the old Murphy ground near Galena, and have begun drilling. This ground was drilled years ago, and sheet ore was reported at 250 ft. depth.

Michigan

Copper

Mohawk—Sinking is in progress in all of the company's five shafts; each shaft, with the exception of No. 5 is equipped with a permanent hoisting plant. No. 5 shaft, the newest of the openings, is to have a new hoisting equipment. A high-duty engine was purchased from the Wolverine mine and will be assembled this summer. Conditions throughout the mine are very satisfactory and rock shipments of from 2000 to 2200 tons daily are being made to the mill.

Wyandot—This company has begun crosscutting eastward from the bottom of its exploratory shaft, which is down about 800 ft. This crosscut will be driven to the sandstone and will cut the various lodes that cross the property.

Copper Range—The shaft on the Globe tract, held under option by this company is down about 1000 ft., and is bottomed in a formation believed to be the Baltic lode, but carrying practically no copper. The shaft encountered this formation at a depth of 980 ft. and will be continued until it cuts through it, when drifting on the vein will be started. Developments in the lateral openings will be watched with interest, as it is upon this that the fate of the tract, as far as this company is concerned, depends.

Franklin—The Franklin, Jr., property is opening the Pewabic lode, by means of crosscuts from the 21st and 23d levels of the Conglomerate shaft.

Seneca—This company is carrying on diamond drill work and a complete cross section of its lands will be obtained. A shaft is also being sunk to open up the Kearsarge lode; this shaft is being sunk 60 ft. from the footwall. As levels are established crosscutting to the lode will be started.

Hancock—No. 1 shaft is sinking below the thirteenth level and at that point a crosscut is being driven to encounter the West lode. Drifts on this lode from the upper levels are showing good rock. No. 2 shaft is down below the 1000-ft. level and is sinking in a very hard formation of conglomerate intermixed with sandstone. During sinking copper has appeared from time to time and one promising amygdaloid formation was passed through. The calculated vertical distance to the West lode from the collar of this shaft is 2000 ft. At the annual meeting of the company, held recently at Hancock, Mich., the old board of directors was re-elected.

Keweenaw—The company is drifting and blocking out ground, sinking being temporarily suspended until such time as the openings are sufficient to keep the mill in operation. A thorough test is to be made on the Medora-shaft rock and the Phœnix mill is to start stamping early next month. This mill is being overhauled and put in first-class working order. Woodbury jigs have been ordered for the concentrating department. The Keweenaw Central railroad has completed its road into Calumet and a regular running schedule is now in effect between there and Mandan, the northern terminus of the line.

Allouez—The crosscut from the sixth level of No. 1 shaft has been holed through to No. 2, thus connecting the two shafts, which is very important for ventilation and affords another passage to and from this shaft. This crosscut intercepted No. 2 shaft at a point 1659 ft. from surface and approximately 700 ft. above the point where No. 2 shaft will cut the vein.

Missouri

Zinc-lead District

The Oakwood and Carbonate, two large sheet-ground mines near Webb City, have shut down. The Oronogo Circle at Oronogo, a large producer, has also closed.

[illegible]—This company is just completing a 225-ton mill on its lease at Prosperity. It has a 40-acre tract with a 12-ft. face of sheet ore, shown by nine drill holes and two shafts.

[illegible]—[illegible] lift pumps have been installed on the tract of this company adjoining the Herald mine at Cave Springs. Many other old mines will have to be unwatered before work in the ground can be started.

Newsboy—A company has been organized to reopen this old mine on the Boston-Duenweg tract at Duenweg. H. W. Dale and Martha E. Bennett own the stock. The mine was worked at the 140-ft. level and a large quantity of ore produced. The [illegible] level will now be worked.

[illegible]—This company has started pumping the upper levels of its ground at Webb City. This will not help the other mines in the neighborhood, as the water encountered in the upper levels has no connection with that in lower ones.

Montana

Butte District

[illegible] Superior—A depth of 1200 ft. has been reached on this property. The shaft will be sunk 50 ft. further and a station will then be cut on the 1200 and electric pumps installed, capable of handling 300 gal. of water per minute. While some exploration work will be done on the 1200, it is generally understood that the company intends to sink several hundred feet more, when the greater part of the exploration work will be done.

North Butte Extension—It is expected that this company will soon be able to straighten out financial tangles, and that the property, now closed down, will resume operations. The shaft is down 600 ft. Some time ago an electric pump of large capacity was ordered for the 1000 level, with the expectation that the shaft would be sunk to a depth of at least 1500 feet.

British-Butte—The early part of this week the company instituted suit against E. D. Moore, alleging that the defendant had attempted to re-locate its Jessie placer claim. The action is brought to secure an injunction against the attempted re-location proceedings and to quiet title to the company's ground.

Missoula County

Amador Mining Company—Some weeks ago the experts sent out to examine the company's properties published an unfavorable report. At a recent meeting, attended by a number of the stockholders, some dissatisfaction was expressed with the report and steps have been taken to secure the services of another engineer to make a further report.

Nevada

Esmeralda County, Goldfield

Goldfield Production for the week ending June 23 varied little from that of last week. It was handled as follows: Combination mill, 640 tons, value $10,200; Nevada Goldfield Reduction Company, 636 tons, $63,600; Western Ore Purchasing Company, 874 tons, $96,140; total, 215 tons, value, $178,040. The producers were: Consolidated, 704 tons; Jumbo, 358 tons; Engineers' Lease, 28 tons; Mushett Lease, 26 tons; Sandstorm No. 5, 15 tons; Knickerbocker Lease, 20 tons; [illegible] Baumgartner Lease, 6 tons, $1000 per ton; Combination Fraction, 87 tons; Mohawk, 40 tons; Rogers Syndicate, 403 tons; Mohawk Combination [illegible] Sandstorm Lease, 4 tons; Little Florence, 40 tons; Van Riper-Mohawk, 183 tons; Parkinson Victor Lease, 24 tons. In addition [illegible] from the Great Western at Hornsilver.

Mohawk Combination—Final returns for the four days run of this lease, the time allowed to it by the board of arbitrators, shows 742 tons of an average value of $90.40, equivalent to a total of $67,077, or a daily production of $16,769.

Rogers Syndicate—This lease on the famous Florence has paid its seventh dividend of $30,000, bringing the total paid since March 28 to $215,600. Two days' output from this lease for which settlements were received last week amounted to $35,750.

Jumbo Annex Lease—A cave has occurred in these workings which runs to surface and is so near the Bullfrog railroad that traffic may be held up temporarily.

Commonwealth—This strike is proving up well; 60 tons of $60- to $70-ore are in chutes awaiting hauling to the mill.

Codd-St. Ives Lease—A pump will be installed to take care of the water on the 500-ft. level where good showings have been encountered.

Gem-Florence—A six months' extension has been granted this lease.

Elk Consolidated Leasing—This company, operating on the Yellow Tiger, will continue its shaft from the 600-ft. level, where a large body of mill ore has been proved to the 900-ft. level.

Esmeralda County—Hornsilver

The mine owners and operators have given notice that beginning July 1 the Tonopah wage scale of $4 and $4.50 will be adopted. If any opposition is shown by the union men the operators will declare the camp open and enforce the scale.

Frances Lime Point Mining Company—This company operating the Murray & Robinson property will make another shipment by the teams which are to haul its hoisting machinery from Goldfield.

Great Western—Both the east and west drifts on the 200-ft. level encountered new orebodies last week which are reported very high grade. Ore is being sacked from the 100-ft. level.

Great Eastern—This property, which lies two miles southeast of Hornsilver, has a 4-in. streak of jaspery quartz which runs almost $1000 per ton. This is the kind of stuff the "old chloriders'" packed 300 miles to Candelaria 40 years ago.

Gold Mountain District

Nevada Empire—All the material for the mill at Gold Mountain has been shipped and construction will begin as soon as it arrives.

North Star—Lessees on this claim of the Keystone Mining Company have 250 sacks of $50 ore on the dump ready to ship.

Nevada Empress—All the lumber and other building material for the Nevada Empress mill is either at the mill site or at the railroad at Cuprite awaiting teams. The machinery has all been shipped and will be on the ground as soon as it can be used. An aerial tramway will probably be built to convey the ore from the upper tunnels to the mill.

Nye County—Lodi

Lodi, situated 30 miles southeast of Fairview, 45 miles east of Luning and 60 miles west of Austin, is to have a smeltery. The contest between the Lodi Mines company and the Lodi Townsite company has been settled by giving four-fifths of the water right to the Mines company and one-fifth to the Townsite company. A 100-ton water-jacket furnace will be installed. The machinery will be hauled from Luning, the railroad point, by two traction engines which will subsequently haul ore to the plant.

Nye County—Tonopah

Belmont—One of the most important discoveries in the history of Tonopah was made this week when pay ore was found on the 1000-ft. level on the north side of the Mizpah fault. Thus far all the known veins on Oddie mountain have been cut on their east trend by the Mizpah fault which strikes northeast and southwest and it has been commonly predicted by mining engineers that no ore would be found north of this fault line. This fault material has been crosscut for nearly 200 ft. It consists of country rock and quartz. On the north or hanging wall side of the fault 3 ft. of quartz was encountered which carries benches of high-grade ore. Development work is now being watched with great interest by both the Belmont company and local mining men in general.

Nye County—Round Mountain

By automobile to Goldfield was brought one day last week $12,000, the clean up from a 15-days' run at the Round Mountain mill and $6000 the result of a week's work by the Round Mountain Hydraulic Mining Company. The former company has distributed $32,000, its first quarterly dividend. The latter company is operating three giants on the Sunnyside and Great Western properties. Operations at one of these points have uncovered a quartz ledge from 20 to 40 ft. in width eight samples from which assayed from $4 to $56 per ton.

Seven Troughs

Mazuma Hills—The Mazuma Hills mill has just made a 10-day clean-up amounting to $20,000. This was from a run on high-grade ore and the results are so satisfactory that the company will treat all its own ore hereafter.

Seven Troughs Kindergarten Mining Company—The mill of this company known as the Kindergarten or Friedman mill has been running continuously for nearly a month and is giving good satisfaction.

Seven Troughs Mining Company—Work has been started sinking the company's shaft from the present 525-ft. point to the 1000-ft. level.

Ohio

The State Mining Department, through George Harrison, chief inspector of mines, on June 24, issued the following important notice, addressed to all mine operators, mine superintendents and mine bosses, operating or having charge of mines in Ohio:

"On and after July 1, 1908, all mining machine cuttings, or what is known as 'bug dust,' must be sent out of the mine, and no portion of it can be thrown back in any room or working place or used as ballast on any track or haulway in any part of the mine.

"The law requires that in any entry or airway in any mine which becomes so dry that the volume of air is liable to become charged with dust, that whoever is operating said mine as owner, lessee, agent, or in any capacity, shall have such entry or airway thoroughly sprayed and sprinkled with water, or cleaned in such a manner that the air will not become charged with dust. The same law makes it imperative that the inspector must not allow an accumulation of dust in any mine. The specific penalty for failure to comply with this provision of the mining law is a fine of from $200 to $500 in each conviction.

"Notice is hereby given that every mine inspector will prosecute to the fullest extent every case of violation coming to his attention on and after the above named date."

Oregon

Baker County

Hidalgo—The vein in this mine, near Sumpter, has been cut in the adit driven by Tompkins Brothers, the owners. The face of the adit is now 900 ft. from the entrance and about 300 ft. below the surface.

Quebec—Negotiations are in progress for the reopening of this mine near Sumpter. A good deal of development work was done on it several years ago.

Pennsylvania

Anthracite Coal

For the past week the Lackawanna county court has been taking testimony on the appeals of the Delaware, Lackawanna & Western, the Delaware & Hudson and other coal companies from the assessments placed upon their property by the county commissioners. The county board employed engineers to put a value on coal lands, and these experts estimated the quantity of coal unmined and valued it at $100 per foot-acre. There is no serious difference as to the extent of the coal, the appeals being taken chiefly on the valuation. It is understood that the companies are willing to abide by the decision of the court. A large number of experts have testified on both sides, but their estimates of the value of coal in the ground differ very widely.

Pine Knot Colliery—Regular mining operations were started at this colliery at Coal Castle on June 29. Development and construction have been going on for some time, and the mine is one of the largest in the anthracite region. It is expected to ship 3500 tons a day. It is owned by the Philadelphia & Reading Coal and Iron Company.

Bituminous Coal

Pittsburg-Buffalo Coal Company—This company is rushing work on its new plant at Marianna in the Pittsburg district. Three shafts have been sunk, and coal is being produced on a small scale. A contract was awarded June 22 for a 550-kw. generator with a Reynolds-Corliss engine to drive it. This is the first of six great generators to operate the plant. The company has built 50 houses for miners, and on June 22 let a contract for 50 more, and the number will be increased by 150 additional houses before the end of summer. All these houses are to be of brick construction, and each will contain a bath room, an innovation in miners' dwellings.

South Dakota

Lawrence County

American Eagle—President Geo. A. Code, of Minneapolis, has taken full charge of the property in Bald Mountain. General manager Goldbloom and J. E. Downs, the mill constructor, have resigned.

Ama Queen—Work has started again with the Sherman boys doing considerable development. Ore is to be hauled to the Custer Peak company's mill.

Utah

Juab County

Tintic Shipments—The mines of this district shipped 66 carloads this week, as follows: Centennial Eureka, 39; Eureka Hill, 6; May Day, 6; Uncle Sam Consolidated, 6; Carisa, 1; Mammoth, 3; Grand Central, 3; Yankee Consolidated, 2; May Day (concentrates), 2 cars.

Sioux Consolidated—The initial shipment of ore from this mine netted $3860 for 35 tons.

Summit County

Park City Shipments—The mines of this camp shipped last week 846 tons, as follows: Daly Judge, 286; Silver King, 350; Daly West, 200 tons.

Washington

Okanogan County

Night Hawk—A new concentrator is now being installed at this mine and it is expected that it will be in operation within a few weeks. The mine has shipped much ore in the past, but owing to long distances and high freight has been compelled to [illegible] treatment.

Ruby—Manager Harman has gone East to confer with stockholders with a view, it is stated, of securing funds and permission to erect a reduction plant at the mine, situated near Loomis. The Ruby contains principally silver ore, some being rich ruby silver, but the excessive freight rates to the Tacoma smelter, where it is treated, are too great a drain, and much of it cannot stand shipment. The mine is well developed with adits and upraises, and a large quantity of valuable ore is on the dumps. Several cars were shipped to the smelter early in the spring, but this is to be discontinued.

Wisconsin

Zinc-lead District

A new corporation, with a capital of $1,000,000, has been formed to take over the new pyritic separating plant and the leading Platteville mines, including the Empire, Acme, Enterprise and probably the Hodge. The new company is backed by the Platteville Separator people.

Calvert—In this mine at Benton the shaft has been completed at the oil rock at 112 ft. depth, and drifting has been begun. The orebody is showing up a strong sheet formation, with a 10 o'clock course. It seems to be the west pitch of the Frontier mine.

Dawson—This mine at Benton has been started up by Chicago people, who bought out the local interests.

Fox—This mine at Hazel Green has opened up richer ground, and has developed into one of the large shippers of the district.

Frontier—This mine at Benton has settled down to a weekly production of about 150 tons of concentrates; the mill is running one shift, milling 700 to 800 tons of rock weekly. In spite of heavy water and low prices of ore, the operators are said to be netting $1600 to $1800 weekly, after paying 10 per cent. royalty.

Kennedy—At this mine, Hazel Green, a second mill is being erected. It is in the gulch west of the old mill, where there is more room for the tailings.

Scrabble Creek—The shaft at this mine is being unwatered. This shaft will also be used by the new Cleveland Mining Company, until its mill is erected.

Canada

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending June 20 were as follows: La Rose, 104,670 lb.; McKinley-Darragh, 60,000; Nipissing, 239,880; O'Brien, 128,120; Trethewey, 65,670. Total, 598,340 pounds.

Cochrane—This property lies directly south of the Temiskaming, and it is believed that one of the rich veins of the latter crosses it diagonally. Work was started last year, but was suspended on account of the miners' strike. Operations are now being resumed under direction of Lloyd Harmon, formerly superintendent of the Temiskaming. A first-class plant will be installed.

[illegible] at the depth of 35 ft. and 60 ft. southwest of the main shaft. A blind vein of rich ore 20 in. wide in places and running parallel to the main vein was disclosed. The value of the find is confirmed by W. E. Hidden, who was at the mine when the vein was encountered.

Lawson—Work has been resumed and the old shaft, which was down 40 ft. is being sunk deeper. A crosscut will be run at the 40-ft. level.

Nipissing—The company has a force of 302 men employed in mining and prospecting, and is working to reach the new find on the Kendall vein struck recently by diamond drill. It is expected that this will be effected in about 10 weeks. About $15,000 worth of silver per week is now being mined.

[illegible]

Big Dipper—A thorough test has been made of this gold property which belongs to a Buffalo syndicate, resulting in the installation of a 10-stamp mill.

Golden Fleece—Hastings county, Ont., This gold mine in Kaladar township was purchased recently by a New York syndicate and operations are being steadily carried on. A 10-stamp mill is working and the output is satisfactory.

Nova Scotia

Dominion Iron and Steel Company—The annual meeting of the shareholders was held in Montreal June 25. President J. H. Plummer put before them the terms of settlement of the dispute with the Dominion Coal Company as proposed by the latter company. The basis of settlement suggested was that the case before the Imperial Privy Council should go on, but that the results of the appeal should be limited by an arrangement in advance of the decision. It was proposed that should the coal company succeed it must give $1,250,000 to the steel company, whereas if the steel company should be successful it should not receive more than $2,000,000 damages. An alternative proposal fixed these amounts at $1,500,000 and $1,750,000, respectively. In either case the price for coal hereafter is to be $1.50 per ton for slack and $1.80 for run-of-mine, adjustable yearly, the coal company guaranteeing to supply 25 per cent. in slack. The pro[illegible] directors to increase the common stock by $5,000,000, and to issue $20,000,000 consolidated bonds to retire the outstanding [illegible]

[illegible]

[illegible] this district continues, eight outfits having left Prince Albert, Sask., on June 24. A stage road is to be opened to Montreal Lake, 75 miles further north.

YUKON TERRITORY

Yukon Gold Company—A large consignment comprising 31 carloads of steel pipe for the hydraulic plant is on the way to Dawson by the White Pass & Yukon railway. This pipe was made in Germany on a special design and is 44 in. in diameter in 30-ft. sections, each section weighing 5 tons. It is for use in the inverted siphon crossing the Klondike river two miles above Dawson, and when put in place will complete the line. The pipe is the first of its kind to be used in mining operations in the Territory.

Mexico

CHIHUAHUA

Piedras Verdes—R. S. Towne has bought from the estate of Buenaventura Becera, of Urique, the Piedras Verdes mines, which he has held under option for about two years, and which are located about five miles north of the surveyed line of the Kansas City, Mexico & Orient Railway, in western Chihuahua and near the Cieneguita district of Sonora.

Promontorio—The Promontorio mine, in the Cusihuiriachic District, owned by Delgado & Barcenas, which is now under lease and bond to Los Angeles capital, is now being examined by R. B. McGinnis, of San Francisco, for the Los Angeles people who are sinking the shaft several hundred feet deeper.

Ojinaga—The third well of the Hearst-Keene syndicate, in the Ojinaga district of eastern Chihuahua, has struck oil at 700 ft., but will be continued to a depth of 3000 ft. with the hope of striking a heavier flow of oil.

COAHUILA

Jimulco Mining Company—This company, owning large copper mines east of Jimulco in the State of Coahuila, which has been closed down since last fall, was opened up again on the first of June by A. L. Tuttle with 150 men. The same company owns the Panuco copper mines, in the northern part of Coahuila, where experiments are being made for concentrating the ores.

FEDERAL DISTRICT

The new bill providing for the paving of 50 or more streets in Mexico City with asphalt specifies that the material shall come from the Mexican asphalt fields at Ebano, State of Vera Cruz.

GUERRERO

Maine & Nebraska Mining Company—This company has obtained a concession to build a railroad from its mines to connect with the Balsas river branch of the Mexican Central Railroad; the construction work will begin in July.

JALISCO

San Sebastian—The Navidad Mines and Reduction Company, of Berkeley, Cal., operating near San Sebastian, in the State of Jalisco, is receiving and erecting the tanks for its 200-ton cyanide plant.

OAXACA

Taviche—The San Juan de Taviche Railroad Company has been organized to take over and push to completion the road from Taviche to Ejutla. It is believed the road will be completed this year.

SONORA

Lucky Tiger—The Lucky Tiger Gold Mining Company, famous by reason of a long drawn out litigation, has greatly increased its operations, having now about 300 men employed, and producing at the rate of more than $100,000, Mexican, per month, with close to $25,000, Mexican, profit per month.

Moctezuma Copper Company—One-half of the new 2000-ton capacity concentrator, Nacozari, is completed and in operation. The concentrator is in two units of 1000 tons capacity each. The second half will be completed in about two weeks. The old concentrator of 700 tons capacity is still being operated, which brings the amount of ore treated per day up to approximately 1500 tons. In the new plant, several departures from the regular milling methods have been made, and all are apparently successful. The new power plant is also in operation.

Cananea-Duluth—In this mine of the Greene-Cananea company, Cananea, on the 300 level large quantities of ore are continually being opened up. The ore averages about 4 per cent. copper and 8 oz. silver.

Democrata Mining Company—Since the shutdown of this company's smeltery several months ago, considerable development work has been done in the mine. At present there are seven machines in operation, all on development work.

Sierra de Cobre—This property, which is one of the Phelps-Dodge interests adjoining the property of the Greene-Cananea company, is practically shut down. Pumping is being done from the 500-ft. level, and two prospect drifts are being run by contract on the same level. Nothing is given out as to when operations will be resumed.

VERA CRUZ

Huasteca Oil—The Huasteca Petroleum Company has obtained a concession from the Federal government for the exploration and exploitation of petroleum products and mineral oils on the company's land in the Huasteca district in the northern part of the State of Vera Cruz, bordering on the States of San Luis Potosi and Tamaulipas, and in return for this concession has obligated itself to spend $500,000 in five years, construct pipe lines, build the necessary railway, and organize as a Mexican company under the country's laws.

ZACATECAS

Mazapil—The company made a material reduction in wages on June 1 because of the continued low price of the metals, and trouble was averted by the presence of Federal troops.

Europe

SPAIN

Exports of metals from Spain for the four months ended April 30 are reported by the *Revista Minera* as follows, in metric tons:

	1907.	1908.	Changes.
Pig and manu. iron......	19,611	6,777	D. 12,834
Copper..................	2,793	3,824	I. 1,031
Copper precipitate......	5,707	8,245	I. 2,538
Spelter.................	398	404	I. 6
Lead....................	63,820	61,848	D. 1,972
Quicksilver.............	1,036	848	D. 188

Exports of sulphur were 3 tons only. Exports of ores and minerals were as follows:

	1907.	1908.	Changes.
Iron ore	3,234,360	2,769,930	D. 464,430
Copper ore...........	487,225	405,153	D. 82,072
Zinc ore.............	63,512	36,593	D. 26,919
Lead ore.............	2,044	1,221	D. 823
Manganese ore........	27,329	9,501	D. 17 828
Pyrites..............	434,320	498,971	I. 62,651
Salt.................	165,024	220,116	I. 55,092

Imports of sulphur this year were 4037 tons. Imports of phosphates and of basic slag for fertilizers were 31,133 tons:

Africa

WEST AFRICA

Gold production in May is reported at 24,227 oz. bullion, which is 881 oz. less than in April, and 1085 oz. less than in May, 1907. For the five months ended May 31 the total was 122,344 oz. bullion in 1907, and 126,259 in 1908; an increase of 3915 oz. The bullion reported this year was equal to $2,454,299, or 118,737 oz. fine gold.

Australia

QUEENSLAND

The Mines Department has reported the production of metals and minerals, other than gold and coal, for the quarter ended March 31, 1908. The production of metals was as follows, the figures in parentheses being the outputs for the corresponding quarter of 1907: Silver, 203,344 oz. (177,704 oz. in 1907); copper, 2754 tons (2602); tin, 1246 tons (1318); lead, 1382 tons (865). Of the tin 372 tons were alluvial and 874 tons lode tin.

The production of ores was: Manganese ore, 330 tons (125); iron ore, 59 tons (717); antimony ore, 7 tons (210); wolfram ore, 73 tons (98); bismuth ore, 6 cwt.; bismuth-wolfram ore, 11 tons (5); molybdenite 3.5 tons (8.25). The limestone quarried as flux was 31,666 tons, an increase of 26,092 tons over last year

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 1—The coal trade in the West shows no material change, the light demand for steam coal continuing to be manifest everywhere. The Lake trade has begun to move, which will improve matters a little. The only increase in business reported is from the Pittsburg district.

In the East also bituminous trade is dull almost everywhere. Steam coal is in light demand and consumers are hesitating about putting in stocks ahead. The anthracite trade, which has hitherto kept up fairly well, is falling off and shows marked signs of dulness.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year to June 20, in short tons:

	1907.	1908.	Changes.
Anthracite......	2,698,724	2,575,880	D. 122,844
Bituminous.....	17,955,624	15,069,890	D. 2,885,734
Coke............	6,690,937	3,177,490	D. 3,513,447
Total.........	27,345,285	20,823,260	D. 6,522,025

Total decrease this year to date was 23.9 per cent.

Coal tonnage reported by Southwestern Interstate Coal Operators' Association, three months ended March 31, short tons:

	1907	1908	Changes.
Missouri.........	714,658	867,528	I. 152,870
Kansas..........	1,623,315	1,876,956	I. 253,641
Arkansas........	575,101	670,330	I. 95,229
Oklahoma...	722,402	877,568	I. 155,166
Total.	3,635,476	4,292,382	I. 656,906

The total increase this year was 18.1 per cent.

New York

ANTHRACITE

July 1—Both prepared and small steam sizes are inactive and the market is very dull. The Lake traffic is at present very light, but it is believed that with the arrival of ore shipments this month the traffic up the Lakes will begin in earnest. Price cutting is general, in some cases as much as 20c. per ton for prepared sizes. The discount on tidewater prices is reduced 10c. today.

Prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

If there is any improvement in the soft-coal market it is very slight indeed. In the far East a few consumers are taking on coal, but an indifference prevails throughout the trade and business is extremely light.

Transportation from mines to tide takes about a week. In the Coastwise vessel trade there is a shortage of small craft in Philadelphia, but not in New York harbor. Vessel captains seem to be willing to charter in order that they may get home to tie up. Freight rates are as follows from Philadelphia: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Newburyport, 75c.; Portsmouth, 55@60c.; Saco, 90c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c.; towages where usual.

Birmingham

June 29—Considerable interest is still manifested in what the commercial coal operators of Alabama will do July 1, when the contract with the union miners expires. The commercial operators are the only interests in the State who recognize the union and they have demanded of the miners the same wage contract as exists at the non-union mines, in order that the competition can be met. There are less than 4000 union miners in Alabama at present. There is a large quantity of coal being mined just at present and the demand is good. Several old mines will resume operation during July, while two or three new mines are to be started.

Chicago

June 30—Summer business runs more and more to fine coals, with lump suffering. Domestic coals are weak and should be kept out of this market for a while. Eastern coals are a good deal troubled with demurrage, and bring cut prices. Illinois and Indiana screenings and the lower-priced run-of-mine coals get the business.

Lump and egg from Illinois and Indiana bring $1.75@2 for most sales; $[illegible]@1.85 for run-of-mine, and $[illegible] for screenings. Brazil block is dull at $2.10@2.20.

Smokeless run-of-mine is in light demand, but with large receipts, and smokeless lump and egg have very light sales. Hocking is selling under circular price, and Youghiogheny has little movement except on contracts. Anthracite has been dull, the end of June discount bringing only light orders.

Indianapolis

June 29—The recent unexpected advance in the retail price of coal and coke of 25 to 50c. a ton is explained by the dealers [illegible] advance made by the operators on account of the increased cost of mining, due to the absence of demand for steam or mine-run coal, and the necessity of supplying domestic coal alone.

There is a marked decrease in the number of idle coal cars on the coal carrying roads, and this has given rise to the belief that the retail yards are stocking up. This belief is strengthened by the increased demand at the mines.

Pittsburg

June 30—There is no material change in the coal situation. Nearly all the railroad mines are in operation and the product is going to Lake ports for the northwestern trade. While the demand is light, prices are being maintained on the basis of $1.15 a ton for mine-run coal at mine. Slack has been quoted for several weeks at around 75c., but sales have been made during the week as low as 40c. All the river mines are running and a large tonnage has accumulated in the pools and harbor.

Connellsville Coke—No particular improvement is noted. Not more than one-third of the 37,000 ovens in the Connellsville regions are in operation, but preparations are being made to put some additional ovens in blast. It has been discovered that many coke workers have left the region and operators will have difficulty in securing a sufficient number of workmen when business revives. The *Courier* in its summary for the week gives the production in both fields at 162,404 tons. The shipments were 6355 cars as follows: To Pittsburg, 2522; to points west of Connellsville, 3412; to points east of Connellsville, 418 cers.

Foreign Coal Trade

Nova Scotia coal shipments, by companies, five months ended May 31, long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
N. S. S.	[illegible]	[illegible]	[illegible]
Cumberland	[illegible]	[illegible]	[illegible]
Acadia	[illegible]	[illegible]	[illegible]
Inverness	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

[illegible] was 15.2 per cent.

[illegible] months ended April 30 were 625,473 [illegible] from last year. Imports of coke were 110,010 tons, an increase of 34,058 tons.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of June 20: Best Welsh steam, \$3.90; seconds, \$3.66; thirds, \$3.54; dry coals, \$3.84; best Monmouthshire, \$3.36; seconds, \$3.30; best small steam, \$2.28; seconds, \$2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 1—The iron and steel markets continue dull, but little new business coming forward. Buyers do not feel any confidence in the present steel quotations; the concessions made were sufficient to induce a hope of further cutting, and little will probably be done until that point is settled. The only considerable sales have been of bars; structural steel coming next in activity, but very far behind. For other material, the market is in a waiting condition.

There has been some business in pig iron. Foundries are not fully supplied yet, and there has been some call for basic pig. A large contract for Alabama basic for second-half delivery is reported made in the West.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for April, and the four months ended April 30, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1907.	1908.	Changes.
April	\$17,684,863	\$15,467,319	D.\$2,217,544
Four months	62,371,457	58,346,306	D. 4,025,151

Leading items of export for the four months, in long tons:

	1907.	1908.	Changes.
Pig Iron	28,346	11,903	D. 16,443
Billets, ingots & blooms	39,728	54,327	I. 14,599
Bars	30,186	19,632	D. 10,554
Rails	113,005	56,240	D. 56,765
Sheets and plates	45,279	31,620	D. 13,659
Structural steel	44,390	47,280	I. 2,890
Wire	2,881	49,376	D. 3,505
Nails and spikes	19,660	15,735	D. 3,925

There were increases in billets and in structural steel, with decreases in all other items.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for April and the four months ended April 30 are valued as follows:

	1907	1908.	Changes
April	\$3,723,176	\$1,633,812	D. \$2,089,364
Four months	13,742,284	7,094,903	D. 6,647,381

Leading items of imports for the four months, in long tons:

	1907.	1908.	Changes.
Pig iron	215,983	39,235	D. 176,748
Scrap	5,461	1,621	D. 3,840
Ingots, blooms, etc	5,427	3,039	D. 2,388
Bars	9,601	10,757	I. 1,156
Wire-rods	5,666	3,798	D. 1,868
Tin-plates	19,117	21,637	I. 2,520

There were decreases in all items except bars and tinplates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the four months ended April 30, are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports	1,752	30,459	I. 28,701
Imports	402,501	256,973	D. 145,528

Imports of manganese ore were 59,345 tons in 1907, and 73,626 in 1908; an increase of 14,281 tons.

Baltimore

June 30—Exports for the week included 991 tons steel billets and 530,571 lb. galvanized sheets to Liverpool. There was also exported 2,310,856 lb. tin scrap to Rotterdam.

Birmingham

June 29—Southern pig-iron producers report conditions fairly good. Sales have not been as active as during the first part of the month but almost all of the producers have booked orders for at least twice as much iron as they can make during July. The Republic Iron and Steel Company will blow in its third furnace at Thomas this week. Williamson furnace, in Birmingham proper, recently leased by a former employee of the Tennessee company, is to be blown in. There is a healthy shipment of pig iron from this section while the home consumption is increasing. The cast-iron pipe concerns are busy. The machine shops and foundries are doing a little better.

Pig iron quotations are strong between \$12 and \$12.50 per ton, No. 2 foundry, the better part of the iron now selling bringing in between \$12.25 and \$12.50. But little iron is being shipped out from this district for export. The Tennessee company has all its furnaces, with but one or two exceptions, on basic iron. Besides iron for the Ensley steel plant an order for something like 85,000 tons of basic pig has been accepted. There is a little demand again for charcoal iron, which sells at \$22 per ton.

Chicago

June 30—Sales of pig iron have not been heavy in the last week but have been well distributed. The market is not so strong as a week or two ago and the feeling of melters seems to be that another sag is possible. Furnace agents uphold the view that with the usual July dullness passed there will be a steady tendency upward in prices and consumption. With sales running from carload lots to 500 tons, buying is again coming to closer deliveries but a certain amount of contract iron for fourth-quarter needs is being sold.

No. 2 Southern foundry is selling for \$12@12.50, Birmingham (\$10.35@10.85 Chicago) and Northern No. 2 for \$17@17.50. The lower prices probably obtain more generally than furnace representatives are willing to admit.

Iron and steel products are not moving briskly in any line. Coke is quiet at \$4.90 for the best Connellsville, with contract buying somewhat larger.

Cleveland

June 30—The outlook on Lake freights is not at all promising. Some season charters have been made for ore on a basis of 70c. from Duluth or Superior, which is 5c. less than last season. As low as 65c. is said to have been accepted. The large ore companies, however, have hardly enough for their own boats. In the coal trade there is some demand for small vessels, but they are not coming forward. Rates are 30c. to the head of the Lakes, and 40c. to Lake Michigan points.

Philadelphia

Philadelphia, July 1—The last week of the half year was particularly devoid of features in pig iron. The vacation period has already set in and many heads of offices are absent for the summer. There have been no inquiries of consequence this week. Negotiations were opened two or three weeks ago between two consumers in this territory and Alabama makers, but they have fallen through. The forge-iron furnaces are doing next to nothing. No. 2X foundry may be quoted \$16 at furnace.

Steel Billets—No important transactions have grown out of the reduction in billets.

Bars—The recent concessions have not stimulated business. The usual quotation is 1.40c., which in some cases is understood to mean the delivery price. The small mills run regularly so far as they do run. Consumers generally are out of iron.

Sheets—The conditions which have prevailed for several weeks continue, and very little change is probable before autumn.

Old Material—Heavy steel scrap continues in the lead, and all other kinds are dragging.

Pittsburg

June 30—The close of the second quarter finds conditions in the iron and steel trade duller than at any time since the opening of the year. There is no new business of any consequence going in any of the finished lines or in pig iron. All the plants of the Republic Iron and Steel Company will close at midnight tonight and no date has been fixed for resumption. The company operates one large steel plant on a non-union basis, but its 11 iron plants have been for years governed by the annual wage scale of the Amalgamated Association of Iron, Steel and Tin Workers. This year the company refused to make a settlement with the Amalgamated, except under terms that the men would not accept. If the company attempts to operate its iron mills on a non-union basis the officers of the workers' organization promise a stiff fight. The independent iron mills in the Pittsburg district are running about as usual and will continue. The Western Bar Iron Association, which includes the independent concerns, has a continuing agreement with the Amalgamated Association which permits the plants to operate under the present scale pending negotiations. A conference will be held in Detroit on July 7. The Homestead works of the Carnegie Steel Company are running nearly to capacity and its other mills in this district are in satisfactory operation.

The wage conference between the American Sheet and Tin Plate Company and the Amalgamated Association closed last night with a settlement. The reduction in the tinplate scale is less than 5 per cent. The cut in sheets averages about 2 per cent.

Pig Iron—The largest sale of pig iron noted this week was 200 tons of off bessemer iron which went at $15.75, Valley. There were a number of sales of carload lots. Prices for delivery during the second half are as follows: Standard bessemer, $16@16.25; malleable bessemer, basic and No. 2 foundry, $15.25@15.50; gray forge, $14@14.25, all at Valley furnaces.

Steel—Billets are $25, Pittsburg, but there is no buying. Plates are 1.60c. and steel bars, 1.40c.

Sheets—The market is fairly active for a dull period. Prices remain at 2.50c. for black and 3.55c. for galvanized sheets, No. 28 gage.

Ferro-Manganese—A few sales for prompt shipment have been made at $46@46.50; for later delivery $1 a ton more is quoted.

Foreign Iron Trade

British Iron Trade—Exports of iron and steel and their products from Great Britain for the five months ended May 31 valued by Board of Trade returns as follows:

	1907	1908	Changes
Iron and Steel.	£19,965,386	£16,462,713	D. £3,502,673
Machinery	8,867,620	9,473,629	I. 606,009
New Ships	4,689,095	3,908,026	D. 781,069
Total	£33,522,101	£29,844,368	D. £3,677,733

The total quantity of iron and steel was 2,300,322 long tons in 1907 and 1,791,023 in 1908; decrease, 509,309 tons. Exports of pig iron to the United States were 16,811 tons, a decrease of 245,458 tons; of tinplates, 20,722 tons, an increase of 1200 tons.

Imports of iron and steel, and of machinery into Great Britain for the five months were:

	1907.	1908.	Changes.
Iron and steel.	£ 2,691,815	£ 3,051,828	I. £ 360,013
Machinery ...	1,767,894	2,325,380	I. 557,486
Total.... ..	£ 4,459,709	£ 5,377,208	I. £ 917,499

The total quantities of iron and steel were 342,366 tons in 1907, and 420,887 in 1908; an increase of 78,521 tons.

Imports of iron ores into Great Britain for the five months were 3,302,695 tons in 1907, and 2,402,147 in 1908; a decrease of 900,548 tons. Of the 1908 imports, 1,794,038 tons were from Spain.

Metal Market

Gold and Silver Exports and Imports

NEW YORK. [illegible]

At all United States Ports in May and Year.

Metal	Exports	Imports	Excess
Gold			
May 1908.	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended June 27: Gold, $79,810, chiefly to the West Indies; silver, $990,054, to London and Paris. Imports: Gold, $135,485, from Central and South America; silver, $13,752, from Mexico.

Specie holdings of the leading banks of the world June 27, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$316,670,200
England..	$197,023,065	....	197,023,065
France........	630,278,435	$189,219,505	819,497,940
Germany.	200,230,000	83,065,000	283,295,000
Spain........	78,050,000	134,250,000	212,300,000
Netherlands. ..	38,515,500	21,327,000	59,842,500
Belgium.... ..	20,763,335	10,376,665	31,140,000
Italy..........	181,160,000	21,500,000	202,660,000
Russia	659,135,000	38,255,000	697,390,000
Aust. Hungary.	234,000,000	66,695,000	300,695,000
Sweden....	19,430,000	....	19,430,000
Norway........	7,265,000	. ... .	7,265,000
Switzerland....	17,965,000	....	17,965,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE

June	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	June-July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
25	4.8695	54[illegible]	25[illegible]	29	4.8695	54	24[illegible]
26	4.8695	54[illegible]	25	30	4.8[illegible]	[illegible]	24[illegible]
27	4.8700	53[illegible]	24[illegible]	1	4.8[illegible]	5[illegible]	24[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to June 18:

	1907	1908	Changes
India	£5,867,244	£[illegible]	D. £[illegible]
China	.	[illegible]400	I. [illegible]
Straits	505,362	[illegible]	D. [illegible]
Total	£6,372,606	£[illegible]	D. £[illegible]

Receipts for the week were £5000 from the West Indies and £182,000 from New York; total, £187,000. Exports were £127,500 to India.

The silver market has reacted rather sharply the past week, on cessation of the active demand for the Indian bazaars; closing at 24 11/16d. in London.

Indian Exchange has revived a little, and for the first time in several weeks there were 10 lakhs of Council bills offered in London this week. The bills were all taken at 15.91d. per rupee.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS

	Copper			Tin	Lead	Spelter	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	12¾ @1[illegible]	12[illegible] @12[illegible]	[illegible]	[illegible]	4.4[illegible] @4[illegible]	4.45 @4[illegible]	4.[illegible] @4.[illegible]
26	12¾ @12[illegible]	12½ @12[illegible]	5[illegible]	27[illegible]	4.45 @4[illegible]	4.45 @4[illegible]	4.30 @4[illegible]
27	12¾ @12[illegible]	12½ @12[illegible]	[illegible]	27[illegible]	4.42½ @4.4[illegible]	4.4[illegible] @4[illegible]	4.[illegible] @4[illegible]
29	12[illegible] @12[illegible]	12[illegible] @12[illegible]	5[illegible]	27[illegible]	4.4[illegible] @4.45	4.4[illegible] @4[illegible]	4.[illegible] @4[illegible]
30	12[illegible] @12[illegible]	12[illegible] @12[illegible]	[illegible]	27[illegible]	4.42½ @4.4[illegible]	4.45 @4[illegible]	4.30 @4[illegible]
1	12[illegible] @12[illegible]	1[illegible] @12[illegible]	[illegible]	27[illegible]	4.42½ @4.4[illegible]	4.4[illegible] @4[illegible]	4.[illegible] @4.[illegible]

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.'s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The stagnation reported last week was short-lived. The discouraging advices received from Europe induced holders to reduce their prices, whereupon a heavy demand for home trade developed, resulting in relatively larger transactions than for some time past. Domestic consumers appear now to be in the frame of mind which was experienced in the case of European buyers late last year, in so far as they are willing to anticipate their requirements, feeling that prices cannot possibly recede very much from the present level. It is, therefore, expected that on every slight concession heavy purchases will be made. The market closes uncertain at 12⅝@12¾c. for Lake copper; 12½@12⅝c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 12¼@12⅜ cents.

The standard market in London has shown a declining tendency throughout the week. The lower prices have not encouraged new speculation and the close is weak at £56 5s. for spot, £57 for three months.

Statistics for the second half of June [illegible]

Refined and manufactured sorts we quote: English tough, £59 10s.@£60 10s.; best selected, £59 10s.@£60 10s.; strong [illegible]

Exports of copper from New York and Philadelphia for the week were 3330 long tons. Our special correspondent gives the exports from Baltimore at 2980 long tons.

Manufactured Copper—Sheets, cold rolled, 18c.; hot-rolled, 17c. Wire, 14¾c. base.

Tin—The London market has again been suffering from almost an entire absence of interest on the part of American buyers. While during the latter half of last week it showed quite a steady tone, it has become weak at this writing. The close is cabled at £124 7s. 6d. for spot, £125 7s. 6d. for three months.

The domestic market anticipated somewhat the decline in London, and transactions among dealers took place at somewhat below the import figures. Consumers continue to be indifferent toward this metal, and the quotation for spot at the close is about 27¼ cents.

Statistics for the month of June show a decrease in the visible supplies of 1500 tons.

Lead—Speculators who bought heavily at the lower prices which ruled some time ago, and who have now to take delivery of the quantities sold them, have been anxious to unload. Buyers are quick to realize this, and business could only be induced at concessions in prices. The close is lower at 4.42½@4.45c. New York.

Forced sales in the London market have established a lower level, and the close is cabled at £12 6s. 3d. for Spanish lead, £12 8s. 9d. for English lead.

Spelter—Business continues of a retail character, and the market has eased off further to 4.30@4.35c. St. Louis. 4.45@4.50c. New York.

Reports from Europe are very discouraging and prices again close lower at £18 5s. for good ordinaries, £19 for specials.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—There have been a few small sales by dealers who are tired of holding out for higher prices. The manufacturers are indifferent and are not buying. Prices are 8⅝@8¾c. for Cookson's, 8¼@8½c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Foreign metal is offered at rather lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic, and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—The market is without life and prices remain unchanged at $23.50 per oz. for hard platinum, $21 for ordinary and $16 for scrap.

Missouri Ore Market

Joplin, Mo. June 27—The highest price paid for zinc ore was $37.75 per ton, the base price ranging from $33 to $35.50 per ton of 60 per cent. zinc. Average price all grades $32.04.

The highest price paid for lead ore was $66 per ton f.o.b. Galena, medium grades selling at $62 to $64 per ton, and all grades averaging $62.08.

As will be seen by the assay base quotation there was an advance of $2 per ton on the medium and lower grade ores, and this was quite general, though the increased sales of silicate prevented the average price being proportionately advanced.

Following are the shipments from the district for the week ending June 27, and the total for the first half of 1908:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,725,650	1,026,570	$92,460
Joplin	1,503,350	236,950	32,763
Galena	608,640	582,660	28,383
Alba-Neck	725,300	......	12,693
Badger	716,640	15,240	12,671
Duenweg	439,670	47,170	8,544
Aurora	559,750	......	8,388
Granby	240,000	100,000	6,600
Carthage	375,430	......	6,570
Prosperity	390,210	2,450	6,321
Miami	296,630	......	4,543
Spurgeon	172,600	72,880	4,059
Quapaw-Baxter	125,890	62,730	3,895
Zincite	121,970	9,530	2,307
Sarcoxie	72,010	......	1,152
Oronogo	52,030	1,130	774
Carl Junction	44,880	......	763
Wentworth	54,940	......	727
Totals	10,275,190	2,157,310	$233,613
Six months	240,270,680	37,267,240	$5,084,582

Zinc value, the week, $164,631; 6 months, $4,089,441
Lead value, the week, 68,982; 6 months, 995,141

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	32.07	June	73.66	60.48
July	45.79	......	July	58.18	......
August	43.22	......	August	59.54	......
September	40.11	......	September	53.52	......
October	39.83	......	October	51.40	......
November	35.19	......	November	43.40	......
December	30.87	......	December	37.71	......
Year	43.68	......	Year	68.90	......

Wisconsin Ore Market

Platteville, Wis., June 27—The highest price paid for zinc ore this week was $35, the base price advancing to $34 per ton of 60 per cent. zinc. Lead ore sold as high as $62 per ton.

Shipments for week ended June 27:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Hazel Green	502,000	....	....
Platteville	294,700	....	167,600
Benton	238,580	79,600	....
Highland	195,700	43,080	....
Livingston	130,000	....	....
Days Siding	88,000	88,000	....
Linden	74,070	....	....
Cuba City	69,500	178,370	....
Harker	56,810	....	....
Dodgeville	42,000	80,000	....
Elmo	....	62,300	....
Total	1,691,360	531,350	167,600
Year to June 27	42,905,445	5,045,725	481,930

Hazel Green, not reported last week, shipped then 724,000 lb. zinc ore. In addition to the above there was shipped this week to the electrostatic separator at Platteville, from Benton, 230,200 lb.; from Dodgeville, 59,900 lb.; from Cuba City, 60,300 lb.; from Rewey, 60,400 lb.; from Linden, 49,200 lb. Shipped to the Enterprise roaster at Platteville, from Strawbridge, 188,200 lb.; and to the Joplin Separator Works at Galena, from Benton, 70,700 lb. zinc ore.

Chemicals

New York, July 1.—The general market is quiet, but this is to be expected at this season. It is believed in the trade that in August a firm market will prevail and hand-to-mouth buying will be superseded by substantial contracts. Dealers in clays and earths report fair business, and producers of pyrites have closed some large contracts.

Copper Sulphate—Demand is fair and some small shipments have been made. Standard goods remain at $4.65 per 100 lb. for carloads and $4.90 for smaller lots.

Nitrate of Soda—The market is quiet and business has been light, and for immediate delivery. Prices remain at 2.30c. for spot and 2.32½ for other positions of 1908.

Phosphate Rock—J. M. Lang & Co. report shipments of phosphate rock through the port of Savannah, Ga., at 9917 tons in May, 1908. Of these 7825 tons went to Germany and 2092 tons to England.

Mining Stocks

New York, July 1—The general stock markets have been quiet, not to say dull, with small fluctuations and rather a lower range of prices. Summer quiet seems to set in.

On the curb also, matters have been dull. A little activity in the copper shares soon ended, leaving them quiet. There was little change in prices though dealings were moderate.

A sale of Homestake, of South Dakota, was made June 27 on the Stock Exchange; 100 shares changing hands at $76 per share. On June 30 another sale was made at $76.50 per share.

The Anaconda Copper Company today declared the usual dividend of 50c. per share

Boston

June 30—A sharp advance in a few of the high grade copper stocks has been the feature in this market. Otherwise price changes are unimportant. Osceola has had the most marked advance, being up $11 for the week to $103. Of this advance, $5 occurred today. The dividend period is near and expectations are that there will be a resumption of dividends, of which there have been none for a year. Tamarack, another Bigelow stock, has also given an account of itself, being up $6.75 to $62.75, but with no dividend mentioned. Quincy also did well, advancing $2.50 to $87 on limited dealings. Calumet & Hecla is off $5 to $655 on very limited dealings. Copper Range and North Butte have, as usual, been the leaders in activity. The former is $1.50 higher for the week at $72.50. President Paine, who has just returned from the Copper Range, speaks rather discouragingly of the Globe tract on which $400,000 has been spent to date in putting down the shaft.

A little activity developed in some of the prospects, but it was short-lived. Elm River touched $1.62½, Mass $4.87½ and Wyandot $1.87½. Accompanying these advances were reports of expectations of striking the Lake lode.

On the curb Ahmeek, a Bigelow stock, rose $4 to $78.

Several payments due on the Davis-Daly property July 1 will be taken care of by the vendors. No plan has yet been formulated for a reorganization.

STOCK QUOTATIONS

NEW YORK June 30

Name of Comp.	Clg.
Alaska Mine	¼
Amalgamated	65[illegible]
Anaconda	41⅞
Balaklala	
British Col. Cop.	4¼
Butte & London	...
Butte Coalition	22¼
Colonial Silver	½
Cum. Ely Mining	7[illegible]
Davis Daly	1¾
Dominion Cop.	1[illegible]
Douglas Copper	3¾
El Rayo	2
Florence	3⅛
Foster Cobalt	41
Furnace Creek	.14
Giroux	3½
Gold Hill	[illegible]
Goldfield Con.	6[illegible]
Granby	†96¼
Greene Gold	[illegible]
Greene G. & S.	[illegible]
Greenw'r & D. Val.	75
Guanajuato	1¼
Guggen. Exp.	150
Hanapah	‡ 20
McKinley Dar.*	76
Micmac	2
Mines Co. of Am.	1[illegible]
Mitchell Mining	¼
Mont. Sho. C.	.74
Nev. Utah M. & S.	2[illegible]
Newhouse M. & S.	5
Nipissing Mines	7¼
Old Hundred	[illegible]
Silver Queen	1.03
Stewart	[illegible]
Tennessee Cop'r.	‡36
Tri-Bullion	1
Union Copper	¼
Utah Apex	4[illegible]
Utah Copper	33¼
Yukon Gold	3½

*Ex. Div. †Ex. Rights.

BOSTON June 30

Name of Comp.	Clg.
Adventure	3⅞
Allouez	28½
Am. Zinc	‡27¼
Arcadian	‡3¼
Arizona Com.	18
Atlantic	15
Bingham	‡ 25
Boston Con.	11¼
Calumet & Ariz.	108[illegible]
Calumet & Hecla	655
Centennial	‡23[illegible]
Con. Mercur	‡ 40
Copper Range*	72¼
Daly-West	10[illegible]
Franklin	9
Greene-Can.	10½
Isle Royal	19¼
La Salle	‡13[illegible]
Mass	‡4¼
Michigan	‡9½
Mohawk	58
Nevada	11
North Butte	66¼
Old Colony	25
Old Dominion	33½
Osceola	101
Parrot	22¼
Quincy	87
Rhode Island	3¾
Santa Fe	‡1[illegible]
Shannon	14½
Superior	16[illegible]
Tamarack	62[illegible]
Trinity	12[illegible]
United Cop. com.	17
U. S. Oil	24
U. S. Smg. & Ref.	‡34[illegible]
U. S. Sm. & Re., pd.	42¾
Utah Con.*	41
Victoria	4[illegible]
Winona	5
Wolverine	132
Wyandotte	‡1

‡Last quotation.

N. Y. INDUSTRIAL

Name of Comp.	Clg.
Am. Agri. Chem.	‡23[illegible]
Am. Smelt. & Ref.	75[illegible]
Am. Sm. & Ref. pf.	99[illegible]
Bethlehem Steel	‡13
Colo. Fuel & Iron	27
Federal M. & S., pf.	‡74½
Inter. Salt	18[illegible]
National Lead	65
National Lead pf.	99
Pittsburg Coal	‡12
Republic I. & S.	18
Republic I. & S. pf.	66½
Sloss-Sheffield	52
Standard Oil	600
U. S. Red. & Ref.	‡10
U. S. Steel	37⅞
U. S. Steel, pf.	102[illegible]
Va. Car. Chem.	22¼

BOSTON CURB

Name of Comp.	Clg.
Ahmeek	72
Black Mt.	‡4
East Butte	7[illegible]
Hancock Con.	‡1¼
Keweenaw	6
Majestic	.56
Raven	.85
Shawmut	.32
Superior & Pitts.	11
Troy Man.	1.40

ST. LOUIS June 27

N. of Com.	High	Low
Adams	.30	.29
Am. Nettie	.03	.02
Center Creek	2.00	1.[illegible]
Cent. C. & C.	70.00	[illegible]
C. C. & C. pd.	79.00	77.00
Cent. Oil	110.00	1[illegible]
Columbia	4.00	3.00
Cons. Coal	18.00	16.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.1[illegible]
St. Joe	15.00	1[illegible]

LONDON July 1

Name of Com.	Clg.	
Dolores	£1 11s	3d
Stratton's Ind.	0 1	[illegible]
Camp Bird	0 13	0
Esperanza	1 9	0
Tomboy	1 11	3
El Oro	1 6	9
Oroville	0 10	7½

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS July 1

Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.13
Belcher	‡ .20	St. Ives	.24
Best & Belcher	‡ .40	Triangle	.03
Caledonia	‡ .06	**BULLFROG STOCKS**	
Chollar	‡ .05	Bullfrog Mining	.03
Comstock	.30	Bullfrog Nat. B.	.04
Con. Cal. & Va.	‡ .49	Gibraltar	.04
Crown Point	‡ .24	Gold Bar	.03
Exchequer	‡ .12	Homestake King	.31
Gould & Curry	‡ .11	Montgomery Mt.	.06
Hale & Norcross	‡ .16	Mont. Shoshone C.	.68
Mexican	‡ .35	Original Bullfrog	.01
Ophir	‡2.40	Tramp Cons.	.14
Overman	‡ .06	**MANHAT'N STOCKS**	
Potosi	‡ .10	Manhattan Cons.	.08
Savage	‡ .23	Manhat'n Dexter	.05
Sierra Nevada	‡ .17	Jumping Jack	.04
Union	‡ .27	Stray Dog	.03
Utah	.	**MISCELLANEOUS**	
Yellow Jacket	‡ .49	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.05
Belmont	.84	Lee Gold Grotto	...
Extension	.66	Nevada Hills	1.50
Golden Anchor	.01	Nevada Smelting	.75
Jim Butler	.22	Pittsburgh S. Pk.	1.08
MacNamara	.33	Round Mt. Sphinx	.26
Midway	.36		
Montana	1.42		
North Star	.06		
Tonopah Mine of N.	7.50		
West End Con.	.54		
GOLDF'D STOCKS			
Adams	.03		
Atlanta	.16		
Booth	.15		
Columbia Mt.	.13		
Comb. Frac	.54		
Cracker Jack	.04		
Dia'dfield B. B. C.	.16		
Goldfield Belmont	.14		
Goldfield Daisy	.80		
Great Bend	.25		
Jumbo Extension	.30		
Katherine	...		
Kendall	.13		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.17		
Roanoke	.		
Sandstorm	.23		

COLO. SPRINGS June 27

Name of Comp.	Clg.
Acacia	5[illegible]
Black Bell	....
C. C. Con.	3
Dante	‡7
Doctor Jack Pot	6⅝
Elkton	56[illegible]
El Paso	35
Findlay	24
Gold Dollar	6
Gold Sovereign	3
Isabella	31
Index	....
Jennie Sample	3
Jerry Johnson	4[illegible]
Mary McKinney	28
Pharmacist	‡3¼
Portland	1.06
Un. Gold Mines	4
Vindicator	‡85
Work	8[illegible]

Assessments

Company	Delinq.	Sale.	Amt.
Birchville, Cal.	June 20	July 11	$0.02
Bullion, Nev.	June 25	July 17	0.[illegible]
Butler-Liberal, Utah	July 17	Aug. 6	0.02
[illegible], Nev.	July 8	July 30	0.10
Con. Imperial, Nev.	June 17	July 9	0.01
Con. Virginia, Nev.	June 12	July 3	0.25
Confidence, Nev.	June 10	June 30	0.20
Lead King, Utah	May 1	May 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev.	June 30	July 2[illegible]	0.01
[illegible], Utah	June 24	July 15	0.02
N. Y. [illegible], Utah	June 9	July 30	.02
[illegible], Cal.	July 16	Aug. [illegible]	[illegible]
Overman, Nev.	June 19	July 1[illegible]	[illegible]
Peruvian Con., Utah	June 22	July 7	[illegible]
Silver King [illegible], Utah	June 11	July 30	[illegible]
Spanish Ridge, Cal.	June 1	July 1	0.05
Tomahawk, Nev.	Julp 10	Aug. 12	[illegible]
Tonopah North Star, Nev.	June 24		[illegible]
Union Con., Nev.	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month	New York 1907	New York 1908	London 1907	London 1908
January	[illegible]	[illegible]	31.769	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]
April	65.462	54.505	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	68.144	..	[illegible]	.
August	68.745	..	31.637	.
September	[illegible]		31.313	....
October	[illegible]		28.863	.
November	58.677	..	27.[illegible]	..
December	54.565	.	25.[illegible]	.
Year	65.327		30.188	..

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK Electrolytic 1907	NEW YORK Electrolytic 1908	NEW YORK Lake 1907	NEW YORK Lake 1908	LONDON 1907	LONDON 1908
January	24.404	13.726	24.825	13.901	106.739	62.[illegible]
February	24.869	12.905	25.[illegible]	13.098	107.[illegible]	[illegible]
March	25.065	12.704	25.[illegible]	12.[illegible]	106.[illegible]	58.761
April	24.224	12.743	25.[illegible]	12.[illegible]	98.625	58.[illegible]
May	24.048	12.[illegible]	25.072	12.[illegible]	102.[illegible]	[illegible]
June	22.695	12.[illegible]	24.140	12.[illegible]	97.272	57.842
July	21.130	...	21.923		95.016	
August	18.356	...	19.255		79.[illegible]	
September	15.565	...	16.047		68.375	
October	13.169	...	13.551		60.717	
November	13.391	....	13.870		61.[illegible]	
December	13.163	...	13.393		60.113	
Year	20.004	...	20.661		87.007	.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	..
February	42.102	28.978	August	37.[illegible]	.
March	41.313	30.577	September	36.[illegible]	.
April	40.938	31.702	October	32.[illegible]	
May	43.149	30.015	November	30.833	...
June	42.120	28.024	December	27.923	.
			Av. year	38.166	..

Prices are in cents per pound.

LEAD

Month	New York 1907	New York 1908	London 1907	London 1908
January	6.000	3.691	19.[illegible]	14.[illegible]
February	6.000	3.725	19.631	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.[illegible]	19.[illegible]	[illegible]
June	5.[illegible]	4.406	20.188	[illegible]
July	5.[illegible]		20.[illegible]	
August	5.[illegible]		19.063	
September	4.[illegible]		1[illegible]	.
October	4.[illegible]		18.531	.
November	4.[illegible]		17.281	.
December	3.[illegible]		14.[illegible]	
Year	5.325		[illegible]	.

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1907	New York 1908	St. Louis 1907	St. Louis 1908	London 1907	London 1908
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	6.441	4.[illegible]	6.291	4.[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]		[illegible]		[illegible]	
August	5.701		[illegible]		[illegible]	
September	5.236		[illegible]		[illegible]	
October	5.430		[illegible]		[illegible]	
November	4.[illegible]		4.[illegible]		[illegible]	
December	4.[illegible]		4.[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, good drill quality, carat..		$85.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum,	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05¾@.06
Emery, in kegs: Turkish flour	"	.01¾@.02½
Grains	"	.03½@.04½
Naxos flour	"	.01¾@.02½
Grains	"	.03½@.04½
Chester flour	"	.01½
Grains	"	.03½@.04½
Peekskill, f.o.b. Easton, Pa., flour	"	.01¼@.01½
Grains, in kegs	"	.02¼@.02½
Garnet, per quality,...	ton	25.00@35.00
PumiceStone, Am. Powd.	100 lb.	1.60@2.00
Italian, powdered	"	.01¼@.01½
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.02¼@.04½
Lump, per quality	"	.05@.25
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.026@.03
Boric	"	.08@.08¼
Hydrofluoric, 30%	"	.02¾@.03
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb		1.25@1.50
Nitric acid, 38°	per lb.	4.25@4.62½c.
Sulphuric acid, 50°, bulk, per ton..		$12 up.
60°, 100 lb. in carboys		.85@1.12½
60°, bulk, ton.		16.00@18.00
66°, 100 lb. in carboys		1.00@1.25
66°, bulk, ton		18.00
Oxalic	"	.07@.07¼
ALCOHOL—Grain 95%	gal.	2.63
Denatured		.39@.45
Refined wood, 95@97%	"	.41@.47
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	lb.	.05½@.06
ALUMINUM—Sulphate, com'l.	"	1.10@1.75
AMMONIA—24 deg. lb		.04½@.05½
" 26 " "		.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.07⅝@.08
Muriate grain	"	.05¾@.06⅛
Lump	"	.09¼@.09½
Sulphate, 100 lb		3.05@3.10
Sulphocyanide com	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lump lb..		.03¼@.04
ARSENIC—White	"	.03¼@.03½
Red	"	.07½@.07¾
ASPHALTUM—		
Barbadoes	per ton	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.12@.14
Gilsonite, Utah ordinary	per ton.	35.00
Trinidad	"	28.00@30.00
California	"	21.00@27.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated, 96@98%		31.50@35.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	38.00@40.00
Nitrate, powdered, in casks	lb.	.05½@.06
Blanc Fixe	per lb.	.02¾
BARYTES—		
Am. Ground	sh. ton.	14.00@21.00
Floated	"	22.00
Foreign floated	"	19.50@22.50
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%,	100 lb.	1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb		4.65
BONE ASH	lb.	.02¾@.04
BORAX	"	.04½@.05¼
CALCIUM—Acetate, gray,	100 lb.	2.00@2.05
Acetate, brown	"	1.25@1.30
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y	"	11.00@14.00
CEMENT—		
Portland, Am. 500 lb.	bbl.	1.55@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	17.50@20.00
Bricks, f.o.b. Pittsburg, M..	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y	"	8.50@9.00
Foreign	"	10.60@17.50
COBALT—Oxide	lb.	1.45
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06¼@.06¾
FELDSPAR—Ground best.	sh. ton.	10.50@15.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis No. 1	"	18.00
" No. 2	"	15.00
Extra	"	20.00@23.00
FIRE CLAY—F. o. b. St. Louis.		
St. Louis, extra quality	per ton	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	11.50@13.50
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump,	100 lb.	.75@.85
Powdered	"	.75@.85
GRAPHITE—Ceylon		
Flying dust, finest to best...	lb.	.01@.04
Dust	"	.01¾@.05
Chip	"	.02¾@.07½
Lump	"	.04@.10
Large lump	"	.07@.10
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	sh. ton.	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. best	lb.	.01¾
French	lg. ton.	56.00
German	lb.	.02½@.02⅝
LEAD—Acetate (sugar of) brown	lb.	.07¾
Nitrate, com'l	"	.08¼@.08¾
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	8.00@10.00
Calcined, powdered	sh. ton.	30.00@40.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.80@1.00
Sulphate (Epsom salt)...	100 lb.	.85@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	18.00@40.00
MARBLE—Flour	sh. ton.	8.50@10.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up.
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained..		.47
Sulphate, single	lb,	.09@.11
" double	"	.06½@.08
NITRATE OF SODA—100 lb. 95% for '08		2.30
95% for 1909		2.30
95% for 1910		2.32½
96% is 5c higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.06¼@.06¾
English glassmakers'	"	.08¼@.08½
Lithopone	"	.03¾@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.26
Red lead, American	"	.06½@.06¾
Foreign	"	.08¼@.08½
Turpentine, spirits bbl.,	per gal.	.43
White lead, Am., dry	lb.	.05⅝@.06
American, in oil	"	.06½@.06¾
Foreign, in oil	"	.10⅛@.10⅜
Zinc white, Am. extra dry..	"	.05⅛@.05⅜
French, red seal, dry	"	.08¼@.08½
" Green seal, dry..	"	.10½@.10¾
PHOSPHATES—Acid		60c per unit
*Fla., hard rock		9.50@10.00
land pebble 68%		4.00@4.25
†Tenn, 78@80%		6.00@6.50
75%		4.50@5.00
68@72%		4.00@4.25
‡So. Car. land rock		6.75@7.00
" " river rock		7.00@7.25

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated..	"	.09@.09½
Bichromate, Am	"	.08⅝@.09
Scotch	"	.10½
Bromide	"	.15@.17
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.04½@.05½
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb..		1.90
Chlorate, powdered	"	.09¼@.09¾
Crystals	"	09@09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	.09½@.10
Prussiate, yellow	"	.14@.14½
Red	"	.32@.36
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported non-arsenical, furnace size, per unit		.12½@.13
Imported, arsenical, furnace size, per unit		.12@.12½
Imported fines, arsenical, per unit.		.08½@.09
" " non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.18
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.50@5.00
Refined, crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry	lg. ton	10.00@15.00
Silex	"	13.00@40.00
Lump Quartz	"	5.00@6.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.36@.39
SODIUM—		
Acetate	lb.	.04¼@.04¾
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.10@1.40c.
Soda, caustic, per 100 lb., 76/60...		1.75@1.85
" " powdered		.02¾@.03½
Salt cake, per 100 lb, bulk		.40
" " bbl		.65@.85
Soda, monohydrate, per lb		1.4@1.75c.
Bichromate	lb.	.07⅛@.07½
Bromide	"	.15@.17
Chlorate. com'l	"	.09@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am	"	1.35 up
German	"	1.60@1.70
Phosphate	100 lb.	2.10@2.30
Prussiate	"	.08¾@.09¼
Sal soda, f.o.b. N. Y	100 lb.	.65@.70
Foreign, f.o.b. N. Y	"	.80@1.00
Silicate, com'l	100 lb.	.80@1.15
Sulphate, com'l, (Glauber's salt)	100 lb.	.60@.75
" " calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07¾@ 8½
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton	22.00
To Philadelphia or Baltimore	"	22.00
Roll	100 lb.	1.85@2.15
Flour	" "	2.00@2.40
Flowers, sublimed	" "	2.20@2.60
TERRA ALBA—French & Eng.	100 lb.	.65@1.00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	16.00@25.00
Italian, best	"	35.00@40.00
TIN—Bi-chloride, 50%	lb.	.08¾
Crystals	"	.18⅛ up
Oxide, lb		.33@.35
URANIUM—Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02¼
Chloride, granular	"	.04½@.06
Dust	"	.05@.05½
Sulphate	"	2.15 up

NOTE These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract

THE MINING INDEX.

The editors of this paper read all the [illegible] erals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ANTIMONY

6576 ANTIMONY SULPHIDE—Purity and Volatility of Precipitated Antimony Sulphide. Lewis A. Youtz. (Journ. Am. Chem. Soc., June, 1908; 17 pp.) Results of experiments taken up to discover whether pure antimony trisulphide could be obtained by precipitation by hydrogen sulphide, the volatility of the product of precipitation coming up incidentally in the course of the work. 80c.

6577 ELECTROLYTIC DETERMINATION—Zur Elektroanalytischen Bestimmung des Antimons. O. Scheen. (Zeit. f. Elektrochem., May 8, 1908; 6½ pp.) Discusses previous methods, and their theoretical aspects; describes a new method and the special apparatus required, and tabulates comparative results. 40c.

BAUXITE

6578 COMPOSITION—The Nature of Bauxite. (Eng. and Min. Journ., May 30, 1908; ¾ p.) A short review of the history of the discovery of bauxite and an outline of the various opinions as to its nature and composition. 20c.

BISMUTH

6579 ELECTROLYTIC DETERMINATION of Bismuth. F. J. Metzger and H. T. Beans. (Journ. Am. Chem. Soc., April, 1908; 3½ pp.) The addition of boric acid to the bath has a decided effect on the character of the deposit, and in addition, it serves to bring about the complete solution of bismuth hydroxide without the addition of very large quantities of acetic acid. 80c.

CEMENT

6580 COMPOSITION OF CEMENT—Ein Studienplan für die weitere Erforschung der hydraulischen Bindemittel. K. Zulkowski. (Stahl u. Eisen, May 13, 1908; 3 pp.) A discussion of the chemical composition of Portland cement. To be concluded. 40c.

6581 CONVEYING MACHINERY in the Portland Cement Plant. C. J. Tomlinson. (Proc. A. S. M. E., June, 1908; 4 pp.) A study of this machinery with a view to deciding on a more economical or intelligent use of the same, especially under present conditions, where capacities are increased and the duties heavier and more exacting.

COAL AND COKE

6582 ANALYSIS—Determination of the Value of Coal for Steaming Purposes. Richard K. Meade. (Min. Sci., May 21 and 28, 1908; 2½ pp.) A continuation of the description of the method employed in the analysis of coal in determining its heating qualities, with formulas and terms of expression. 40c.

6583 ANKYLOSTOMIASIS—"Miners' Anemia." A Resume of European Experiences. Francis William Gray. (Journ. Min. Soc. of Nova Scotia, Vol. XI, 1908; 22 1-3 pp.) Notes on this disease written from the standpoint of the mining engineer.

6584 ARTIFICIAL FUEL—[illegible] Fuel from Refuse. Herbert G. Coales. (Eng. Rev., June, 1908; 3 pp.) The article deals with the conversion of refuse from ash bins into fuel. 40c.

6585 AUSTRALIA—Coalfields and Collieries of Australia—IX and X. F. Danvers Power. (Aust. Min. Stand., April 15 and 22, 1908; 2 pp.) These comments [illegible] conditions in South Australia, Western Australia and Tasmania. [illegible]

6586 AUSTRALIA—Coalfields and Collieries of Australia—XI. F. Danvers Power. (Aust. Min. Stand., May 6, 1908; [illegible]) Continuation of the article on the coalfields and collieries of Australia [illegible] with the positions and [illegible] that may be employed at a [illegible]. To be continued. 40c.

6587 AUSTRALIA—Coalfields and Collieries of Australia—XII. F. Danvers Power. (Aust. Min. Stand., May 6, 1908; 2 pp.) Continuation of the article on the coalfields and collieries of Australia. This number deals largely with the shipping facilities at various ports. Illustrated. To be continued. 40c.

6588 BRAZIL—The Coal of Southern Brazil. B. J. Dos Santos. (Min. Journ., May 30, 1908; [illegible] p.) Goes into the geology of the coal-bearing formations and describes the coals of several different districts. 40c.

6589 BRIQUETTING—Binders for Coal Briquets. James E. Mills. (U. S. Geol. Surv. Bull. 343, 1908; 51 pp.) A complete and comprehensive discussion of all phases of this important subject, based upon investigations made at the fuel-testing plant, St. Louis, Mo.

6590 BRIQUETTING—The Coal Briquet Plant at Bankhead, Alberta, Canada. Edward W. Parker. (Bi-Monthly Bull. A.I.M.E., May, 1908; 7¼ pp.) Describes the two units of the plant, and goes into the details of the operations; illustrated.

6591 BRITISH COALFIELD—The Kent Coalfield. (Min. Journ., May 23, 1908; 1 p.) Discusses the geology and early work done in County Kent, England, and describes some of the collieries; illustrated. 40c.

6592 BRITISH COLUMBIA—The Telkwa River and Vicinity, B. C. W. W. Leach. (Geol. Surv. of Can., 1907; 23 pp. 1 map.) A description of the topography, transportation, timber, geology and coal at Telkwa river and vicinity, British Columbia.

6593 COAL MINING—Special Methods for Mining Coal in England. George Raylton Dixon. (Eng. and Min. Journ., June 13, 1908; 3 1-3 pp.) Modifications of standard plans to suit special conditions. Details of an economical system of pony haulage. 20c.

6594 COAL MINING—The Longwall Method of Working in England. George Raylton Dixon. (Eng. and Min. Journ., June 6, 1908; 3½ pp.) Sets forth the advantages of the system and gives details of operation and plans for supporting the roof; goes into the rate of pay for miners; illustrated. 20c.

6595 COAL MINING—Working a Coal Seam of Moderate Thickness. George Raylton Dixon. (Eng. and Min. Journ., June 20, 1908; 2 pp.) Describes [illegible] extracting pillars without causing crush and [illegible] little timber is lost. 20c.

6596 COAL MINING PLANT—The Koehler Coal Mine. Frank A. Young. (Mines and Min., June, 1908; 3½ pp.) Description of the St. Louis, Rocky Mountain and Pacific Company's new mine at Koehler, New Mexico, the systems of mining, haulage, ventilation and the tipple; illustrated. 20c.

6597 COAL MINING PLANT—The Boissevan Plant of the Pocahontas Consolidated Collieries Co. (Mines and Min., June, 1908; [illegible]) [illegible] the Pocahontas Consolidated Collieries Company, Inc., at Boissevain, Va., surface arrangements, method of mining, transportation, etc.; illustrated. 20c.

6598 COAL WASHER—[illegible] water instead of having the water agitated [illegible]

6599 DETERIORATION [illegible] weathering processes, but rather to the simple [illegible]

6600 DETERIORATION—Weathering [illegible] May 15, 1908; 1 p.) Discusses the variations in the composition, structure and nature of [illegible]

6601 ELECTRIC EQUIPMENT—Modern Electric Coal Mining Equipment. Frank C. Perkins. (Min. Wld., June 13, 1908; 1 1-3 pp.) Describes the installation of electric power in the operation of a modern coal mine, illustrated with photographs. 20c.

6602 EXPLOSION at the Mines of the Compania Carbonifera de Sabinas. Manuel [illegible] pp.) Describes conditions existing at the mines of Compañia Carbonifera de Sabinas, at Rosita, Mex., gives the probable cause of the explosion, and sets forth the measures which have been adopted for the prevention of similar accidents; illustrated. 20c.

6603 EXPLOSION—Notes on the Monongah Explosion. James Ashworth. (Mines and Min., June, 1908; [illegible]) [illegible] ideas suggested by the lay-out of the mine and methods of blasting, and discusses the watering of dust and explosions from air [illegible]

6604 EXPLOSION—Report of the French State Commission on the Courrières Explosion of the 10th March, 1906. (Can. Min. Journ., [illegible]) [illegible] conditions existing before the catastrophe, [illegible] the steps to be taken as a result of this explosion in order to prevent similar occurrences. 20c.

6605 FORMATION OF COAL—Some Problems of the Formation of Coal. David White. (Econ. Geol., June-July, 1908; 27 pp.) The formation of coal is considered from the standpoint of the geologist and paleontologist, and the need of further field ob[illegible]

6606 PEAT as a Steam Fuel. W. C. Milne. (Can. Eng., June 5, 1908; ½ p.) Describes and discusses the different commercial forms in which peat is marketed. 20c.

6607 PEAT—[illegible] Peat Manufacture. Otto K. Zwingenberger. (Eng. Journ. of Can., June, 1908; 1¾ pp.) The method of manufacturing peat by the Ziegler [illegible] ing ovens are described. 20c.

6608 PERU—The Cerro de Pasco Coal and Coke Plant. A. B. Gullberg. (Min. Wld., [illegible]) [illegible] scribes the methods used by the Cerro de [illegible] in Peru. Extract from Bull. Am. Soc. of [illegible]

6609 PHILIPPINE ISLANDS—The Compostela-Danao Coal Field. Warren D. Smith. (Min. Wld., May 23, 1908; 1 p.) History of the coal mining industry in Cebu, [illegible] tions; illustrated. Extract from *Philippine* [illegible]

6610 PURCHASE AND [illegible] ter of coal, its purchas[illegible]

[illegible]

and prospects, localities worked for coal, transportation facilities, mapping of the field and general geology.

6612 SHOT FIRING — Group Electric Shot Firing. Sydney F. Walker. (Eng. and Min. Journ., June 20, 1908; 1½ pp.) It is pointed out that the uncertainty in group shot firing is due to the differences in the fuses themselves. 20c.

6613 SUBMARINE COAL MINES. John Johnstone. (Indus. Advocate, May, 1908; 1 p.) No attempt is made to deal with the many different phases which may present themselves, this paper dealing with the subject in a general way. 20c.

6614—WASTE OF MINERAL FUEL RESOURCES. I. C. White. (Eng. and Min. Journ., June 6, 1908; 2 1/3 pp.) Discusses the waste of natural gas and coal, and gives the probable duration of the Appalachian coal supply. 20c.

6615—WEST SCOTLAND — Reports of Mines Inspectors for 1907. (Iron and Coal Tr. Rev., May 22, 1908; ¾ p.) Gives the output of mineral in this district, and interesting and valuable data regarding machinery used, accidents, explosives, safety lamps, etc. 40c.

COPPER

6616—AMALGAMATED COPPER COMPANY. (Eng. and Min. Journ., June 6, 1908; ¾ p.) Abstract of the important parts of the report of this company for 1907. 20c.

6617—BRITISH COLUMBIA—Mining in the Boundary District of British Columbia. Frederick Keffer. (Iron and Coal Tr. Rev., June 5, 1908; 1 1-3 pp.) The mining operations and methods of handling ore in this district, which produces copper from exceedingly low-grade ore, is discussed. Illustrated with cross-sections of workings. Abstract of paper before Brit. Instn. of Min. Engineers. 40c.

6618—CALIFORNIA—Copper Deposits in the Western Foothills of the Sierra Nevada. William Forstner. (Min. and Sci. Press, May 30, 1908; 5½ pp.) A general description of the belt, with short descriptions of some of the deposits which emphasize the geological conditions; illustrated. 20c.

6619—CHEMISTRY IN COPPER AND BRASS INDUSTRIES—The Chemist's Relation to the Copper and Brass Industries, Ernest A. Lewis. (Journ. Soc. Chem. Ind., May 30, 1908; 3¼ pp.) States the position of the chemist in these industries, and discusses and points out the best methods of sampling fuel. copper, spelter, scrap metals, and etc. 80c.

6620—ELECTROLYTIC COPPER-REFINING INDUSTRY in 1907. John B. C. Kershaw. (Electrician, June 5, 1908; 1¼ pp.) The article contains an account of the production and price, the details of various works, new developments and processes. 40c.

6621—ELECTROLYTIC COPPER — The Production of Electrolytic Copper. J. Leeds Brown. (Mines and Mining, May 22, 1908; 1¼ pp.) Outlines the steps involved in the production of commercial copper from crude ore. 20c.

6622—ELECTROLYTIC REFINING—The Tank House and Copper Furnaces of the New Addition to the Raritan Copper Works. Frank D. Easterbrooks. (Electrochem. and Met. Ind., June, 1908; 5¼ pp.) A complete description of the construction and equipment of the tank house and copper furnaces in the new addition at this works; fully illustrated. 40c.

6623—OVERHEATED COPPER — Ueber Verbrennungs-, Ueberhitzungs- und Korrosionserscheinungen am Kupfer und an dessen Fabrikaten. W. Stahl. (Metallurgie, May 22, 1908; 3 pp.) Discusses the composition of overheated copper, its weaknesses, and a number of methods for counteracting them. 40c.

6624—PERU—Los Yacimientos cupriferos de Huitor (Cañete). J. J. Bravo. (Boletin de Minas, Lima, Peru, Apr. 10, 1908; 5 pp.) Describes the geology and the copper ore occurrences in the coastal region of Peru.

6625 — PRECIPITATION OF COPPER FROM MINE WATERS at Butte, Mont. Floyd Bushnell. (Min. Sci., June 4, 1908; 2 pp.) A history of the methods employed in recovering copper from solution in the water from the Butte copper mines and mills; illustrated. 20c.

6626—SMELTING—Modern Reverberatory Smelting of Copper Ore—I. C. Offerhaus. (Eng. and Min. Journ., June 13, 1908; 4 1/3 pp.) Describes the application of the reverberatory furnace for the reduction of ores. The latest furnace at Anaconda is shown in sectional plan and elevation together with many cross-sections illustrating its construction. Dimensions and details of furnace are given and its operation described. To be continued. 20c.

6627—SMELTING—Reverberatory Smelting of Copper Ore—II. C. Offerhaus. (Eng. and Min. Journ., June 20, 1908; 5 pp.) The second instalment of this article on the smelting of copper ores in reverberatory furnaces. It follows the charge from the time it is introduced into the furnace until the matte is tapped, and treats of the starting up of a reverberatory furnace. Illustrated. 20c.

6628—SOUTH AFRICA—Areachap Copper Mines. (So. African Min. Journ., May 16, 1908; 2 pp.) Description of the workings and geological features. This is another African copper mine, which, although very young, is expected to be a large producer eventually. 20c.

6629—SOUTH AFRICA—The Messina Copper Mine. (So. African Min. Journ., May 16, 1908; 1¼ pp.) Completion of the concentrating plant; ancient and modern methods; the scheme of treatment detailed. This is one of several copper mines in Africa for which a great future is predicted. 20c.

6630 — TASMANIA — Mining at Mount Lyell. R. C. Sticht. (Am. Min. Rev., June 6, 1908; ¾ p.) Method of mining, reduction work and metallurgical practice at this famous mine in Tasmania. To be continued. 20c.

GOLD AND SILVER

6631—ALABAMA—Notes on Some Gold Deposits of Alabama. H. D. McCaskey. (Geol. Surv., Bull. 340-A, 1908; 17 pp.) Discusses the geology of the district and describes the ore-bodies; gives the production of the different fields and describes some of them in detail.

6632—ALASKA—The Fairbanks and Rampart Quadrangles Yukon-Tanana Region, Alaska. L. M. Prindle. (U. S. Geol. Surv., Bull. 337, 1908; 102 pp.) This report is a second of a series on the Yukon-Tanana region, which extends westward from the international boundary between the Yukon and Tanana rivers to their confluence. The article treats of the descriptive and economic geology, and the various groups of placers in the district. Illustrated.

6633—ARIZONA—The Mineral Deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Ariz. F. C. Schrader. (Geol. Surv., Bull. 340-A, 1908; 31 pp.) A description of the region, its topography and drainage; discusses the orebodies and geology of the district in detail.

6634—ASSAYING—Experiments in Fire Assaying at the Redjang Lebong Mine, Sumatra. G. V. Hogenraad. (Journ. Chem. Met. and Min. Soc. of South Africa, April, 1908; 2 pp.) This is a discussion by J. E. Clennell of a previous paper upon the use of borax in the assay of gold and silver, in which discussion it is held that the loss of gold and silver is not due to the use of borax. 60c.

6635—BLACK SANDS—Beach Sands of the Pacific Coast. J. L. Mallery. (Northwest Min. Journ., May, 1908; 1½ pp.) This article contains notes on the economic treatment and value of the beach sands as a source of iron and platinum. 20c.

6636—BRITISH COLUMBIA—Nickel Plate Mine and Mill in British Columbia. C. Arthur Alphonson. (Min. Wld., May 30, 1908; 2¼ pp.) A complete history of this mine and the district in which it is situated with a description of both mine and mill; illustrated. 20c.

6637—CALIFORNIA—O'Hara Pocket Mine. (Min. and Sci. Press, June 6, 1908; ¾ p.) The ore occurs in pockets somewhat similar to those of the Bonanza mine near Sonora, Tuolumne County, California. 20c.

6638—REDUCTION OF GOLD CHLORIDE by Charcoal. D. Avery. (Journ. Soc. of Chem. Ind., Mar. 31, 1908; 2½ pp.) Recounts some attempts which were made to prepare charcoal free from all occluded reducing gases, so that the part played by the charcoal alone might be determined. 80c.

6639—COBALT—Notes on Cobalt's Past, Present and Future—I. and II. Alex. Gray. (Min. Wld., June 6 and 13, 1908; 4 pp.) Comments on the injustice done to mining interests by irresponsible criticism, and discusses geology, ore reserves, shipments and the possibilities for the future; illustrated. The second instalment compares the various shipping mines in the district, and mentions briefly the present conditions. 40c.

6640—COLORADO—Gold Placer Deposits near Lay, Routt County, Colo. Hoyt S. Gale. (Geol. Surv., Bull. 340-A, 1908; 12¼ pp.) Description and general geology of the district; takes up the distribution, character and origin of the auriferous deposits.

6641—COLORADO—Primary Gold in a Colorado Granite. John B. Hastings. (Bi-Monthly Bull. A. I. M. E., May, 1908; 6½ pp.) Discusses the gold occurrence in a large area of unconsolidated lake beds, situated about 10 miles from Hartsel, near Antelope Springs, in Park County, Colo.

6642—COLORADO—The Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., May 28, June 4 and 11, 1908; 5 pp.) Second, third and fourth articles of a series descriptive of the different mining camps, their geology, history, ores, methods of mining and ore treatment, dealing in the present instalments with the Cripple Creek district. 60c.

6643—CYANIDATION—Laboratory Methods Used in Modern Cyanide Mills. Clyde H. Jay. (West. Chem. and Met., May, 1908; 8 pp.) An article which gives information, most of which may be found in text books or papers, in such a concise and compact form that it will greatly aid the young engineer in readily taking up the work required in the laboratory of a cyanide mill. 60c.

6644—CYANIDATION—The Separation of Slime in Cyanide Treatment. Horace G. Nichols. (Min. and Sci. Press, April 25, 1908; 3½ pp.) Describes a process which first suggested itself in connection with the dewatering of tailing at a property in Central America; accompanied by sketches. 20c.

6645—CYANIDATION—Laboratory Tests on the Use of Coarse and Fine Lime for Cyaniding. W. J. Sharwood. (Journ. Chem. Met. and Min. Soc. of South Africa, April, 1908; 4½ pp.) Experiments to ascertain the rapidity with which commercial lime in various states of division would be dissolved when distributed through a charge of inert sand subjected to the action of percolating water or cyanide solution. 60c.

6646—CYANIDATION—The Chemistry of Silver Sulphide Cyanidation. W. A. Caldecott. (Eng. and Min. Journ., June 27, 1908; ½ p.) Abstract from paper read before the Chem., Met. and Min. Soc., of South Africa, March, 1908. 20c.

6647—ELECTRICAL EQUIPMENT of Gold Mines. H. J. S. Heather. (Inst. of Min. and Met., April 2, 1908; 15½ pp.) The transmission and distribution of electric power is described in connection with the electrical equipment of gold mines.

6648—GUANAJUATO—Résumé of Mine Operations for Six Months. (Mexican Min. Journ., June, 1908; ¾ p.) Some interesting facts and figures taken from the recent report of the Governor of Guanajuato to the State Legislature. 20c.

6649 HOMESTAKE MINE—Beneficio de minerales de Oro. I. D. Osso. (Boletin de la Soc. Nac. de Mineria, Feb., 1908; 10 pp.) Describes in great detail the operations and the results attained at the Homestake mine, South Dakota.

6650—KLONDIKE GRAVEL DEPOSITS—Report on Gold Values in the Klondike High Level Gravels. R. G. McConnell. (Geol. Surv. of Can., 1908; 34 pp., 1 map.) This report deals principally with the value still remaining in the bench and creek gravels, and especially in the important high level deposits known as the white Channel gravel.

6651—MEXICAN NOTES. Mark R. Lamb. (Min. and Sci. Press, May 23 and 30, 1908; 4½ pp.) A general discussion of conditions in silver mining, showing the contrast between the old and new arrangements of treatment plants; illustrated. 40c.

6652—MEXICO—The Ore Deposits of Santa Eulalia, Mexico. Claude T. Rice. (Eng. and Min. Journ., June 20, 1908; 4 1/3 pp. The occurrence in *mantas* and *abras*, and the prevalence of large open caves, is characteristic of this district in Chihuahua. The article describes this old Mexican district and is the result of the author's observations made recently. Illustrated. 20c.

6653 — MICROSCOPIC ANALYSIS. A Method of Analysis in Roasting Sulpho-Telluride Ores. William H. Davis. (West. Chem. and Met., May, 1908; 11 pp.) Describes the microscope work done at the Wano mine, near the northern boundary of the Boulder county telluride belt, about 45 miles northwest of Denver, Colo., where there is in operation a 50-ton dry-crushing, roasting, cyanide mill. 60c.

6654—MONTANA—Gold Deposits of the Little Rocky Mountains, Montana. William H. Emmons. (Geol. Surv., Bull. 340-A, 1908; 20 1-3 pp.) Goes into the history of development, geology, ore deposits, character of the ore, and gives a detailed description of some of the mines.

6655—NEVADA—Round Mountain, Nevada. George A. Packard. (Min. and Sci. Press, June 13, 1908; 2 pp.) Describes the geology and ore occurrence at this Nevada camp. 20c.

6656—NEVADA—Geology and Mineral Resources of the Osceola Mining District, White Pine County, Nev. F. B. Weeks, (Geol. Surv., Bull. 340-A, 1908; 16¼ pp.) Contains a general description of the Snake range, and goes into the physical features, general geology, history of development, mining, genesis of the ore and distribution of the mines in the Osdeola mining district.

6657—NEVADA—Goldfield, Nevada—I. T. A. Rickard. (Min. and Sci. Press, April 25, 1908; 3⅓ pp.) Contains many interesting facts about the early history of Goldfield. 20c.

6658—NEVADA—Goldfield, Nevada—II. T. A. Rickard. (Min. and Sci. Press, May 16, 1908; 3¾ pp.) Gives some historical data on the growth of Goldfield in which George Wingfield is the central figure. 20c.

6659—NEVADA—Goldfield, Nevada—III. T. A. Rickard. (Min. and Sci. Press, May 30, 1908; 1½ pp.) This number goes into the different scientific investigations of the district and discusses its geology; illustrated. 20c.

6660—NEVADA—Goldfield, Nevada—IV. T. A. Rickard. (Min. and Sci. Press, June 6, 1908; 3½ pp.) This is the fourth instalment of the article on Goldfield and its riches. It treats of the fabulously rich ore which has been found in this district, and the prevalence of "high grading." 20c.

6661—OREGON—Mines of the Riddles Quadrangle, Oregon. J. S. Diller aand G. F. Kay. (Geol. Survey Bull. 340-A, 1908; 3½ pp.) Discusses the geology and ore deposits and describes some of the principal mines.

6662—PLACER MINING—Constructing a Placer Sluice. Dennis H. Stovall. (Min. Sci. June 11, 1908; ¾ p.) The method of building sluices for placer mines is described and illustrated by a photograph. 20c.

6663—RAND MINING—Present Mining Conditions on the Rand. Thomas H. Leggett. (Bi-Monthly Bull. A. I. M. E., May, 1908; 14 pp.) A comprehensive view of the industry and its surroundings as a whole, marking its general development and the lines of its future progress. An abstract of this paper is contained in the JOURNAL of June 20, 1908.

6664—SIBERIA—Kupfer-, Silber- und Goldgewinnung im Altai. F. Thiess. (Zeit. des Oberschlesischen B.- u. Hüttenm. Vereins, Apr., 1908; 8 pp.) Abstract of a chapter in a Russian publication giving an historical review of the gold, silver and copper industries of Altai, Western Siberia.

6665—SILVER PRODUCTION—A Geological Analysis of the Silver Production of the United States in 1906. Waldemar Lindgren. (Geol. Surv., Bull. 340-A, 1908; 13 pp.) Goes into general geological conditions and discusses the output of ores according to their classification into silver-base metal ores, silicious silver ores, silver-lead-copper ores, silver-gold ores, and silver ores.

6666—STAMP MILLING—A Few Notes on Stamp Milling. W. H. Jane. (Journ. Chem. Met. and Min. Soc. of South Africa, April, 1908; 1 p.) Briefly discusses the operation and theory of the stamp battery. 60c.

6667—STATISTICS—Die Statistik der Edelmetalle als Material zur Beurteilung wirtschaftlicher Fragen. Ernst. Biedermann (Zeit. f. B. H. u. S.wesen, 1908, I Heft; 108 pp., 3 plates.) A very detailed and exhaustive discussion of the world's production, exchange and consumption of gold and silver, illustrated with numerous diagrams and tables. It discusses the relative values of the two metals, the influence of production upon prices, the consumption of the metals for industrial purposes, etc. $1.

6668—TUBE MILLING—The Economics of Tube Milling. H. W. Fox. (Mines and Min., June, 1908; 4 pp.) Sets forth experiments showing the relation between the amount of ore, pebbles, and solution and the amount of power consumed; contains interesting charts and tables. 20c.

6669—YUKON GOLD. O. B. Perry. (Min. and Sci. Press, April 25, 1908; 1½ pp.) A letter containing some remarks and figures regarding operations of the Yukon Gold Company; also editorial comment. 20c.

GYPSUM

6670—MONTANA—Gypsum Deposits of Montana. J. P. Rowe. (Eng. and Min. Journ., June 20, 1908; 2 pp.) A description of the three gypsum fields of Montana. This State has as large gypsum resources as any State in the Union. Illustrated. 20c.

IRON AND STEEL

6671—ALABAMA—The Brown Iron Ore Deposits of Alabama I. and II. William B. Phillips. (Iron Age, June 4 and 11, 1908; 6 pp.) The first instalment is devoted entirely to the geology of the Alabama iron fields. The second part deals with the production for a period of years and contains some remarks relative to the future production. 40c.

6672—ALABAMA—The Iron Ore Industry in Alabama. Eugene A. Smith. (Eng. and Min. Journ., June 6, 1908; ¾ p.) Describes the principal ores of iron, their occurrence and utilization. 20c.

6673—ALLOYS—New Steel Alloys. (Mech. Eng., June 5, 1908; ¾ p.) A particularly tough and hard metal, having a high tensile strength and with little susceptibility to injury from shock or impact, consists of a combination of nickel, titanium, manganese, and chromium, with iron or steel of various carbon contents. 20c.

6674—ANNEALING—Novel Air and Annealing Furnaces. (Foundry, June, 1908; 3½ pp.) Describes the furnaces in use at the new plant of the Allegheny Valley Malleable Iron Company, New Kensington, Penn., by which the time of making heats and annealing the castings is reduced to three days; illustrated. 20c.

6675—BASIC BESSEMER PROCESS—The Flohr Improvement of the Basic Bessemer Process. (Iron Age, May 28, 1908; 1p.) In this method the temperature during decarbonizing is higher than during the dephosphorizing stage in the basic bessemer converter. 20c.

6676—BASIC STEEL—Das Düdelinger Verfahren zur Durchführung des Thomasprozesses. P. Goerens. (Stahl u. Eisen, May 13, 1908; 4½ pp.) Discusses a number of recent developments in the Thomas open hearth process. 40c.

6677—BLAST FURNACE—Zur Berechnung und Profilierung der Eisenhochöfen. J. von Ehrenwerth. (Oest. Zeit. f. B. u. H., May 9, 1908; 1½ pp.) Discusses the effect of furnace profile upon the smelting reactions, with reference to its design under given conditions. 40c.

6678—BLAST FURNACE CALCULATIONS. S. J. Koshkin. (Iron Age, May 28, 1908; 4¾ pp.) Describes the method of calculating a blast furnace charge, together with the formation of the slag. The blast and escaping gases are also considered. 20c.

6679—BLAST FURNACE FUELS—Charcoal and Coke as Blast-Furnace Fuels. R. H. Sweetser. (Bi-Monthly Bull., A. I. M. E., May, 1908; 7½ pp.) Describes the furnaces and gives the data of comparative runs made with charcoal and coke at the works of the Algoma Steel Company, Sault Ste. Marie, Ontario.

6680—BLAST FURNACE IMPROVEMENTS—Ueber neuere Hochofenbeglchtungen. O. Simmersbach. (Stahl u. Eisen, May 6 and 13, 1908; 10 pp.) Describes and illustrates a number of recent improvements in German blast furnaces, especially in connection with charging devices. 60c.

6681—BLAST FURNACE SLAG—The Manufacture of Cement and Bricks from Blast-Furnace Slag. C. C. de Schwarz. (Eng. Rev., June, 1908; 7 pp.; Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Contains the history of the manufacture of cement and bricks from blast-furnace slag and the utilization of such slag for manufacturing cement. The article contains description of the various processes employed in such work. Paper before the Iron and Steel Institute. [illegible]

6682—BOILER HOUSE—The Standard Boiler House of the Oliver Iron Mining Co. A. M. Gow. (Proc. Lake Superior Min. Inst., June, 1908; 15 pp. 8 plates.) The standard boiler house of the Oliver Iron Mining Company is treated under the head of the boiler; the boiler setting; the fronts and appurtenances, the stack and breeching, the building, coal trestle and elevator; costs. The article contains a full set of working drawings reduced to a convenient size.

6683—CANADA—The Iron Ores of Canada. C. K. Leith. (Econ. Geol., June-July, 1908; 15½ pp.) The classification of iron-ore deposits in Canada is based upon recent detailed studies of the Lake Superior ores and ores of Western United States. Describes the various types, together with the commercial importance of several classes of ores. 60c.

6684—CARBON AND SULPHUR IN IRON—Iron, Carbon and Sulphur. Donald M. Levy. (Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Supplements previous research work by a complete thermal and metallographic investigation of the subject. 40c.

6685—CAR WHEELS—The Chilled Cast Iron Car Wheel. P. H. Griffin. (Iron Age, June 4, 1908; 2¼ pp.) The difficulties with which the manufacturer has to contend, the small margin of price between new and old wheels, mixtures, chills, and other considerations are discussed. 20c.

6686—CASE HARDENING—The Gas Process of Case-Hardening. J. F. Springer. (Iron Age, May 28, 1908; 1¾ pp.) A description of the method of case-hardening developed by Adolf W. Machlet, superintendent of the American Gas Furnace Company, Elizabeth, N. J.; illustrated. 20c.

6687—CAST STEEL—Herstellung und Verwendung von Stahlguss. [illegible] (Zeit. [illegible], May 23, 1908; 2 pp.) [illegible] the [illegible] of manufacturing cast steel. 40c.

6688—CAST IRON in the Construction of Chemical Plant. F. J. R. Carulla. (Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Lays down some simple rules on the use of cast iron, a substance that the chemical manufacturer [illegible] 20c.

6689—CASTING—PIPES in Permanent Molds. Edgar A. Custer. (Journ. Frank. Inst., June, 1908; 20½ pp.) Describes methods and apparatus for casting pipes in permanent molds which are not destroyed by molten iron and which alleviates unequal heating and cooling; illustrated. 60c.

6690—CHROMIUM STEEL—[illegible] (Zeit. [illegible] May 15, 1908; ½ p.) Describes a new chromium tool-steel made in the electric furnace. 20c.

6691—COATING IRON WITH ZINC—The Deposition of Zinc for the Protection of Iron and Steel Surfaces. Sherard Cowper-Coles. (Iron and Coal Tr. Rev., May 15, 1908; 5½ pp.) Outlines and discusses the four methods used at present for applying zinc to iron and steel; illustrated. 40c.

6692—COLORADO—Die Colorado Fuel and Iron Company. F. Frölich. (Zeit. des Vereines Deutscher Ingenieure, May 9, 1908; 6 pp.) Describes the plant in some detail, discusses its operation and enumerates the sources of its crude materials. 40c.

6693—CORROSION—The Rusting of Iron. J. Newton Friend. (Iron and Coal Tr. Rev., May 15, 1908; [illegible]) [illegible] several theories why iron corrodes when exposed to the combined action of the air and water. 40c.

6694—CORROSION—Methods for Protecting Iron and Steel Against Corrosion. Geo. B. Heckel. (Journ. Frank. Inst., June, 1908; 15 pp.) A general discussion on this subject with a review of the work which has been done in connection with it. 60c.

6695—CUPOLA PRACTICE—Kupolofenbetrieb in Amerika. O. Leyde. (Stahl u. Eisen, May 20, 1908; 5½ pp.) A discussion of cupola furnace practice in the United States, quoting largely from American authorities. 40c.

6696—DUPLEX STEEL PROCESS at Ensley, Alabama. (Iron Age, May 21, 1908; 18 pp.) The new Ensley bessemer and open hearth plants of the Tennessee Coal, Iron and Railroad Company and the connected blast furnaces are described in great detail. The article contains many working drawings and reproductions of photographs. [illegible]

6697—ELECTRIC FURNACE—Der Elektrische Ofen von Ischewski. B. Neumann (Stahl u. Eisen, May 20, 1908; 1½ pp.) Illustrates a revolving electric furnace for continuous operation. 40c.

6698—ELECTRIC FURNACE—New Type of Furnace for Smelting Iron. B. Igewsky. (Mech. Eng., June 5, 1908; [illegible] pp.; Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Description of a rotating electric furnace in which a high voltage is used. Paper read before the Iron and Steel Institute. [illegible]

6699—ELECTRIC FURNACE—[illegible]guss aus dem elektrischen Ofen. B. Osann (Mech. Eng., June 5, 1908; 2½ pp.) Illustrates a number of castings poured from the Steffans electric furnace, describes the arrangement [illegible] and [illegible] cost of operation. 40c.

6700—ELECTRIC IRON AND STEEL FURNACES. [illegible] 2½ pp.) A comparison of the Héroult, Keller, Gin, Harmet, and various other electric furnaces is given in the first instalment. To be continued. 40c.

6701—ELECTRIC STEEL—[illegible] Electric Steel and Gas Power. (Electrochem. and Met. Ind., June, 1908; 1⅜ pp.) Tells [illegible] manufacture; contains a table which shows [illegible]

6702—ELECTRICALLY DRIVEN MECHANICAL IRON MILL at the [illegible] Steelworks. [illegible] matic auxiliary machinery. 40c.

6703—ELECTRICAL EQUIPMENT of the Cargo Fleet Iron and Steel Works. (Iron and Coal Tr. Rev., June 4, 1908; 5 pp.) Treats of the use of electric motors in iron and steel works. Describes the installation at the Cargo Fleet [illegible]

6704—ELECTRO-METALLURGY of Iron [illegible] in Mexico. [illegible] A review of the conditions in the iron ore industry in Mexico, pointing out the ad- [illegible]

6705 EQUIPMENT The New Equipment at the Newport Mine. (Iron Tr. Rev., June 18, 1908; 9 pp.) The new shaft "D" has just been completed and supersedes the old shaft "A." A description of this shaft is given and illustrated by drawings and photographs. 20c.

6706 FATIGUE TEST –A New Fatigue Test for Iron and Steel. T. E. Stanton. (Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Outlines a test which gives a combination of rolling abrasion and alternate tending; fully illustrated. Paper read before the Iron and Steel Institute. 40c.

6707 FOUNDRY Problems Involved in the Erection and Equipment of a Modern Foundry. W. T. Hatch. (Foundry, June, 1908; 3 pp.) Discusses the many questions, general in character, which must be considered in building and fitting up a modern foundry. 20c.

6708 FRANCE Le Minerai de Fer dans l'Ouest de la France. L. Campredon. (Metallurgie, May 20, 1908; ½ p.) Describes the occurrence of iron ores in some of the western districts of France. 40c.

6709—GALVANIZED IRON PIPE—Notes on the Action of Water on Galvanized Iron. W. F. Monfort. (Can. Eng., June 5, 1908; 1 p.) Treats of the action of a partially softened water upon the zinc coating of galvanized iron pipe as affecting their durability. 20c.

6710 — GAS INCLUSIONS –'Gaz Occlus dans les Aciers. G. Belloc. (Bull. de la Soc. d'Enc. pour l'Ind. Nat., April, 1908; 25 pp.) Describes the apparatus and method used, and gives detailed results of a series of careful experiments into the nature of the gases included in steel and into the conditions under which they are absorbed and given off.

6711—INGOTS Piping and Segregation in Steel Ingots. (Bi-monthly Bull, A. I. M. E., May, 1908; 29 pp.) Discussion by members of the Institute of Prof. H. M. Howe's paper on the above subject, which was previously mentioned in this Index.

6712—IRON-WORKS LABORATORIES–Zur Organisation moderner Eisenhüttenlaboratorien. A. Wencelius. (Stahl u. Eisen, May 13, 1908; 3½ pp.) Describes the plan, equipment and management of the modern laboratory for iron works. To be concluded. 40c.

6713—LAKE SUPERIOR—Kohle und Eisen in Nordamerika. Prof. Baum. (Glückauf, May 9 and 16, 1908; 12 pp.) Continuation of article previously indexed. This section describes the mining and shipping methods in use on the Lake Superior ranges. 60c.

6714 –MALLEABLE CAST IRON—Temperguss in Amerika. C. Geiger. (Stahl u. Eisen, May 13, 1908; 1 p.) Compares the properties of malleable castings made in different ways. 40c.

6715—MALLEABLE CASTINGS—'Production of Malleable Castings—V. Richard Moldenke. (Foundry, June, 1908; 2 pp.) A continuation of this article, discussing mixtures for making various grades of malleables and methods of calculating the furnace charges. 20c.

6716—NEW YORK—Future Adirondack Iron. George F. Archer. (Sibley Journ. Eng., June, 1908; 1¼ pp.) Describes the geology of this district and some of the more important mines. Goes briefly into the possibilities of the future for this Adirondack mountain district; illustrated. 40c.

6717—NITROGEN IN IRON—L'Azote et le Fer. (La Metallurgie, May 27, 1908; ½ p.) A study into the influence of nitrogen upon the fracture, and the mechanical properties of iron and steel. 20c.

6718—PHYSICAL QUALITIES of Steel in Relation to its Mechanical Treatment. James E. York. (Iron and Coal Tr. Rev., May 15, 1908; 1½ pp.) Reviews the existing methods for the mechanical treatment of steel, and suggests some changes which the writer believes will result in the production of more reliable steel rails and other similar sections than those now produced by ordinary methods. Paper before the Iron and Steel Institute. 40c.

6719—REFINING IRON AND STEEL—Preliminary Results of Trials in Refining Iron and Steel by Means of Vapours of Metallic Sodium. Albert Hiorth. (Iron and Coal Tr. Rev., May 15, 1908; 1 p.) Discusses the effect of different elements, drilling for chemical analysis, the causes of defects in casting and mechanical tests. 40c.

6720—REGENERATING FURNACE—Die Wärmetechnik des Siemens-Martinofens. F. Mayer. (Stahl u. Eisen, May 20, 1908; 9 pp.) Discusses results of an exhaustive series of tests on the operation of a regenerating basic open-hearth furnace. 40c.

6721—SEMI-STEEL MIXTURES and Methods of Calculating the Charges. M. B. Smith. (Foundry, June, 1908; 1½ pp.) Goes into the origin, chemical mixture and methods of making semi-steel; gives some representative analyses and tells how to calculate mixturers. 20c.

6722—SILICON IN IRON—La Metallographie de la Fonte. (Génie Civ., May 23, 1908; 2½ pp.) Discusses, with photomicrographs, the influence of varying proportions of silicon upon the properties of cast iron, particularly upon the condition of the carbon contents. 40c.

6723 SLAG ANALYSIS- A Systematic Scheme for the Analysis of Basic Slags, Etc. Gordon Mills. (Iron Age, June 11, 1908; 1¾ pp.) Describes a method proposed by the author which is said to have the advantage of being conducted in a systematic manner, combined with accuracy and rapidity. 20c.

6724 — SPECIAL STEELS — Function of Chromium and Tungsten in High-Speed Tool Steel. C. A. Edwards. (Iron and Coal Tr. Rev., May 15, 1908; ½ p.) Traces the influence of chromium on high-speed steels, and throws some light on the term "red hardness," which was introduced by Mr. Taylor in his paper on "The Art of Cutting Metals." 40c.

6725—SPECIAL STEELS—Die Spezial stähle im Automobilbau. (Metallurgie, April 22, 1908; 9 pp.) States the composition and properties of certain special steels suitable for automobile construction. 40c.

6726—STEEL PLANT—The Keystone Structural Works of the Jones and Laughlin Steel Co. (Iron Tr. Rev., June 4, 1908; 3½ pp.) Gives the general plan of this plant, and describes the system of cranes, the girder shop, and the power plant; fully illustrated. 20c.

6727—TITANIUM IN CAST IRON. Richard Moldenke. (Iron Age, June 18, 1908; 2 pp.) Describes methods of using the alloy and gives numerous tests with titanium varying from 0 to 0.15 per cent. Paper read before Am. Fdymen's. Assn., June, 1908. 20c.

6728—TITANIUM IN CAST IRON—Ueber Titan als Zusatz zum Gusseisen. B. Feise. (Stahl u. Eisen, May 13, 1908; 2½ pp.) Discusses, from experiments, the influence of varying proportions of titanium upon the mechanical properties of cast iron. 40c.

LEAD

6729—ANALYSIS—Advance Notes on the Peroxide Method for Lead. W. S. Medell. (West. Chem. and Met., May, 1908; 4½ pp.) Discusses and points out some of the faults and inaccuracies in the determination of lead by volumetric methods, and describes in detail the peroxide method. 60c.

6730 — DETERMINATION — Technical Method for the Determination of Lead in Ores, Etc. A. H. Low. (Journ. Am. Chem. Soc., April, 1908; 1¾ pp.) The chromate-oxalate method devised by the author is substituted for the method of separating as oxalate and subsequently titrating with permanganate. 80c.

6731—OCCURRENCE OF LEAD ORES—Notes on Lead—I. A. Humboldt Sexton. (Mechan. Eng., May 22, 1908; 5¾ pp.) Goes into the physical and chemical properties and describes the ores of lead; discusses the occurrence and the industrial conditions in the different producing countries of the world: first paper. 20c.

6732—ORE TREATMENT—Notes on Lead—II. A. Humboldt Sexton. (Mech. Eng., June 5, 1908; 4½ pp.) Preparation of lead ores, the air reduction processes, the amount of lead produced, the slag, chemistry of the process, influence of foreign constituents, and various processes are described in this instalment. 20c.

LIMESTONE

6733—WEST VIRGINIA—Limestone in West Virginia. G. P. Grimsley. (Eng. and Min. Journ., June 6, 1908; 1 p.) A geologic and economic discussion of the limestones of this State. 20c.

MAGNESITE

6734 ARTIFICIAL MAGNESIA Ueber die mineralogische Zusammensetzung kunstlicher Magnesitsteine, insbesondere über ihren Gehalt an Periklas. F. Cornu. (Centralblatt f. Mineralogie, May 15, 1908; 5½ pp.) A chemical and microscopical study of the composition of calcined magnesite. 20c.

MANGANESE

6735—MANGANESE-CARBON ALLOYS—Beitrag zur Kenntnis des Mangans und seiner Legierungen mit Kohlenstoff. A. Stadeler. (Metallurgie, May 8 and 22, 1908; 27 pp.) Describes the apparatus used and gives results of a series of experiments into the nature and characteristics of these alloys. 60c.

6736—GEORGIA—Mining and Preparation of Georgia Manganese. Thomas L. Watson. (Min. Wld., June 13, 1908; 1½ pp.) Georgia is the third largest producer of manganese ore in the United States. Mining is done by open cuts, shafts and tunnels; illustrated. Extract from Bull. No. 14 of the Geol., Survey of Georgia. 20c.

PETROLEUM

6737—BAKU PETROLEUM INDUSTRY during 1907. (Petrol. Rev., June 6, 1908; 1½ pp.) The article deals with the chief points in the yearly report of Vice Consul Macdonald concerning the petroleum trade of Baku during 1907. 40c.

6738—BATOUM—The Petroleum Trade of Batoum during 1907. (Petrol. Rev., June 6, 1908; 1¼ pp.) This is the annual consular report upon the trade and commerce of Batoum for 1907. 40c.

6739—ITALY—The Petroleum Industry of Italy. (Petrol. Rev., June 6, 1908; 1 p.) The development of the petroleum industry in Italy during recent years is described briefly by the German Consul General at Genoa. 40c.

6740—LUBRICATING OIL TESTS—Review of Statistical and Technical Facts Submitted to the President by the Commissioner of Corporations. L. H. Eddy. (Cal. Derrick, May, 1908; 4 pp.) A continuation of this report, dealing with tests and comparisons of values and prices of Standard and independent lubricating oils. Deals also with transportation of petroleum. 20c.

6741—OKLAHOMA—The Glenn Pool. (Petrol. Rev., May 23, 1908; 3½ pp.) Interesting details of developments in the Glenn pool, one of the most important oilfields in the United States. 40c.

6742 WELL BORING Improvements in the Apparatus for Deep Well Boring. (Petrol. Rev., May 23, 1908; 1 p.) Describes an invention, the object of which is to provide a core-bearing tool which may be suspended and lowered by a chain or the like as the boring proceeds, thus overcoming the necessity of lengthening the shank or stem and the consequent disadvantages. 40c.

PHOSPHATE ROCK

6743—SOUTH CAROLINA PHOSPHATES. (Am. Fertilizer, May, 1908; 1¾ pp.) Review of the present conditions and the future outlook, based upon the annual tour of the phosphate commission. 20c.

6744—TENNESSEE—Phosphate Rock in Tennessee. H. D. Ruhm. (Eng. and Min. Journ., June 6, 1908; 1 p.) Contains statistics of production for 1905, 1906 and 1907, with comments on the industry in this State. 20c.

PRECIOUS STONES

6745—DIAMOND—Neue Festellungen über das Vorkommen von Diamanten in Diabasen und Pegmatiten. H. Merensky. (Zeit. f. prak. Geol., Apr., 1908; 3½ pp.) A review of opinions as to the origin of the diamond, as influenced by the finding of diamonds in pegmatite and in diabase. 40c.

6746—DIAMONDS—The Origin of Vaal River Diamonds. Hans Merensky. (So. African Min. Journ., Apr. 4, 1908; 1 p.) Discusses the characteristics of river diamonds, their distribution and occurrence, and explains some of the peculiarities of the deposits. 20c.

RARE METALS

6747—COLORADO—Occurrence of Vanadium near Telluride, Colorado. Edward R. Zalinski. (Eng. and Min. Journ., June 6, 1908; 1 1/3 pp.) A few notes on the occurrence of vanadium on Big Bear Creek, about 14 miles west of Telluride, Colorado, and about 2 miles south of Wilson station, on the Rio Grande Southern narrow gauge railroad. 20c.

SALT

6748—FUSION PROCESS of Salt Manufacture. (Chem. Trade Journ., May 23, 1908; 1½ pp.) Describes the direct production of white salt from rock salt by what is known as the fusion process, in which rock salt is fused or melted, and the impurities separated whilst the salt is in a molten state. 40c.

6749—OCCURRENCE AND MANUFACTURE Salt: its History, Occurrence and Manufacture. A. A. Hayward. (Journ. Min.

Soc. of Nova Scotia, Vol. XI, 1908; 17½ pp.) Goes into the history of salt, its origin, some of its principal occurrences, with a description of some of the methods of manufacture.

TIN

6750 ASSAYING—A Wet Method for the Assay of Tin in Ores, Etc. (So. African Min. Journ., May 2, 1908; ¾ p.) Gives a simple and reliable process for the determination of tin in tin ores by the wet method. 20c.

6751 ELECTROLYTIC REFINING—Die Elektrische Raffination des Zinn. O. Steiner. (Elektrochem. Zeitschrift, May, 1908; 3 pp.) Discusses the subject from a theoretical standpoint, and gives conclusions from a series of experimental operations. To be concluded. 40c.

TUNGSTEN

6752 TUNGSTIC ACID DETERMINATION—A New and Short Method for the Determination of Tungstic Acid in Tungsten Ores. John B. Ekeley and George D. Kendall, Jr. (Univ. of Colo., Journ. of Eng. No. 4, 1907-1908; 4 pp.) Details of a practical and accurate method for the determination of tungstic acid in tungsten ores.

ZINC

6753 JIGS and Jigging in the Joplin Zinc-Lead District. Otto Ruhl. (Min. Wld., May 30, 1908; 3 1/3 pp.) Describes the construction and operation of the hand jig, which is efficient in treating so-called free ore, describes and comments on the different styles of jigs and sets forth the requirements of a serviceable jig; illustrated. 20c.

6754 METALLURGY of Zinc—I. and II. (Aust. Min. Stand., April 29 and May 6, 1908; 2 1/3 pp.) The author discusses the various machines used for the concentration of zinc ore, and points out improvements in water concentration. 60c.

6755 METALLURGY of Zinc—III. J. W. Richards. (Electrochem. and Met. Ind., June, 1908; 1¾ pp.) Discusses and gives tables of the vapor tension of zinc; states and solves a problem in the reduction of zinc sulphide. 40c.

6756 ORE TREATMENT—Economical Treatment of Zinc Ores. R. C. Canby. (Min. Wld., June 6, 1908; 1 p.) Discusses the separation and concentration of the zinc in some of the complex ores found in the western part of the United States. 20c.

6757—ORE TREATMENT—The Mechanical Preparation of Ores in Sardinia. Erminio Ferraris. (Bi-Monthly Bull. A. I. M. E., May, 1908; 25½ pp.) Reviews the mining industry since 1879, and goes fully into the classification and separation of the ores; illustrated.

6758 PRODUCTION AND CONSUMPTION of Zinc in 1907. Walter Renton Ingalls. (Eng. and Min. Journ., June 13, 1908; 4 pp.) Statistics of zinc ore production in the United States, Canada and Mexico; spelter production; and consumption according to uses. The production of zinc in 1907 is compared with that in 1906. 20c.

6759 SMELTING AND REFINING—Notes on Zinc—IV. A. Humboldt Sexton. (Mech. Eng., May 8, 1908; 3½ pp.) Goes into the smelting and refining of zinc, the manufacture of zinc white, and describes some electrolytic processes; to be continued. 20c.

ECONOMIC GEOLOGY—GENERAL

6760—BRITISH COLUMBIA—The Correlation of the International Strata—II. Horace F. Evans. (Min. Wld., June 13, 1908; 2 pp.) It is proposed to introduce a new system of nomenclature which would be common to Canada and the United States and would overcome local prejudice. 20c.

6761—CANADA—Report on a Portion of Northwestern Ontario Traversed by the National Transcontinental Railway Between Lake Nipigon and Sturgeon Lake. W. H. Collins. (Can. Dept. of Mines, Geol. Surv. Branch, 1908; 23 pp. 1 map). This is a report on the region between Lake Nipigon and Sturgeon lake, bordering the National Transcontinental railway line. The report covers the topography, and the geology, economic geology, glacial geology, etc.

6762—CANADA—A Partial Bibliography of Publications Referring to the Geology and Mineral Resources of Alberta, British Columbia and the Yukon. J. C. Gwillim. (Can. Min. Journ., June 1, 1908; 2 pp.) A continuation of this bibliography. 20c.

6763 DIVINING ROD—A Scientific Test. E. T. Wherry. (Eng. and Min. Journ., June 6, 1908; ½ p.) Describes the divining rod and gives the result of a test made. 20c.

6764 GEDRITE—On the Occurrence of Gedrite in Canada. Newton [illegible] [illegible] Barlow. (Amer. Journ. of Sci., June, 1908; 1¼ pp.) A [illegible] of the district in which this mineral is found. 60c.

6765 GENESIS OF ORE DEPOSITS—Unconformity and Deposits. Otto Ruhl. (Min. and Sci. Press, June 6, 1908; 2½ pp.) It is shown how the application of the idea, that [illegible] were always accompanied by dynamic movement [illegible] in which the ores were deposited, completely misconstrued the facts in ascribing an origin for the lead and zinc ore deposits of the Missouri-Kansas district. Illustrated. 20c.

6766 GENESIS OF ORES in the Light of Modern Theory. Horace V. Winchell. (Popular Sci. Monthly, [illegible]) A general [illegible] pointing out some of the more important facts which experience and science have brought to life. 40c.

6767 GLAUBER SALT—Die [illegible] von Glaubersalz (Mirabilit) und Solquellen [illegible] M. A. Nowomejsky. (Zeit. f. prak. Geol., Apr., 1908; 3 pp.) Describes the discovery, the geological occurrence, and composition of these sodium sulphate deposits, and suggests their economic value. 40c.

6768 LOCALIZATION OF VALUES IN ORE BODIES and the Occurrence of Shoots in Metalliferous Deposits. R. H. Sales, F. L. Ransome, M. Boehmer. (Econ. Geol., June-July, 1908; 14 pp.) Discussion of J. D. Irving's article in the March issue of "Economic Geology," dealing with ore shoots at Butte, Mont., the relation between certain ore-bearing veins and gouge-filled fissures and secondary enrichment and impoverishment. 60c.

6769—MARYLAND—The Succession of Faunas in the Portage and Chemung Formations of Maryland. Charles K. Swartz. (Journ. of Geol., May-June, 1908; 18¾ pp.) The author proves the existence of the Ithaca fauna in Maryland. 60c.

6770 METEORIC AND MAGMATIC WATERS. James F. Kemp. (Min. and Sci. Press, May 23, 1908; 3½ pp.) A general discussion of meteoric and magmatic waters, more especially in their relation to the origin of ore deposits. 20c.

6771 NEW JERSEY—Features Indicative of Physiographic Conditions Prevailing at the Time of the Trap Extrusions in New Jersey. C. N. Fenner. (Journ. of Geol., May-June, 1908; 28 1/3 pp.) Treats of the clastics, the shales, the sandstones, the conglomerates and other rock formations of New Jersey. Illustrated. 60c.

6772—ORE DEPOSITS—Tendencies in the Study of Ore Deposits. Waldemar Lindgren. (Min. and Sci. Press, April 25, 1908; 4½ pp.) Gives the history of the study of ore deposits, the advances made and the methods employed; points out the trend of modern thought as compared with opinion held in by-gone years. 20c.

6773 SOUTH AFRICA—Uebersicht über die nutzbaren Lagerstätten Südafrikas. F. W. Voit. (Zeit. f. prak. Geol., Apr., 1908; 8 pp.) A description of the character and geological occurrence of the gold-bearing rocks of South Africa. 40c.

6774—TEXAS—Paleozoic Formation in Trans-Pecoc, Texas. G. B. Richardson. (Amer. Journ. of Sci., June, 1908; 10½ pp.) A discussion of the Cambrian, Ordovician, Silurian, Carboniferous and Guadalupian rocks. 60c.

6775—WEST AUSTRALIA—The Distribution and Occurrence of the Baser Metals in Western Australia. Edward S. Simpson and Chas. G. Gibson. (West. Aus. Geol., Surv., Bull. No. 30; 1907; 129 pp.) A bulletin compiled with the object of assisting prospectors and persons interested in the search for metals other than gold; accompanied by map.

MINING—GENERAL

6776 BLASTING STUMPS—Methods and Cost of Blasting 1100 Stumps. (Eng.-Con., June 3, 1908; 1 p.) Data which is of interest in connection with the construction of wagon roads in a wooded country. 20c.

6777 BRAZIL—Atopite and the Manganese Deposits of Miguel Burnier, Brazil. E. Hussak. (Min. Journ., May 30, 1908; ¼ p.) A short geologic discussion of the deposits which occur chiefly in the State of Minas Geraes. 40c.

6778 COLORADO—The Montezuma Mining District. Etienne A. Ritter. (Mines and Min., June, 1908; 4 pp.) [illegible] the district and a description of the [illegible] belt, the ores, and methods of mining and transportation. Illustrated. 20c.

[illegible] determining specific gravity, porosity and [illegible] gram in determining the cubic contents of a [illegible] to estimate the amount in place or tonnage [illegible] 60c.

[illegible] methods of conveying in which the material [illegible] are considered. 40c.

[illegible] District. Frederick Keffer. (Can. Min. Journ., Mar. 15, 1908; 2½ pp.) Contains tables giving in detail the progress and costs of drilling work which has been carried on more or less continuously in the mines of the British Columbia Copper Company for the last three years. Paper read before Can. Min. Inst. 20c.

6782 FIRE EXTINGUISHMENT—[illegible] Steam be Used as a Fire Extinguisher? A. G. Williams. (Pract. Engr., June, 1908; ¾ p.) An old wooden mill near Bradford, Eng. [illegible] and set on fire. A full head of steam, introduced into the building, prevented con[illegible] 20c.

6783 FIRE EXTINGUISHMENT—The Use of Carbon Dioxide. Sydney F. Walker. (Mines and Min., June, 1908; 2 pp.) Gives methods of generating and using this gas in extinguishing mine fires, and mentions examples of its successful application. 20c.

6784 GUATEMALA—Mining and Transportation in Guatemala. Clarence C. Sample. (Eng. and Min. Journ., June 13, 1908; 1½ pp.) Conditions in the mining industry of Guatemala are described and attention is called to the fact that the government does not look favorably on the advent of prospectors into the country. 20c.

6785—HEAD FRAMES—Mine Head Frames. E. E. Ward. (Northwest Min. News, June, 1908; 1 p.) Various types of head-frames are discussed and illustrated by drawings, diagrams and photographs. Paper read before the Min. Eng. Soc., Washington School of Mines. 20c.

6786 HYDRAULIC FILLING—A Simple Method of Water-Storage Employed at No. 5 Pit of the Escarpelle Mines. Sainte-Claire-Deville. (Trans. North of Eng. Inst. of Min. and Mech. Engr., April, 1908; 7 pp.) Description of a simple installation having regard to the [illegible] the hollows left by working, to the settlement which the strata undergo, and to the influence of the process upon the maintenance of the roads.

6787—MINE SUPPLIES—The Laboratory: Its Economic Value. A. McA. Johnston. (Journ. Chem., Met. and Min. Soc. of South Africa, April, 1908; 2 pp.) Author's reply to discussion by members of the Society. 60c.

6788 MINE WATERS—[illegible] and Value. Alfred C. Lane. (Min. Wld., June 6, 1908; 1 p.) Discusses [illegible] their relation to ore deposits, with special reference to those of the Lake Superior copper and iron districts. 20c.

6789—NORWAY—Mining in Norway. F. E. Drummond-Hay. (Min. Journ., May 30, 1908; ¾ p.) Reviews the iron ore trade and the copper industry during 1907, and contains notes on nickel and silver, and the manufacture of zinc from low-grade ores. 40c.

6790 PERU—[illegible] of Interest to Mining Men and Investors. L. Lema. (Min. [illegible]) A [illegible] the topography, climate, and mineral resources; contains also other interesting facts; [illegible]

6791—PIPE—Tests of Cast Iron and Reinforced [illegible] Talbot. (Univ. of Ill. Bull. No. 22, April, 1908; 66 pp.) Tests of cast iron, concrete and reinforced concrete pipe to determine their resistance to pressure for culverts in railway embankment.

6792 PROMOTING MINING PROPERTIES—Capitalizing and Promoting Mining Properties. W. A. Crooks. (Min. Wld., June 6, 1908; 2¼ pp.) Shows how mining [illegible] position of the promoter and the public. 20c.

[illegible]

contains a description of the mineral resources, consisting of iron, copper, gold and asbestos.

6794—QUEBEC—Mining in the Eastern Townships of Quebec. Fritz Cirkel. (Can. Min. Journ., June 1, 1908; 2 pp.) A discussion of the mineral resources of this district, with special reference to the asbestos and chrome industries; illustrated. 20c.

6795—REPORTS—Current Monthly Reports of Mines. H. S. Denny. (Eng. and Min. Journ., June 6, 1908; 3 pp.) Tells how to collect information concerning operations and arrange the data so that they may be easily compared and summarized. 20c.

6796—RUSSIA—Mining in the Batoum District, Russia. Consul Stevens. (Min. Journ., May 30, 1908; 1½ pp.) Discusses the copper, manganese, and petroleum industries in this district; accompanied by a map of consular districts of Batoum. 40c.

6797—SHAFT LINING—Abdichtung eines Kuvelagebruchs im Schacht VI der Saar und Moselbergwerksgesellschaft zu Karlingen Lothringen. F. Jungst. (Glückauf. May 16, 1908; 3½ pp.) Describes the occurrence of a break in the cast-iron lining of a coal mine shaft, and the means taken to repair it. 40c.

6798—SHAFT SINKING—Deep Shaft Sinking and Mining in South Africa. (Iron and Coal Tr. Rev., June 5, 1908; 1 p.) This article is the result of five years' experience in shaft sinking in South Africa, and discusses such points as labor, explosives, timbering, and briefly mentions other points of interest. Paper read before No. Staffordshire Inst. of Min. and Mechan. Engineers. 40c.

6799—SHAFT SINKING—Methods of Shaft Sinking. (Iron and Coal Tr. Rev., May 22, 1908; 1¾ pp.) Describes the Kind-Chaudron method, the freezing process, sinking by means of drop shafts, and subaqueous sinking by means of sackborers, and gives the application of the diffeent methods; illustrated. 40c.

6800—SHAFT SINKING in Quicksands and Boulders. George W. Stuart. (Journ. Min Soc. of Nova Scotia, Vol. XI, 1908; 5¼ pp.) Description of a method employed in a country far from transportation, where ingenuity played the principal part.

6801—STREAM DIVERSION—Methods and Cost of Building a Concrete-Steel Culvert to Carry an Irrigation Canal Under a Creek Bed. Henry A. Young. (Eng. Con., June 10, 1908; 1 1/3 pp.) The data in this article should be valuable to the mining engineer who is confronted with the problem of diverting a stream. 20c.

6802—STREAM DIVERSION—Diverting the Rivers at the Loretto Mine. (Iron Tr. Rev., June 18, 1908; 3¾ pp.) An interesting and unusual engineering undertaking at the Loretto mine on the east end of the Menominee range. By diverting the course of the Sturgeon river the mine workings were made safe. Illustrated. 20c.

6803—TASMANIA—Mining in Zeehan Silver-Lead Field, Tasmania. Ralph Stokes. (Min. Wld., June 6, 1908; 2½ pp.) Mentions the discovery of galena and its effect upon stock speculation; goes into the geology of the silver-lead deposits, and also into industrial conditions; illustrated. 20c.

6804—TIMBERING—Mine Methods and Timbering. W. H. Storms. (Am. Min. Rev., June 6, 1908; 1¼ pp.) The necessity and usefulness of bearers in shafts; how they are placed; methods of framing. Illustrated by drawings. To be continued. 20c.

6805—TIMBERING—Mine Methods and Timbering. W. H. Storms. (Am. Min. Rev., May 2, 1908; ¾ p.) Discusses the placing of timbers in inclined shafts and lining the sets, shows the necessity for perfect alignment, and cautions against carelessness; to be continued. 20c.

6806—TIMBERING—Steel Supports for Mine Drifts. R. B. Woodworth. (Eng. and Min. Journ., June 13, 1908; 1 1/3 pp.) An improved form of steel support for mine drifts is described and illustrated with drawings. Abstract of a paper in Proc. Eng. Soc. of W. Penn. 20c.

6807—TRINIDAD—Mineral Resources of Trinidad. John Cadman. (Iron and Coal Tr. Rev., June 5, 1908; 2/3 p.) Iron Ores, graphitic schists, limestone, coal, bituminous minerals, manjak, asphalt and petroleum form the principal mineral products of this island. Abstract of paper read before the Instn. of Min. Engineers. 40c.

6808—TUNNEL LININGS—Streckenausbau mittels Eisenbeton. W. Stark. (Glückauf, May 9, 1908; 2 pp.) Describes the methods of lining a coal mine entry in Germany with reinforced concrete. 40c.

6809—UNWATERING—Recent Work on the Comstock. Walter D. O'Brien. (Min. and Sci. Press, June 13, 1908; 2 1/3 pp.) The old cumbersome Cornish pumps were insufficient to handle the volume of water on the Comstock lode and the mines were forced to shut down. New pumping installations have enabled these mines to resume operations. Illustrated. 20c.

6810—WASHINGTON—The Lake Chelan Country. S. G. Dewsnap. (Northwest Min. Journ., May, 1908; 2 pp.) Briefly describes the mineral resources of this Washington district. 20c.

6811—WEST AUSTRALIA MINING PRACTICE—VI. E. Davenport Cleland. (Monthly Journ. Chamber of Mines of W. A., Mar. 31, 1908; 19 pp.) A complete illustrated description of the methods of stoping and timbering and the costs of the same. 80c.

ORE DRESSING

6812—CRUSHING—Ore Reduction Practice, W. A. (Aust. Min. Stand., May 6, 1908; ¾ p.) The article discusses thé various conditions influencing the selection of rock crushers. 40c.

6813—SULPHIDE ORE TREATMENT—Dressing Sulphide Ores. E. B. Wilson. (Mines and Min., June, 1908; 1¼ pp.) Gives some causes for poor results in concentration and points out the importance of adapting the methods of treatment to the peculiarities of the ores. 20c.

METALLURGY—GENERAL

6814—ELECTRIC CONDUCTIVITY OF METALS—Folgerungen für die Technik aus dem heutigen Stande unserer Erkenntnis des elektischen Leitungswidestandes der Metallegierungen. W. Guertler. (Metallurgie, May 22, 1908; 4 pp.) Discusses the relative conductivity of several metals and their alloys. 40c.

6815—LABORATORIES—The Metallurgical and Chemical Laboratories in the National Physical Laboratory. Walter Rosenhain. (Iron and Coal Tr. Rev., May 15, 1908; 3 pp.) An account of the present state of the department with special regard to the work which is either in hand or which the department is capable of undertaking. Paper read before the Iron and Steel Institute. 40c.

6816—SMELTER—Constructing a Crude Smelter for Prospectors. Francis C. Nicholas. (Min. Wld., June 6, 1908; 1¾ pp.) Describes an old Spanish-American smelter and tells how it may be utilized profitably in regions far distant from transportation or a modern smelter. 20c.

6817—SMELTER SMOKE—Solving the Smelter Smoke Problem. (Min. Sci., June 11, 1908; 1½ pp.) This article describes various tests and experiments made to overcome the difficulty caused by smelter smoke. Gives an account of a method evolved by C. B. Sprague. 20c.

6818—SMELTER SMOKE—Arsenic in Vegetation Exposed to Smelter Smoke. R. E. Swain and W. D. Harkins. (Journ. Am. Chem. Soc., June, 1908; 13 1/3 pp.) Deals with the distribution of the more notable constituents of the smelter smoke, particularly arsenic, over the district in the vicinity of a copper smelter near Anaconda, Mont. 80c.

6819—WATER SUPPLY SYSTEM for McDougall Furnaces. Evans W. Buskett. (Min. Wld., June 13, 1908; ¾ p.) Adoption of a system which prevents the formation of scale in pipes and makes possible the utilization of impure water. Illustrated.

6820—WHITE METAL DROSSES—The Smelting of White-Metal Drosses and Residues and the Manufacture of Solder and Babbitt Metals. Lionel D. Waixel (Brass Wld., June, 1908; 3¾ pp.) Deals with the reclaiming of dross from white metal or other low smelting alloys. Illustrated.

MINING AND METALLURGICAL MACHINERY

6821—AERIAL ROPEWAY at a Spanish Mine. (Engineer, Lond., May 22, 1908; 3 pp.) Discussion of a ropeway haulage installation at the Asturiana mines in Spain, using the single endless rope system, one rope performing the double duties of hauling and supporting ropes. 40c.

6822—BELT CONVEYOR. C. Kemble Baldwin. (Proc. A. S. M. E., June, 1908; 24½ pp.) Discusses the different kinds of belt conveyors, their proper arrangement, capacity, discharging devices, and the driving machinery and power required; illustrated.

6823—BLOWING ENGINES—Allis-Chalmers Blowing Engines. (Eng. and Min. Journ., June 6, 1908; ¾ p.) Describes the different types of blowing engines of this company; illustrated. 20c.

6824—BOILER AND FURNACE DESIGN—Some Results Due to Improvement in Boiler and Furnace Design. A. Bement. (Journ. West. Soc. Eng., April, 1908; 74 pp.) This paper presents one feature of an extended study to improve on present practice, which can be materially advanced. 40c.

6825—BUCKET DUMPING DEVICE. (Eng. and Min. Journ., June 6, 1098; ¾ p.) A short description of an ingenious arrangement for dumping the hoisting bucket at the top of the shaft. From "Glückauf." 20c.

6826—CALCINING KILNS. Greville Jones. (Iron and Coal Tr. Rev., June 5, 1908; 1 2/3 pp.) Calcining in the open air and in kilns is discussed, and the various methods employed are outlined. Paper read before Inst of Min. Engineers. 40c.

6827—COMPRESSORS—Les Compresseurs. (Revue de Mecanique, April 30, 1908; 20 pp.) Reviews with illustrations, the latest progress in the design and construction of air compressors in the United States and Europe.

6828—CONVEYING—Continuous Conveying of Materials. Staunton B. Peck. (Proc. A. S. M. E., June, 1908; 33½ pp.) A discussion of the many types of continuous conveyors for both ores and merchandise, giving their capacity, power required, and other valuable information; illustrated.

6829—DREDGING EQUIPMENT on the Panama Canal. F. B. Maltby. (Eng. Con., June 10, 1908; 2 1/3 pp.) Gives a brief description of the machinery used in connection with the Isthmian Canal Commission, and includes four distinct types of dredges of entirely different characteristics. From Proc. Eng. Club of Philadelphia, Jan., 1908. 20c.

6830—DRILL SHARPENING—The Electric Furnace at the Village Deep. C. A. Mannerheim. (So. African Min. Journ., May 16, 1908; 1 p.) A new design of electric furnace used in South Africa to heat drills before sharpening. 20c.

6831—ELECTRIC POWER at the Clausthal Mines. Alfred Gradenwitz. (Eng. and Min. Journ., June 6, 1908; 4½ pp.) Complete description of a plant in which current from producer gas engine and turbine plants drives the ore-dressing works during the day and the mine hoists at night; illustrated. 20c.

6832—FUELING EQUIPMENT—Engineering Practice as Applied to the Fueling Equipment of Power Houses. Harry P. Cochrane (Journ. Frank. Inst., June, 1908; 22¾ pp.) The article deals with the eçonomy of mechanical devices for handling fuel and describes the machinery for power plants of varying capacities. Illustrated. 60c.

6833—GAS ENGINES and Producers. W. B. Tuttle. (Elec. Trac. Wkly., June 4, 1909; 2 pp.) The paper deals with the action of producer gas in gas engines, and gives the average consumption of various coals and gas. 20c.

6834—GAS PRODUCER PLANT—Test of a Small Suction Gas Producer Plant. H. B. MacFarland. (Journ. West. Soc. Eng., April, 1908; 35½ pp.) Describes the essential features of a gas producer, gives its requirements, describes its operation and a test which was made. 40c.

6835—GAS PRODUCERS—Producer Gas and Gas Producers. R. T. Strohm. (Pract. Engr., June, 1908; 3½ pp.) The economy and efficiency of steam engines and gas producers are discussed, together with the duration and automatic control of the gas. 20c.

6836—HOIST—Mine Hoist Operated by Impulse Water Wheels. (Eng. and Min. Journ., June 6, 1908; 2 pp.) Describes a mine hoist, the drum of which is driven by a pinion on the shaft of the reversing wheel, the rope being carried 750 ft. to the head sheave; illustrated. 20c.

6837—HOISTING—Winding Engine Tests, with Notes and Suggestions on the Design and Testing of Plant. S. L. Thacker. (Iron and Coal Tr. Rev., June 5, 1908; 2 pp.) The article contains methods of testing, instruments employed, description of plants tested, steam consumption and design of hoisting plants. Abstract of paper read before the Brit. Instn. of Min. Engineers. 40c.

6838—HOISTING AND CONVEYING MACHINERY. George E. Titcomb. (Proc. A. S. M. E., June, 1908; 33½ pp.) Discusses in detail the machinery for unloading ore on the Great Lakes and goes into the methods of handling and storing coal by the Dodge system; fully illustrated.

6839—HOISTING DRUM—A New Winding Drum at the Robinson Deep, Ltd. E. Goffe, (Journ. Transvaal Inst. Mech. Eng., May, 1908; 2½ pp.) Describes the installation and details of construction of this drum; illustrated.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, JULY 11, 1908. NO. 2.

The North Side of the Coeur d'Alene District

Deposits of Lead, Silver and Gold in This Region Promise to Become as Productive as Those of the More Famous South Side

BY HERBERT S. AUERBACH*

The Cœur d'Alene district embraces that mountainous region in the northeastern portion of Shoshone county, Idaho, which is drained by the North and South forks of the Cœur d'Alene river and their numerous tributaries. The North fork sweeps along the northern and western borders of the district while its southern limit is defined by the St. Joe range. To the east rises a rugged chain of mountains marking the dividing line between Idaho and Montana. These are spurs of the Bitter Root range, known as the Coeur d'Alene mountains and from them the district takes its name

The district has been locally subdivided into the North Side and the South Side, a subdivision which hinges upon the fact that the region is traversed near its center by a ridge of mountains trending east and west and giving rise to two drainage basins, drained by the North and the South fork of the Coeur d'Alene river, respectively.

On the South Side lie Wardner, Burke, Mace, Gem, Wallace, Mullan and other camps, with their mines which have made the Coeur d'Alene famous as a lead producer, while on the North Side are Delta, Eagle City, Murray, Littlefield and Raven, all big gold producers in their day, and a large section of semi-developed mineral country destined to add greatly to the lead output of the Coeur d'Alenes, and to the gold and copper production of the district.

IDAHO HILL, GOLDEN CHEST MILL ON THE LEFT

DISTRICTS OF THE NORTH SIDE

The mineral resources of the South Side have received occasional mention in periodicals and technical publications, while those of the North Side have never been more than touched upon. The North Side is divided into six mining districts, i.e., Summit, Cœur d'Alene, Eagle, Beaver and Union, and embraces a gold, a lead-silver and a copper belt. It comprises a succession of serrated mountain ranges and sharp ridges whose loftiest peaks rise to a hight of more than 6,000 ft. The general topography is made up of steep and rugged hills set among a tangle of tortuous valleys, intersecting gulches and narrow ravines. The angle of the hills rising abruptly from these affords excellent opportunity for deep exploration by adits and most of the mines are worked in this manner.

The rocks of the region have been subjected to extensive disintegration; the bedrocks are covered with detritus, in many localities to a depth of hundreds of feet, and only in the most precipitous places does the unaltered country rock show up. The detritus of the highlands has been washed into the main valleys in such quantities that the larger streams possess but very slight fall, and the lower portions of their course become mean dering streams. During the major portion of the year the water supply is plentiful, but with the advent of the summer, usually lasting from July 1 to October 1, the creeks run very low and at times are almost dry.

---

*General manager, United Golden Chest Mines Company, Murray, Idaho.

THE "PIT," COEUR D'ALENE PLACER COMPANY

Geology

In some period of geological time this region was submerged by the Pacific ocean. Later in the earth's history the Cascade range was thrown up, which defined the western boundary of a great inland sea. During the existence of this inland sea its shallow waters deposited enormous masses of sediments. Subsequently the bed of this sea was elevated and became dry land. The sedimentaries, under enormous pressures produced by this upheaval were folded, crumpled and shattered, while innumerable fissures were formed. In this complex folding process intense heat was developed and this, in the presence of water, produced the phenomenon known as metamorphism, changing the silts and shales into slates, and the sandstones into quartzites.

Many of these fissures followed closely along the general dip and strike of the country rock, and they became channels through which hot mineralized solutions and vapors from the earth's interior found their way to the surface, depositing their mineral contents as they passed among the rocks which lined the fissures.

It was during this era that most of the gold-bearing veins appear to have been formed. At some subsequent period a series of syenite dikes forced their way through the sedimentaries producing additional folding and fracturing of strata and causing contact metamorphism in the vicinity of the intrusives. The quartzites affected were converted into dark, fine-textured rocks, of the hornfels type, and the silicious slates were altered and in places recrystallized.

These syenite dikes possess a northeast trend, while the productive lead-silver veins strike northwest. It is probable that the lead-silver deposits and possibly some of the gold deposits owe their formation to these plutonic dikes.

Rocks of the Region

The country rock of the Coeur d'Alene region comprises a series of sedimentaries of great age and thickness, varying from shales through slates to sandstones and quartzites. The metamorphism which they have undergone has destroyed all traces of fossils, but by correlation with igneous formations Ransome has shown them to be Algonkian and Precambrian in age. Their total thickness is known to exceed 12,000 ft. These sedimentaries are probably underlain by granite and syenite, stringers of which come to the surface as dikes or laccoliths.

The Prichard slates, which cover a large area, constitute the oldest and the dominant formation of the region. They attain in places a known depth of 8000 ft. These slates vary in color from bluish black to light gray, and contain numerous strata of sandstones and quartzites.

Resting conformably upon the Prichard slates, is the Burke formation, grading from thin-bedded and light-colored sandstones to gray and white sericitic quartzites. In its widest exposure this formation shows a thickness of about 2000 ft. The Burke gradually merges into the overlying Revett formation, which consists of thick-bedded white quartzites, having a maximum thickness of about 1500 feet.

All the auriferous formations are found in the Prichard slates, while the principal lead deposits occur in the Burke quartzite, although some smaller ones are found in the Revett quartzite, and the Prichard slates.

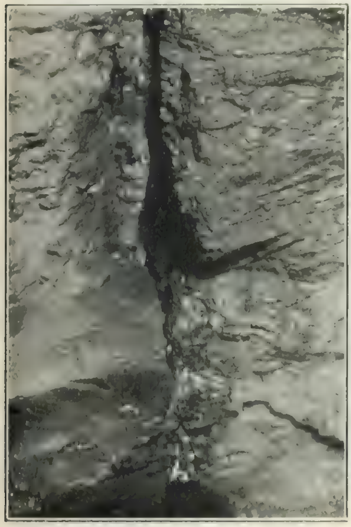
The only known eruptives of any consequence are syenite, and porphyry. An important series of steeply dipping syenite dikes traverses the country in a northwest-southeast direction, cutting across the sedimentary formations. These dikes vary from a few feet to several miles in width, and come to the surface in many places. The largest known is the one running northeast from Gem to Nine Mile cañon and thence through Sunset mountain and into Granite and Cement gulches.

The Orebodies

The entire region has been subjected to extreme dynamic metamorphism, both regional and contact, and at the time of these disturbances the great pressures exerted caused cleavage planes and joints. These generally occur at right angles to the dip of the rock. In fresh fractures the joints are often scarcely perceptible, but as weathering progresses they show plainly, and the rock gradually falls to pieces. Although folding undoubtedly affects the deposition of ore in the gold deposits, it does not appear to influence the deposition of lead-silver ores. Faulting is very common, and in many cases due to the eruptive intrusions; the faults generally occur at right angles to these. The main structural faults appear to have been formed subsequent to the deposition of the ore.

Fissures are frequent, and generally mineralized to a greater or less degree. They cut the formation in a general northwest-southeast direction, and their size in many places seems to depend upon their proximity to the intrusives.

Three general types of commercial orebodies are known: Placers and veins yielding gold, lead-silver deposits and copper ores. The vein filling of the gold deposits consists of quartzite, slate, calcite, siderite and chlorite. As a rule, the ore lies wholly in the sedimentaries, although it is known to occur at the contact of the sedimentary formation and the syenite.



OPEN FISSURE, IDAHO HILL, GOLDEN CHEST MINE

HEAVY GOUGE, IDAHO VEIN, [illegible]

The gold ores are found in veins striking north and inter-bedded with and apparently conforming in strike and dip to the country slates. In many instances, however, there is a slight difference, both between the strike and the dip of the gold veins and their inclosing strata. Although gold-bearing fissure veins occur, the general form of gold deposit is the bed vein.

Ore is found at varying intervals along the vein as "shoots" or "chimneys," the area between these shoots generally consisting of poor or barren vein matter. The shoots pitch in every direction. They sometimes occur as bodies, having a well defined lenticular or columnar shape, but are often entirely lacking in any distinct outline or regularity of form. Generally the ore deposits are of greater size and value where other veins or branches intersect the main vein. Rich pockets are often found where breaks or depressions in the strata occur.

[illegible]

The mineralized rock is often identical with the country rock on either side. Quartz seems to be the main indication of gold, but this does not always hold, for places are known where silica [illegible] quartz generally carries persistent and rich gold ore.

The gold is often in a very finely divided state. It is found sprinkled about in the gangue and a large part of it appears to be locked up mechanically in the pyrites. It varies in fineness between 750 [illegible] the [illegible] [illegible] gold as a rule carries little silver.

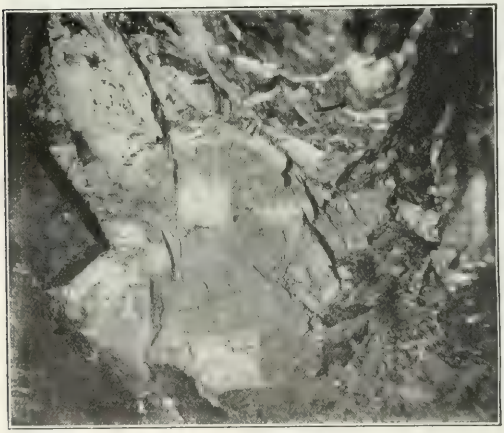
Tungsten is known in several properties and occurs in considerable quantities in the Golden Chest mine, which produced [illegible] tons of scheelite [illegible] assaying from [illegible] per cent. WO_3. At the Golden Winnie tungsten is also found generally as a concentrating ore, with occasional pieces the size of an apple. Several tons of concentrating ore are now [illegible] at the mine. Scheelite was frequently found in the sluice boxes while placer operations were carried on in Trail and Pony gulches. In Eagle gulch Dunlap & Smith had scheelite in their boxes, and [illegible] vein has been [illegible] near the Columbus group.

[illegible]

The lead-silver ores generally [illegible] northwest fissures, cutting across the country formation. They occur as plain fissure fillings and as metasomatic deposits. A distinctive feature of the Coeur d'Alene lead deposits is the association of quartzite with the ore, all the great orebodies found occurring in quartzite formation.

Although networks of quartz veinlets often penetrate the lead ore, the veins do not carry any great amount of quartz. Lead ore occurs in shoots similar to those carrying gold. The lead shoots often increase in width and length as depth is attained.

Cerussite, anglesite and pyromorphite occur in the oxidized zone as alteration products of galena. The carbonates are richer in silver than the sulphides. Iron carbonates are common in the upper zones of the gold veins, as well as in those of the lead deposits.



KLONDIKE VEIN, 3½ FT. WIDE, DARK PORTION IS PURE SCHEELITE

THIRTY FEET OF THE KLONDIKE VEIN, SHOWS RIBBON STRUCTURE

The fault-plane fissures generally carry a gouge. In the quartzite formation the predominating class of fissures are those having but one principal plane of fissuring, although fissures with two planes are not infrequent. The fissures possess a width varying from that of a knife edge to hundreds of feet, and those carrying lead-silver ores generally have a dip greater than 40 deg. They are usually accompanied by a gouge, and one or both of the walls may be slickensided.

The preëxistence of an open space, however slight, to give passage to the ore-bearing solutions, was the essential factor for the formation of orebodies. The greater the shattered area adjoining the fissures the greater was the area of contact afforded the mineralized solutions, and the greater the ore deposition. Where the fissure grows smaller and the country rock becomes harder and more unaltered, the ore diminishes in quantity and quality until it gradually fades away into the country rock.

Deposits of Gold Ore

The gold ores were formed subsequent to disturbances which rendered the rocks schistose. Some gold-bearing fissure veins are known but the gold deposits occur mostly as bed veins. The mineral contents of these bedded veins appear to have been introduced by fissures and are not due to surficial sedimentary deposition, as is generally supposed. The form of these gold veins is probably due to a large extent to the softness and solubility of the rocks in which they occur. There is a series of such bed veins exhibiting remarkable continuity, and extending over rather a wide stretch of country, but possessing the same characteristics wherever exposed. They are found in a belt about five miles wide by ten miles long, and embrace the following properties: Gold Dust, Golden Chest and Mother Lode group, Buckeye Boy, King, Winnie, Crown Point, Fanny, Wake-up-Jim, Fay Templeton, Mammoth and Evolution. Although dissected and altered by folding, faulting and erosion, there is little doubt that at one time they constituted a series of continuous veins covering a large territory.

These veins occur wholly in the Prichard slate formation, this formation varying from shales to silicious slates and containing occasional inter-bedded ribs of quartzite. In many places the shales have undergone extensive pyritization and where the slates have been shattered silicification has generally resulted.

The mineralizing solutions of the gold deposits were probably deep-seated, hot, carbonated and alkaline waters laden with silica and metallic sulphides. As these ascended from the earth's interior the silica and sulphides were deposited by reduction of pressure and temperature as well as by chemical reaction. In some instances metasomatic interchange has taken place, and the vein matter and country rock cannot be differentiated. Gold frequently occurs with mispickel and is sometimes associated with antimony, apparently in some mineralogical combination. The outcrops of the gold veins are generally stained brown from decomposed pyrites and often have a cellular structure.

Ores of Other Metals

The majority of the lead-silver deposits in quartzite are metasomatic fissures. Mineral-bearing solutions circulated through these fissures, altering their walls and impregnating the adjacent crushed quartzite with iron, lead and zinc compounds. In some cases the iron compounds were subsequently metasomatically replaced by lead and zinc sulphides. Where zinc is plentiful magnetite frequently occurs.

Crystals of galena are unusual, the mineral being generally of a fine-grained texture, which would indicate substitution for fine-grained quartzite. The galena is often slickenslided and frequently contains pieces of quartzite, iron pyrites and iron carbonate. The orebodies are generally very irregular and the gradual gradation of ore into country rock indicates that the ore was not deposited in preëxisting open spaces. In slate formation the lead deposits generally have a hanging and a footwall, but the shoots are very irregular and usually of no great size.

The copper deposits have been but slightly developed. The general form of deposit appears to be an impregnation of quartzite with sulphides and carbonates of copper.

The Golden Chest Property

The Golden Chest series and the Mother Lode veins have been the heaviest gold producers, but numerous other lodes have contributed considerable amounts.

MURRAY, IDAHO

The Golden Chest group lies about a mile due east of Murray and embraces 40 claims, mostly patented, in the heart of the Murray gold belt. These claims cover Idaho hill, Chest hill and a large portion of Reeder hill. They are operated by the United Golden Chest Mining and Milling Company, a consolidation of the Golden Chest Company, Katie & Dora Company, Paymaster Company, Butte Creek Placer Company and various smaller interests.

The Chest hill stands at the head of Reeder gulch slightly less than a half mile above the stamp mill and attains a maximum elevation of about 4500 ft. The earliest workings of the property are located upon this hill which has been honeycombed with many miles of tunnels, crosscuts, stopes and shafts. The hill is composed of shales, graywackes, slates and quartzites with intermediate varieties of these, the slates predominating.

GOLDEN CHEST MILL

A series of important gold-bearing veins are found in this hill, and these conform approximately in strike and dip with the inclosing country rock. The veins possess a general strike of north 15 deg. west and dip to the west at angles varying from 30 to 60 degrees.

The uppermost of the series is the Gold Brick vein, which ranges from 6 in. to 5 ft. in width. About 150 ft. beneath is the Clagett vein, varying from 2 to 6 ft. in thickness. About 25 ft. below the Clagett is the Hanging Wall vein, which carries from 3 in. to 12 ft. of ore. Below the Hanging Wall vein and separated from it by 30 feet of stratified gold-bearing slate, is the Footwall vein possessing a width of 3 in. to 3 ft. From this vein some very rich ore has been taken.

The Hanging and Footwall veins are locally known as the Katie and the Dora. The slate filling between these veins is seamed with quartz threads and stringers, and in many places is badly fractured and twisted. Besides the veins mentioned, several are known to exist in the upper portion of the hill, but as yet they have not been explored.

Nature of the Deposits

The veins consist of quartz and slate carrying free gold, tellurides, tetrahedrite, pyrite, mispickel, chalcopyrite, galena, sphalerite, and scheelite, the latter mineral occurring in commercial quantities, a large tonnage being now exposed.

Some of the richest lodes consist of ribbon quartz, in which the ore occurs between the layers of slate and quartz. The ore is found along the foot or hanging wall, often extending from wall to wall and at times scattered in bunches throughout the vein.

The veins from time to time widen out into ore shoots of considerable magnitude. One of the most extensive of these bodies is in the Klondike fissure on the Katie and Dora veins, and from it large quantities of high-grade ore have been extracted. The Klondike is in many ways an exceptional orebody, and has produced several fortunes. It is the largest and one of the richest gold shoots in the entire region.

A short distance within the Idaho tunnel is a large shoot of high-grade ore, called the Jumbo, 30 ft. wide, which continues for 150 ft. [illegible] fault. A few feet beyond this fault a large fissure vein known as the Idaho or Paymaster vein is encountered and the tunnel follows this for more than 800 ft., continuing in ore practically all the way. This vein has an average dip of 40 deg and follows the general lay of the country formation. The footwall consists of very hard quartzite and the hanging wall is slate. Next to the hanging wall is a clay gouge, in places 1½ ft. thick and averaging 6 in. A number of tunnels and shafts penetrate this vein at various points along the hillside, exposing an enormous tonnage of low-grade ore, with occasional shoots of high-grade material.

The north slope of Ophir mountain rises abruptly to a hight of 1500 ft. above the waters of Prichard creek, and in this mountain, directly across the creek from the Golden Chest, is the Mother Lode series. The formation here is almost flat and the strata consist of thin layers of quartzites and silicious slates with occasional interbedded quartz veins. The Mother Lode series comprises two veins conforming to the general country formation and separated from each other by a vertical distance of about 250 ft. These two veins are known as the Upper and Lower, or as the Treasure Box and Mother Lode veins. Their general strike is northeast and they dip to the northwest at an angle varying from horizontal to 20 deg. The ore is generally in irregular shoots, raking to the west. The pay vein ranges between 2 and 6 in. in width. The veins are without doubt a continuation of those encountered in the Chest ground.

The Treasure Box, Mother Lode, Occident, Daddy and Yosemite companies operated on these veins for many years and extracted more than $500,000. They proved low-grade as a whole but contained occasional pockets of extremely rich ore, much of it free gold. The veins were drifted upon for several hundred feet, and flat stoping was employed. As the veins were followed into the hill the ore became too base for the stamp mills to handle, and the mines were closed.

Prichard Valley

From Littlefield to Reeder gulch a great deal of placer gold has been found in Prichard valley, especially along the north rim. The main valley paid well from Wesp gulch to Gold Run. Opposite Dream gulch and about one mile below Murray is the "Pit," owned by the Cœur d'Alene Placer Company. The north rim at this place yielded considerable gold. The pit is, as the name indicates, a great water-filled excavation in the gravels of Prichard creek.

These gravels are hydraulicked, then run through riffle boxes and finally stacked by means of a 10-in. hydraulic elevator, the power for which is furnished by a 22-in. pipe line, about 22,000 ft. long, bringing water from the vicinity of Raven, and delivering it under a head of about 90 lbs. per sq. in. at the pit. The gravel here is from 18 to 30 ft. deep, and contains a great number of large boulders.

The gold is found in the immediate vicinity of the bed rock, or lying directly upon it. The top gravel is practically without value. No reliable data are available, but the gravel at the pit probably runs in the neighborhood of 50c per cu. yd., and under present conditions, it should cost from 40 to 50c. to move a cubic yard of gravel.

Bear Top Lead-Silver Mine

The Bear Top vein outcrops on the north slope of Bear Top mountain about 1200 ft. above Bear Gulch. The croppings show a mass of white fractured quartzite about 20 ft. wide with frequent stringers, and bunches of galena and carbonates throughout its entire width The vein varies in strike from east-west to north 60 deg. west and dips from 45 to 70 deg. to the south.

The vein was drifted upon to east and west, and an ore shoot was discovered to the west of the main ore shoot as well as one to the east of it. The main ore shoot was found to be 70 ft. long and varied from 4 to 35 ft. wide. A raise was made from this level to the surface and continued in ore throughout its length. Over 1500 tons of high-grade lead ore carrying silver, gold and copper were shipped from this stope. The west shoot is about 40 ft. long, and carries from 3 to 6 ft. of concentrating ore. The east shoot is about 40 ft. long and contains from 3 in. to 3 ft. of steel galena of shipping grade.

Manager Kiebler is now running a 1500-ft. crosscut to tap the ledge about 500 ft. below the present workings, and according to late reports has encountered 4 ft. of galena carrying silver, gold and a little copper.

The Bear Top vein is a metasomatic fissure, the hanging wall being well defined and slickenslided, while the footwall is generally indiscernible. Two faults are known, but the throw in neither case exceeds 30 ft. The Bear Top has the best lead-silver showing on the north side. The company owns a concentrator of 75 tons daily capacity and the property is well equipped with steam and water power besides a compressor and sawmill.

The British vice-consul at Santo Domingo reports that the Anibaje springs, east of Santiago de los Caballeros, Dominican Republic, contain sulphur and iron. In the western section of the Republic there are numerous sulphur springs, and in the Yayas de Viajama a sulphur mine has been reported. In the same district there are various thermal springs strongly impregnated with sulphur.

International Nickel Company

This company controls the nickel business in the United States and a large part of the foreign business also, holding the stocks of a number of constituent companies in this country, Canada and Europe. Its report is for the year ended March 31, 1908.

The bonded debt at the close of the year was $10,390,837, of which a total of $747,000 was held by the sinking fund, and a further $292,000 was held in the treasury for future sinking-fund requirements. The capital stock was $17,735,288, of which $8,822,662 is common and $8,912,666 preferred. The current liabilities were $2,590,083, and the current assets $4,433,592. There was $2,216,799 in the surplus funds.

The income statement for the year, condensed, is as follows:

Net earnings constituent companies in America	$2,434,952
General expenses, taxes, etc.	$149,583
Depreciation of plants	215,975
Mineral exhaustion	94,352
Bond sinking fund	168,250
Interest on bonds	482,050
Total charges	$1,110,210
Net profit for the year	$1,324,742

From the net profits dividends of 6 per cent. on the preferred stock were paid, amounting to $534,733, leaving a balance of $790,009, added to surplus.

During the year the sum of $1,548,482 was expended for new construction, equipment and replacements. There was appropriated from the surplus for further depreciation of properties $300,000. All buildings that are not of fireproof construction are fully covered by insurance. In addition to the above, a fund is being accumulated which, at the end of a short time, will be sufficient to enable the company to dispense with purchase of outside insurance.

President A. Monell's report says: "During the past fiscal year the power plant at the falls of the Spanish river, in the Province of Ontario, Canada, has continued in successful operation. The installation of electric mine hoists and compressors referred to in our last report has been completed, and the machinery is now in operation. The third unit at the power plant, also referred to, is now in course of erection.

"The board of directors has deemed it advisable to appropriate from the surplus a further sum of $300,000 to write down the cost of the properties. Our efforts during the past year to introduce nickel into new commercial arts have been vigorously continued. As the business conditions of the past year, especially the latter part thereof, are so well known, it is hardly necessary to state that our own business felt the general depression."

The Mines of Northwestern Altar, Sonora, Mexico

By George W. Maynard*

The early development of that part of the Altar district bounded by Arizona on the north and the Gulf of California on the west was confined to the wet-and-dry washing of the gold bearing surface outcrops of quartz veins. There are no reliable records of the output, but that the work extended over an extensive area is evident from the pits, trenches and tailing heaps.

The principal workings were contiguous to El Plomo, a small village which took its name from the early discovery of lead ore on the property denounced as Abundancia, subsequent development fully justifying the name. The situation of El Plomo is shown on the general map of the district. It is about 40 miles south of the United States boundary and about 65 miles from the Gulf of California.

There are two ways of reaching El Plomo, one from Santa Ana on the Sonora railway, which extends from Nogales on the United States boundary to Guaymas on the Gulf and thence by road via the town of Altar 125 miles, and the other, and better, route from Tucson via Sasabe on the boundary, where there is a sub-custom house, 123 miles. The distance is easily covered in 10 hours by automobile.

Climate

The altitude is only 1200 ft. Notwithstanding the low altitude the midsummer temperature is not oppressive for the reason that a cooling breeze comes up from the west every afternoon. The winter climate is delightful. Malarial fevers, and other diseases incident to semi-tropical countries, are unknown. During the summer the foliage is always green because of the unfailing water within 30 to 40 ft. of the surface as has been proved by the sinking of numerous wells for domestic and milling purposes.

Mining Development

The first systematic development in the district was carried on by the National Mexican Mining and Development Company from 1896 to 1898. The work was confined to the Leones and Ruizena groups six miles from El Plomo, and other outlying mines. On the formation of the Illinois Development Company in 1905 the holdings of the National Mexican company were taken over together with the Abundancia mines.

The quartz outcroppings of the Abundancia lode are in a prairie country and practically continuous for more than half a mile. At several points the outcrops indicate the existence of three or more veins within a width of 150 ft. The general strike is north and south and the dip westerly. The surface dimensions of the group are on the strike 4920 ft. with an average width of 1748 feet.

The geology has not been worked out in detail, but the country is in the main rhyolite, sometimes showing fine grained felsite, then again crystals of feldspar (felsite porphyry) and frequently both quartz and feldspar (quartz porphyry). The surface outcrops show the carbonates and sulphates of lead with a peculiar brownish incrustation or varnish of hematite. Barite is also found in the outcrops. The country rock adjoining the outcrop has become kaolinized; in fact, kaolinization has in many places extended as far as the veins have been opened in depth.

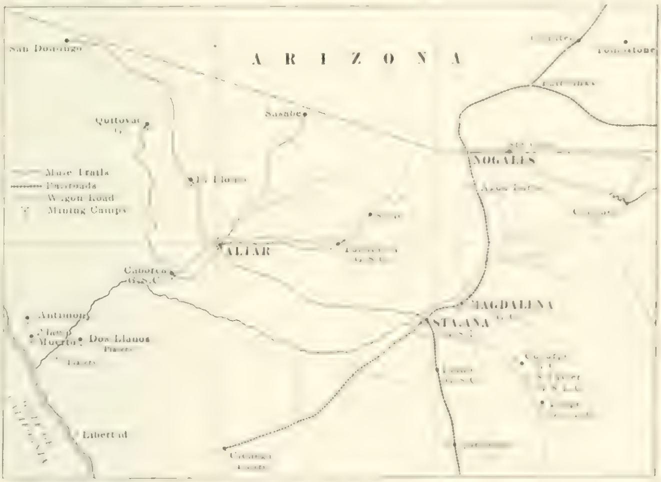
La Abundancia Mine

At the time of the purchase of the property by the present owners, the workings had been confined to the sinking of a vertical shaft near the north end of the claim to a depth of 75 ft. From the bottom of the shaft a level was driven north, 120 ft. and south 100 ft. between well defined walls and in ore for the entire distance. Sixty feet north of the shaft a winze was sunk 28 ft. in ore. For 120 ft. in length the ground was stoped nearly to the surface leaving, however, some blocks of high-grade ore. Drifting at the north end now amounts to 500 ft. with no variation in the character of the vein. Farther sinking could not be carried on on account of water. The extreme development in depth at this point is but 103 ft. The ore thus far developed in the north end of the lode is cerussite (lead carbonate) and anglesite (lead sulphate), the latter predominating. Without exception these minerals carry relatively high silver and gold contents down to the lowest workings. The final sampling [illegible] width of [illegible] The average, however, of 59 samples was 2.5 ft. and the total average value in lead, silver and gold $21.54 per ton.

During the progress of development daily samples were taken of the entire exposure for a period of six months. The average of the entire sampling for six months was: Lead, 23.43 per cent.; silver, $4; gold, $3.55. The mode of occurrence of the gold in the oxidized lead ore has not yet been determined. At the bottom of the winze the first small bunch of galena was found, the forerunner of the unoxidized ore in depth.

The south workings on the lode consist of a 335-ft. drift at 100 ft. north of a shaft 176 ft. deep, and cross-cuts which have shown the existence of parallel veins. In addition to the lead ore burches of chalcopyrite are frequently found and in places there are evidences of the persistence of copper sulphides in depth.

On an average the grade of the ore at the south end is not as high as at the north, but where copper comes in it is higher. Some of the samples contained 6 to 8 per cent. copper. Where copper oc- [illegible] The 100-ft. level has been extended 211 ft. [illegible] of connecting with the level which has been driven south 210 ft. from the north [illegible] solutely determined that the two levels are on the same vein. The extreme north [illegible] apart. [illegible] up. [illegible] prove absolutely the continuity of the lode.



Map of a Portion of Sonora

---

*Consulting mining engineer, 20 Nassau street, New York.

The Leones and Ruizena Groups

These are six miles south of El Plomo on the east and west slopes of Ruizena mountain. The road is practically level to the foot of the mountain. The mountain mass is granite. Professor Guild, of the University of Arizona, has identified the basis dikes as camptonite, a rock consisting of crystals of hornblende in a ground mass of plagioclase feldspar. The composition is the same as diorite, and in the field these dikes are usually called "diorite dikes." The term "camptonite"[1] refers mostly to the structure which cannot be made out without the microscope. The granite has been weathered more or less on the surface and immediately adjoining the veins in depth. The veins, which, as a rule, are well defined and readily traced on the surface, bisect the formation at angles ranging from 20 to 35 deg. from the vertical. The general definition of the veins is strongly marked, and they are readily followed. The vein mass or filling is made up of quartz and kaolinized country rock. The hydration and consequent displacement of the rocks which inclose the vein cause slips and local faultings which throw the vein, but a careful study of these phenomena has made it possible to catch the vein when faulted.

The metamorphism adjoining the veins has been more extensive and complete on the west side of the mountain than on the east, and as a result the veins are more easily followed and the mining is less costly. On the east side the ore lacks the continuity which characterizes that on the west, and where it does occur it adheres to the vein filling, which is largely quartz, so that the cost of mining is much greater than on the west side.

As the east side mineralization differs so widely from that on the west, it will probably be found that the veins do not coincide when the west side levels are driven through the mountain.

To P. W. K. Robertson, of Parral, is due the rapid development of the Abundancia mine under very adverse labor conditions.

Leones Group on West Side of the Mountain

This group covers 4845 ft. on the strike of the veins already determined and a width of 656 ft. from the foot of the mountain to the summit. The development has been carried on through five adit levels. The two lower levels have not been driven far enough to cut the vein, but the three upper levels are in ore for 375 ft. on the strike. The levels are connected by winzes to a depth of 330 ft. The east ends of the levels are in ore, so the extent of the vein is still to be determined.

For the purpose of arriving at the value of the ore already opened up, the exposures were broken down as they would be for shipment to the mill. The total amount was 39,952 lb. Each lot was passed through a Comet crusher and then into Cornish rolls set to 5/16 in. The mixing and quartering for assay was carried out in the usual manner. The average assay value of the entire sampling was $9.77, and the average width of the workable veins 2 feet.

By pan amalgamation 59 to 72 per cent. of the gold contents was extracted. The tails from the amalgamation were concentrated and contained 0.90 to 9.20 oz. of gold.

In the lowest workings iron pyrite begins to come in and a little water.

Ruizena Group

This group is on the eastern slope of the mountain and nearly in line with the Leones. The length on the assumed strike is 2191 ft. and 984 ft. in width. The veins occur in granite, but unlike the western slope the weathering has been very limited, and the definition of the vein is not as marked as in the Leones, and as the ore is distributed through the gangue and adheres more closely to it, close cobbing or dressing is necessary. The ore is for the most part galena and iron sulphurets.

The development consists of an adit of 680 ft., and slopes from 60 to 100 ft. and some inaccessible workings below the adit level. There are no records of the tonnage mined and sent to the dressing plant at El Plomo, so that the number of tons which went into the dressed ore is an unknown quantity. The only reason for giving the mine any consideration is that the returns from the Pueblo and El Paso smelting works from 286 tons of concentrates and 150 tons of hand-sorted ore, making a total of 436 tons, gave a net yield after the payment of freight and smelting charges, of $60,663.72. The concentrates are said to have averaged $150 per ton.

Prospects of the District

The foundation of successful mining in the El Plomo district will rest primarily on the development of the Abundancia group, and the work thus far done amply justifies vigorous exploration. Remoteness from transportation and traveled routes is the only explanation of the ignorance of the district.

Intelligent exploratory work on the lines already inaugurated for, say, 18 months, should put enough ore into measurable reserves on the Abundancia, to warrant the next step, viz, the building of a railway from Port Libertad on the Gulf of California to El Plomo and to extend eventually to Tucson. The reasons for an independent road to the gulf are manifold. Primarily, to the bringing in of supplies for the establishment of a large mining and smelting works, subsequently the supply of coke and the shipment of matte and base bullion to the Pacific terminus of the Tehuantepec railway and over that road to the Atlantic terminus when European smelting works could be reached. The Tehuantepec road is now offering very favorable rates. At both ends of the road the most approved machinery for handling heavy freight is now being installed. At the present time coke is being laid down at Santa Rosalia on the Gulf, the port of the Compagnie du Boleo, a French company, at $8 per long ton. On the completion of the Panama canal the cost will be materially reduced.

Port Libertad is the best port on the coast north of Guaymas; it is sheltered by high bluffs from the northwest winds and has deep water up to the shore line.

Apart from the development referred to in this paper, important discoveries of copper ores just south of the Arizona line have been made at Cobota and also at Caborca, south of El Plomo.

The drawback to development of the district has been the lack of reduction works and transportation facilities. When these are established this corner of Sonora will be controlled by those who have the capital and patience to tackle the problem on the lines indicated.

---

[1] Camptonite was named by Rosenbusch because the sample of rock sent to him was found at Campton in the Pemigewassett valley, New Hampshire.

Nickel-Copper-Platinum Ore in Nevada

By A. Maurice Thompson*

A deposit of ore similar in many respects to that at Sudbury, Ontario, has been the object of considerable investigation and development in southeast Nevada. It is situated at the west end of the Virgin River mountains, about five miles west of the Nevada-Utah boundary. The district is reached from Moapa, on the San Pedro, Los Angeles & Salt Lake railroad, by a 35-mile stage ride, passing through Bunkerville.

The country consists of mica schists and limestones, into which lenses of diabase have been injected. The lenses range from 10 to 50 ft. thick, and from 50 to 600 ft. long, and have a northeast-southwest strike.

At one locality, about 5000 ft. of development work has been done, reaching a maximum depth of 400 ft., and blocking out 150,000 tons of ore. An average of 25 samples taken throughout this development shows copper, 3 to 5 per cent.; nickel, 2.5 per cent.; and platinum, 0.3 oz. per ton. Certain specimens have been reported to carry as much as 12 per cent. nickel.

Deposits of this nature are of wide extent in the district, and, were it not for the distance from nickel-refining centers, a large output of ore could easily be made. The platinum seems to be uniformly distributed throughout, as every sample shows a yield of this metal.

---

*Bunkerville, Nev.

Ore Contracts from the Smelter's Standpoint

Smelting Involves a Great Many Varying Items of Cost Which Can Not Be Fairly Apportioned under a Flat Rate

BY CLARENCE A. GRABILL*

The article by H. M. Adkinson on ore contracts in the JOURNAL of May 16 has attracted my attention, owing more, perhaps, to its representing a very common belief that the average smelter manager is in business merely to make all he can out of each individual lot, than to its correctness. In fact its many discrepancies and incorrect conclusions lead me to a desire to show: (1) that his method of comparison was wrong and necessarily leads to uncertain, if not incorrect, conclusions; and (2) that the reasons for the so-called peculiar methods of calculation are based on justice and sound reasoning, and are intended to be as far as possible equitable to both sides and that the flat rates so much desired by Mr. Akdinson and everyone else would involve uncertainty and unfairness, and are consequently not used except in special cases.

I do not mean to say that competition is not advisable. Far from it. But I do consider that with the exception of his last two contracts the differences were not so much due to the contract as to the peculiar phases developed by changes in prices or grade or composition of the ore.

I will state in passing that I have been in the past connected with a customs smelter and expect to be in the future, although not now actively so.

VARIABLES AND DIAGRAMS

To take up the first part of my thesis, I wish to call attention to the fact that Mr. Akdinson's tables contain, or are affected by eight independent variables, i.e., the prices of lead and silver and the percentages of lead, silver, gold, insoluble, iron and sulphur, besides the dependent variables.

Now it is impossible for human ingenuity to construct a diagram to represent so many changes and will be until the mind can comprehend multidimension space. Consequently the tables merely represent phases of the changes, isolated points as it were; and the peculiar results are frequently due to some overlooked variation other than the contract to which they are ascribed. The best we can do is to limit our variables to quantities whose variation we can observe, say two or three, taking planes in space rather than points.

I have, therefore, made certain assumptions derived from Mr. Adkinson's figures and data which, although not adhering closely to any one case, are approximately true of all. Unfortunately his data do not always agree with his tables as will hereafter appear.

I have assumed that for every unit of lead there were in the ores 0.005 oz. gold and 0.4 oz. silver, and that, beginning with an ore running 45 per cent. lead and 14 per cent. Fe the iron increased one per cent. for every decrease of 2 per cent. lead; that the insoluble was constant at 8 per cent.; and that all assays were fire assays. In Fig. 1 I have plotted the value from the ores of different grade under the different contracts assuming a constant market price for lead and silver of 4c. per lb. and 60c. per oz., respectively. In Fig. 2 I have plotted two ores running 22 and 42 per cent. lead respectively, with a varying price for lead as shown by the abscissas, the ordinates showing the value received by the miner as in the previous case.

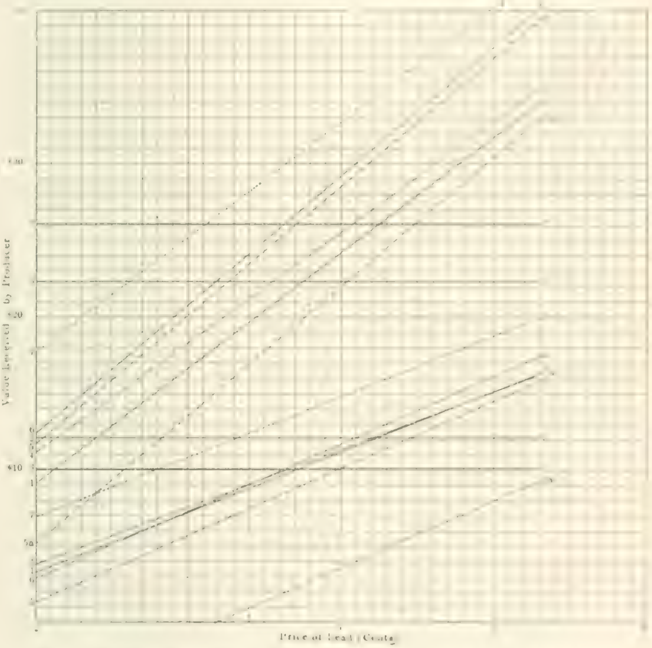


FIG. 1. CURVES SHOW RETURNS TO PRODUCER FROM [illegible]

The curves are numbered to correspond with Mr. Adkinson's tables, curve 1 representing the results under the contract or arrangement shown in his table No. 1. Two curves are given [illegible] [illegible] states them, and the second or lower, [illegible] timing I wish to note that although his [illegible] the actual averages hung pretty closely to [illegible] except under Table No. 5.

MEANING OF THE CASE STATED

[illegible] that matters happened about as follows (for convenience let us call the miner or his company *B* and the smelters *X*, *Y* [illegible]

Miner *B*, having from time to time [illegible] them to the nearest smelter and there disposed of them at a tariff, curve 1, in- [illegible] necessarily higher than for a regular or large shipper. Such a rate is usually made more favorable for low-grade ores; and for such it compares favorably with most of the others, particularly under the circumstances. It was intended to encourage the shipper of low-grade ores, but bears rather hard on the high-grade man who can presumably better afford it. This is, broadly speaking, a general principle; but it must be borne in mind that small irregular shipments are more expensive to handle than large regular ones.

---

*Metallurgist, Patagonia, Ariz.

Finding that his shipments were regular *B* obtains a contract, curve 2, which was the best arrangement for very low-grade ores with lead at 4c. that he ever received, and for his average ore was better than any except the last two, and but little different from one of them. Yet, Mr. Adkinson calmly informs us that it was not so advantageous as No. 1.

The trouble appears to be that as a flat price was paid for lead, the smelter received all the advantage of a rise and suffered all the loss due to a fall. In the case given the price rose to 4.32c., at which price the terms of No. 2 are surpassed by his first open rate and the second and last two contracts. Had the price fallen he would have had a different story to tell.

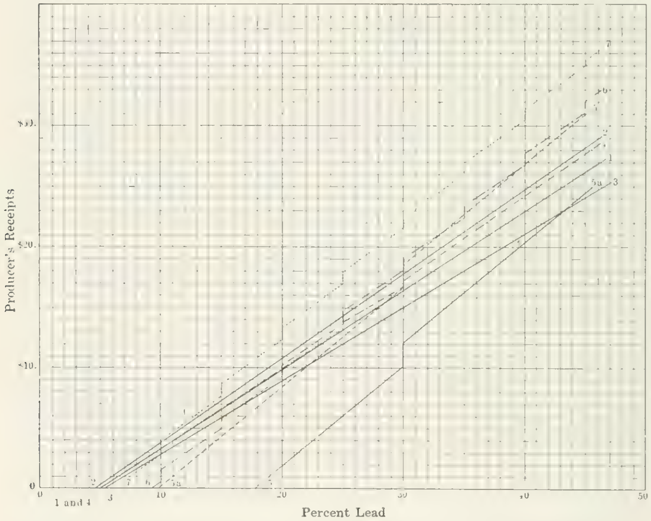


FIG. 2. VALUE TO PRODUCER OF A 42-PER CENT. LEAD ORE UNDER MR. ADKINSON'S CONTRACTS WITH A VARYING PRICE OF LEAD; GOLD 0.21 OZ.; SILVER 16.8 OZ. PER TON. FIG. 3 COVERS THE SAME CONDITIONS EXCEPT THAT THE ORE CONTAINS 22 PER CENT. LEAD

Contracts of this type are very unsatisfactory to the purchaser, but are often made at the solicitation of the miner who, "wants to know what he is going to receive for his ore." I am not revealing a professional secret when I add that they are not often or intentionally made on a falling market. They are best avoided. Roulette or faro offers a surer method for one who is looking for financial difficulties on a small scale.

Contract of Another Type

At the expiration of this contract, I regret to say, there appears to have been a little jockeying and curve 3 represents the smelter's move. This was obviously unsatisfactory to everyone concerned except Mr. Adkinson, who calls it the best so far. Reference to Fig. 1 shows that with lead at 4c., the miner received less than any arrangement except that represented in curve 5. Reference to Fig. 2 shows that this statement holds for high- and low-grade ores at all prices of lead above four cents.

At the close of this period contract No. 2, curve 4 was agreed upon, which with lead at 4c. is not so good as his first contract, though at all prices above 4.2c. it is better (Fig. 2). It is an arrangement similar to No. 1, but better by about $1.50 per ton in most cases. I regret to see that Mr. Adkinson says it is "the least favorable so far," for it is better than No. 1 in all similar cases with lead below 5c. and better than No. 3 in all probable cases and better than No. 2 in most probable cases, on ore of similar grade and composition at the same market price for metals.

Under a contract giving a fixed price of lead, as in Nos. 2 and 3, the miner's percentage rises as the market price falls; but under a contract with a fixed deduction from the market price the miner's percentage increases with a rise in price. This difference should be constantly borne in mind, both in examining the tables and in practice when the price is varying according to its usual custom.

At this point *B* appears to have tried a bluff, or else to have lost his head, for he makes a new deal which he apparently does not understand. At the best the data given with the table are incorrect. This contract was especially unfavorable to low-grade ores, a 17-per cent. ore yielding nothing under its terms.

An Examination of Mr. Adkinson's Figures

Mr. Adkinson states that the miner received a bigger percentage than under the former contracts. He would have received a bigger percentage still under any of the other contracts on ore of the same grade and at the same price. He also states that the smelter paid the freight. He is doubtless correct, but equally doubtless it was charged up against *B* in the account in spite of the, "increase in favor of the miner."

For convenience I give his tables omitting the percentages in the last column.

ADKINSON'S TABLE NO. 5.

New York Values.

Gold at $20.67	$566.56
Silver at market	769.93
Lead at market	2,811.50
Total value of product	$4,147.99
Total marketing expense	$211.44
Net proceeds.	1,957.67
Producer's portion	$2,169.11
Treatment	$476.27
Freight at $6.50	526.27
"?"	976.34
Smelter's portion	$1,978.88
Total	$4,147.99

The terms of this contract as indicated by Mr. Adkinson are: Gold, at $19 per oz.; silver 95 per cent. at New York market price; lead, full contents at 45c. per unit, this price based on a lead quotation of $3.75 per cwt.; for each 5c. increase or decrease add or deduct 1c. per unit to or from the above price; treatment: $6 per ton over 30 per cent. Pb and $8 per ton under the same.

Examination of this shows that the lead is paid for at the New York market price less 1.5c. Proceeding to our calculations on the above basis we find that the gold at $20.67 equivalent to $566.56 is equal to $520.79 at $19 per oz.; 95 per cent. of the silver value is $731.43, giving a combined credit of $1252.22. Deducting this from the "producer's portion" we have a credit balance of $916.89, evidently due to the lead, to which must be added the treatment charge $476.27, giving us a total credit of $1393.16 on the assumption that the smelter paid the freight out of its deductions. Deducting this $1393.16 from the lead value $2811.50, we have a smelter's portion of the lead $1418.34. This we have seen is equivalent to 1½c. per lb.; hence the $1393.16 must represent 1.47c. per lb., giving a total New York market price of 2.97c. per lb., which is contrary to the data given and also absurd.

If, however, we assume that the freight, though paid by the smelter, was charged against the shipper's credit, we must add that amount $526,27 to the lead credit previously obtained, giving a total of $1919.43 credit from the lead. Deducting this from the $2811.50 we obtain a smelters portion of $892.07 to represent the 1½c. deduction from which we calculate that the New York market price was 4.73c. per lb. which corresponds with the balance of the figures and is, therefore, probably correct, though the data given call it 4.05 cents.

The Ore Under Earlier Contracts

If we take the terms given under the previous contract and assume the insoluble and iron as accompanying the table we may calculate the yield for this ore under the second contract. The result is rather startling and is as follows:

Gold	$520 79
Silver	731 43
Lead	1,601 39
Total	**$2,853.61**
Treatment	456 31
Producer's portion	**$2,397 30**
Producer's portion	57 9 per cent

From which we see that the contract called by Mr. Adkinson "least favorable" when applied to the ore sold under this improved, made-to-order-contract actually yields a greater percentage to the miner. Evidently *B* recognized the necessity of raising the grade under this contract and, as it was by all odds the poorest of the lot, on its expiration he hastens to *Z* for a contract that was really an improvement for higher-grade ores and at high prices though nothing startling on medium or low-grade ores, being surpassed by others under some circumstances. The last contract was apparently drawn by a company needing lead; for its terms are especially favorable, though I have not examined its figures carefully from the smelter's standpoint.

Some Variables not Considered

I do not contend by any means that competition is inadvisable or even unnecessary, but I do contend that comparison by means of a table like that of Mr. Adkinson is inequitable and unfair to both parties, and leads, as it led him, to incorrect conclusions. It is impossible to state without knowing all the conditions, probability of change of price, grade of ore, composition and regularity of shipments, which contract would be the best. Some would be better with a rising, others with a falling market, some with increasing lead, others with decreasing. About the only general statement seems to be that the conclusions drawn were wrong and even that statement has its exceptions.

It is well to remember that as values increase, no matter from what cause, so does the miner's percentage (Fig 3) and also that as the proportion of the value in gold and silver rises compared with the value of lead, so does the miner's proportion, because he gets from 92 to 95 per cent. of the precious metal values and rarely above 75 per cent. of the base metal. Treatment charges are excepted in both cases.

The arrangement given in the tables fails entirely to allow for these variations under one and the same contract. I know of no simple method or short-cut for the so-called mysteries of smelter contract for those who do not know. Blind luck, and trust in the purchaser which is not often abused, employment of one who does know, or sufficient study to inform one's self of all the conditions involved are the only ways. The last of which simply means a little plain hard work and applies to the smelter man who does plenty of it himself on every contract involving new conditions or any considerable amount. In fact the amount done on some would very likely be a revelation to many shippers. Nor is there a desire to beat the small shipper as is often believed, for it is to their interest to encourage small shipments; but small shipments are expensive to handle and for that reason are frequently charged extra.

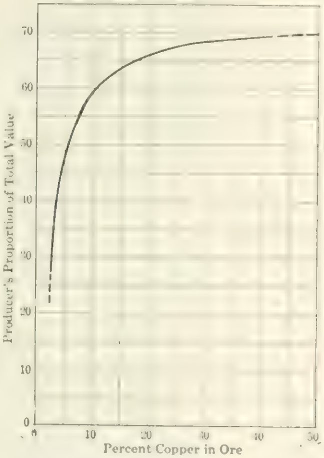


Fig. 3. Producer's Portion with Varying Percentage of Copper

Principles Involved in Calculating Smelting Costs

In order to consider why the flat rate cannot be successfully given it will be necessary to examine roughly certain principles involved in smelting and, since I am more familiar with copper than lead, I will take up the matter from that standpoint. The principles apply equally to both cases.

Roughly costs, i.e., the cost of treatment of any metal containing rock by smelting and subsequent refining, may be and are divided into two large classes, each of which is in turn divided into two smaller classes, dependent on the nature of the material handled.

The two classes are *A* those dependent on and caused by the metal portion of the ore; *B* those dependent on and caused by the ore itself as a whole. Class *A* [illegible] the nature of and in proportion to the percentage of metal present; (2) fixed costs independent of the quantity. Similarly *B* is divided into those (1) dependent on the bulk of the ore, and (2) those dependent on its composition. These four classes of costs, independently variable, depend on entirely different causes and are the source of the complex (?) smelter tariff.

The smelter man usually keeps his costs by several methods, notably: per ton gross burden smelted; per ton charge proper; per ton net ore; per ton silica smelted (or in basic regions per ton FeO or CaO smelted); and per pound copper produced. He bases his charges on these figures and on the losses which may be included in the costs as above divided.

As an example of *A* (1) we have volatilization (not flue dust which is here not taken into account, it presumably being returned constantly) of gold, silver, lead and copper. In these cases a definite amount of blast will volatilize a definite amount of silver (or lead) under the same conditions as to surface and temperature; and, since surface, generally speaking, is dependent on the amount present so is the volatilization. An example of the fixed cost per pound or ounce is the refining charge. An example of the cost in proportion to the mass of the ore is the cost of handling; while *B* (2) is represented by the fluxes necessary due to the composition.

Smelting Losses

Silver recovery is usually taken at 95 per cent. This figure is more or less uncertain, and published data are admittedly unsatisfactory. The loss undoubtedly often is 10 per cent. and with especially well supplied plants may fall to 2 per cent. The low figures published are frequently due to neglected amounts in fluxes or ores low in silver, and where roasting has been adopted (because necessary), the loss probably runs nearer 10 per cent. The copper metallurgist usually treats a charge so low in silver that the errors in sampling and assaying obscure the result, and this is also true of gold and to a greater degree. Having recovered, say, 95 per cent. of the silver, allowing the slag loss as part of the 5 per cent., the smelter must still pay for the refining and sale of the silver so he actually pays more for it than he finally receives, compensating himself and finding his profits by other charges, while the miner promptly calls him a thief and a robber and a liar.

In the case of gold, which is more fav- [illegible] the smelter by volatilization or in the slag, although that is appreciable. It is per- [illegible] is rarely sufficiently well done to give exact figures, and errors of assay, sampling and neglected and undetermined quantities in fluxes, etc., usually mask the exact result. The loss in slag varies with the amount on the charge and the matte or lead fall, but the percentage loss undoubtedly decreases with increased amounts; hence the higher price paid for larger amounts. I am inclined to estimate actual gold losses at 5 per cent., although usually masked by the causes mentioned, so that they appear less.

Allowing four months for investment from time of sampling to finally returns and interest at 6 per cent. a year, we have an additional loss or expense of 2 per cent., and since $19 is about 92 per cent. of the actual value, this leaves 1 per cent. to pay for refining and coinage. These figures for interest apply to silver also. When $19.50 per oz. gold is paid we appear again to have a loss to be met by other charges. The miner frequently feels that he is being robbed if he does not get $20 an oz. for gold, and all his silver at market price, and will admit an increased smelting charge rather than decreased payments. Competition and this psychological fact have frequently resulted in peculiarly worded contracts.

I remember one case in which a contract was offered with the usual premium of 10c. a unit for iron and corresponding deduction for insoluble. The miner's view of the matter, as reported to the office, was, "The Lord Almighty put the silica in the ore and I won't pay for it." The ore was fairly uniform, and perhaps slightly higher in iron than the insoluble, so the contract was adjusted satisfactorily, I believe, by striking out the penalty for silica and the payment for iron.

Cost of Producing Copper

Turning to copper, the fixed costs for this metal are due to its converting and subsequent refining, and may be calculated on the actual weight of the copper, since they are almost wholly dependent on that. Converting may be taken at ¾c. per lb. shipment East as converter bars at ½c. per lb. Refining costs about ⅔c. per lb., but the smelters usually pay about ¾c. for that operation; sales commission and remelting cathodes to wire bars ¼c.; interest on investment for four months ¼c. Insurance may be included in the shipping charge.

We thus have expenses of 2½c. per lb. directly chargeable to the copper. It is this 2½c. that appears as a reduction of from 2½ to 3c. or more off the New York market price of electrolytic copper, depending upon whether the particular manager includes certain losses in this amount or not, and whether he figures profits here or elsewhere. I know of one contract that called for 6c. reduction from the market price on certain ores. The ores in question were low-grade silicious and required a large amount of flux involving an increased slag loss which was covered by that method using a sliding scale. This charge could not be covered by a flat rate if the grade of the ore changed, nor could it be covered by a percentage arrangement if the price changed. In the latter case let us suppose we deduct 20 per cent. from the copper or the price, the result being the same. Then with copper at 10c. the smelter would receive only 2c. per lb. to pay 2½c. If, however, the price rose to 25c. and the deduction of 20 per cent. were taken, then 5c. would be taken to pay 2½c., manifestly unjust both times.

Handling and Fluxing the Ore Mass

Taking up our class *B* of expense, we have the handling, sampling, feeding etc., due entirely to the ore mass, and on the other hand if the ore requires a flux it involves not only the cost of the flux but its handling, fuel to smelt it, increased slag loss due to its presence, increased volume of slag, perhaps decreased saving due to decreased matte fall, etc., all of which must be considered; it is obvious that these charges could not be covered by a figure dependent on the weight of the precious metal contents.

This cost accounts for the bonus paid for iron and penalty for silica. If we assume an extreme case, as of pure quartz with gold, the smelting charge in the Southwest today by regular open schedules would be $10 penalty for insoluble and $3 smelting charge, which is not unjust as will be seen later. I am excepting, of course, special cases such as the use of quartz ores for converter linings and similar cases. To make matters clear I shall take two cases of an extreme type and for simplicity will omit silver and gold values. I will assume that the ore and fluxes are pure, that no flue dust is made, or at least is resmelted as fast as made, and that the coke has no ash. The figures given will represent extreme cases and will, therefore, be exaggerated examples of actual variations occurring on a smaller scale.

Typical Cases

I will assume (1) a low-grade silicious ore carrying 6 per cent. copper, 92 per cent. silica and 1½ per cent. sulphur; (2) a high-grade silicious ore carrying 60 per cent. copper 15 per cent. sulphur and 25 per cent. silica. For costs I will take coke at $12 per ton, limestone at 50c., labor 50c. Power, repairs, supplies, taxes, general expense, management, superintendence, etc., at $1 per ton of ore and fluxes handled. Slag losses will be taken at 0.6 per cent. copper per ton of slag, and slag at 40 per cent. silica, and that all necessary fluxing will be done with lime, the average run of ores of the plant carrying sufficient iron to permit this. We will simplify matters by neglecting flue dust, matte fall, grade of matte, difference in value of slags owing to changed composition, etc. Lime will be taken at 50 per cent. available CaO.

Our first ore will have an excess silica of 0.92 tons to be fluxed to a slag, or 0.92 ÷ 0.40 = 2.30 tons slag containing 1.38 tons CaO or 2.76 tons limestone. We may assume that 12 per cent. coke will be required. Tabulating the costs we have the accompanying table.

COSTS OF SMELTING LOW GRADE SILICIOUS COPPER ORE.

(*a*) 2.76 tons limestone at 50c	$1.38
(*b*) 2.76 tons limestone, 12 per cent. coke at $12	3.97
(*c*) 2.76 tons limestone, labor, etc., at $1.50	4.14
Total	$9.49
(*d*) 1 ton ore, 12 per cent. coke at $12	1.44
(*e*) 1 ton limestone, labor, etc. at $1.50	1.50
Total	$12.43
(*f*) Slag loss, 2.3 tons at 0.6 per cent. — 27.6 lb. copper.	
2.76 lb. copper at 10c*	2.76

*Market price of copper taken at 12.5c per lb. f.o.b. N. Y.

Of these costs *d* and *e* are flat costs dependent on the mass of ore involved and amount to $2.94, from which we may assume a smelting charge of $3 per ton of ore; *a*, *b* and *c* are dependent on the insoluble in the ore and since the total cost $9.49 is due to 92 units of silica, it is correct to charge the smelting cost at 10.3c. or in round figures at 10c. per unit. Cost *f* is dependent obviously also on the silica. The price of copper was taken at 12½c. New York, less the 2½c. for converting, refining, etc. Reckoning this cost per unit of silica, we have an additional charge of 3c. per unit, making a total penalty of 13 cents.

We still have our profits to account for and it seems most equitable to proportion it to the investment in the ore and its value; therefore we will take 10 per cent. of the copper as profit. Since this yields only 10c. per lb. to the smelter, i.e., at the assumed price of 12½c., New York, the profit on this ore will be 10 per cent. of 120 lb., or 12 lb. which at 10c. equals $1.20 per ton; this must also cover any losses above 95 and 92 per cent. in silver and gold, should the ore contain these metals, and represent the profit for handling.

The figures I have taken as to costs are actual figures at different plants in the West, but not from the same plant nor taken at the same time. For example, $12 coke is a high assumption at this moment, but it was not last year; $1 for power, etc., applies to a medium-sized plant; 50c. for limestone is unusually low, etc.

Application of Results

We may now base our tariff on the figures obtained. It will run as follows: gold, $19 per oz.; silver 95 per cent. of New York market price; copper, 90 per cent. at New York market price of electrolytic wire bars, less 2½c. per lb.; treatment, $3 per ton; insoluble charged at 13c. per unit. This tariff certainly has a familiar appearance and carries the usual variations. Let us see how it would work on the higher-grade ore. In the smelting charge 0.25 tons silver requires 0.375 tons lime or 0.75 tons limestone, and makes 0.625 tons slag.

COSTS OF SMELTING THE HIGH-GRADE COPPER ORE.

0.75 ton limestone	$0 375
0.75 ton, 12 per cent. coke at $12	1 08
0.75 ton, labor, etc., at $1.50..........	1.125
1 ton ore, labor, etc. at $1.50	1 50
1 ton coke	1 44
Copper loss 0.625 tons at 0.6 per cent. Cu = 7.5 lb	0 75
Total.	$6 27

CHARGES

Treatment 1 ton at $3	$3 00
25 per cent. silica at 13c	3 25
Total ..	$6 25

The profit on this ore would be 10 per cent. of 1200 lb. copper or 120 lb. at 10c. which equals $12. This seems large but it must be remembered that it is a very rich ore, involves a large investment, and moreover, there is usually a sliding scale treatment charge in favor of the high-grade ores. Also ores of this grade would come in small amounts and involve more expense in handling.

Plotting this contract, using as ordinates the "producer's percentage" of the total value and as abscissas the per cent. of copper in the ore, and assuming a neutral ore with no excess silica, we get the curve shown in Fig. 3 showing that as the grade rises so does the miner's percentage. Plotting the curve shown in Fig. 4 for a 10-per cent. ore, using a variable price as abscissas, we see that the same thing happens for an increase in price. A moment's thought will show that as the proportion of gold and silver in the total metal value rises so will the miner's percentage. In other words, anything which causes an increase in the total value of the metal contents will increase the producer's portion, excepting the substitution of large amounts of base metal for noble metal, and Mr. Adkinson's tables are more representative of this condition of affairs than any other one thing.

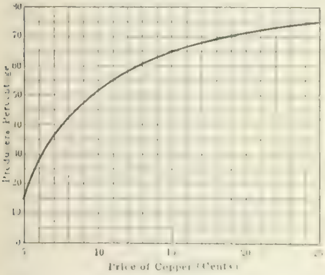


FIG. 4. PRODUCER'S SHARE FOR A 10-PER CENT. NEUTRAL ORE UNDER TERMS OF HYPOTHETICAL CONTRACT WITH VARYING PRICE OF COPPER

I have necessarily omitted all reference to many things effecting the final results, such as fineness, sulphur, alumina, risk of change in market price, relative value of different quotations, etc., but I think I have shown that the peculiar (?) wording of contracts is based on justice and sound reasoning, and that flat rates are applicable only in special cases and are extremely liable to be unjust to one party or the other.

Shorthand by Machinery

According to the London *Times*, a machine has been devised for writing shorthand—a machine so simple that anyone can master it, and so efficient that even the highly trained stenographer cannot hope to do more than rival it. The "Stenotyper," as this wonderful contrivance is called, is in bulk and weight a mere fraction of the standard typewriter, and can readily be worked on the operator's knee. It has only six keys, and by permutations and combinations of these six keys, taken two or three together, a complete alphabet is built up—an alphabet of dot and dash, similar in kind to that of the Morse code. The learner has simply to commit this alphabet to memory, and the machine will do the rest. With less diligence than is often devoted to the acquisition of a mere parlor-game, any ordinary person should be able to write "stenotypy" at a serviceable speed.

This new shorthand is not based on phonetics. Its units are not single sounds, but syllables, many of which can be formed by one touch of the hand on the keyboard. As if playing the piano, the operator simply strikes a chord and imprints a character decipherable to the trained eye at a glance. Unessential vowels and consonants can be dropped out, for the grouping of the symbols indicates how they are to be read. Thus the second conspicuous advantage of the stenotyper is attained, i.e., the "note" which it writes is legible, not only to the operator, but to anyone else who has mastered the alphabet. Wilful idiosyncrasies and accidentally imperfect outlines cannot be introduced into "stenotypy." The note is necessarily correct in form, and, therefore, legible to all stenotypists, and at any distance of time. The third great advantage of the machine is that it can be used with equal facility for any language—provided that the operator knows that language.

The construction is of admirable simplicity. The keys print on paper that is self feeding from an endless roll. A spring-lever and a few cog-wheels make up the essential working parts. There is none of the mechanical intricacy of the typewriter, and, therefore, there is nothing to go wrong. The machine is so easily portable and works so silently that there is no reason why it should not be used in ordinary reporting work; but for commercial purposes its usefulness is still greater; for the notes taken by one operator can be distributed for transcription among any number of clerks.

Volumetric Estimation of Lead

A. H. Low (*Journ.* Am. Chem. Soc., [illegible]) for the determination of lead in which the lead is precipitated as oxalate and subsequently titrated with permanganate. Calcium and antimony do not interfere with the method, nor does bismuth in small amounts. In a mixture containing 10 per cent. bismuth and 23 per cent. lead, the result was only raised 0.36 per cent.

One-half gram of the ore is dissolved, heated with sulphuric acid and filtered on a 9-c.m. filter in the usual manner. The lead sulphate is dissolved from the filter by means of a jet of hot sodium acetate solution. The sodium acetate solution is prepared by diluting a cold saturated solution of commercial sodium acetate with an equal volume of water and adding 40 c.c. of 80-per cent. glacial acetic acid per liter.

The original flask is replaced by a small beaker containing a little potassium dichromate and the washing continued. If any lead chromate appears, add the mixture to the original filtrate. If any precipitate shows in the flask, redissolve by boiling.

To the flask is now added 10 c.c. of a 5-per cent. solution of potassium dichromate, the solution is brought to a boil, and boiling continued gently for a few minutes to render the precipitate basic and easily filtered, which condition is shown by its reddish yellow color.

The solution is filtered hot and the flask and filter each washed once with hot water. The lead chromate is washed back into the flask with a jet of hot oxalic acid, using from 25 to 40 c.c., and the sides of the flask are washed down with a little hot water. The oxalic acid solution consists of a cold saturated solution of commercial acid 1 part, water 3 parts. Grain alcohol is added to the mixture in the flask and the whole boiled until the chromic acid is all reduced and the lead converted to oxalate.

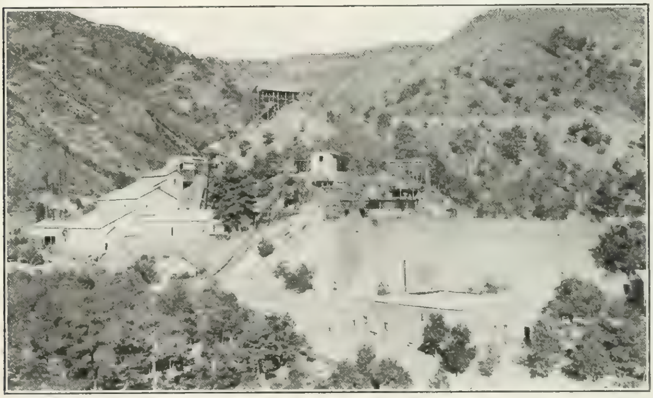
The solution is then diluted with 30 c.c. of cold water and thoroughly cooled. The cold solution is filtered through an 11-cm. filter, the flask washed out with cold water and the filter and precipitate washed ten times. The washed filter and precipitate are thrown into a flask containing about 125 c.c. of a hot dilute sulphuric-acid solution (5 c.c. strong sulphuric acid to 120 c.c. water). The solution is then titrated with a standard permanganate solution. The oxalic value of the permanganate multiplied by 1.642 gives the lead value; but under working conditions [illegible] It is best to standardize on, say, 0.2 gram of pure lead, running through the whole procedure. If [illegible] be dissolved from the filter with a slightly stronger sulphuric-acid solution and the filter washed well with hot water.

El Rayo Gold Mine, Near Santa Barbara, Mex.

The Veins Are Developed from Adit Levels and the Silicious Ore Is Treated by Cyanidation and Zinc-dust Precipitation

BY CLAUDE T. RICE

The El Rayo property is situated in southwestern Chihuahua, Mexico, about 10 miles east of Santa Barbara. The district is sometimes included in the Santa Barbara camp, but since the ores are distinctly gold ores carrying little silver and practically no lead, and since the vein is entirely in an andesitic breccia, while at Santa Barbara the ore is mainly silver-lead occurring in a shale country rock, it seems better to consider this, the Azules district, separately from the Santa Barbara district.



EL RAYO GOLD MINE

The Azules district, in which the property is situated, is not new, for ore was discovered by Mexicans about 18 years ago on the Azules property. Later, Americans discovered ore in other parts of the district and now all these properties have been combined under the El Rayo Mines Company, of Maine.

The district comprises a band of intruded or extruded andesite cutting in a north and south direction through the indurated cretaceous sediments which form the country rock in the greater part of southwestern Chihuahua. In this andesite a lens or egg-shaped mass of diorite has been intruded. While it is not clearly shown that there is any connection between the intrusion of this diorite and the formation of the orebodies, still, since the veins are roughly parallel to the diorite lens, it seems probable that the intrusion of this rock has caused parallel fractures to form in the andesite. Merely the shrinkage of the diorite mass may possibly have been the cause of the fracture, but it seems more probable that the fracturing was the direct result of the violence of the intrusion.

The Ore Occurrence

The main veins in the district have an approximately north and south strike and dip about 50 deg. to the west. The ore consists of iron pyrites, accompanied in certain parts of the vein by a little galena, chalcopyrite and sphalerite, in a gangue of quartz and silicified andesite.

Much of the quartz shows crustification, but considerable of the ore is simply silicified andesite, so that, while some of the ore was formed in open spaces, other of the ore was formed by impregnation. The ore carries mainly gold but there is also a small amount of silver present; at present, the ore treated at the mill averages about $19 gold and 4.5 oz. silver per ton.

EL RAYO MILL

The zone of oxidation is very irregular, for in one place oxidized ore has been found at a depth of 850 ft., while in another place sulphide ore is found within 200 ft. of the surface.

The veins vary considerably in width along the strike, apparently being widest near those places where a series of faults, having a strike of roughly north 60 deg. west, have cut across the veins, displacing them slightly (generally only 4 or 5 ft., but never more than 15 ft.). Near these faults the silicification and impregnation has extended into the wall rock forming larger bodies of ore at those points than elsewhere along the vein.

There are three main veins: the West Pettit, the San Jose and the El Rayo; from these, fingers or branch veins put off into the wall rock, some of which reunite with the vein while others do not.

The West Pettit vein, which runs at an angle with the two other veins, has been developed for a distance of 500 ft. on the adit level, 750 ft. below its outcrop. This vein is not as large as the San Jose or the El Rayo, for it only averages about 2½ ft. in width, but the ore is of good grade.

The El Rayo and the San Jose are both much larger veins, and, therefore, they have been developed much more extensively. Both have a general north and south strike and both vary in width from 2 to 18 ft. On the El Rayo vein are the Descubridora, the North Rayo and the South Rayo workings, while on the San Jose vein are the San Jose, Adele and Azules workings.

Method of Development

All these veins have been developed by adits, for the rough, steep hills, in which the veins are found, encourage such development. These different adit levels have been connected by raises, and on the El Rayo vein several winzes have been sunk, the deepest of these being 150 ft. deep, and from the winzes short drifts have been driven. Considerable development has been done in the property, for over a mile of drifts has already been driven, but as yet little stoping has been done. The present company has mined only 30,000 tons of ore and the older companies did not ship very much ore owing to the fact that the railroad to Parral was not completed until 1900 and to Santa Barbara not until 1902.

As has been said, the veins are developed mainly by adits and as these adits have developed several hundred feet of backs much of the ore for many years will be mined from above them.

The walls of the stopes vary greatly in strength so that several different methods of overhand stoping will be used. In some parts of the vein a smooth fault plane forms the hanging wall, in other places the wall is jagged, being broken up by many small fractures or jointings, while in still other parts of the vein the boundary of the orebody is entirely a commercial one and there is no hanging wall.

Where the wall rock is strong, ore filling will be used in the stopes, but where the walls are somewhat broken up by fracturing so that in time slabs would scale off and mix with the ore filling if such a method were employed, open stull-timbered stopes will be used, the stope being filled with waste from time to time as mining advances. But in those parts of the mine where the wall rock is so weak that much waste rock is blasted down with the ore, the ore will be blasted upon staged stulls, and the waste sorted out will be used for filling.

Single-hand drilling and also machine drilling are used. Formerly only piston machines were used, but recently Waugh air-hammer drills have been introduced in the stopes, and it is expected that the number of men on the pay roll, now 400, will soon be considerably reduced.

Since the mine makes considerable water the company will have sufficient for all future milling requirements. The company also owns considerable timber land, so that it can furnish for several years all the timber and fuel required by the mine and the mill; it is, therefore, in a favorable condition compared to other mines in northern Mexico.

The wages paid at the mine are somewhat higher than in Parral, for miners and peons get 2 pesos, while timbermen get 3 pesos per day. A timberman has two helpers, instead of one as in the United States, so that they can handle the long stulls required in many of the stopes.

Mill Treatment

The north adit of the mine is connected with the mill by a short aërial tramway, but the ore from the south adit is trammed to bins in the mine cars, and then, after being hand-sorted, it is hauled by mule in a 6-ton car to the mill bin.

The ore is broken first by Blake crusher and then by roughing and finishing rolls to about 8-mesh size. Then it is fed to Huntington mills where it is crushed to pass through a 50-mesh screen. The pulp is concentrated on Frue vanners and the tailings are cyanided after being separated into sands and slimes. The lime is fed to the ore at the crusher, and so a good mixture of ore and lime is obtained; at present while treating oxidized ore 16 lb. of lime are added per ton of ore crushed.

In the cyanide plant the sands are treated by downward percolation in 25x6-ft. cylindrical tanks to which the pulp is fed by modified Butters-Meins distributors. The tanks hold 115 tons; it takes 36 hours to fill them, 150 hours for percolation, and 24 hours for draining and emptying the tanks so that the complete cycle consumes 210 hours or about 8½ days. Strong cyanide solution carrying 2.5 lb. cyanide per ton is used most of the time and then weak solution is used for washing.

The slimes are agitated in 25x16-ft. tanks by means of mechanical stirrers for a period of 24 hours. The strength of the cyanide solution is 3 lb. per ton; compressed air is admitted at the bottom of the tank so as to obtain proper aëration. A Merrill automatic discharge slime press and a Butters filter have been installed to handle the slimes. Experiments regarding the sands are now underway to determine whether to use complete sliming or not.

Zinc-dust Precipitation

Zinc-dust precipitation is used in treating the solutions, and this works admirably. At Mercur, Utah, the zinc dust is fed to a tank in which the dust and solution are agitated by means of compressed air and then fed by gravity to the filter presses, but here the zinc dust is fed by hand to a small cone where it is agitated in water by compressed air. This zinc-dust emulsion overflows through a small pipe to a larger 6-in. pipe placed low enough so that the solution from the "gold" tank will flow into it. This 6-in. pipe serves as a well for the suction pipe of the solution pump and consequently the zinc dust is intimately mixed with the solution as it is pumped to the Merrill precipitation press. Since this press is 200 ft. away from the well, a good agitation of the zinc and solution is obtained, and press [illegible] time is given for precipitation.

The length of pipe, through which the solution and zinc dust is pumped, is very important, for the precipitation does not appear to be instantaneous, either because a time factor enters into the precipitating reaction, or because of the failure to get an intimate mixture of the dust and solution.

At present the zinc dust is fed to the cone by hand at certain intervals, but it is planned to install at some later time the unpatented automatic feed used by Mr. Merrill at Lead, South Dakota. This consists of a feed belt, the drive-wheel of which is fastened by rope to a float in the gold-solution tank. As the surface of the solution falls, the belt is moved ahead a certain distance. On the belt throughout the distance which the belt moves during the emptying of the tank, the amount of zinc dust necessary for the precipitation is spread in an even layer, so that by this belt an even feed of zinc dust in the right proportion is obtained. The zinc dust falls from this belt into a cone-and-well system such as has been already described, so that everything is automatic.

This obtaining of an automatic regular feed is important in zinc-dust precipitation, especially in Mexico, for little precipitation of gold occurs in the press itself. Besides, by this method of feed the zinc-dust consumption is greatly reduced. The great advantage of zinc-dust precipitation, in addition to the excellence of the precipitation obtained by this method, is that the precipitate is always locked up and so all temptation to steal is removed; this also is an important advantage in Mexico.

The tailings are impounded and not allowed to flow into the *arroyo*, because the Mexican government, owing to the dependence of the inhabitants upon the surface streams for water, strictly forbids any pollution of these streams.

The zinc-dust precipitate is shipped to smelters, without refining, for in those districts of Mexico far from the railroad, such as the Azules district, the cost of freight and chemicals is too great to make it economical to refine the precipitate at the mine.

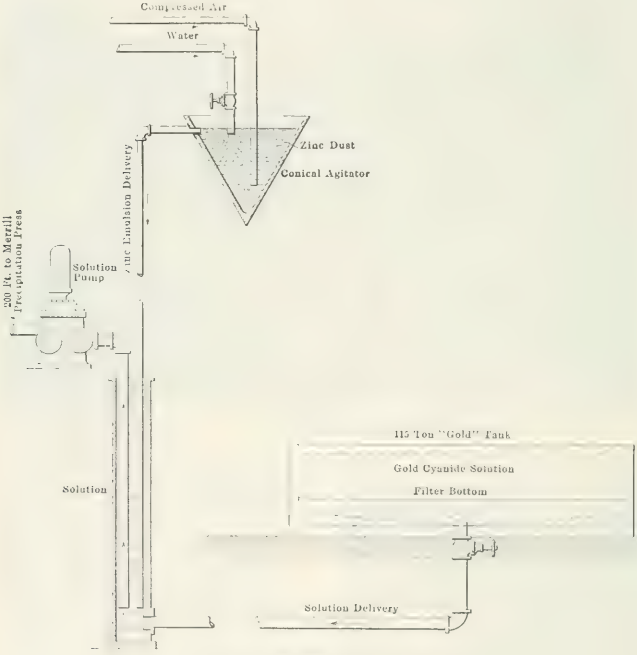
All labor about the mill and cyanide plant is Mexican except three on day shift and two on night shift, and of course an English-speaking superintendent.

Extraction Obtained

The mill and cyanide plant treat 110 tons of ore per day. At present the mill is designed for sand and slime treatment, but probably the ore will finally be treated by complete sliming and filtering.

The head sample now assays about $10 gold and 4.50 oz. silver. About [illegible] per cent. of the extraction is obtained from the vanners, which makes a concentrate assaying about $125 gold and 15 oz. silver per ton. The sand going to the tanks assays $10.31 gold and 3.6 oz. of silver per ton, while the slimes assay $14.70 gold and 4.65 oz. silver. On the slimes an extraction of about 90 per cent. was obtained when treating the sulphide ore in the Merrill presses, while on the sands the percentage of extraction is about 75 per cent. As at present about 35 per cent. of the crushed ore is slime and 65 per cent. sand, a total extraction of 88.15 per cent. is obtained, 18.9 per cent. of the total production assay value being obtained from the slimes, 29.25 per cent. from the sands, and 40 per cent. from the vanners.

While treating both sand and slime, four tons of cyanide solution were used per ton of ore treated, but at present, when only the sands are treated, only three tons of solution are required. When treating slime and sand 1.2 lb. of zinc dust is used per ton of ore treated, but when treating only the sand 0.6 lb. of zinc dust is required. Owing to the presence of a small amount of copper in the ore the zinc-dust consumption and the consumption of cyanide is higher than it would be otherwise. The head solution assays $3.75 gold and about 1 oz. silver per ton, but after zinc-dust precipitation they assay only a trace in both metals.



ZINC DUST FEED, EL RAYO MILL.

The wages of the mill men per shift of 12 hours are 2.50 pesos and at the cyanide plant 2.25 pesos, but the vanner man, a Mexican, gets 4 pesos. A total of 23 men are employed on both the shifts at the mill and the cyanide plant.

Electric Power for Cement Plants*

By J. B. Porter†

The present consumption of cement is enormous. The great advantage of electric power for cement plants lies in its flexibility and capacity for economical subdivision. A small saving such as one cent per barrel justifies an elaborate expenditure, yet the cement industry is behind others in the application of electric power, while the opportunities for its successful employment are greater.

The manufacture of cement permits the division of plants into departments, each containing one operation comparatively independent of the others. This allows, with the employment of electric power, a close watch on the power consumption of each department.

The vital factor in cement manufacture is the kiln output, as this controls the output of the entire plant. The kilns should be worked to their full capacity. The factors which affect the output of the kiln are variation of speed of kiln, variation of feed of raw material, and variation of coal feed for combustion. Electric power applied to the kilns permits of a much higher degree of control than does any other form of power. For the crushers, a belt drive from an electrically driven line shaft, the motors to be equipped with automatic circuit breakers, provides the best protection for both motors and crusher. Sudden clogging of the crusher will throw off the belt and the gradually acquired overload will cause the automatic circuit breaker to work.

The buildings of a newly designed plant, where electric power is to be installed, can be arranged so as to permit the extension of each building as the expansion of the plant may require, while the designer will be independent of the necessity of accommodating the position of his buildings to the need of economy in the transmission of power either by steam pipes or rope drives.

One of the difficulties hitherto attending the use of electric power for driving cement machinery has been lack of information on the power required. Measurements have not been made in the past and, where motors have been employed, the power required to start the machinery has been so great and the changes so sudden that it has been impossible to take a reading. The writer hopes that a curve-drawing meter will solve this difficulty. Because of inability to determine the starting torque in the past, motors have been used with a capacity greatly in excess of the requirements. The writer admits that the starting torque, which is sometimes two or three times the running torque, will not permit the economical operation of motors capable of handling it and consequently running far below full load.

Alternating current installations are recommended because of the readiness with which motors may be protected from dust, the fewer spare parts needed, the extent to which wiring and automatic devices can be inclosed, thereby lessening the fire risk, the suitability of the motors for overloads, and the lesser first cost due to the higher voltage that can be employed.

Electric power is especially recommended because of the ease with which it is subdivided without loss of efficiency; each machine, having its own motor, can be shut down for repairs without affecting other machinery or requiring an expensive line shaft to be kept turning. As compared with steam, electric power is recommended because of the ease with which the power can be measured, not only for total consumption but for each department. It is thought that these advantages will more than compensate the mechanical losses due to generating power in a steam plant, converting to electric power in a dynamo, and using this through a motor.

---

*Abstract of the paper read before the Association of American Portland Cement Manufacturers.

†Of the Light and Power Department of the General Electric Company.

Short Talks on Mining Law—III

By A. H. Ricketts*

All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, and the lands in which they are found, are free and open to exploration, occupation and purchase, except, by statute, in the States of Michigan, Wisconsin, Minnesota, Missouri, Kansas and Alabama, or if within a subsisting Indian, military, naval, and possibly park reservation, or land which is withdrawn from sale under authority of Congress or an executive order, or mineral lands below high tide, except in the district of Alaska (but without right to patent), coal or iron lands within the limits of a railroad grant, and all mineral lands within the limits of the right of way of a railroad. Mineral lands within an unpatented townsite, and land known to be mineral at the date of the application for patent for the townsite, are subject to location; mineral land, if situated within a forest reservation, or the limits of a grant to a State or railroad before patent issues is open to location.

Meaning of Certain Terms

The term "public land" as used in the legislation of Congress means such lands as are subject to appropriation as a mining claim, or subject to sale, or other disposition under general laws. The terms "unoccupied," "unappropriated" and "vacant" refer to land that is not in the possession of one who claims the right of possession by virtue of a compliance with the law,.or who is diligently prospecting for mineral.

The terms "location," "mining claim" and "mine" have not the same meaning although sometimes used as of equal import. Strictly speaking, the term "location" refers to the acts constituting the appropriation of a segment of the public domain under the requirements of law; but it is often applied to the land taken up. A "mining claim" is a parcel of land containing mineral. In other words it implies a perfected location. It may consist of as many locations as may be deemed expedient to include therein. No land can be a "mining claim" unless based upon a location or its equivalent, otherwise it may be "mining ground," or a "mine," which are nearly synonymous terms.

It has been held that the term "mining ground" includes the vein specifically located, all the surface ground located on each side of it and all other veins or lodes having their apexes inside the surface lines. Yet, it has been held that if the term "mining ground" was equivalent to the terms "lands valuable for minerals" and "valuable for mineral deposits" it "would lead us into bogs and ferns of uncertainty respecting its interpretation as some lands have been held to be subject to location under the federal laws, which are scarcely to be regarded as the subject of mining in the ordinary sense." For instance, building stone worked as a quarry only, or bog iron or guano, which are not minerals.

It has been held that where land covered by an agricultural patent is worked for its minerals it is mining ground and not a mining claim within the meaning of a State law giving the right of lien to a miner for his unpaid work upon a "mining claim." So also that land within a Mexican grant is not a "mining claim" under that law, although many mines may have been opened within its boundaries and the owners of the grant claim such mines as their own.

A ditch appurtenant to and furnishing water to a mine has been deemed to be "mining ground" within the meaning of a State statute requiring the consent of a majority of the stockholders of a corporation to the sale of its "mining ground." While the bed of a navigable river within a State is not subject to location as a mining claim because it belongs to the United States, it is mining ground if mining is conducted thereon by the dredging process.

It has been held that an unworked placer claim was not a mine in the sense of a State statute providing for the summary sale of a mine in probate proceedings, the court saying that a mine or mining ground has no necessary identity whatever, with land patented as a placer mining claim.

The existence of mineral is not necessary to constitute a mine unless it is a "known mine" within the purview of the federal laws. In that case it must be an actual opened mine producing mineral at a profit, or shown to be capable of so doing, not theoretically, but as a fact. In general the existence of a mine is determined by the mode in which the mineral is obtained and not by its chemical or geological character.

The term "mine" implies that actual mining operations are being conducted on the property. The "process of mining" is the prospecting or developing of ground by shaft, tunnel or other opening or by quarrying, or the dredging of the bed or banks of a waterway to obtain mineral therefrom.

Right of Location

It follows that land subject to the process of mining is "mining ground," or a "mine" without regard to the nature of the title to the ground in which they lie, whether the work done yields profitable returns or not, or because the exigencies of some statute requires it to be placed in such category; that it is a "known mine" only when its exploitation shows it possesses tangible commercial value; that land is a "mining claim" when title is obtained in pursuance of the mining law, i.e., by location or by virtue of holding the same in the absence of an adverse claim for a sufficient time under the local statute of limitations and possibly the payment of taxes, to operate as a right against the United States for a patent therefor. Such possession is the equivalent of a location.

Although the Mining Act, in terms, limits the right of appropriation to citizens of the United States and those who have declared their intention to become such, a location made by an alien is merely voidable and subject to attack only by the United States in proceedings termed "inquest of office found," or by the land department in proceedings to obtain patent; or the question may be raised in an adverse claim suit by a party thereto, that is, a suit brought in opposition to the claim for patent. It is too late to raise this question for the first time in an appellate court. Naturalization before judgment acts retroactively upon the right of the alien to obtain the patent. The question of alienage is immaterial in all actions other than those above named, as until "office found," an alien may, under the weight of authority, exercise the same right of ownership in a mining claim as may those who are declared by statute to be competent locators.

It follows that an alien corporation may locate and hold an unpatented claim, but it cannot secure the government title thereto, in its own name, nor under the rulings of the land department obtain the same through a trustee. A patent issued to an alien is not subject to collateral attack upon that ground. By the terms of the act an alien may acquire patented mining property.

In 1898 Congress enacted that native-born subjects of the Dominion of Canada should be accorded certain mining rights and privileges in the district of Alaska, but the act has been declared to be impracticable and inoperative.

Generally a location may be made by any natural or legal person, without respect to the age of the former upon any day. It is not usually necessary for a locator to make location personally, nor specifically to authorize it to be made in his name, nor does it affect the validity of the location nor the right of such party therein that he did not know his name was to be used. All persons named in a location become co-tenants, or co-owners, as the act terms them, in the claim, with *pro-rata* interests therein, unless the contrary is stated in the notice.

[illegible]

There does not seem to be anything in terms of the Mining Act to prevent a re- [illegible]

The actual commencement of labor or

---

*Member of the San Francisco Bar, San Francisco, Cal.

making improvements upon the land upon the last day of the term and its completion in the ensuing year is sufficient to prevent adverse relocation if continuous. It is "continuous" although suspended on Sundays and holidays. The law of assessment work applies to both lode and placer claims. It is wise and salutory and must be complied with to prevent possible adverse location until the land is paid for, as evidenced by the receipt of the receiver of the local land office. Nothing else excuses its non-performance, except when the claim is held adversely and the expenditure is prevented by force, or threats of personal violence by the person in possession.

As stated in a previous article, the work may be done within or outside of the claim or a group of contiguous claims. Such work must enure to the benefit of all and equal the amount that would be required if they were separate and independent, i.e., the work done must have a direct bearing upon the present or future improvement of the property, whether done within or outside of the property, as say, by the running of a tunnel from another claim or the construction of a wagon road say, leading to the claims. It is a question of fact whether such work, when done, tended to develop the locations within the group not worked upon, but it has been held that a court cannot substitute its own judgment as to the wisdom and expediency of the method employed in good faith for developing a claim. The number of locations embraced in such group is immaterial, except in case of petroleum-oil placer claims. In the latter case, under a special act, the group upon which the work is to be done must not exceed five claims in all, and the labor thereon must tend to the development or to determine the oil-bearing character of the locations within the group. In that act the annual expenditure is in terms confined to "labor" and "improvements" not being found therein.

Personal expenses, or the value of time spent in the effort to obtain means to develop property, is not sufficient—but the services of a watchman may be considered as in compliance with the law, if necessary to preserve tunnels, buildings or structures erected to work the property. That is, if it is intended to make use of the same within a reasonable time. But, if it is not intended to use appropriately the same within such time, or the watchman merely lives in a house upon the claim, or if his services are upon a naked mining claim to warn others against a relocation, his services do not constitute annual labor.

As was stated in a previous article, a statutory record of annual expenditure in the form of an affidavit is merely *prima facie* evidence of the facts therein stated and does not preclude other proof as to the truth or falsity of such statements. It may be filed before the time allowed by statute, but, if after such time, it is without legal effect. A failure to file such an affidavit within the statutory period cannot work a forfeiture of the claim. Its existence merely facilitates the proving of the facts shown therein.

Transvaal Mining Notes

SPECIAL CORRESPONDENCE

A syndicate has commenced work on the Transvaal silver mines, not far from Pretoria. Ecksteins did considerable work on this group many years ago, but it has been idle ever since. The present syndicate—consisting of B. and J. Weil, Sir Aubrey Woolls-Sampson and John R. Williams, formerly consulting metallurgist to H. Eckstein & Co.—has a working capital of £4000. Ten stamps are erected and will start work this month. The rich ore dump is sufficient to keep the mill going for 18 months or so. It is thought that the present mill can produce 100 tons of concentrates each month, going about 70 per cent. lead and 18 to 20 oz. of silver. On a conservative basis it is thought that the syndicate can earn about £4000 per year. It has a five years' lease on the property.

Last week the Goerz group of mines held the annual meeting, and the chairman gave a full account of the operations on the different mines during the past year. Many of the mines of this group are of the struggling class, and one of them—the Lancaster—is now running at a heavy loss.

In reading over the reports one is struck by the fact that there is far more hope in the future for the Eastern Rand, than there is for the Western Rand. The Lancaster and several other struggling mines of the group are on the West Rand, while the results obtained in the development of the two mines on the Eastern Rand, namely the Geduld and the Van Dyk properties, encourage one to think that here they will get two distinctly payable mines.

It is satisfactory to note that the Geduld is doing so well, for there was a fraud perpetrated on the public at this mine when the reef was first struck. In some way or other the samples were salted, and the assays showed such very rich results that the shares jumped away up. On re-sampling it was found that the values were very low and the shares dropped. This incident gave Geduld a bad name, and as the values kept low for a long time it was feared that the mine would prove a failure. There has been a steady improvement, and the directors have decided to erect a 50-stamp mill as a start. The Van Dyk is also considered good enough for a mill.

The profits made by the Rand gold mines for April amount to £979,028, an increase of £1135 over the previous month. The working costs varied on the mines from $7.72 per ton on the Jumpers mine, to $3.08 per ton milled on the Robinson mine. The average working costs for all the mines of the Rand works out at about $4.44, while the average for the whole of the Transvaal is $4.48. The average working profit per ton milled made by the mines of the Rand was $3.26, while the average recovery value was $7.69 per ton.

During the past few months one or two of the shares of the Rand have steadily advanced in price, in spite of the bad times. One of the most conspicuous has been the New Modderfontein mine. This mine has forged ahead in fine shape, and promises to be one of the great mines of the future. To start with, it has a very large area, over 1200 claims. The profits are now about £20,000 per month. At a special meeting of the directors held last week it was decided to increase the present capacity of the reduction plant from 30,000 tons per month to 45,000 tons, by the erection of additional stamps, tube mills and necessary accessory plant and buildings. It is calculated that the cost of this work will be approximately £100,000, and it will be met out of accumulated profits without interfering with the continued payment of dividends. The additional plant will probably be at work in about nine months' time. It is then expected that the New Modderfontein will earn £30,000 per month.

It is a great disappointment to many people to hear that the Gordon stope drill, from which so much was expected, has not come up to expectations. It appears that when tried for long periods, the machine is found wanting. Had it solved the great Rand problem of economical stoping in narrow stopes, it would have made a fortune for itself, and been a benefaction to the Transvaal.

F. H. P. Cresswell, the champion of the white labor policy, is stumping the Rand, preaching his doctrines. Like Peter the Hermit, he is full of his subject, and he is drawing many people to hear him. All are agreed that something should be done to increase the employment of white labor in the country, or the white man will be forced to the wall. The question is how to do it?—and it is not an easy one to answer.

With pig iron costing $25 per ton, old carwheels $20 and scrap averaging $16, a large foundry has sold 600-lb. wheels for $9@10 each, or about 1.5c. per lb. f.o.b. cars at works. At this price there was still a small profit. The capacity of this foundry was upward of 500 tons per day.

Platinum ocurs with gold in the sands of the rivers in the Choco and San Juan regions, Colombia.

Handling Blast Furnace Bullion at the Selby Smelting Works

By James C. Bennett

The accompanying drawings illustrate a method of handling bullion which has, after considerable experiment, been brought to a point where it gives good satisfaction; perfection would be too strong an expression to use, as the system is not entirely ideal, owing to the fact that it is still necessary to cool and re-melt the bullion. It will be understood that, in this smelter, the refining is done on the premises, hence it would be desirable, if conditions permitted, to avoid cooling the bullion. For the average smelter, however, which does no refining, the method here described would seem to approach very nearly to the ideal.

The Cooling Pot System

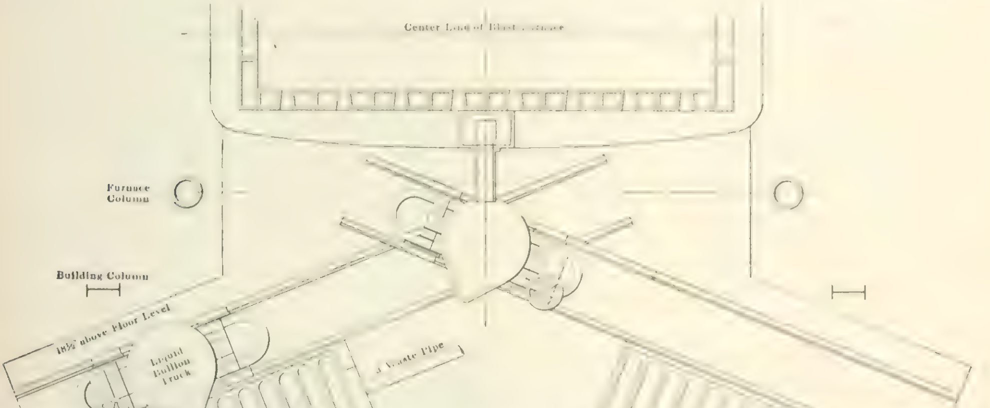
The method formerly used was the very commonly employed, of collecting the bullion in a "cooling pot," from which it is ladled into individual molds, then turned out and placed upon a car or truck for transportation from the furnace. This is, of course, a laborious way of handling, and, in the event of an unusually high lead production, becomes incapable of disposing of the output, as the molds have no interval in which to cool and the bullion therefore cools very slowly. In view of these two objections, it was thought advisable to seek some other means of handling, and the present method has, as has been stated, been finally brought to a state of [illegible] excellence.

The New System

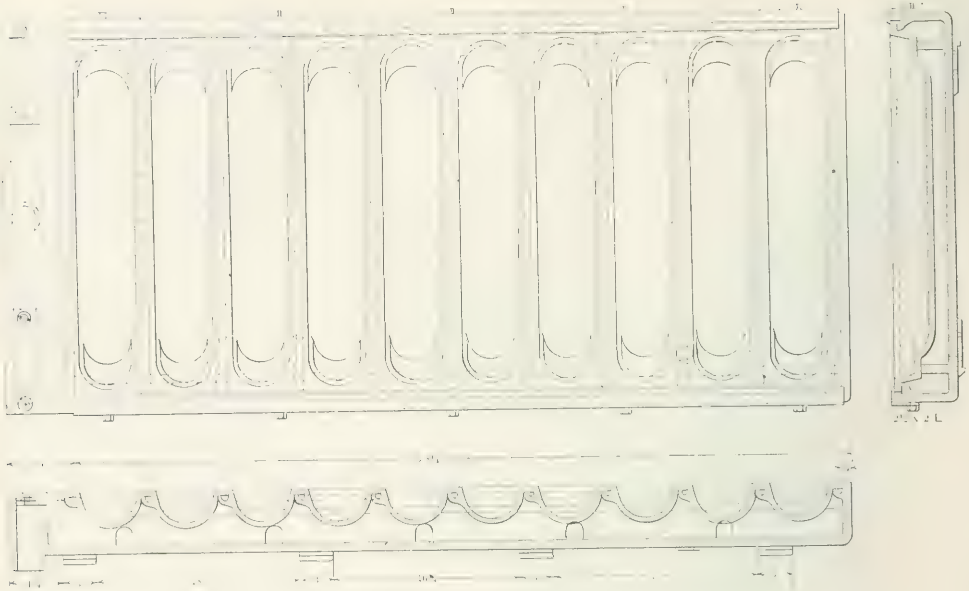
As the drawings show the arrangement of the parts, a detailed description is unnecessary. It may, however, be well to give some detail as to the operation and the difficulties that were encountered. In operation there is always a pot standing beneath the spout of the lead-well, for as the filled one is drawn away the empty is pushed into its place. If the lead is running quite freely a stopper of clay is placed in the spout during the change, otherwise it is allowed to continue running, as the little which falls to the floor can be easily cleaned up when a sufficient amount has accumulated. The full pot is drawn to the mold farthest from the center and gradually pushed back as the successive molds are filled. The capacity of the bowl or pot is just equal to that of the 10 molds which comprise one side; thus it is unnecessary to leave a small amount in the bowl to form a button. If the furnace has been hung up for a time for some repair, the pot will cool to such an extent that when again started the lead will chill and nearly fill the bowl until the temperature again approaches that of the bullion. This is accomplished by successive filling and emptying, a little [illegible] time than [illegible] the [illegible] of any special provision for maintaining the temperature during the time that the furnace is not in active operation. After the pot reaches the temperature of the bullion, there is no further difficulty on that account, as the interval between emptying and filling when running normally is insufficient for the temperature of the iron to drop greatly below that of the bullion.

[illegible]

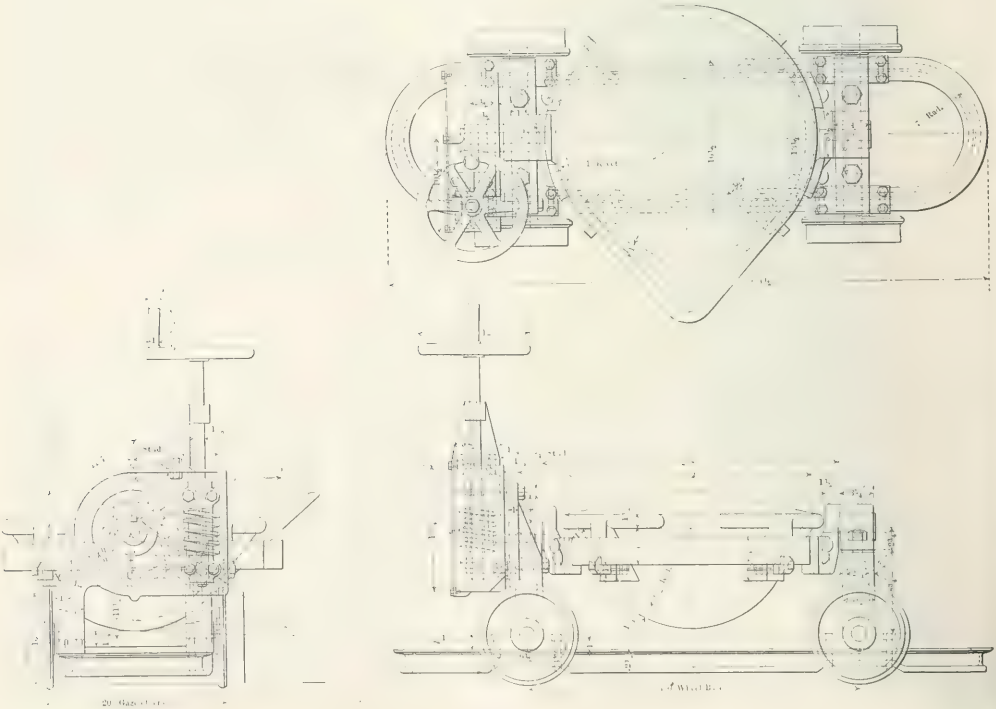
When solid, the bars are loosened by the use of a particularly sharp poll-pick which is driven into the bar with a short quick stroke and the bar is pushed up and toward the workman, only enough to enable him to grasp it by the ends so that he can transfer it to the car or truck. It will be seen in the drawing that the width of the mold is slightly greater at one end than at the other. The wide end is set away from the pot, thus rendering it easier for the workman to remove the bar, especially if there be any unevenness in the casting. With the exception [illegible] the stream into the molds, there has been [illegible]



ARRANGEMENT OF CASTING PLANT FOR BULLION



MOLDS FOR CASTING BULLION



TRUCK FOR MOLTEN BULLION

however, gave a considerable amount of trouble and have required a good deal of experimental changing. The original molds were cast in blocks of five each, cored out, making the bottom and sides in one piece with the five molds, the water being passed through them at the regular service pressure of about 40 lb. This will be recognized as similar to the practice of making cast-iron furnace jackets. In order to secure a smooth surface on the inside of the molds proper, they were cast bottom upward. The foundryman, however, found so much difficulty in keeping the core from floating, thus causing the iron to be very thin in the bottom of the block, that this plan was modified by casting the molds and sides in one piece, leaving the bottom open and securing the cast-iron cover-plate to the block by means of cap screws. This form developed a new difficulty, or rather another, as it is probable that it existed unexposed in the first attempt because the thin bottom condemned the casting before anything else could develop

Difficulties in Casting the Molds

On casting the bottom-plate in a separate piece, the molds proper appeared to have porous or spongy bottoms, as they allowed the water to seep through the iron, thus rendering the mold and its entire block useless. The water came through in a somewhat irregular line running lengthwise of the mold. While the iron was cold the castings appeared perfectly sound, even when subjected to a pressure somewhat in excess of the 40 lb., but very soon after the molten lead was poured into it, causing the iron to be alternately heated and cooled, the leak developed. After trying two or three blocks to make certain that the trouble was not with an individual casting, one was broken up, when the cause was at once revealed. Bearing in mind still that the molds were cast bottom upward for the purpose of insuring a smooth inside surface, it will be seen that the iron, in casting, was obliged to spread over the top of the block and then to rise simultaneously on the sides of all the molds, finally joining the two sides at the bottom of each mold. The sheets of molten iron thus forming the sides were so thin—⅜ in.—that the faces or edges chilled before reaching the line of juncture along the bottom and so failed to unite or weld thoroughly, so as to speak, thus forming what the foundryman terms a "cold shut" in each individual mold.

After trying a second foundry in the hope that this difficulty might be overcome, the plan of having a multiple mold block was abandoned, and the general plan indicated by the accompanying drawings was adopted. A fresh problem presented itself with this arrangement, the leakage of bullion between the molds. This was not unforeseen, but the surprise was caused by the persistency with which the lead went into the pan. The first molds of this type were made with a flat ledge running along the side instead of the grooved one here shown. The possibility of lead leakage was thought of, but it was believed that the iron would chill the lead so that it would not get into the pan between the molds. When put into service, however, the lead seemed to granulate on striking the iron, as the pot passed from one mold to the next, and rolled through the cracks and into the pan, where it piled up, making dams the full length of the molds, and one between each two. Then followed the present grooved ledge, which was planned to contain a gasket of clay, oakum, lead pipe, or whatever might prove to be best suited to the purpose. The first attempt used no gasket whatever, and it was found that the lead itself formed one, the groove appearing to collect the particles until it had filled solid, after which comparatively little lead reached the pan. It is still necessary to clean the pan occasionally, but this can be done during the times of temporary shutdowns, and is thus cheaper than making machined joints between the molds. Attention is called to the fact that in these molds the only machine work necessary is the drilling and tapping of the hole for the supply pipe and those holes required to hold down the angle-irons and the hand-hole covers over the launder. It will be noticed that this style of molds, while water-jacketed, is not subjected to any pressure, as the top is open to the air—thus neither pan nor mold is so liable to leakage on account of a slightly inferior casting; and if any mold proves defective, it can be removed by loosening the angle-irons and without disturbing any of the others.

Capacity of the Apparatus

The quantity of water used is small, but, owing to the use of salt water at this smelter, it is found advisable to use pipes of liberal dimensions to provide for the filling up with the accretions carried in the water. The 20 molds of this type have never been crowded even when, on a few occasions, the bullion product of the furnace has been abnormally high, whereas with the old arrangement of 33 plain molds it was at times all but impossible to take care of an abnormal production with a furnace whose capacity was considerably less than the present one. This incapacity of the molds was due to the absence of the water-jacket, for the reasons that have already been stated.

Knocking the bottom-post from under the swinging doors of a cupola is generally done with a sledge. This practice has resulted frequently in death or injury to the cupola tender. By attaching a ring to the bottom of the post and conducting a chain to a simple lever about 30 ft. away the post may be pulled from under and all danger eliminated.

Turkish Quicksilver Mining

[illegible] page 138, F. P. Monaci has given some details in regard to two plants for mining and smelting quicksilver ores in Asiatic Turkey. The mines are the Kara Bournou and the Koniah, both belonging to an English company.

The Kara Bournou mine is 30 km from Smyrna and 3 km. from the sea. The ore is a silicious rock impregnated with cinnabar, the mineralized portion being in such a large mass that it can be quarried in open workings. This circumstance greatly reduces the cost of production and permits the treatment of very low-grade ore, even as low as 0.25 per cent. mercury. The average contents of the output mined and treated in the year 1906-07 was 0.75 to 1 per cent, and the average monthly output of mercury was 250 to 275 flasks.

The smelting plant includes two Spirek tower furnaces for coarse ore, and a Cermak-Spirek furnace for finer ore. The total capacity is 40 tons per day. The plant was completed and went into operation in May, 1906, since which time it has been in uninterrupted operation

The Koniah mine is near the town of the same name, in central Anatolia, and at an altitude of 1800 m. Operation is somewhat hindered by the severe winters at this elevation. The district is richly mineralized, and mining operations date back to antiquity, judging from the relics of former mining villages and smelting plants. The ore occurs as an impregnation of cinnabar in a zone of silicious limestone. Work is at present confined to an upper layer of limestone in which about 13,000 tons of ore, averaging 1 per cent. mercury, has been blocked out. The smelting plant at this mine includes one Spirek tower of 15-tons daily capacity, and one Cermak-Spirek furnace of 8-tons capacity per day. The workmen, Turks, Armenians, Greeks and Kurds, are industrious and docile.

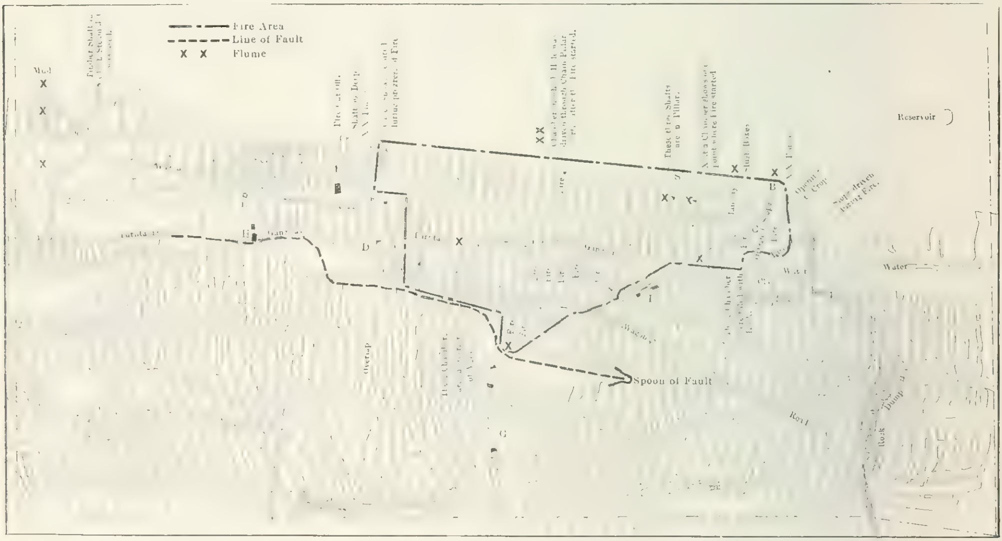
The immense size of its great orebodies, the fair grade of the ore, and the favorable natural conditions for their exploitation combined to make the Cœur d'Alene become the greatest lead-producing district of the United States, its only drawbacks having been remoteness from the great smelting centers and labor difficulties. The lodes are so situated that they can be worked to a large extent through adits levels. Up to 1903 at least 70 per cent. of the ore previously mined had been extracted through adits, at no charge for hoisting and pumping, and of the remaining 30 per cent. at least two-fifths had been hoisted through underground shafts, to be subsequently hauled out through tunnels. The Tiger-Poorman was the [illegible] the surface.

Fighting Fire in an Anthracite Coal Mine

Many Problems in Timbering and Ventilation Were Encountered. Mine Was Flushed Full of Clay. Dangers from Gases Overcome

BY P. H. DEVERS*

The Jersey mine of the Delaware, Lackawanna and Western Railroad Company was opened about 1860 in the Red Ash seam, in the southwestern section of the Wyoming valley coalfield. The mine was developed by two slopes. The original slope is about 350 ft. long on an average dip of 35 deg. at a depth of 350 ft. Two gangways were driven on the strike of the seam, one east of the slope, for a distance of 2000 ft., and the west gangway about 5000 ft. Chambers were turned at right angles to both gangways and driven directly up the pitch to within 50 ft. of the outcrop, at this point a chain pillar was left to prevent the surface water from flowing into the mines. After several chambers were driven up to the chain pillar on the west gangway, the coal was drawn out and the rooms abandoned. A counter slope was driven from the head of the original slope diagonally across the pitch, also across old chambers driven from the west gangway of original slope. The counter slope intersected the west gangway driven from the original slope about 450 ft. west, and was continued for two lifts below, or a total distance of 1200 ft. At the foot of the slope, an overlap fault was struck. A tunnel was driven in the conglomerate measures through a fault connecting the Jersey and Avondale workings. At this time the counter slope was converted into a gravity plane; and all the coal mined afterward in the Jersey mine was lowered to the Avondale.



MAP OF THE JERSEY MINE OF DELAWARE, LACKAWANNA & WESTERN COAL COMPANY, SHOWING FIRE AREA

Securing a Water Supply

About 1893, the Avondale mines underwent a general squeeze, which cut off all the workings north of the shaft, including the Jersey workings. On May 18, 1901, at about 7:30 p.m., a large volume of smoke was noticed coming out of the original and counter slopes. The officials of the Avondale mine were promptly notified and at once went to the scene. Upon their arrival they found a large fire raging about 300 ft. below the surface on a counter slope. The officials at once organized a large gang of fire fighters and immediately started to lay a line of 4-in. pipe from the mouth of both slopes to the artesian well about 4000 ft. northeast. Although the pipe was laid within a short time, unfortunately the water supply from this source soon gave out. This made it absolutely necessary to lay a line of 8-in. pipe from the Avondale swamp at the Ross shaft up over the mountainside, a distance of 4500 ft. to a reservoir situated about 300 ft. northeast of the slopes. Two 3-in. siphon pipes were laid from the reservoir to the fire. A Jeanesville pump having a capacity of 750 gal. per min., and built for a lift of 1000 ft. was taken from No. 1 shaft, Auchincloss mines, and installed at the swamp to pump water to the fire against a head of 375 feet.

The work of installing the pump and laying a pipe line was completed with all possible despatch, but the fire had lost no time. The timbers had burned out in both slopes, and cave-ins had allowed the fallen débris to attain to a white heat. The men were employed reopening the counter slope, which had to be accomplished in face of the most intense heat, gradually fighting the fire as they advanced. Good progress was made for about 75 ft. between the head of both slopes. At this point an empty chamber 30 ft. wide, and on fire, was encountered. After making a heroic effort to fight the fire back and cross this chamber to follow the fire down the slopes, the plan had to be abandoned. A large slush box holding 2000 gal. of water was erected on the surface and a sluice was laid from the outlet of this box to the empty chamber. A large gang of laborers was employed to fill the sluice with clay, while the box was filling with water; this operation required four minutes. The water was then instantly liberated into the sluice and the clay was washed into the empty chamber. After a time this plan also had to be abandoned.

---

*Assistant district superintendent, Delaware, Lackawanna & Western Coal Company, Plymouth Township, Penn.

The officials then tried to sink a new slope through an old chamber 600 ft. west of the counter slope and through the chain pillar. I might add here, that the chamber referred to was opened from a water-level gangway driven along the strike of the seam above the chain pillar, which is left at the face of those chambers driven from the west gangway of the original slope; the outcrop of the seam is 300 ft. higher on the mountain on the west side of the slopes. A force fan was erected by the time the men reached the chain pillar, and air was forced to them. After working two days on a pillar, they succeeded in breaking a hole through to an old chamber, but this feat came near costing the lives of the men on the shift. The great outrush of carbon moroxide (white damp), which was penned up in old workings, immediately found vent and overtook the men before they could retreat; fortunately, the miners did escape, and had enough presence of mind to drag their semi-conscious companions with them to safety. All tools, fan, etc., were lost. The cause of this sudden outrush of gas was due to the hole being driven through the chain pillar at an elevation 50 ft. higher than the mouth of both slopes.

When the hole was broken through the chain pillar, the slopes immediately became the downcasts, and the hole the outlet. This change in the direction of the air currents allowed the latter to cross the top of the old chamber on the original slope, and to start to force their way down the counter slope through the fire and cave in. The loading and handling of all débris had to be accomplished in wheelbarrows by two men being hooked up in harness to pull, while another pushed on the handles.

While some progress was thus made, the men found themselves working in loose rock 40 ft. over the coal seam, with the fire underneath. This plan was then abandoned, streams of water were left running over the loose rock and a new plan was adopted. This latter scheme was to work down the original slope, and was carried on successfully to the first crosscut driven on the west side to the old chamber, which had given so much trouble. A windlass was erected in this crosscut and a counter slope was started across the old chamber, which had caved, also through the pillar under the counter slope. The intention was to get on the slope, reopen it, and follow the fire. The windlass was used to hoist a small truck, and four men were employed to turn the windlass on each shift. Such were the discouraging conditions under which I assumed charge of the fire on Oct. 1901.

Plans for Fighting the Fire were Changed

About four months after the fire had started, W. F. Powell was appointed foreman on the opposite shift; one week later we got together and decided other plans had to be adopted in order to successfully combat the flames. While working on the night shift, I discovered an old crosscut on the east side of the original slope and immediately stopped the three o'clock shift from working at the face, and started to explore the old workings on the east side. After working our way through the crosscut we found ourselves close to the face of an old chamber and a crosscut leading to the next chamber on the east. We worked our way gradually across five of these chambers, which were driven from the east gangway of the original slope.

It was here found possible to descend with a rope and we lowered ourselves about 350 ft. to a body of water, which was found to be the east gangway, and filled to within about 3 ft. of the roof on the upper rib. Some planks were sent down, and a raft constructed; two of us pushed our way back toward the original slope on the raft, and found, after coming back to the fifth chamber, that we had reached the original slope pillar. I may also add, that our print was incomplete, but accurate, all there was to it, as only the gangways, slopes and tunnels were shown. No surveys had been made of the chambers or airways.

This finding it possible to [illegible] slope on the gangway, changed the whole plan of fighting the fire, for it gave [illegible] valuable information. After consulting with Mr. Powell, foreman, and Montrose Bonnard, district superintendent, it was decided to install boilers and a pair of 10x12-in. Lidgerwood hoisting engines on the surface east of the original slope; it was also decided to drive a hole through the chain pillar in line with the engine; erect a sheave wheel and start a slope across the old chambers and through the pillars to a point we had reached on the raft above water level through the slope pillar to the west turntable or fire gangway. This work was started on Oct. 11, 1901, and on Oct. 21, we had reached the west gangway, as we thought then below the fire. It was here discovered that the west gangway on the slope pillar was blocked with baked clay, which accounted for the large body of water east of the slope. Evidently this was the clay and water that had been flushed into the open chamber from the slush box.

A Successful Plan of Operation

The gangway was open for about 50 ft., but a long [illegible] could be seen in the distance. We proceeded carefully, timbering every inch of the ground until we could reach the fire with two streams of water. The moment water was turned on the fire, the steam and sulphur fumes drove us out to the surface. We shut the water off, waited for the steam and sulphur fumes to clear away, fastened both lines of hose so as to reach the fire, withdrew our men and turned the water on. After five hours of impatient waiting, the fire had cooled sufficiently to allow us to proceed. The flames here raging proved to be at the entrance of the old chamber, which we found so much trouble to cover over between the slopes. We loaded out the cooled débris, timbered and forepoled our way through the cave; put in a frame set at the entrance to the chamber, secured nozzles made out of 1-in. gas pipe in 8-ft. lengths, pushed them as far as possible up the pitch into the fire, withdrew our men and turned on the water. It was our intention to cave the chamber and prevent any sudden fall from closing in on our gangway timbers and entombing our men.

This caving plan proved so successful that we immediately adopted it and caved all our open chambers as we advanced on the gangway for 1250 ft. through a solid wall of fire. In all, we crossed 36 chambers on this gangway, on some occasions requiring two weeks to cross one chamber. The delay in crossing was due to rushes of coal and rock all on fire, which at times filled the gangway for 25 ft. On again reaching the face after these rushes of fire, we always found a pitch chamber partly opened and could see the chain pillar at the face on fire, also the roof of the chambers were at a white heat. This was a beautiful sight and was similar to standing and looking into a blast furnace. We at once forepoled the timbers to the cave with 25-lb. T-rails, and 3-in. pipes and covered the same with sheet iron to prevent any more rushes coming in on the gangway.

We then proceeded to push 1-in. gas pipe nozzles up to the fire, fastened on the hose, withdrew our men and turned on the water. The water coming in contact with the fire caused heavy explosions and in a very short time caved the open chamber, thereby allowing all the rock and coal to rest on timber. We then proceeded as before to open the gangway to the next chamber. About the time we reached the point where the counter slope intersected the west gangway, R. A. Phillips, superintendent, paid us his first official visit. On passing by this place, Mr. Phillips, called my attention to the large amount of heat coming up and said, "young man the fire has gone below you on this slope." I had purposely passed this point to see if Mr. Phillips would notice the heat coming up; as Mr. Barnard, district superintendent, and I had [illegible] maintained that the fire had gone down the slope into the lower workings, which afterward proved to be correct, but Mr.

Barnard was of the opinion that the heat from the fire on the gangway was working down through the west chambers and coming up the slope

AN OLD SHAFT WAS REOPENED

After this investigation it was decided to erect 12x14-in. Lidgerwood engine boilers and a derrick at the old shaft, 1000 ft. west of the slopes, and reopen this shaft. The timbers of the shaft had rotted out, allowing a large quantity of clay and débris to fall down completely filling the shaft for a distance of 130 ft. This pit passes through the Red Ash seam at a point 40 ft. on the pitch of 45 deg. south of the gangway that we were working in at the slope end. Our reason for reopening this shaft was to work our way up through the chute to the gangway to meet the fire and if possible to prevent it from spreading. Upon reaching the fire, our intention was to drive a chamber out to the surface and cut the fire off.

After opening the shaft, we made good progress for a short time, but the firemen at Woodward, Pettebone and Avondale mines went on strike and shortly afterward the miners at these collieries joined the strike in sympathy with the firemen. The strikers were not satisfied until the fire fighters had joined their ranks. Although no coal had been mined in the Jersey workings since 1893, this strike hampered us to a great extent. But after employing new men, whom we had to board and protect on the property, we decided to retreat 250 ft. west of the shaft and reopen a chamber, which was 98 ft. wide, pitching 45 deg. on the line of the shaft, and work our way up; upon reaching the face, we proposed to drive to the outcrop. This plan proved a large and dangerous undertaking. We constructed a jugular manway along the right rib and gradually worked our way to the face, and drove a chute through the chain pillar to the water-level gangway.

As a reward for our labor we got a shower of fire, which nearly trapped our men. We built an iron battery in the chute to prevent the fire falling into the chamber, and laid two lines of hose up the manway, making a desperate effort to get our water-level gangway to cut the fire off, but with little success. About this time H. G. Davis was appointed district superintendent, Mr. Barnard having resigned. Wm. E. Walters was foreman on the opposite shift. After holding a consultation, it was decided to sink a new shaft from the surface a depth of 130 ft. to the water-level gangway about 400 ft. west of this chamber. It was also decided to reopen a gangway leading from No. 9 plane, Avondale mines to the Jersey tunnel, which was driven through the fault at the foot of the counter slope, and reopen it to cut the fire off and meet the men working down through the fire from the west gangway. This was also accomplished, but the heat was so intense that the men worked in relays of about 3 min., naked with the exception of gum boots and trousers. After the slope was connected to the tunnel, we had the fire surrounded, and it was then decided to erect a dam in the tunnel. This tunnel was the only opening which was driven through the fault.

The line of fault also passed from the bottom of the slope near the foot of the old shaft and intersected the fire gangway about 300 ft. west. The gangway from this point ran parallel with the fault. We worked our way in this gangway until we found a chamber driven to the water-level gangway, and in which no crosscut was driven to the west; this made a good chain pillar, so we decided to erect a dam on the gangway on this pillar. We were considerably hampered during the erection of these dams by the large percentage of carbonic acid gas (blackdamp) which was flowing into and mixing with our air current from the fire and old workings.

The construction work was accomplished by gangs of men, one gang relieving the other about every five minutes in order that the men who had been working on the dams might go back into a fresher air current. After completing the dams and reopening the water-level gangway from the new shaft, until we reached the fire at a point not exceeding 40 ft. west of the line chamber, we retreated 60 ft. west of the fire on the water-level gangway and reopened a chamber through to the shaft 50 ft. deep on the outcrop, and constructed dams across the water-level gangway on the chain pillar. This completed the actual work of fighting the fire underground, with the exception of building flumes from the surface to the foot of the counter slope; also to the head of the old shaft and to the hole we had driven to the outcrop. We also sunk a 6-in. bore-hole from the surface to the face of the chamber on the shaft line, and built a flume on the mountainside, connecting same with the bore-hole. We then laid 4-in. water mains to the flumes and employed a large number of men with teams, plows and scrappers, and started to haul clay, which they had plowed up, to the flumes and then washed it into the mines. This plan was continued until the entire mine was filled with incombustible material and the fire put out, after four years of the most hazardous and difficult work. The work of extinguishing this fire was fortunately accomplished without serious accident or loss of life. The last chamber driven to the outcrop and also the dams constructed on the water-level gangway were done under the supervision of M. V. Lewis, inside foreman, at the Avondale mines.

METHOD OF TIMBERING

The following is the method of timbering, ventilating, blasting and treating persons overcome with carbonic acid, CO_2 (blackdamp) or carbon monoxide, CO (whitedamp), also the approximate number of gallons of water pumped to the fire:

All set timbering consisted of a 5½-ft. collar between notches, 7-ft. legs having 2½-in. pitch to a foot; this stood on a mud sill 8 ft. 5 in. between notches. The center of the collar was lagged and forepoled where necessary with 3-in. wrought-iron pipe, 25-lb. T-rails and sheet iron. Four employees, called hosemen, were constantly on duty patrolling the gangway and openings left in the rear of the men employed at the face, to watch the timbers and prevent the same from burning out.

VENTILATION

All known systems of ventilation were tried at various times during the progress of the fire. Hand fans were used in isolated hot holes and a steam jet was employed in the timber shaft on the outcrop to keep the current heavily charged with CO_2 (blackdamp) moving in the same direction. A force fan was driven with a water-wheel by using the water which ran down the counter slope to the tunnel through the fault, and gave good results. The force-fan method did not give good results at the old shaft; its use drove carbonic gas up about 40 ft. in the shaft, at which hight the gas remained making it impossible for us to descend.

The exhaust-fan system gave good results in the old shaft, located at the same point and ventilating the same workings where we had tried the force-fan system; the same fan was used for both methods. The fire itself was used to good advantage at times, when feasible to produce ventilation. All blasting was done with C. Atlas 40-per cent. dynamite. The dynamite was placed on top of hot rocks and wrapped in water-soaked canvas or blue clay and fired with a short fuse; no holes were drilled in the rocks at any time, although, approximately, 25 short tons of powder were used during the period the fire was fought.

During the progress of the fire it was a common occurrence for men to be carried out unconscious, overcome by carbonic acid, CO_2, or carbon monoxide, CO. These victims were quickly treated and restored to consciousness by resorting to artificial respiration and using the powerful heart stimulant, ammonium nitrate, inhaled by saturating a handkerchief. The patients were also given medicine containing ingredients prescribed by Dr. D. H. Lake, Delaware, Lackawanna & Western surgeon.

AMOUNT OF WATER USED

The approximate amount of water pumped to the fire in 33⅓ months, or 1000 days, by a 20x7½x24-in. Jeanesville duplex pump, running 200 strokes per minute, and in operation 22 hours each day amount to 990,000,000 gal., besides the large amount of surface water caught on the mountain water shed and conducted to the reservoir, and siphoned to the fire during the wet season of the year. This vast amount of water had to be repumped up the No. 1 slope and the Ross shaft, Avondale mines from the No. 2½ west lift, Red Ash seam, by a 24x48-in. Duplex Jeanesville pump, besides the regular mine water against a head of 440 feet.

During the time the clay was being flushed into the workings through a hole driven through the chain pillar at a chamber 600 ft. west of the slopes, and the hole was being filled to the surface level, an explosion occurred, which blew the baked clay and ashes for hundreds of feet on the mountainside, similar to a volcano sending up lava and ashes from its crater. This hole was immediately reflushed and has since remained intact.

The method of crossing hot chambers above the seat of the fire was to construct overhead canvas airways, which were kept continually wet to prevent the canvas from burning, the hot air and gases were passed back over the heads of the men. This method proved successful.

The following is a report of David T. Davis, inspector of mines 8th Anthracite district, to the Department of mines on the fire, in his report for 1905: "I am pleased to be able to report that this stubborn and serious mine fire, if not entirely extinguished, has been so surrounded by incombustible material that it will be practically impossible for it to spread into any other part of the adjacent old workings."

The fire was discovered on May 18, 1901. The origin has always been a mystery. It has cost the company a tremendous amount of money. The officials and workmen engaged at this work have also suffered a great many trying ordeals, and are well pleased with the conditions existing at present, as the work of fighting a fire of the magnitude of this one in old abandoned workings where no system of ventilation could be adopted or applied, is a problem that taxes the ability of the most competent mining men.

Many ways of decreasing the injurious effects of coal dust on miners have been tried in foreign countries. In these methods either the dust is allayed by spraying or it is prevented from entering the lungs of the miners by respirators. With regard to the latter devices, the miners object mainly because such machines hamper conversation with a near-by partner. At the St. John del Rey Mine, Brazil, helmets supplied with air from the compressed air pipe are worn by the machine men. The small rubber pipe, which brings the air to the helmet, can be detached instantly by means of a connection, the valve in which closes automatically when detached. Expansion cools the air, and renders work in a hot seam more pleasant.

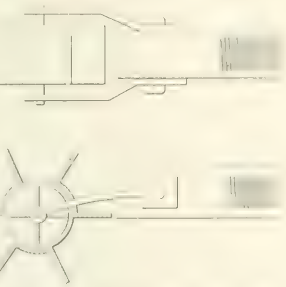
Coal Mine Dust

In *Annales des Mines*, Dec., 1907, [illegible] Breynært states that systematic watering of coal-mine entries has not become general in England, and is practiced only in Wales and in a few collieries in Durham. In the Cardiff district, 62 mines are provided with systems of water under pressure, having about 250 miles of pipe. The Llwnypia colliery has a water main passing through all the principal entries; for a distance of 200 yd. from the shaft the entries are sprinkled with a hose and nozzle; beyond this distance the mains are furnished with jets from point to point, which shoot out sprays of water into the entries.

Cost of Installation

The cost of installing such an arrangement is about as follows:

5.8 miles of 1½-in. pipe	$5000
Junctions	[illegible]
Brackets and hangers	[illegible]
¾-in. nipples	[illegible]
Labor of installation	[illegible]
Hose	60
Total	$6150



PLAN AND SECTION OF WATER JET SPRAY

In the mine wherein this equipment is installed, the expense of watering amounts to 0.4c. per ton of coal hoisted; this figure includes interest on the cost of the plant but not its depreciation, nor the cost of the water, which might in some circumstances, be considerable. In the Durham collieries, the cost is estimated at 2c. per ton.

In the Browney colliery, Durham, a plan has been adopted which is economical of power and water. The water is applied wherever it is most wanted, while the scheme does not permit the discharge of an excessive amount, to the detriment of the passageway. The installation includes a little pump of 2-in. diameter, and 6-in. stroke, which gets its water from a small tank fed from a main and regulated by a float-valve. The pump is driven mechanically by the passage of the trip. In an entry where head and tail rope are used, the tail rope passes over a pulley which transmits its power to the pump. Where an endless rope is used, the pump is driven by a chain which engages the cars as they pass by; in this case the pump works only when a trip is [illegible] one, two or three pipes which span the entry at a distance of 300 ft. apart. On the under side of each of these pipes are spaced five or six spray jets made of ¾-in. pipe, closed at the end and pierced by a very small hole. A little paddle-wheel affair, made of sheet tin soldered together, is fastened to each jet to aid in pulverizing the stream of water. One form is shown in the accompanying figure. The amount of water projected by one of these sprays is about one quart per minute.

Labor and Accidents in British Columbia Coal Mines

The report of the Department of Mines of British Columbia for the year 1907 gives the following statement of the labor employed at the coal mines of the Province during the year:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total coal mined during the year, with its disposition, was as follows, in long tons: Sold for consumption in Canada, 916,262 tons (41.3 per cent. of total); sold for export, 673,114 (30.3); used for making coke, 419,541 (18.9); used at collieries, 165,931 (7.5); added to stocks on hand, 44,760 (2.0); total, 2,219,608 tons. The average coal mined per employee, including all classes, was 366 tons; per miner, 1186 tons.

The production of coke was: Sold for use in Canada, 155,579; sold for export, 60,110; added to stock, 7224; total 222,913 tons. The average yield of coke was 53.1 per cent.; that is 1.85 tons of coal were used in making a ton of coke.

The number of accidents in coal mines for two years past is reported as follows:

	[illegible]	[illegible]	[illegible]	[illegible]
Killed	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

The increase in the number killed and injured last year was large; 85.5 per cent. in number and 47.2 per cent. in proportion per 1000 employees. The causes of accident reported were: Gas explosion, 1 [illegible] rock, 10 and 37; mine cars and timber, 8 and 42; powder explosions, 1 and 6; miscellaneous underground, 1 and 8; on surface, 10 killed and 11 injured. Falls of [illegible] per cent. of the deaths, and 30.3 per cent. of the injuries. In 10 years there have been 413 employees killed and 656 injured in British Columbia collieries.

Colliery Notes

It is better to have a good fire and a bad boiler, than a bad fire and the best possible boiler.

In order to reduce the dust in German mines, holes are drilled in the solid coal and water at a high pressure is forced in for some considerable time before the coal is shot down.

A considerable falling off took place last year in the quantity of foreign coal imported into Spain; the returns just issued show a total of only 1,888,032 tons as compared with 2,199,097 tons the previous year.

In designing a mine car, remember that it is of the utmost importance to keep the wheels as large and the axles as small as possible, consistent with the strength of the latter; upon the ratio of the two depends the friction.

Although the coal mines of Belgium are looked upon as being among the most dangerous in the world, such care is taken to insure the safety of the miners that the total death rate during 1901-1904 was only 10.10 per 10,000 employed.

Pressure gages on steam engines should be tested by occasionally shutting off the steam and letting the pointer run back to zero. The average or safe-working pressure of a boiler should be indicated on the pressure gage by a prominent red line.

The Erie Coal Company, of Pittston, Penn., hereafter, will discharge and refuse to take into their employ any foreigner with a police record. The company will be furnished with a list of the same by the city and county authorities.

During the year 1907, 25 coal mines were worked in Africa. The gross tonnage produced 3,969,884 tons, valued at £796,361. The white men employed numbered 498, while there were 10,076 colored workmen. There were only 35 fatal accidents; 291,991 ft. of workings were driven, and 3089 ft. of shaft were sunk.

In plants worked by mechanical draft, an economizer is an important item, as the saving effected will pay the running expenses of the fan and the final temperature of the gases may be reduced considerably below what is necessary to maintain the chimney draft. It is possible to work with exit gases below 200 deg. Fahrenheit.

Pounding in a pump indicates that the pump chamber is not filling as it should. This defect may be overcome by an air chamber located on the section pipe near the boiler; this will induce a continuous flow of water to the suction valves and so remedy the trouble. Pounding is usually due to a defective suction pipe, though sometimes it is caused by defective valves or water lagging behind the plunger.

Efficient pipe lagging is all important in the prevention of condensation in steam pipes. Not only the barrel of the pipe, but the flanges also should be lagged. Leaky joints are often the result of pipes put up without proper provision for expansion. Good spring-bends, heavy flanges and thin joints which cannot blow out, will remove all cause for anxiety about the inconvenience of flange covers.

The manufacture of briquets from black grass meadow mud is an important industry of Russia and Holland. This mud is carboniferous in character, and is a lower vegetable deposit than peat. It is chiefly composed of vegetable matter, rotted under water, intermixed with earthy substances. But little preparation, aside from drying after leaving the briquetting machine is necessary to convert this mud into briquets.

Breathing appliances should be used with a considerable degree of caution. The explorer should have had ample experience before undertaking rescue work and should be thoroughly acquainted with the mine itself. Facts go to show that rescue work in a mine after a disaster is very uncertain and that rescue appliances, although excellent in themselves, may lead to further disaster when improperly used underground.

For a slow-speed engine, a receiver near the engine and small pipes with a high velocity of steam is more economical than large pipes; but with high-speed engines, the receiver is only a source of condensation and loss. Steam traps are used to deal with the condensation, and often add to the losses by heavy leakage. Do not bury them or hide them away where they cannot be seen, but treat them with suspicion and keep them under close observation.

The wear and tear on mechanical ash conveyers is great; for this reason, ash pits under boilers with a light railway, at a lower level, into which the ashes will run without much assistance is often a more economical arrangement than conveyers. In cases where elevators must be used, they should have few wearing parts and these should be lubricated with hard grease instead of oil, as the latter washes grit into the bearings while the former helps to squeeze it out.

The statement is made that soft coal is to take the place of anthracite in the freight service of the Lackawanna railroad. There will be no change in the passenger service, unless the company should change its present plans. The change will be made for economic reasons. The saving resulting from the use of bituminous coal will amount to thousands of dollars a year. Another reason favoring the change, is the claim of higher efficiency with soft coal, which makes a hotter and quicker fire. Bituminous coal has already been in use on the Buffalo division for several years.

During 1907 the death rate in the mines of New Mexico was 1.04 per cent., which compares with a rate of 0.0382 per cent. during 1906. This increase is credited mainly to carelessness on the part of the miners and the pernicious habit of shooting off the solid. The mines of the territory are quite dusty, and the principal danger to be guarded against is the explosion of this dust. The system of paying for run-of-mine coal instead of clean coal has led to the increase of shooting from the solid, which has greatly increased the number of fatal accidents resulting from dust explosions.

All engine bearings should be examined systematically; they should not be screwed up too tight as this increases the friction. If they are tightened in the morning before starting operations, when they are cold and contracted they are likely to be screwed up too tight. The best time for such examinations is right after work is finished for the day when they are expanded from the friction of working and are in their operating condition. Care should be taken to guard against the possible accumulation of dust as it increases friction. When undue friction exists in the bearings, examine the lubricant on them and you will find metallic particles in the oil.

Nothing will keep a plant and the working staff in such good order as periodical tests and the recording of data intelligently supervised. The educational value on the men, of single day full tests is great, as it emphasizes the importance of attention to small details. The workmen soon learn how to improve their methods and get the best value out of the plant. There is also the stimulant of healthy competition among the men on different shifts if they are tested under similar conditions and their work compared. Much could be learned and many improvements made if the working staff responsible for the management of a colliery knew more concerning the items which go to make up the working expenses.

Beech props are not used extensively in English mines owing to their weight, which exceeds that of most other timber. Such props when employed are generally used in return airways as they stand the weathering effect of the air current well. Pitch pine is used for supporting the roof and sides in wet places. It is of a resinous character and extremely durable in wet places, but cannot be used with a large margin of safety anywhere else as it burns quickly and is therefore dangerous. Oak is the timber of permanence and durability and is used for main roads or in any place where permanence is required and where the pressure is great. Roads timbered with oak have been known to last over 50 years. It is the most durable timber and stands weathering well.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec'y.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for June, 1908, was 41,000 copies.

July 4 16,000
July 11........ 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
The Copper Market 91
Dry Air Blast in Steel Making 91
Cadmium as a By-product 92
Alexander L. Agassiz.................... 92
The Eight-hour Day in British Coal Mines.. 92
Gold Mining Prospects in California 92
*The North Side of the Coeur d'Alene District *Herbert S. Auerbach* 65
International Nickel Company 70
*The Mines of Northwestern Altar, Sonora, Mexico *George W. Maynard* 71
Nickel-Copper-Platinum Ore in Nevada. *A. Maurice Thompson* 72
Ore Contracts from the Smelter's Standpoint *Clarence A. Grabill* 73
Volumetric Estimation of Lead 77
Shorthand by Machinery 77
*El Rayo Gold Mine, Near Santa Barbara Mexico *Claude T. Rice* 78
Short Talks on Mining Law III *A. H. Ricketts* 81
Transvaal Mining Notes 82
*Handling Blast Furnace Bullion at the Selby Smelting Works *James C. Bennett* 83
Turkish Quicksilver Mining 85
*Fighting Fire in an Anthracite Coal Mine. *P. H. Devers* 86
*Coal Mine Dust........................ 89
Labor and Accidents in British Columbia Coal Mines 89
Colliery Notes........................ 90
Correspondence:
Canadian Mining Institute..*E. Jacobs*.... 93
Facts Concerning Cardiff Mine Explosion. *Geo. S. Rice* 93
Mining Supplies...................*G. T. B.* 94
*Safety Sinking Hook *Thos. H. Prisk* 94
Production of Mica in North Carolina. *Joseph Hyde Pratt* 94
Reform in the Comstock Mining Company.. 94
Gold Stealing in Western Australia 94
Questions and Answers 95
New Publications 96
The Lake Superior Mining Institute 97
St. John del Rey Gold Mining Company.... 98
An English Gold Mine 98
Personals, Obituaries, Societies and Technical Schools 99
Special Correspondence 100
Mining News....... 103
Markets, etc... 108
*Illustrated.

The Copper Market

About a fortnight ago the copper market, which previously had been dull, developed weakness, owing to the desire to sell on the part of some producers whose nerves were unable to stand the strain. However, on the decline, domestic consumers manifested more interest than for a long time previously, and considerable purchases were made by them, especially at 12½c. for electrolytic. At that point there were found to be a good many inquiries in the market, with the probability that a small further concession would bring about very large business. American manufacturers appeared to be, indeed, in the frame of mind that the Europeans were in last November, when they realized that the price for copper was low and appreciated the advantage of providing for future requirements, even if the latter were not immediately in sight.

American manufacturers also recognized that copper was cheap at that time, but they did not have the money to invest. Since then, nearly nine months have elapsed. The supply of money has become abundant. Business is showing some signs of improvement. Confidence is being gradually restored. Consequently, it is the part of wisdom for American manufacturers to provide for their future requirements of copper. Under these circumstances, it was perfectly natural that there should be some recovery in the price for copper as has been experienced during the past week.

Dry Air Blast in Steel Making

The Gayley dry-air blast system, as is well known, has been used with marked success at several blast furnaces during the last three years. Recently a series of tests was undertaken at the South Chicago works of the Illinois Steel Company, the object being to prove the inventor's belief that the dry blast would be equally beneficial in connection with the bessemer converter. The dry-air plant already constructed for the South Chicago blast furnace was used, and a run of two days was made, the average reduction of moisture in the air blown into the converters being from 5.98 to 1.39 grains of moisture per cubic foot.

The results obtained were so remarkable that so high an authority as P. H. Dudley, who tested the ingots and rails produced, feels justified in speaking of the test as "of technical and historical importance. . . . A great step in advance for the bessemer process from every standpoint of consideration and practical operation." The results obtained with the dry blast were encouraging in the direction of increased capacity for carrying scrap, and other items bearing on cost; the enlarged control of high or low silicon irons; the most significant, however, being the great improvement in the product, as shown by Mr. Dudley's test. The ingots cast from steel made with the dry blast were more solid, free from blowholes, except at the extreme top, and the blooms made from them showed unusual solidity and freedom from segregation. Throughout the test a better and more nearly uniform grade of steel was apparent. The blooms were used, with only the usual discard, in rolling 100-lb. section steel rails; and in careful tests of these rails only 1 per cent. were rejected as defective or of second quality. This is a very unusual proportion.

The results thus shown may be of great importance in restoring confidence in the bessemer process, and putting the converters again on a parity with the open-hearth furnaces as far as the quality of the product is concerned. The test was on such a scale and so carefully made that it may be accepted as fully confirming Mr. Gayley's claims for the advantages of using dry air in the converter as well as in the blast furnace. It is not impossible that in this application may be found the solution of the steel-rail question, over which there has been so much controversy during the past two years. If parallel results can be secured in continuous operation—and there is no apparent reason why they cannot—there will be no necessity of abandoning the bessemer converter and resorting to the open-hearth furnace for rail-making metal.

Years ago Dr. William B. Phillips predicted that the next great improvement in iron making would be in the drying of the blast. He was not able to find supporters, or to carry out his ideas into practice at the time; and it was reserved for Mr. Gayley to devise the method of drying the air, and to test it on a scale which has demonstrated the technical [illegible] ment

Cadmium as a By-product

Some of the producers of zinc ore in the Joplin district have discovered that their ore contains considerable cadmium, sometimes upward of 0.5 per cent., and as a local newspaper puts it, "The producer receives no extra money for his cadmium, although in many instances its value will be more than $10 to the ton of zinc." Certain of the mine operators have suggested that there be some method of receiving pay for this by-product. We fear that they are doomed to disappointment in this respect.

It is quite true that the Joplin blende contains a comparatively high percentage of cadmium, indeed more than we know of in any other ore produced in large quantities, but unfortunately the uses of cadmium are few. The production of metallic cadmium in 1907 was about 70,550 lb. in Silesia and about 15,000 lb. in the United States; this represents the world's production.

Although under present conditions cadmium fetches a high price, its value in the United States being $1.25 per lb., it is one of the substances in limited demand for which a high value is maintained only so long as the production is small. The inauguration of competition in such industries invariably leads to a tumble in price that is disconcerting and dispelling of fond hopes of immense profits. Recent experiences in the production of bismuth, cobalt oxide, lithia and other substances are illuminating in this respect.

At present radium is perhaps the most precious of substances, but its extraordinary value is decreed by the fact that the world's supply in marketable form is scarcely a spoonful. If some one should be able to supply a cupful there would probably be a *debacle* in radium.

With respect to cadmium, the amount that can be recovered as metal is only a tithe of what exists in the ore. But even so, the present producers could furnish a vastly greater quantity if they could sell it, and moreover the smelters of silver-lead ore could also furnish it.

The producer of zinc ore is not refused anything to which he is entitled when he is not paid for the cadmium in his ore. On the contrary the smelter is a good deal more likely to object to its presence. He has to be constantly on his guard to avoid paying for cadmium as zinc, because with the careless chemist cadmium may be reckoned as zinc in the assay; and, moreover, a considerable portion of the cadmium goes into the spelter, to which some consumers of spelter object; unreasonably we think, but still they do object.

Alexander L. Agassiz

In his recent examination in connection with the trial of the suit of A. S. Bigelow against the Calumet & Hecla Mining Company, Alexander L. Agassiz, president of the Calumet & Hecla, became righteously indignant and said: "I have served the Calumet & Hecla Mining Company from the beginning; I have been perhaps an autocrat in running it. But I defy anyone to find anything in my conduct which will in any way show that I have benefited in the least at the expense of any of the other stockholders. If working tooth and nail for 40 years means anything, all I can say is that it is not worth the while of anybody to work, if what I have done is subject to the attacks such as I have been subjected to during the last six months."

Mr. Agassiz has had so many reasons for feeling irritated under the wild charges made in connection with this litigation that he will readily be forgiven for displaying some indignation. However, he can rest easy with the assurance that everyone in the mining industry whose opinion is valuable recognizes the great work that he has done in building up the Calumet & Hecla Mining Company, and any ordinarily well . informed person knows what has been the position of the Calumet & Hecla in the copper trade and marvels at the ridiculousness of the charge that it has been attempting to create a trust. On the contrary, the Calumet & Hecla has ever been the great exponent of the open market, and as such has been the champion iconoclast of the trusts.

The Eight-hour Day in British Coal Mines

The Eight Hours Bill for limiting the working hours of coal miners in Great Britain is now being discussed by Parliament. As to the necessity of the bill there is considerable difference of opinion. It is recognized that if it is passed the cost of production will be increased and that prices will rise, which will have a serious effect on the iron and steel and other industries. Practical men, such as the chairman of Pease & Partners, one of the large coal and iron companies of the north of England, complain of the interference of government departments and of the expense and waste of time in making complicated returns. If this bill is passed, clerical work of this nature will be still further increased. The evidence brought forward to show that the hours of miners are already too severe is not weighty. It is well known that colliers do not always work six days a week. At the collieries of Pease & Partners every Saturday and Monday there are 20 to 30 per cent. of the miners idle. For the eight weeks ended Sept. 28, 1907, the average time lost was 24.19 per cent. of that which would have been made if the men employed in the mine had worked full time. The causes of the loss of time were 17.4 per cent. simply idle, 3.17 off through illness, and 3.62 per cent. off through accidents.

That the bill as it stands is likely to have a far-reaching effect on the industries of Great Britain, appears to be causing alarm to the government, and important amendments modifying the hours of labor and postponing the operation of the measure have already been accepted.

Gold Mining Prospects in California

The unusual scarcity of water this season, which is due to the light snowfall on the Sierra Nevada last winter, will probably cause an early closing of all the mines along the Mother Lode in California this season. The mining situation will be the dullest in several seasons because of this lack of water at the mines. The scarcity will affect the mines as far south as Tuolumne county. In that county the ditch and power men think that they will be able to supply water up to September, but hardly expect to do so beyond that time, until the winter rains come. Therefore many of the mines expect to close for a while in about three months from now.

The recent formation of several new associations, intended mainly for the discussion of coal-mining methods and of means for the prevention of accidents, cannot fail to be productive of good results. The interchange of experiences and the discussion of local methods will broaden the views of managers and lead to the adoption of many improvements.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Canadian Mining Institute

There were several mistakes in the account of the meeting of the western branch of the Canadian Mining Institute, held at Rossland, B. C., on May 14, as published in the JOURNAL of June 20, which I shall esteem it a favor to be permitted to correct.

When I was at the Tyee Copper Company's smelter, Ladysmith, Vancouver Island, a few weeks prior to the meeting, the manager, W. J. Watson, was good enough to explain to me the advantages he was obtaining in using a matte separating forehearth, which was his own adaptation of the old Orford settler to a water-jacket receiver. My notes, read at our meeting, were to the effect that among other advantages afforded by the use of this matte separator are the elimination of danger of men being burned when tapping, the much cleaner slag made (this causing a saving which in one month more than pays the cost of installation), the economy effected in the services of a tapper being dispensed with in each of the three shifts, the reduction in the wear and tear of matte pots (the stream of matte not striking the side of the pot as in the ordinary tapping operation), and in the saving of tapping-clay. A photograph and blue prints of drawings illustrated this subject.

Next, in connection with C. M. Campbell's excellent paper on "Granby Mining Methods," the Granby mines up to the time of the meeting had not produced "over 5,000,000 tons of ore," as stated in the JOURNAL. These figures are about 1,000,000 tons in excess of the actual production, and they do not appear in the carbon copy of Mr. Campbell's paper supplied to the secretary. Neither do I find any statement to the effect that in one place the ledge, measured horizontally, is 700 ft. in width. Mr. Campbell did state, however, that "at the place where this section is taken a crosscut could be started in ore at the footwall and driven for over 600 ft. before again encountering waste rock."

Then, the gold medal presented to Frank E. Lathe was not given by the institute, but by last year's president. As that gentleman, Frederic Keeffer, was prevented by important business from attending the meeting, he sent the medal to the president of the branch, A. B. W. Hodges, and requested him to take advantage of Mr. Lathe's presence at the meeting to publicly present him with the medal, which was for the best paper submitted by a student last year. Incidentally I would like to add that the judges of the students' papers described Mr. Lathe's paper as "an excellent monograph, carefully written, with full attention to details, and especially to the costs and expenses of manufacture; a point in which many technical papers are deficient."

Finally, the paragraph in the JOURNAL relative to my reading "a paper from notes by Mr. Miller of the Tyee smelter," is also incorrect. What I did read was a few notes I made on "Ore Hoisting Appliances at the Tyee Copper Company's Smelter," which I also obtained when visiting the works. In particular I described a trolley designed by Mr. Watson, the manager, which has been found to work effectively in hoisting ore from vessels into bunkers on the wharf at Ladysmith. Photographs and blueprints of drawings were kindly supplied by Mr. Watson at my request, to better show the devices I endeavored to describe.

E. JACOBS,
Sec'y Western Branch of C. M. I.
Victoria, B. C., June 25, 1908.

Facts Concerning Cardiff Mine Explosion

In the communication of H. N. Dodge in the JOURNAL of May 23, regarding gas explosions, I was surprised to see certain statements relating to the explosion at Cardiff, Ill., several years ago. Noting in the JOURNAL of June 6 that another correspondent refers to this subject I think it is important that such statements, upon which theories are liable to be built, should be quite exact. I, therefore, wish to correct Mr. Dodge when he states that no gas had been found before the explosion. Assuming the usual meaning of "gas" in mining parlance, to be marsh gas either pure or diluted, to my personal knowledge, several "feeders" had been found. As Mr. Dodge was night foreman at the time of the explosion, I think he will need only a spur to his memory to recall at least one feeder which was ready to light on all occasions, issuing in a small jet from the floor at the mouth of one of the rooms near the seat of the trouble.

Whether or not marsh gas had any effect in the first explosion is a matter I am not prepared to state; briefly, the origin of the trouble was this: A section [illegible] oned, to be reopened to pull pillars at a later period. Meantime it was being ventilated and supposedly examined daily. The facts that developed were, that a heavy fall of roof in a room in a thick upper seam dropped on to the floor, knocking a hole in this through strata about 6 ft. thick into workings of a lower seam. There was a little water standing in this room and when the "soapstone" of the upper seam roof came in contact with it spontaneous combustion set in. When discovered the gob fire was burning so fiercely, having set fire to the coal in the pile, that the local management concluded they could not put it out by direct means and undertook to brattice off the whole district. Before this was completed an explosion occurred blowing out the stoppings. An attempt was made to flood the seat of the fire and at the same time to re-erect brattices across the return airways. This work was never finished, successive explosions covering several days causing the loss of nine men in all, wrecking the mine and setting fire to it. The hoisting shaft lining burned out and allowed quicksand to run in. This in turn pulled the steel tower down into a hopeless tangle.

The lesson to be learned from this heavy loss is, unceasing vigilance in inspection of old workings and prompt action at the immediate seat of fire, first trying to put it out by direct means and, if the mine makes gas, using brattices with great caution. If brattices have to be erected they should be placed as close to the fire as possible on the return side first.

Geo. S. Rice.
[illegible]

Mining Supplies

There are a few classes of supplies which all mines use, upon which little information is obtainable, except that furnished by selling agents. This is all right, so far as it goes, except that each contradicts all the others. I refer particularly to drill steel, lubricants, packing for pumps, engines, air and steam pipe, and compound for lubricating and preservation of hoisting ropes. In visiting mines, one sees a different variety in use at each one. The master mechanic always swears by his particular brand and condemns all the others, which, of course, he has tried and found worthless. Conditions vary somewhat, but there must be information floating around, if it could only be corralled, which would save a great deal of the experimenting, which is now done each man for himself. The conditions vary, as I have said, but the principles must remain largely the same. Engines are a good deal alike and must be lubricated. Steam only varies in pressure and temperature.

I am particularly interested in the question of rope compounds. There must be some best lubricant for the inside wires of a hoisting rope. Can it be combined in varying proportion with the best material for resisting water more or less acid, or must some other ingredient be combined to get the maximum result? Not the greatest length in the life of the ropes necessarily, but the best results for the money expended; balancing the cost of the rope against that of the compound and the expense of applying it.

The cost of compound made by the manufacturers is very high. When salesmen insist on taking your order for a large trial shipment, at prices ranging from 10 to 35c. per lb. f.o.b. the factory, nothing to be paid unless its use is successful (that is, unless it proves more economical than the brand in use, whatever it may be), I am forced to the conclusion that there is considerable profit in its manufacture. This is a subject on which I desire information. If anyone has definitue figures on the cost of the ropes as affected by using different compounds, it would be distinctly a gift to the profession to make them public, and in my case would save wasting time and money in trying some brands. The cost of rope and compound is a small charge against a ton of rock hoisted, but in a large mine it amounts to a considerable sum in a year, and as such commands attention.

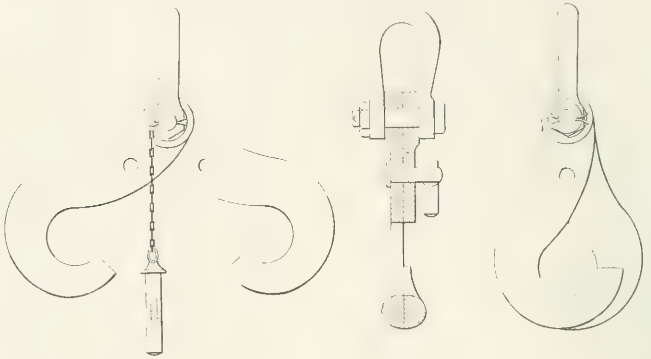
G. T. B.

Globe, Ariz., June 27, 1908.

The bulk of the tungsten ore produced in the United States comes from Colorado.

Safety Sinking Hook

I have read with interest in the JOURNAL of April 18 the paper by Henry Louis on "Safety Sinking Hooks." I should like to add to the illustrations already given another sketch showing a hook which was designed by myself for Wheal Kitty and Penhalls United, Ltd., and which gave every satisfaction in shaft sinking. It has no springs or other delicate parts to get out of order. It is impossible for the bucket to drop off the hook. It is easily attached and detached, and is so simple that it can be made by any ordinary smith. In my opinion this hook is superior to any of those illustrated by Mr. Louis.



PRISK'S WINDING HOOK

THOS. H. PRISK.

St. Agnes, Cornwall, May 20, 1908.

Production of Mica in North Carolina

By JOSEPH HYDE PRATT[*]

There still continues to be a large demand for North Carolina mica, and during 1907 there was a slight increase in the production over that of the previous year. The production[1] for 1907 amounted to 645,221 lb. of sheet mica valued at $209,956. Besides this, there were 1371 tons of scrap mica produced, valued at $15,250. As can be judged from the ratio of the price to the pounds produced, a large proportion of the North Carolina mica was of comparatively large sheets, some of which were valued at $3 or more per pound. This production was obtained from nine counties in the western part of the State.

---

[*] State geologist, Chapel Hill, N. C.

[1] These statistics were collected by the U. S. Geological Survey and the North Carolina Geological and Economic Survey in coöperation.

Reform in the Comstock Mining Companies

SPECIAL CORRESPONDENCE

F. B. Sturgis, Pennsylvania coal-mine operator, who recently secured controlling interests in several of the old Comstock Lode, Nevada, mines, has stirred things up in the offices of those companies in San Francisco. He suggested that the mines were run on a "top-heavy" system, and that salaries of office forces should be largely reduced. This proposition has met with the unanimous approval of the directors of the several companies affected and the following adopted the recommendations: Alpha, Andes, Sierra Nevada, Union, Consolidated, Ophir, Mexican, Consolidated California & Virginia, Savage, Chollar, Potosi, Gould & Curry, Bullion, Julia and Exchequer. In most cases the salaries of the presidents and secretaries have been cut in half. After three months the positions of assistant secretaries are to be abolished. All supplies will hereafter be purchased under contract from the lowest bidder. Auditing committees on each directorate will pass on all expenditures. The cut in salaries alone will total an annual saving of $55,000. Sturgis is now attempting to secure a reduction in the water rates from the Gold Hill & Virginia City Water Company, whose revenue from the Comstock mines for supplying them with water, is reported to be not less than $1,000,000 pĕr annum.

It is notorious that a number of the Comstock companies have been run for a long time for the benefit of the official staff, deficiencies being made good by assessments on the stockholders. Mr. Sturgis has, apparently, taken hold in the expectation of making money by mining, and expects that most of his costs will be made at the mines, and not in the offices.

Gold Stealing in Western Australia

Gold stealing in Western Australia has been greatly reduced since the authorities endeavored seriously to put a stop to it. The returns of gold production furnished to the Mines Department and the amount of gold sold to the mint or entered for export from the State, showed a difference of £485,000 in 1905. In 1906, when the Gold Stealing Commission instituted inquiries the difference was £247,437. In 1907, when the new laws were enforced and special detectives were employed at the cost of the mines, the difference was only £104,327.

The production of iron ore in Japan in 1906 was 40,766 tons; of iron pyrites, 42,155 tons.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Market for Infusorial Earth

I am endeavoring to find a market for the product of my infusorial earth mine. The material is high grade and I am desirous of securing the names of the firms who are in the market for it.

A. B. L.

We suggest that you correspond with W. H. Whittaker, 245 Front street, New York City, or Hammill & Gillespie, 240 Front street, New York City.

Barium Carbonate

Please give me the names of reliable wholesale establishments that can furnish barium carbonate, precipitated, 98 per cent. pure, in large quantities.

H. O. E.

Gabriel & Schall, 205 Pearl street, New York City, make a specialty of all barium products. Hammill & Gillespie, 240 Front street, New York City, and John C. Wiarda, 259 Greenpoint avenue, Brooklyn, N. Y., also handle barium products.

Market for Tungsten Ore

Is there any custom concentrator for tungsten ore in Pittsburg, Penn., ready to treat or purchase the crude ore? What concerns are interested in the purchase of tungsten concentrate?

F. T.

Henry E. Wood & Co., Denver, Colo., buy crude tungsten ore for concentration. The Primos Chemical Company, of Primos, Delaware county, Penn., is a purchaser of tungsten concentrate.

Value of Arsenic Ore

What is the market for mispickel ore carrying from $6 to $30 per ton in gold? I have communicated with the smelter at Everett, Wash., but find it will not pay for the arsenic.

W. A. H.

The only concerns in the United States which recover arsenic from ores are the Puget Sound Reduction Company, of Everett, Wash., and the Anaconda Copper Mining Company, of Anaconda, Mont. In Canada the Deloro Mining and Reduction Company, of Deloro, Ont., treats arsenical gold ore and produces white arsenic.

The fact that the smelter at Everett will not openly pay for the arsenic as such does not imply necessarily that no payment is made. Payment may be made in the form of a lower treatment charge than otherwise would be demanded, which, of course, is equivalent to an allowance for the arsenic, although it does not appear as such on the face of the returns. We know that certain shippers of arsenical ore to the Everett works obtain in this way an allowance for the arsenic value of their ore.

Generally speaking, a smelter which is equipped for recovery of arsenic as a by-product can afford to pay about one-third of the market price of white arsenic for the arsenic content of the ore in excess of 10 per cent. For example, if the price for white arsenic is 3c. per lb., an ore assaying 30 per cent. arsenic would be worth 20 [illegible] 100 [illegible] $0.01 [illegible] This basis of payment leaves a fair margin for profit to the smelter, but, of course, as pointed out above, the arsenic value may be paid for in the form of a reduced treatment charge.

Market for Ozokerite

I am in a position to furnish the best quality of ozokerite in quantity and should like to know where I could find a market for the material. I should also like to know how much ozokerite is imported into the United States, and how it is packed for shipment.

A. K. S.

Ozokerite is produced chiefly in Austria, where the industry is controlled by a trust. The production in the United States is practically nil, Colorado and Utah producing small amounts which, however, is probably not all true ozokerite. The total imports of all waxes into the United States is about 8,000,000 lb. per annum, and of this quantity it is estimated that true ozokerite consists of 25 per cent. Ozokerite is used chiefly for mixing with waxes for the purpose of hardening them; and as an insulating material for wire cable. The best grades of true ozokerite are worth about 17c. per lb. to the consumer; the price grades down to 10c. per lb. for the poorer qualities. If you have the true ozokerite you will doubtless find a market for it in this country, for the demand is good. Messrs. Stanley Jordan & Co., 100 William street, New York, and John S. Lamson & Brother, Maiden Lane and William street, New York, are dealers in this material, and we suggest that you send them each a 1-lb. sample, representing the average grade. The material is packed in bags for shipment.

Cryolite

What are the uses for cryolite and what is its value?

J. J.

Cryolite is used in the manufacture of sodium salts, the manufacture of certain special kinds of porcelain and glass, and as a flux in aluminum smelting. For the last purpose, however, the demand has lately been greatly diminshed by the substitution of a product derived from fluorspar. By far the major portion of the cryolite imported into the United States is employed for the manufacture of sodium salts. The business is entirely in the hands of the Pennsylvania Salt Manufacturing Company, of Natrona, Pa. The average value of the cryolite imported into the United States in 1904 was $14.30 per 2240 lb.; in 1905, $14.05; in 1906, $19.72; and in 1907, $22.51.

[illegible]

What is the composition of commercial magnesite? How much carbon dioxide will it yield? What is the value of liquid carbon dioxide? In burning magnesite, how much residue remains in the kiln? What percentage of fuel is required? What is the value of calcined magnesite?

W. I.

Magnesite should be high in magnesium carbonate. The commercial mineral frequently contains as much as 98 per cent. In burning a charge of 90 per cent. of high-grade magnesite mixed with 10 per cent. coke, 50 per cent. of the weight of the magnesite is obtained in the form of carbon dioxide. The price of liquid dioxide depends upon the use to which it is to be put, the maximum price being about 10c. per lb. However, the price is very variable and must be determined by negotiation. About 48 per cent. of the weight of the magnesite remains as residue in the kiln, plus the weight of the ash of the coal or coke used. Coal or coke may be used as fuel. In the case of coke, the requirement is about 10 to 12 per cent. of the weight of the magnesite. The value of calcined magnesite is $14 to $15 per 2000 pounds.

Price of Gypsum

What is the market price of gypsum, and who are dealers in this material?

S. L. L.

Ground gypsum is quoted at $4@7 per short ton, f.o.b. New York. J. B. King & Co., 1 Broadway, New York City, is a dealer in ground gypsum. The U. S. Gypsum Company, 1123 Broadway, New York City, is the largest miner of gypsum in the United States.

Loss of Vanadium

Is there any loss of vanadium in the manufacture of ferro-vanadium from ferrous vanadate?

A. H. H.

This is a subject on which there are only one or two authorities in this country; little of value has been published regarding it. In processes of this kind there are inevitable losses. In this particular case, the loss would depend on the character of the vanadate, the kind of alloy desired, the type and intensity of the furnace used, and many other things.

A consular report from Calcutta states that the Burma Oil Company, of Ran-[illegible] line for transporting oil from the Yenangyaung oilfields to the pumping station at Pyinbinhla, 25 miles above Prome. The section is now opened in the northernmost part of the line, which in future will feed Rangoon refineries.

New Publications

Power Gas Producers, Their Design and Application. By Philip W. Robson. Pp. 247, illustrated. 5¾x8¾ in.; cloth, 10s 6d., London, 1908: Edward Arnold.

The Principles of Mechanics for Students of Physics and Engineering. By Henry Crew. Pp. 295, illustrated. 5¼x8¼ in.; cloth. New York, 1908: Longmans, Green & Co.

The Telkwa River and Vicinity, B. C. By W. W. Leach. Geological Survey of Canada. Pp. 23, 1 map. 6½x 9½ in.; paper. Ottawa, 1907: Government Printing Bureau.

Summary Report of the Geological Survey Department of Canada for the Calendar Year 1906. Pp. 206. 6½x9½ in.; paper. Ottawa, 1906: Printed by S. E. Dawson.

Illinois State Geological Survey, Bulletin No. 4. Year-Book for 1906. H. Foster Bain, Director. Pp. 260, illustrated. 5¾x8¾ in.; cloth; Urbana, 1907: University of Illinois.

Binders for Coal Briquets. Investigations made at the Fuel-testing Plant, St. Louis, Mo. By James E. Mills. U. S. Geological Survey, Bull. No. 343. Pp. 56. 5¾x9 in.; paper, Washington, 1908: Government Printing Office.

Annual Report, Geological Survey of Canada, 1904. Vol. XVI. (New Series) Reports A, B, C, CC, G, H and S. Illustrated, including maps in separate cover. 6½x9¾ in.; cloth. Ottawa, 1906: Printed by S. E. Dawson.

Geology and Mineral Resources of the Controller Bay Region, Alaska. By G. C. Martin. U. S. Geological Survey. Bull. No. 335. Pp. 141, illustrated, including maps. 5¾x9 in.; paper. Washington, 1908: Government Printing Office.

Physical Geography of the Evanston-Waukegan Region. By Wallace W. Atwood and James Walter Goldthwait. Illinois State Geological Survey, Bulletin No. 7. Pp. 102, illustrated. 6x9 in.; cloth. Urbana, 1908: University of Illinois.

Uebersicht Ueber die Nutzbaren Lagerstaetten Suedafrikas. By Dr. F. W. Voit, Sonderabdruck aus "Zeitschrift für Praktische Geologie." XVI, Jahrgang, 1908, Heft 4 and 5. Pp. 38, illustrated. 7½x10½ in.; paper. Berlin, 1908: Max Krahmann.

The Ceratopsia. By John B. Hatcher, based on preliminary studies by O. C. Marsh. Edited and completed by Richard S. Lull, U. S. Geological Survey, Monograph XLIX. Pp. 294, illustrated. 9x11¾ in.; cloth. Washington, 1907: Government Printing Office.

The Design of Typical Steel Railway Bridges. An Elementary Course for Engineering Students and Draftsmen. By W. Chase Thomson. Pp. 178, illustrated. 6x9¼ in.; cloth. New York and London, 1908: The Engineering News Publishing Company.

Report on a Portion of Northwestern Ontario Traversed by the National Transcontinental Railway between Lake Nipigon and Sturgeon Lake. By W. H. Collins. Pp. 23, 1 map, ilustrated. 6½x9¾ in.; paper. Ottawa, 1908: Canada Department of Mines, Geological Survey Branch.

The Falls of Niagara. Their Evolution and Varying Relations to the Great Lakes; Characteristics of the Power, and the Effects of its Diversion. By Joseph William Winthrop Spencer. Pp. 490, 2 maps, illustrated. 6½x9¾ in.; paper. Ottawa, 1907: Canada Department of Mines, Geological Survey Branch.

The Fairbanks and Rampart Quadrangles Yukon-Tanana Region, Alaska. By L. M. Prindle, with a Section on the Rampart Placers. By F. L. Hess, and a Paper on the Water Supply of the Fairbanks Region. By C. C. Covert. U. S. Geological Survey, Bull. No. 337. Pp. 102, illustrated, including maps. 5¾x9 in.; paper. Washington, 1908: Government Printing Office.

Mines and Minerals of the British Empire. By Ralph Stokes. Pp. 403; illustrated. 5½x8½; cloth, 15s. London, 1908: Edward Arnold.

The author was formerly mining editor of the *Rand Daily Mail,* of Johannesburg. His book is the account of his travels among the important mining districts of the British Empire, during which he visited nearly all of them. The reader is bound to admire his industry in pursuing his subject. His observation was keen and his description and analysis of what he saw are intelligent. The work that he assigned to himself was well done, and his book is not only interesting to read, but also is a valuable contribution to knowledge.

Record of the Mines of South Australia. Fourth Edition. H. Y. L. Brown, Government Geologist. Pp. 382. 6x9¾ in.; paper. Adelaide, 1908: C. E. Bristow, Government Printer.

Contents: A short account of the chief geological features of the State of South Australia. Early history of South Australian Mining. Copper. Silver-Lead. Gold. Iron. Mineral Phosphates. Brown coal, lignite, etc. Manganese. Miscellaneous. Gems and rare minerals. Metallic minerals, earthy minerals of economic importance, and gems (chief localities). Return of Annual Mineral Production since 1840. Index. Map, showing approximate area occupied by metal-bearing rocks.

The Architect's and Builder's Pocket-Book. By Frank E. Kidder. Pp. 161, illustrated. 4¼x7 in.; leather, $5. New York, 1908: John Wiley & Sons.

This is the fifteenth edition of the well known pocket-book which among architects and builders ranks as Trautwine and Kent do among engineers. The changes in the new edition consist of the correction of typographical errors and the rewriting of the chapters on "Fireproofing of Buildings" and "Reinforced Concrete." This work has been done by Rudolph P. Miller, who was for 10 years connected with the Department of Building, New York City, and for the last five years as its chief engineer. At the time of Mr. Kidder's revision for the 14th edition, he was not satisfied with these chapters, and would have revised them personally if he had lived.

Lehrbuch Der Bergbaukunde Mit Besonderer Beruecksichtigung Des Steinkohlenbergbaus. Erster Band. By F. Heise and F. Herbst. Pp. 604, illustrated. 6¼x9¼ in.; cloth. Price, 11 marks. Berlin, 1908: Julius Springer.

Even to enumerate the contents of this work would require a column of our space. It will be sufficient to say that it is the latest among the monumental books dealing with the art of mining, of which those of Goupilliere, Köhler and LeNeve Foster are illustrious predecessors. Professor Heise is director of the mining school at Bochum, while Mr. Herbst is professor in the well known technical high school at Aachen. Thus they are well equipped for the subject which they have undertaken. This first volume relates chiefly to coal mining; the authors hope that they will be able to publish the second volume before the lapse of two years.

Such criticisms as we might be disposed to make respecting the volume before us are disarmed by the disclaimers of the authors. Their work is distinctly intended for the use of the student in school, rather than for the technical man in practice; and they have limited their discussion of methods to those which are employed in Germany. However, these limitations will not prevent the book from receiving the appreciation to which it is entitled among technologists, to whom it will be valuable as well as to the students, and it is bound to take rank among the classics of engineering literature.

The manner in which the book is published, including typography, printing, binding and its noteworthy engravings, is of an excellence that excites our admiration, and last, but not least, the book is provided with a comprehensive index.

Lake Superior Mining Institute

Special Correspondence

The thirteenth annual session of the Lake Superior Mining Institute, held last week on the Minnesota ranges, was one of the best meetings ever held by that organization. Not only was there a larger and more representative attendance than usual, but the trips taken were of greater interest in that there were more new things to see. Those who attended the Minnesota meeting of the American Institute of Mining Engineers, four years ago, will recollect the admirable program then carried out, and the comfort of the special trains (veritable traveling hotels) then used. The program for this year, and the arrangement of special trains for three days were similar, only possibly more complete than those of four years ago. The party, leaving Duluth on Wednesday night, traveled in two trains. The two Minnesota ranges were traversed from the east end of the Vermilion range, at Ely, to the west end of the Mesabi range operations, at Coleraine; the entire distance from and to Duluth was 450 miles.

Business Meeting

The business meeting of the institute was held at Hibbing, in the new high school which contains a splendid auditorium capable of seating 700 persons. The following officers were elected for the ensuing year: President, M. M. Duncan, of the Cleveland Cliffs Iron Company, Marquette range; vice-presidents, W. J. Richards, of Corrigan, McKinney & Co., Crystal Falls, and Chas. Trezona, general superintendent of Vermilion range mines for the Oliver Iron Mining Company; managers, T. E. Keese, Ishpeming; W. J. Uren, Calumet; L. M. Hardenburg, Hurley; treasurer, E. W. Hopkins, Commonwealth; and secretary, A. J. Yungbluth, Ishpeming; the latter two were re-elected, and the choice was a tribute to the two men who have served long and well in their respective positions. The election of Mr. Duncan foreshadows a meeting next year on the Marquette range. Seventy-two applications for membership were favorably considered, bringing the active membership to 547; the treasury balance showed $4670 on hand. About 240 members participated in the trip, while 40 or 50 more joined the party at points en route.

In the course of his presidential address, delivered at Virginia, Minn., President T. F. Cole referred to the brightening outlook for the metals, especially iron and copper, in which the members of the institute are particularly interested. He spoke of the conservation of natural resources, not alone in the saving of what materials we are using but in the utilization of others that lie about us, referring to the water power of the St. Louis river near Duluth, which when fully utilized, will be equivalent to the consumption of 1,300,000 tons of coal annually. This power the institute had visited the preceding day. He referred to the time when mining companies would be compelled to use steel for mine supports, and said that the Oliver company was even now considering the use of steel in main lateral openings, and is already using it in shafts. He outlined the future of the new Minnesota works of the United States Steel Corporation, stating that there was every reason to expect that this plant would supply all the steel consuming territory lying west of the Great Lakes and north of a line, between Duluth and, say, Denver, insofar as that territory could be supplied by steel from Lake Superior ores. To include all this region, there were needed but a few short railway links to connect nearby points and give the proper rates.

Of the trip on the Vermilion range it is unnecessary to speak, other than to mention the steel shafthouses, four of them about 165 ft. high extending over a distance of little more than a mile. This gives an idea of the importance of the orebodies beneath. These were inspected and also the three Sullivan automatic hoists at the Pioneer, Zenith and Savoy-Sibley power houses. At Vermilion lake the geologically inclined among the party examined some of the most notable exposures of folded jaspers and dioritic intrusions to be seen anywhere, and discussed with some acidity the meaning, origin and necessity of the word "taconite" as adopted by the Minnesota survey for the jaspilite of the Mesabi range.

At the Norman mine, Virginia, the party was interested in the problems arising from the stripping of a caved underground mine, in which the work had been done so long ago that the underground workings were wrecked. The rooms, drifts, winzes and crosscuts had filled solidly with earth and boulders. Steam shovels, operating on supposedly solid ground might, in a moment, disappear from sight in some old working. The cost of taking out the old surface is estimated to be eight or nine times as great as would have been the case if there had been no prior openings. Notwithstanding this, there has been removed from the Norman surface in the last twelve months about 1,000,000 cu.yd. of overburden, averaging 35 ft. thick, and the property is expected to produce in the next three years as near 6,000,000 tons as is possible, on account of the expiration of the lease. The change from underground to open-pit methods was brought to the attention of the members even more sharply on the following day, at the great Monroe-Tener mine, near Hibbing. This property, containing some 45,000,000 tons of ore, was planned as a milling pit, only four years ago, after elaborate and extensive exploration and a very thorough study of the situation, as it then existed. A large area was opened to ore, lying at a depth of 75 to 90 ft. beneath the soil. Three steel shafts were sunk, extensive and elaborate laterals were run into the ore, many mills were raised to surface, a complete underground electric haulage plant was installed, and all was made ready for a product of two million or more tons per year. Aside from the stripping, all this is to be abandoned, the shaft houses removed, the tramming system taken away, and a long surface approach is to be constructed for steam-shovel mining. Even the milling system is too slow, and a mile-long approach is to be cut to enable locomotives to pull trains of ore out of this enormous pit.

At Mountain Iron the chief attraction was the Oliver Iron Mining Company's clubhouse, open to its employees and all citizens, and without doubt the most comfortable, convenient and well arranged clubhouse in any town of its size.

Treatment of Sandy Ores

Saturday was spent at Coleraine, where the Oliver company is opening the Canisteo mines and experimenting with a washery to treat the sandy ores of the west Mesabi range. The announcement was made that the experiment is a success, and that the company was just beginning the construction of a permanent washing plant, on the shore of Trout lake. This plant will consist, at first, of five units, each capable of treating not less than 1000 tons per 10 hours. By the use of a machine called a turbo, the loss has been reduced to 13 per cent. This machine is similar to a screw conveyer, segmented, and running in an open curved trough; through the bottom water is forced, agitating the material as it is carried along the trough. The loss will be further reduced about one-half by the addition of settling tanks, through which the tailings water will pass. Experiments in the small mill erected here show that 40 tons can be treated in about 15 minutes. The ore going into the works is as low as 35 per cent. iron, the washed ore being about 59 to 60 per cent., with better structure; with the present loss this makes a concentration of about two into one, for the lower grade. No details as to cost were given, and perhaps cannot be, on account of the experimental nature of the work so far. The successful outcome of this experiment, however, has added many hundred million tons of ore to the resources of the Mesabi range and the tonnage of the Steel Corporation, and too much credit cannot be given the tenacity of purpose and the bravery of execution that has countenanced an expenditure exceeding $4,000,000 on an experiment, however justifiable. Four million yards have been stripped at Canisteo and Holman and only 30,000 tons of ore have been shipped. Big shipments cannot begin for two years.

The production of asbestos in the United States in 1907, was 950 short tons, valued at $11,000.

St. John del Rey Gold Mining Company

Special Correspondence

The St. John Del Rey Mining Company owns a gold mine in Brazil and in respect to age, it is one of the oldest established mining companies in existence. The annual meeting held this month is the seventy-seventh, so that the formation of the company must have been in the year 1830. During its long career it has twice been reconstructed, and has now an issued capital of £646,265, divided into 546,265 ordinary £1 shares and £100,000 in 10-per cent. preference shares. There are also debenture bonds outstanding amounting to £82,220.

The net profit for the year ended Feb. 29, 1908, was £70,840, which compares favorably with the average profit of the six preceding years, £58,747. According to the sectional plan of the mine attached to the report the lowest workings are at a depth of 4000 ft. below the adit at which depth the lode is reported to compare favorably, both as regards area and quality, with the workings above. Attention is called in the report to labor difficulties. It appears that the company imported a large number of miners from Spain, but failed to get more than a small proportion at the mines. Most of the men found that there was a demand for their services at Rio de Janeiro, and were able somehow or other to evade their agreements.

The 120-stamp mill of the Morro Velho mine was in operation during the year, crushing 151,454 tons (2240 lb.) from which gold to the value of £324,882 was produced. Excluding gold won from low-grade stone, rusty sand, etc., the average recovery was $10.15 per long ton crushed or calculated on the ton of 2000 lb. a return of $9.05 or, say, 9 dwt. fine gold. The working costs at the Morro Velho mine are classified as follows, per long ton crushed:

Mine department	$3.19
Reduction	2.34
Mechanics and general	1.37
Total	$6.90

To this must be added for duties, transport charges, development and London expenses, $1.11, making a total of $8.01 per ton.

On the short ton the costs are in round figures $7.20 per ton. A statement is given showing the details of the capital expenditure for the period March 1, 1901 to Feb. 29, 1908, amounting to £229,839. The bulk of the expenditure has been in connection with the installation of new power plant. The funds have been raised partly by an issue of shares and to the amount of £132,065 by transfers from profits.

Attached to the report of the directors, is a lengthy report by George Chalmers, superintendent at the mines. Full particulars are given of the work done and estimates are made of what may be expected in the future. The ore reserves are estimated to be sufficient to continue the present output on a safe basis for six years, and it is confidently expected that this reserve can be maintained by development below the present bottom of the mine. The average width of the lode at bottom is 10 ft. In discussing the sanitary condition of the mine the superintendent says that dust protectors have been provided but that the men will not use them. In all mines it is difficult to get men to use safety appliances to reduce the dangers of miners' phthisis and Morro Velho is no exception. As regards labor the manager refers to its poor average quality, and expresses the opinion that it would be more economical to employ, if it were possible, first-class miners at the highest rate of wages, rather than poor labor at a lower price. The average gold recovery is given as 91.06 per cent., as against 97.93 in 1907; and considering the refractory character of the ore, which contains sulphides to the extent of 30 to 40 per cent. this extraction is praiseworthy. The manager describes the numerous experiments that have been made from time to time and explains how the success of the present process is largely due to the introduction of the cyanide process and of tube mills for finer grinding. It is of interest to note that tube mills at this mine are of local manufacture. The secondary process used for extracting gold from the slimes is called the oxygen process, and was answerable during the year for 21.68 per cent. of the recovery. Attention is called to the fact that the mine is situated in an isolated part of the country, far from factories or coalfields and that consequently it has to be made as independent as possible. The company enters into a number of trades to supply its wants and has heavy establishment charges. A large output is therefore required, so that these charges may be of moderate amount compared with the total expenditure.

As explained above, a considerable capital expenditure has already been made to equip the mine so as to enable it to maintain a large output. The benefit of this expenditure is now being felt and the good results may lead the directors to still further expand the production by carrying out some railway work, which would connect some of the outlying mines with the central mill at Morro Velho.

The report is drawn up in somewhat an old-fashioned manner, but it is none the worse for that. It strikes one as being thoroughly straightforward, and one in which no attempt is made to conceal from the shareholders any weak spot in the finance or in the condition of the mine. Facts and figures are intelligently put forward, and it is not necessary to be an accountant or a professional mining man to understand the past results and the future prospects of this admirably managed company. Perhaps it is because the directors are aware that their report, as a report, is above the average that they mark it "price one shilling." It is worth it anyhow.

An English Gold Mine

Special Correspondence

About a year ago a mysterious syndicate, called the Chastan Syndicate, was formed which claimed to have discovered a new goldfield in England. The formation, it was said, was similar to that of the Rand, and the property had, therefore, immense possibilities. No information could be obtained for a long time as to its situation. This had to be kept dark until all the available ground had been legally secured. This story seems to have satisfied some people. At all events shares were bought and sold at high prices, to the advantage of the vendors and at the expense of the credulous public. A case in the courts last week throws some light on this business. The syndicate brought an action against a gentleman whose name had been put on the share register without any authority by his cousin, one H. A. Trower, described as a financier, who had been connected with the Whitaker Wright companies of evil reputation. The claim was for calls unpaid and the syndicate took its case. The property is situated in the Forest of Dean, Gloucestershire, and the mine appears to consist of some beds of old red sandstone, which are said to be auriferous, but not in paying quantities. It came out on the trial that one of the promoters, a Mr. Kennedy, who was vendor, managing director and solicitor to the company, has netted £6000, while a statement that H. A. Trower, who did not appear, had made £26,000 out of the business, was left unchallenged. In cross-examination Mr. Kennedy announced that some of the shareholders were bringing an action against him for the return of £11,000 paid for shares, and it is to be hoped that this gentleman and the other promoters will be made to disgorge. It is only fair to say that the defendant in the action just tried withdrew the allegations of fraud and misrepresentation that had been made against the plaintiffs in the pleadings. There appears to be a conglomerate formation and there appears to be gold in it. But it does not appear to be payable, and the promoters do not appear to have done their duty in calling in competent professional men to report on the merits of the undertaking before offering shares for sale.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Forbes Julian, of London, is on his way to Mexico on professional business.

Bernard MacDonald, who has been in New York for the last three weeks, has returned to Guanajuato, Mexico.

C. F. Moore, of Salt Lake City, is back in Mexico City after an extended trip into the southern part of Mexico.

Wong Kokshan has been appointed manager of the Ping-han-yeh Coal and Iron Company, of Hankow, China.

E. N. Atkins, of the firm of DeGolia & Atkins, San Francisco, is examining mining property in Tuolumne county, California.

A. H. Bromly has been appointed manager of the Pacific Copper Company, with headquarters at Sihuatanejo, Guerrero, Mexico.

John D. Ryan, managing director of the Amalgamated Copper Company, is in the Lake Superior copper country for a short visit.

Clive B. Newcomb arrived in the City of Mexico, July 8. He will be associated with George M. White as metallurgist and mill builder.

Donald B. Gillies, of Tonopah, Nevada, is in Mexico with a number of the stockholders of the San Toy Mining Company, of Chihuahua, Mexico.

W. Murdock Wiley on July 1 resigned his position as president and director of the San Gregorio Mining and Railway Company, of Guanajuato, Mexico.

George E. Ross, recently with the Acadia Coal Company, has been appointed manager of the Lake Copper Company, at Copper Lake, Antigonish, Nova Scotia.

R. B. McGinnis has returned to San Francisco from an examination of the Promontorio mine, in Cusihuiriachic, Chihuahua, Mexico, for California people.

Prof. C. E. Rowe, head of the School of Mines, University of Texas, is spending the summer in Colorado and will make Denver his headquarters during that time.

Bainbridge, Seymour & Co., mining engineers, formerly of 1 St. Helen's Place, London, England, have moved into their new offices at 352-5 Salisbury House, London Wall.

Austin H. Brown, for some years past general manager of the Trinity Copper Company, has severed his connection with that company. His address is at Redding, California.

H. F. Lefevre, of New York, has been in Nevada and Mexico on professional business, and is now on his way to Central America, where he expects to remain about a month.

T. H. Oxnam has returned to Los Angeles from an examination of the Santa Barbara mine of the Rio de Plata Mining Company, near Guazapares, Chihuahua, Mexico.

J. P. Hutchins, consulting mining engineer, of New York, has gone to British Columbia on professional business, which is likely to occupy him for a considerable portion of the summer.

Roy N. Bishop, manager of the Balaklala Consolidated and the First National Copper companies, is now also manager of the Trinity Copper Company, with office at Coram, Shasta county, California.

Wm. Howard has resigned his position as superintendent of the cyanide mill of the Esperanzas Mining Company, El Oro, Mexico, to take a similar position with the Amparo Mining Company, near Etzatlan, Jalisco, Mexico.

Captain Charles Trezona has been appointed general manager of all the Oliver Iron Mining Company's mines on the Vermilion range in Minnesota. He has been in active charge of the mines for some time.

Randolph Bolling, recently consulting metallurgist of the Nova Scotia Steel and Coal Company, Ltd., at Sydney Mines, N. S., severed his connection with that company last March. He is now engaged in professional work in Virginia.

Dr. W. C. Heraeus has been awarded the John Scott legacy premium and medal of the Franklin Institute of Philadelphia, for his improvements on the Heraeus-Le Chatelier pyrometer, and for the accuracy and interchangeability of the thermocouple which he has devised, known as the Heraeus element.

Obituary

Charles Vincent Potter died June 1, at Balwyn, near Melbourne, Victoria, Australia. He was the inventor of a number of mechanical and metallurgical devices, the best known being the Potter flotation process for the treatment of sulphide ores, which is now in use at Broken Hill, New South Wales.

Joshua Walter Rhodes, who died at Detroit, Mich., June 30, was born in Pittsburg in 1872, and was brought up in the iron trade, in which his father is still prominent. He was interested in several iron companies, and organized the Cherry Valley Iron Company at Leetonia, Ohio. This was merged in the United Iron and Steel Company in 1905, Mr. Rhodes being active in the management of the new company.

Societies and Technical Schools

University of Nevada—The new catalog of this institution at Carson City, Nev., shows full courses in mining and metallurgy. The mining department is housed in the new Mackay building, recently described, and has 61 students.

University of Utah—The [illegible] catalog of this institution at Salt Lake City reports 190 students in the School of Mines. A new building 104x62 ft. has recently been added, and is well supplied with milling and smelting machinery, and an assay room with all necessary appliances.

Bituminous Mine Foremen and Fire-bosses' Association—This association has been formed with headquarters at Barnesboro, Penn. John Hayes, Carroltown, Penn., is secretary. At the request of the Chief of the Bureau of Mines of Pennsylvania, the association sent a delegate to the conference held at Pittsburg, July 7-9, on the proposed new mine law for the State.

Colorado School of Mines—On the basis of gifts from Thomas F. Walsh and others, the trustees have established a separate fund, to be called the Vinson-Walsh fund, to be used to maintain a bureau of original research. The first work of this bureau will be to investigate the occurrence of rare minerals and metals in Colorado, their uses and possibilities. This bureau will be under charge of Dr. Herman Fleck, professor of chemistry, with Sidney W. French as special assistant.

Western University of Pennsylvania—The 1908 catalog of the School of Mines of this university at Pittsburg shows a number of courses, permitting a wide range of subjects to be chosen by candidates for the degree of mining engineer and metallurgical engineer. In addition to the regular courses, special or partial courses are provided, especially intended for men who have had practical experience in mining, and desire to fit themselves for positions as foremen, superintendents, etc. The school has been thoroughly reorganized and its teaching facilities much enlarged.

University of Arkansas—The Department of Geology and Mining of this university, at Fayetteville, Ark., will offer next fall a four-years' course for the degree of "bachelor of science in cement engineering." Besides the general engineering, geology, etc., special work extending over two years will be given in the geology, occurrence, examination and testing of cement materials and in designing and operation of cement plants. Besides [illegible] in the Kansas gas district the university is especially well situated for this work, since in the immediate vicinity of Fayetteville are several well exposed outcrops of limestone and shale, suitable for making portland cement. At least two months' actual work at a cement plant will also be required before the degree is granted.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 2—The Standard mine, near Cima, San Bernardino county, idle for the past year owing to litigation, is being reopened. The ore carries both gold and copper. The deepest shaft on the property is 256 ft., and some 4000 ft. of crosscuts and drifts have been cut.

The Tecopa silver-lead mines at Tecopa in Inyo county, on the border of San Bernardino county, will be shortly started up again under superintendence of J. H. Lester, the former manager. The mine last year shipped all its ore to Salt Lake smelters, this ore carrying both lead and silver. The mines ceased shipping a few months ago while a concentrator is being erected. The two mines operated are the Gunsight and Noonday, which are about a mile apart. Extensive development work is about to be undertaken and some 50 men will be set at work. Mines were worked in this section in the early seventies and some high-grade ore hauled out by team. When the Tonopah & Tidewater railroad was built within a few miles of the properties much lower-grade ore could be shipped at good profit. The ore is of a desirable fluxing character and in demand at the smelters. Leasers on the Alexandria claim of the company have recently shipped considerable high-grade ore. The properties are 35 miles south of Greenwater. W. A. Starr is president of the company.

There have been several oil excitements in the desert region of San Bernardino county, but nothing has come of them thus far. Now, however, some hundreds of prospectors are rushing to a tract five miles south of Daggett, where traces of oil have been found. Some thousands of acres of land have already been located, and boring will begin at once. The discovery of oil was made in a well sunk for water.

The mining engineers who have been experting the numerous properties of the Champion Mining Company at Nevada City, have completed their examinations and will forward their report to H. G. Torrence in London. These are the most important quartz mines in Nevada City and comprise some 30 or more claims at that place and others in other parts of the county. After long litigation, and resultant idleness, the Champion won its suit and last year again became productive. The owners, however, have not sufficient funds to carry on necessary explorations on so extensive a property and have accordingly bonded it. The recent examinations were made in the interest of English capitalists holding the bond.

Nevada county is about to advertise its mineral resources in San Francisco, by installing a permanent display of gold quartz, nuggets, etc., in the Mining Bureau quarters in the Ferry building. Cabinet specimens are now being collected for this purpose and it is expected that some $20,000 worth will shortly be on display. As many mines as possible will be represented. Nevada was the banner gold county of California for many years continuously although now the dredges in Butte county show the largest output of gold.

The Pennsylvania Dredging Company, at Oroville, which has been enjoined from working by the efforts of Sutter county, did not have its dredge working in the Feather river at all. The pit in which the dredge floats is separated from the river by a rim of some 20 or 25 ft. in width, and 3 ft. above the level of the river. Nevertheless the Anti-Débris people assert that a large quantity of the tailings escape daily into the Feather river. The matter will be brought out clearly in the coming trial. It is noteworthy, however, that the dredge is not working, nor has it been, in the river bed proper.

"Paddy" Campbell's once famous Blue Point hydraulic mine, near Smartsville, Yuba county, is being put in shape to be again productive, but this time, the gravel will be worked in water-power arrastras and not by hydraulic process. The new company has paid all delinquent taxes, cleared off a $45,000 mortgage, and is now making headway in clearing away brush and trees along the old water ditch, which has been idle for years. The ditch in former years supplied a great many farms with water, winding about in a devious course, until it reached the gravel diggings. It was a big revenue getter, but since Campbell ceased mining operations it has been altogether neglected. Its entire length of 38 miles has been overgrown, but the men clearing it out have only about 10 miles yet to go before their part of the work will be finished. The company intends to enlarge the ditch to 6 ft. at the bottom, 12 at the top and 4 ft. deep, carrying a larger volume of water than ever. The work of completing this task will be slow and costly; and in places attended with much difficulty.

The Tightner mine at Alleghany, Sierra county, continues to yield very largely. The last clean-up was $102,000, taken out in one week by four men. A sale of this mine recently fell through because the expert reported it to be "pockety." H. L. Johnson has since taken out as much as he offered to sell for and the phenomenally rich ore still continues. Numbers of miners have started prospecting and reopening old claims in the Alleghany section, attracted by this rich find in the Tightner.

The Hidden Treasure drift mine on the Forest Hill divide in Placer county, is the most extensive mine of its character in California, and the most completely developed and equipped. It has been worked for many years and is now in charge of Harold M. Power, son of Harold T. Power. This same channel has been in charge of the grandfather, son and grandson successively, three generations of the same family having taken their turn at managing the working of the property.

The trouble between the Lawley heirs over the ownership of certain properties resulted last week in the sale at public auction of the Cloverdale quicksilver mine, in Sonoma county, by the referee of the court. It was bought by Mrs. Mary Patten, one of the heirs, for $15,000. The mine has been worked by Lawley Brothers for a number of years in a small way, the production being a few hundred flasks of quicksilver yearly.

At the annual meeting of the Steifer Mining Company, which is working a gravel channel on the Magalia ridge in Butte county, some dissatisfied stockholders criticized the management for failure to bring forward promised returns on the investment. Nevertheless Steifer Brothers, who own the controlling interest in the property, were again elected officers and directors, the majority of the stockholders being satisfied with the reports of progress. P. B. Steifer is president and M. Y. Steifer secretary of the company. A great deal of development work has been done on the property within the past years, but there have been no profits as yet.

As soon as the testimony taken at Quincy, Plumas county, can be transcribed, the mineral land case of the Government against E. V. Darby, N. F. Golden and others will be placed in the hands of the Susanville officials for decision, after which it will be taken to Washington to be passed upon by the Commissioner of the General Land Office and perhaps the Secretary of the Interior. About 960 acres are involved, the Government's witnesses contending that the land is more valuable for its timber than mineral, and the defense arguing to the contrary. The Government, probably because of the taking up of land by corporations, is becoming more strict in its inquiries, and, as this case shows, demands definite information, development work on mining claims and a definite estimate as to mineral values.

Greenwater, the copper camp of Inyo county, which two years ago attracted so much attention, is again to the front, after being dead for many months. It is now reported that the shaft sunk by the Charles M. Schwab interests on the Copper Queen No. 2, about half a mile southwest of the town of Greenwater, struck an orebody between the 960- and 1000-ft. levels, and that assays of this ore show it to average high in copper, with a fair showing of gold. The strike, it is said, was made about June 1, but was kept as quiet as possible until the Schwab interests could secure control of contiguous territory. Meantime there is again a rush of prospectors and others into the camp, incited by this reported discovery.

An important sale for the gold camp of Randsburg, Kern county, is that of A. C. White's Sydney mine to Eastern men, represented by E. V. Williams of Los Angeles. The price is reported at $75,000. The mine has been more or less productive for the past 10 years. The new owners of the property will arrange for extensive development, and one of the methods the syndicate is said to be considering is the tunneling of the mountain from the Garlock side, which will greatly facilitate the removal of ore.

Goldfield, Nevada

July 1—A. D. Parker, vice president of the Florence-Goldfield Mining Company, arrived this week and thoroughly inspected the properties. He absolutely denies any sale or intended sale of the Florence to the Consolidated, although it is tacitly admitted that the apex trouble between the Jumbo Extension and the Consolidated, the former a Parker-Lockhart property, will be amicably adjusted. The third quarterly dividend of 10c., amounting to $105,000, was posted, payable July 15. President Lockhart has been adjudged in contempt of court for refusing to pay into the custody of the court the $117,935, which is ordered impounded upon the prayer of the Little Florence lease.

The controversy between the Consolidated and D. Mackenzie, who controlled the Frances-Mohawk Leasing Company, passed through another stage this week, but is still in the hands of the court. After the lease had expired a big cave-in occurred. The Consolidated accused the leasers of bad mining, and brought suit, placing an attachment on $125,000, which was to the company's credit in the bank. The end is not yet.

J. R. Egan has brought suit against the Frances-Mohawk company and the Keane Wonder Mining Company for the recovery of 160,000 shares of stock of the latter company. He alleges in his complaint that the Frances-Mohawk company took up, without his knowledge or consent, the last four notes issued by the Keane Wonder company and held by the State bank, and also the block of stock mentioned which he allowed to be used as security, together with over 800,000 shares advanced by Homer Wilson merely as an accommodation. This is another interesting echo of the looting of the State bank of its valuable assets by favored customers after the officials had taken the cream.

Henry Weber has been found guilty of embezzlement by the jury and sentenced to seven years in the penitentiary. Weber was one of the many young men who in the boom days here made money so fast that they overlooked the fundamentals. The community at large sympathizes with Weber, but deprecates the immense harm done to Goldfield and Nevada by these wild-catting affairs. Weber was allowed bail pending his appeal, on account of his poor health.

Three companies paid five dividends here in June, amounting to $235,000. This does not include $32,000 from the Round Mountain Mining Company, which is owned here whence the dividend was paid.

The Loftus-Davis Leasing Company has been reorganized under the name of the Loftus-Davis Federated Mines Company, and the capitalization increased from 50,000 to 250,000 shares. No stock was offered to the public and all subscriptions were at par.

Combination Fraction has about the only live stock on the local market this week, and that, due to the activity of this stock in San Francisco, where George Wingfield is said to have been buying all the shares offered. Rumor has it that A. D. Myer, who with Tom Murphy, owns the control, has sold out his entire interest to the Consolidated, and that Wingfield's buying is for the same account. The facts are not yet obtainable.

Salt Lake City

July 2—The property of the St. Joe Mining Company in Bingham has been sold under an execution for $25,000. It was bid in by some of the leading stockholders.

The United States lead smelter at Bingham Junction will resume operation not later than Aug. 1. The company has begun receiving custom ore and has ordered production started again from the Richmond-Eureka mine at Eureka, Nevada, which has been idle for about six months. One converter at the smelter is now in commission, cleaning up a lot of matte and silicious ores which were not used up when the plant was shut down last February.

The quarterly report of Coal Mine Inspector J. E. Petit has been submitted to Governor John C. Cutler and covers the second quarter of the year. General conditions of the mines are reported good and with a single exception found them to be free from firedamp. Some carelessness with explosives at the Pleasant Valley mine of the Union Pacific Coal Company, and in the property of the Independent Coal Company, at Kenilworth were reported, but mine officials promptly corrected the fault on being notified.

A deed has been filed conveying all the property of the South Columbus Mining Company, to the South Columbus Consolidated Mining Company, the successor of the former.

Judge Marshall, of the Federal court, has granted the application of the Silver King Consolidated Mining Company, for an order of court permitting its surveyors to enter the Silver King Coalition mine at Park City for the purpose of surveying certain workings alleged to have been extended into the property of the former. The court also granted the Silver King Consolidated officials the right to tear out any bulkheads or other obstructions should any be found to interfere with the work of the surveyors. In event of any caves being found, the court instructs that prompt notice thereof be made known, when such relief as necessary will be forthcoming. The Silver King Coalition Company is defendant in suits involving the unlawful extraction of ore. A similar order was made on the same date permitting engineers in the employ of N. Treweek and others, owners of adjoining property, to enter certain levels of the Coalition mine for a like purpose. The suit pending involves between $3,000,000 and $5,000,000, the value of ore alleged to have been unlawfully taken.

The Taylor & Brunton Sampling Company, has concluded to erect a sampling mill in the Tintic mining district not far from the new Tintic smelter. It will have capacity for 600 tons of ore per day. Work on the plant is to begin right away.

The Ohio-Kentucky Mining Company, with headquarters in Salt Lake, but operating at Pioche, Nev., has purchased the property of the Nevada-Pioche Mining Company, where the main works will be placed.

A special meeting of shareholders of the American Flag Mining Company, has been called for July 11, when the matter of issuing $150,000 in bonds will receive consideration. It is proposed to raise funds in this manner sufficient to provide milling facilities. This company operates at Park City

Butte

[illegible] operations yesterday after a shut-down of several weeks. The line of the Great Northern Railway, connecting Butte and

Great Falls will be ready for traffic in a few days. The annual meeting of the stockholders of the East Butte company has been again postponed on account of the absence of some of the directors, and July 8 fixed as the date for the meeting. Work on the new 300-ton concentrator of the Pittsburg & Montana company is being pushed rapidly. The Mountain View mine of the Boston & Montana company is closed, awaiting the repairing of the smelter at Great Falls; the Pennsylvania mine of the same company is also shut down while the shaft is being re-timbered. At the annual meeting of stockholders of the Tuolumne Mining Company, recently held in Butte, directors were elected in place of F. A. Heinze, resigned, and D. J. Hennessey, deceased.

Denver

July 3—In the Cripple Creek district, the output for June is given at 64,150 tons, with a gross value of $1,302,530. The deep drainage tunnel has now been driven 2700 ft., the intermediate shaft being down 460 ft., and is expected to reach the level of the tunnel by September.

In the suits of the Portland Gold Mining Company, against Stratton's Independence, Ltd., to recover $400,000 and damages for value of ore alleged to have been extracted by the latter's lessees from the ground of the former, a decision has been rendered in the Court of Appeals, denying a motion for a re-hearing of the case, which was decided in favor of Stratton's Independence by the United States Court, and afterward sustained on appeal to the higher court. It is said that the case will be taken to the Supreme Court of the United States.

The annual stockholders' meeting of the Elkton Consolidated Mining and Milling Company, will be held at Colorado Springs July 13.

In the Silverton district, the old North Star, on Sultan mountain, is credited with an important strike of 4 ft. of $80 ore, of which $60 is gold. At the close of 1882, this mine had produced, according to the director of the mint, 100,000 oz. silver, and 1,500,000 lb. lead, the average of the ore being about 0.5 oz. gold, 40 oz. silver to the ton and 50 per cent. lead. It is a fissure vein in monzonite, the character of the ore being galena and gray copper. The new shoot is said to have a length of 145 ft. and a known depth of 800 feet.

In the Yampa coalfield, Routt county, the Perry mine, on Oak creek, has now a slope on the seam 600 ft. in length, and the mine is being opened up and equipped with up-to-date machinery for the purpose of supplying the locomotives of the Denver, Northwestern & Pacific railway with coal. The grade of this railroad is completed to the foot of the dump, and rails will be laid and trains operated probably in November. The seam shows 10 ft. of bright, dense coal in all the openings, and 65 tons per day are being taken out in doing deadwork alone. This is the first mine being systematically opened in this new coalfield.

Peoria, Illinois

The recent act requiring coal miners in Illinois to obtain certificates of competency having been referred to the legal department of the State for an opinion on certain of its provisions, Attorney-General Stead holds that the miners' qualification act applies only to men actually engaged in cutting and digging coal, and has no reference to others employed at the mines. He also holds that managers and examiners who hold certificates from the respective boards must, if they dig or cut coal in addition to their duties, obtain certificates of competency. Miners engaged in their work July 1, and for two years prior to that date, are entitled to certificates upon proof of such service without answering the 12 questions required by the law. Everyone to whom a certificate is granted must pay a fee of $1 to the examining board.

In view of the impossibility of examining all miners and issuing certificates before the law took effect on July 1, it is understood that no prosecutions for violation of the law by working without a certificate, or by employing unlicensed miners, will be begun until a reasonable time has elapsed.

Toronto

July 6—Extensive bush fires near Cobalt have done considerable damage to some of the outlying mining properties. The district affected was the southeastern portion of Coleman township. On June 28 the fire destroyed the buildings and machinery of the Columbus, Coleman Development, Cochrane, Lumsden, Shamrock and Fisher-Eplett companies and many other properties narrowly escaped. The smoke was dense rendering it difficult to fight the flames, but the miners worked heroically and saved many buildings. The Temiskaming lost its powder house. The fires did not reach Cobalt and none of the large shipping mines were touched. The fire finally burned itself out and heavy rains, which fell on July 1 helped to subdue it.

London

June 27—An attempt is being made to raise capital in order to restart one of the old tin mines of the St. Just district, Cornwall. The new company that it is proposed to form is to be called the Boscaswell United Tin and Copper Mines, Ltd., with a capital of £200,000, half of which is in ordinary shares and half in deferred shares. A lengthy prospectus, describing the past history of the mines and the future possibilities according to J. H. Collins and others, has been somewhat lavishly advertised. And to make the venture the more attractive, a plan of the locality, fairly bristling with lodes, has been issued, as well as a section containing the most precise information as to the ore reserves. Stopes worked out, stopes containing pillars of ore and payable deads, ore developed on one side and on three sides and ore not developed at all are shown to the future shareholder. Considering that the greater part of the old workings must be inaccessible, the valuation of a mine on these lines is ridiculous, and is not creditable to the professional men concerned. The mines may be worth reopening, granted that sufficient capital is provided, but there must necessarily be much uncertainty as to the value of the ore and as to the capital required in a mine of this class. The condition of the old levels and shafts must be more or less a doubtful quantity, and past records as regards tonnages and values of old Cornish mines are notoriously of a vague character. Valuations and estimates such as occur in this prospectus are to be deprecated. They certainly must fail to inspire business men with confidence, especially if they take professional advice before making an investment in mining property.

There are other features in this prospectus which call for unfavorable comment. It is stated that the vendors are taking the whole of their purchase consideration in deferred ordinary shares, which do not rank for dividends until 7 per cent. has been paid on the ordinary shares. Yet among the contracts it appears that the Cornish Finance Syndicate, Ltd., which is the immediate vendor and promoter of this company, is to receive £10,000 in preferred ordinary shares or cash from the new company as consideration for paying all preliminary expenses. As noted above, the amount spent on advertising has been heavy, but if the expenses come to less than £10,000, the promoters will not be paid entirely in deferred shares, and that statement does not appear to be quite straightforward.

Another point to be noticed is that the articles of association allow the directors to proceed to allotment, if 10 per cent. of the shares offered are subscribed for. The directors, however, say that they will not proceed to allotment unless at least 15,000 of the shares are applied for. Mr. Collins has estimated that £75,000 will be sufficient to equip the combined properties on a large scale, so that to go ahead with only £15,000 seems to be courting disaster. It is, however, stated that Mr. James, the company's general superintendent, considers that £12,500 will make a portion of the property payable; and it looks as if the directors intend to go ahead if only £15,000 is subscribed. The vendors in that event will, it is to be hoped, take their consideration of £10,000 for preliminary expenses in the form of shares; otherwise the working capital will be trivial.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

BIBB COUNTY

Woodward Iron Company—This company has begun work on a new brown iron-ore mine at Woodstock, where the company's ore fields are. Two miles of new track are being constructed from the Alabama Great Southern railroad to the proposed slope and the necessary machinery, which has been purchased, will be installed in due course.

Alaska

KETCHIKAN DISTRICT

It Copper Mine—Work has been begun on a tramway 5200 ft. long from this mine to Kasaan bay. For 1200 ft. from the mine the tramway will be worked by gravity; the remaining 4000 ft. being nearly level. At the bay a wharf 1200 ft. long is being built out to deep water, permitting the direct transfer of ore from cars to vessels.

Jessie—Work on this gold mine at Dolomi is advancing well. The shaft is now down 80 ft. and is in ore. Drifting will be started at the 100-ft. level.

Arizona

YUMA COUNTY

Cobralla—One of the richest mineral sections of Arizona has been opened up by the building of the Arizona & California railroad. At present the road extends to Parker at which point a steel bridge is being constructed. Among the most productive properties of that section of the territory is the Cobralla property which was discovered about 18 months ago and has rapidly gained prominence. Development during the past year has exposed bodies of sulphide ores in a lime and porphyry formation similar to that at Bisbee, Clifton, Morenci and Globe with the exception that the Cobralla ores run high in gold and silver as well as copper.

California

AMADOR COUNTY

Bay State—Men are repairing the recently burned hoist at this mine near Plymouth, preparatory to reopening the property.

Little Illinois—The company holding under bond the Little Illinois mine at Drytown is preparing to reopen it.

BUTTE COUNTY

Blue Lead—In this property at Bangor the 1000-ft. tunnel has been completed, and paying gravel reached.

Butte Creek Consolidated Dredging Company—The timbers for the new dredge of this company have arrived on the ground and construction will now begin.

Cape Horn—All the machinery is now in place at this mine, including the gravel mill, and work on the mine is to be done on a large scale.

CALAVERAS COUNTY

Dredge—T. C. Huxley, of Oakland, has bought the Green Mountain placer mine, the Eastern Extension, the Green Mountain Extension, and the Chile Gulch Fluming Company's mine, near Chile Gulch, and will organize a company to dredge the ground.

Stockton Ridge Consolidated—This company, operating the Hexter tunnel gravel mine near Mokelumne Hill, Stephen Hughes, superintendent, now has its tunnel in 1725 ft. and small seams of cemented gravel are being found.

Utica Mining Company—In this mine at Angels a rich pocket containing a few thousand dollars was found recently, which was exaggerated in the newspapers up to several hundred thousands.

EL DORADO COUNTY

Prevolcanic Channel Gold Mining Company—This company, near Pacific House, is running drifts to ascertain the extent of the cemented gravel, and will put up a mill to crush it.

INYO COUNTY

Empire—At these silver claims, J. B. Ellis, superintendent, near the junction of Black and Marble cañons, some shipping ore is being taken out, and development is being advanced.

KERN COUNTY

Cottonwood Mines—[illegible] working [illegible] abandoned and filled-in prospect hole in Cottonwood creek, on the south side of the Piute, have struck rich ribbon rock. Along the same creek W. E. Congdon is having a number of holes sunk with a well-drilling apparatus to determine the value of the sands.

MARIPOSA COUNTY

No. 5—Doctor O'Brien and associates recently purchased this mine near Hornitos, and development having proven its richness, they are now about to erect a mill. The mine has been idle many years.

NEVADA COUNTY

[illegible]—At the property, Washington district, three shifts of miners are at work in the new tunnel, and as soon as the vein is intersected a mill and other surface improvements will be built. C. L. Stokes is manager.

Erie—At this mine, near Graniteville, Geo. Mainhart and associates are doing preparatory work in the reopening operations.

Inkmarque—The four miners who have leased this Grass Valley mine for two years from Louis Rosenthal have unwatered it and commenced active mining.

PLUMAS COUNTY

Del Monte—J. D. Murray, who has a bond on this group of mines on the North fork, has uncovered a good ledge, which is being developed.

Gruss—L. R. Gruss has purchased a new hoist for this mine, the Genesee. The 15-stamp mill will shortly be running.

Seneca—The production of gold from this mine (formerly the White Lily) at Seneca, is attracting many miners to that locality.

SAN BERNARDINO COUNTY

[illegible]—At the property of this company, near Bagdad, a rich strike has been made. The corporation is a close one with John Denair, of Los Angeles, superintendent.

Oro Belle Mines Company—This company, formed of Duluth, Minn., capitalists, has made final payment to Hart & Hilt for the Oro Belle and Oro Belle Fraction mines at Hart, and active operations have been inaugurated.

SAN DIEGO COUNTY

[illegible] has been appointed superintendent of this property at Dulzura, and extensive preparatory operations have commenced.

[illegible] are being made than formerly.

SHASTA COUNTY

E. P. Connor Group—Connor & Cor[illegible] this group of eight claims at Harrison gulch (Knob P. O.).

Victor Gold—At this property, Harrison gulch, they are building a gallows frame for the new hoisting plant.

SIERRA COUNTY

Forest City—This company, operating the Mabel Mertz mine, near Forest City, expects to reach gravel in the main tunnel this month.

Grizzly Consolidated—P. F. Roddy and associates have leased this mine near Poker Flat.

Poker Flat—A shaft is being sunk through the lava to strike the gravel in this mine at Poker Flat. M. Duval is superintendent.

SISKIYOU COUNTY

Blue Ledge—This copper property, near the Oregon boundary line, has been closed down until financial affairs are in better condition. Large sums have been spent on the property, but both a smelter and railroad are needed to put it on a paying basis.

TUOLUMNE COUNTY

Dreisam—The recent strike in this old mine continues to yield well. W. W. Parlin has become a part owner in the property.

Fair Oaks—A new hoist is being installed at this mine near Columbia. C. F. Layman is superintendent.

Colorado

BOULDER COUNTY

Ida Mining and Milling Company—This company has been organized with $25,000 capital and Denver people are interested. One of the directors has invented a new machine which is being used for working the dump of the famous Caribou mine near Cardinal.

Monarch—Messrs. Waltemeyer and Wolcott, of this company, operating the Wano mill at Jamestown, Colo., have gone to Omaha, Neb., to consult with their associates as to increasing the capacity of the mill and additional facilities for larger operations at the mine. The monthly returns from their mill are about $10,000, the ores averaging about $10 per ton.

CLEAR CREEK COUNTY

Colorado Central—Ruby silver has been opened up in the Ocean Wave level, which is being worked under lease by F. A. Maxwell, of Georgetown.

Mint—This mine, on McClelland mountain, is to have a plant of machinery operated by electric power, for the purpose of driving the big crosscut. J. U. Harris, Georgetown, Colo., is manager.

Princess of India—A lease and bond for one year in the sum of $30,000 has been given to New York people, and a heavy compressor plant is to be installed in their tunnel on Columbia mountain. J. J. White, Georgetown, Colo., is manager.

LAKE COUNTY—LEADVILLE

Carbonate Hill—The Morning and Evening Stars are working steadily and shipping in the neighborhood of 350 tons daily of an excellent grade of iron. The Little Nell, on the crest of the hill, is shipping steadily a good grade of iron and some sulphides. On the lower part of the hill the Starr people continue to ship from the recent strike and the values hold up to the standard. From the Jolly shaft shipments are steady and the lessees are driving into new territory.

Champion—M. M. Bohen and associates, of Leadville, are working this property, on Battle mountain, and for the last few weeks have been developing a body of sulphide ore. A few days ago a streak, 2 in. wide came in about the middle of the sulphide and this was sacked and 100 lb. of it taken to an assayer at Leadville and it netted in the neighborhood of $30 per pound. The streak is simply a pocket and Mr. Bohen expects to have it worked out in a few days. The sulphide body is of a good grade and shipments are being sent out regularly.

Dinero Tunnel—On this adit, Sugar Loaf district, 240 ft. were driven during the month of June leaving only 360 ft. to be driven before the Dinero veins are cut. At present the tunnel is being driven through black flint.

Down Town Section—The lessees on the Penrose, Midas and Coronado are shipping regularly from the upper levels of the different properties, and at the same time are doing considerable prospecting in new territory. The present month will see the ore tonnage greatly increased as orebodies have been opened. The ore that will be shipped will be principally iron of a good grade. Prospect work is being carried on at the Hibschle shaft, East Seventh street.

Helena—At this mine, Iowa gulch, the ore that was caught at the 500-ft. level shows every sign of being in place and as work proceeds the vein widens; the grade is medium and shipments will be started soon.

Sunday Tunnel—The work of cleaning up and re-timbering is nearly completed, and when the electric plant is installed the work of driving ahead will be started. A station will be cut well in toward the breast and at this point the electric plant will be installed.

MINERAL COUNTY

Rio Grande—This group on Campbell mountain, near Creede, has been leased to a syndicate composed of Creede and Denver people. Work is to begin at once on a large scale.

SAN MIGUEL COUNTY

La Sal—James H. Hill, of New York, has taken a lease and bond on this copper mine at Cashin. The bond is to run one year. It is said that the Denver & Rio Grande railroad will build a branch down the Paradox valley to reach this and other mines in the district.

TELLER COUNTY—CRIPPLE CREEK

During June an advance of 187 ft. was made in the drainage tunnel. The total length on June 30 was 2670 ft. The rock encountered during the month was extremely hard. The intermediate shaft was lowered 98 ft. in June and was 453 ft. deep at the end of the month.

Mary McKinney—The directors have declared a one-cent dividend on the issued capital, making a disbursement of $13,085, payable July 25. This will bring the total dividends paid to $814,150. The directors ceased the payment of dividends in April, 1907, but since then the treasury accumulation warrants the payment of the above amount, besides leaving enough to carry on development work and to pay the company's subscription to the deep drainage tunnel. Another announcement is that the company has leased the main workings of the property down to 700 ft., comprising about 35 acres, to the Western Investment Company. The lease, which runs for two years, provides that the main shaft be sunk to water level.

Ophir—A depth of 200 ft. has been attained in the new vertical shaft on this mine on Raven hill, and a crosscut has been started to the main Ophir vein. At the same time, operations are being carried on from the old incline shaft and a good grade of ore is mined therefrom. The Ophir is owned by the J. J. Cone estate.

Idaho

IDAHO COUNTY

Idaho Mascot—This is a group of three claims near Elk City and adjoining the Del Rio group, which has been recently located by John and Ed. Massam, of Spokane, as quartz-gold mining claims. There is a vein of rich ore 600 ft. from the Del Rio vein which has made a good showing under a small amount of development. The owners have been quietly working to locate the lead for about a year, having found much float near the foot of the hill. An adit is now being run to the lead, but it will take 400 ft. of work to reach it.

Espy—There is now being installed a new five-stamp mill in addition to the three-stamp mill that has been in use for over a year. The mine was bought last fall by eastern capitalists who have put a local man in charge with instructions to open the mine on a large scale. Two adits have shown good results, and now a third is to be run.

Crackerjack—This mine on June 21 came into the possession of M. J. Sweeney, of Spokane, who secured it on a mortgage for $8000. The mine is said to have owed about $20,000, as a great deal of work had been done toward opening up the large, but low-grade deposits. It has been rumored that Mr. Sweeney is acting for the American Smelting and Refining Company, but confirmation cannot be had. It is not known whether any work will be done this summer or not.

SHOSHONE COUNTY

Copper King—At a special meeting of stockholders, held in Mullan, June 15, it was decided to drive a long crusscut adit on the property to open the ore at depth. Work will be started within 30 days, according to a statement by the management, and will be pushed vigorously. This property has been inactive since the Greenough interests declined to take up an option they held on it last fall.

Charles Dickens—At the annual stockholders' meeting in Spokane last week the following officers were re-elected: President, W. H. Taylor; vice-president, W. N. Nickerson; secretary-treasurer, W. A. Elliott; manager, A. D. Gritman. Manager Gritman states that the mill will be started up shortly.

Indiana

After being under probation for more than a year, 52 miners employed at the Summit mine were expelled from the United Mine Workers of America on June 30, because they refused to submit to fines for participating in a "stampede" strike, as provided in the district agreement between miners and operators. The miners were out eight days on a stampede strike and $8 were deducted from each man's pay. Of the 420 men employed, 52 in all, contrary to the advice of the district officers, brought suit and recovered the amounts deducted from their pay, the court holding the fining clause invalid. The district association made the amounts recovered good to the operators and will reinstate the expelled members as soon as they repay the association the amount of fines; four have already been reinstated and are now employed by the operators.

GREENE COUNTY

Golden Knob—The machinery of this mine, the property of an Ohio company, is being taken out and shipped away. The mine was operated in a small way nearly four years.

P. & I. Coal Mine—This mine, near Jasonville, is again in hard luck, or, rather, the stockholders are, owing to the insolvency of G. G. Hadley & Co., of Chicago, operators. There is a labor indebtedness of $1200 hanging over the mine, besides other bills. Judgments have been taken and executions issued against available property. The mine and equipments have been seized by the sheriff.

PARKE COUNTY

Rush Coal Company—This company, with offices at Cate's Station, has made an assignment. The assets are greater than the liabilities. Homer Hood owns a controlling interest and is general manager. The company has been in operation for five years and was originally established by Toledo men. The property is likely to change hands.

Kansas

ZINC-LEAD DISTRICT

Hartford—This company has just completed a new mill on its lease south of Galena, and is installing a six-drill air compressor.

Michigan

COPPER

Keweenaw—The temporary shaft house at the Medora shaft is nearing completion and will soon be in shape to handle rock. The rock crushers are on the ground and are being assembled; the Phœnix mill is practically ready to begin stamping. The spur connecting the mill to the main line has been widened to standard gage, and barring some unforeseen delays all will be in shape to begin the mill test on this rock the latter part of July. The company's new, or No. 2 shaft has reached the ledge, passing through about 15 ft. of overburden.

Ojibway—Sinking continues at No. 1 shaft, which is down about 230 ft.; the first level will be started at a depth of 500 ft. from surface, when a crosscut will be driven to cut the lode. At No. 2 shaft drifting at the first level, 350 ft. from surface has been suspended in the north end, but continues toward the south; the total length of this drift is about 150 ft. Preparations are being made to resume sinking at No. 2 shaft and the next level will be established at a depth of 500 ft. The formation in the drift is somewhat disturbed, probably due to surface influences and it is believed that, as depth is obtained, conditions will become settled and a more uniform copper-bearing rock will be disclosed. Work has been started on the spur connecting the mine with the Keweenaw Central railroad, and with this connection made the property will be given ample railroad facilities.

Superior—Preparations are being made to install two skips in the shaft. Work on the railroad connecting the mine and the Atlantic mill, will be started soon and will be rushed to completion; when finished a thorough mill test will be made.

Ahmeek—This company will sink two new shafts during the summer; several sand pipes have been driven down to test the overburden and get a contour of the ledge. The proposed shafts will open up the central and northern portions of the tract. The present shaft commands the ground in the southern end and the northern shaft will intercept the lode at depth and will be in close proximity to an extension of No. 5 Mohawk, which is showing up exceedingly well.

IRON

Empire—This mine, on the Cascade range will resume operations in a week or two. The company closed down the mine early in the year, laying off about 50 men.

Brule Mining Company—This company has resumed operations at its Chatham mines at Stambaugh. Only a small force is employed at present.

Missouri

ZINC-LEAD DISTRICT

The Little Princess, Elking and Diamond Jack mills have been shut down. The Fullerton mill has been totally destroyed by fire. The Yellow Dog has laid [illegible]

Big Chief—This company is putting up a 200-ton mill on its lease, north of the Mission mine at Baxter Springs.

Big Fly—This company made its first turn-in recently, and promises to be a regular produce. Its mill is at Alba.

Continental—This company has started its mill at Johnstown, after a long shutdown. A 10-in. and a 6-in. pump were necessary to drain the mine.

Diamond Jack—The derrick and tramway at this mine have been destroyed by fire.

[illegible] Land—A company composed of H. H. Black, Charles Humes, E. M. Hunt and J. H. Jackson—has leased 12 lots of this land south of Carterville, and is sinking a shaft to the ore, which was encountered in an abandoned mine at 85 ft. depth.

[illegible] —This company has discontinued its office at Webb City, and consolidated it with the Oronogo office.

Hall Land—McGee & Co. have opened [illegible] depth, on their 20-acre lease on this land south of Duenweg.

[illegible]—This company has opened up ore at 112 ft. on its lease on the Granby land at Chitwood. The mill has been rebuilt.

Kelley Land—A good drill strike was made on this land, near the northeast corner of the Chautauqua ground at Carthage. Ore was found at 188 ft. depth.

McConnell—This company is opening up a 40-acre tract south of Duenweg. An 8-ft. face of silicate ore was found at 32 ft. depth.

[illegible]—This company is sinking a shaft to open up the sheet ground on its 20-acre lease west of Joplin.

Tailings Mill—D. Cooper, C. J. Gunth and L. F. Roberts have bought the Water Oak mill, and are moving it to the West Side mine at Alba, to work the tailings.

[illegible]—This company has started

two 11-in pumps in the old cave near the Silver Dick. An incline is being built to run skips down into the cave.

Montana

Butte District

Parrot—In view of the fact that this company was the only one of the larger Butte concerns which failed to make any showing of net earnings in the recent annual reports, the strike in the Little Mina last week is of interest. The strike was made in a drift on the 1000-ft. level. Some years ago the mine was closed down as the result of litigation between the company and the Heinze interests, but was started again in 1906 when the fight between Heinze and the Amalgamated interests was settled. Since then the shaft has been sunk from the 800- to the 1000-ft. mark. The strike, while of no great importance, has revealed ore of a much higher grade than was formerly encountered.

Copper Eagle Mining Company—The property is located in the northern part of the Butte district, north of Walkerville. While no development work has been done recently, the shaft, down 225 ft., has been kept free from water and is in condition to resume operations at short notice. It is reported that negotiations are now being carried on to secure capital with which to sink to the 1000-ft. level. The upper levels have thus far shown silver ore, but no copper.

Amy-Silversmith—This mine, located in the silver belt of the Butte district northwest of Walkerville, is being worked by leasers. In times gone by several fortunes have been taken from the property, ores of which run high in gold and silver.

Butte Central & Boston Copper Company—Last week a petition was filed in the Federal Court by the creditors of the company asking that the company be adjudged bankrupt. For some time past there have been dissentions between the stockholders. The Tri-National company, of Boston, instituted suit against the company several months ago for the payment of a note for a considerable amount. The minority stockholders thereupon petitioned the court for permission to come in and defend the action, alleging in their petition that the company's directors were about to confess judgment. This suit is still pending. The company owns the Ophir mine, one of the oldest in the camp. Up to the time the company secured control, two years ago, this mine had been worked intermittently for silver ore, but it was thought that copper would be found with depth. The company has sunk the shaft from the 300- to the 500-ft. level, and has also installed a well equipped surface plant.

Davis-Daly—All leasers operating upon properties formerly owned by the Daly estate and now optioned to the Davis-Daly Estates Copper Company, have ceased work, pending a settlement of the financial difficulties of this company. The claims held under option from the Daly estate include the Silver King, Hesperus, Red Chief, Lizzie and Yellow Jack.

Beaverhead County

Polaris—Superintendent Harry Armstead states that arrangements are being made for the resumption of work about August 1. The mines and smelter have been closed down since last December.

Missoula County

Cape Nome Mining Company—The property of this company is located near Clinton. The Speculator Mining Company, former owner of the North Butte properties, owns the Black Hawk group of claims in the immediate vicinity of the Cape Nome, and has also secured an option on the claims which directly adjoin the latter. For the purpose of prospecting its own ground the Speculator company, according to a mutual agreement, sunk the Cape Nome shaft from the 300- to the 500-ft. level, whence it will run drifts into its own properties.

Nevada

Esmeralda County—Goldfield

Ore Shipments—The camp's production this week while maintaining the tonnage fell off a little in value, being 2061 tons valued at $148,315. The Western Ore Purchasing Company handled: Rogers Syndicate, 291 tons; Mushett lease, 200 tons; Little Florence, 73 tons; Engineers' lease, 222 tons; Oddie dump, 33 tons; Van Riper dump, 132 tons. The Nevada Goldfield Reduction Company treated: Jumbo, 149 tons; American mill tailings, 9 tons; Diamondfield Black Butte, 33 tons; Mohawk Combination, 33 tons; Sandstorm, 80 tons; Victor lease, 40 tons. Kendall lease shipped to Bonnie Claire mill 100 tons. The Combination mill treated 665 tons of Consolidated ores and made a special run on 30 tons which was valued at $60,000, which amount is not included in the above total.

Mohawk—In view of the reduction in freight and smelter rates the Mohawk is reported to be about to resume shipments of high-grade ores.

Mohawk Combination Lease—This lease has paid a dividend of $40,000, largely from the ore extracted during its last four days of existence. As soon as it disposes of its machinery and equipment the last of the famous Mohawk leases will have passed into history. This lease had quite a history. It was a union of the Kalfus lease on the Mohawk and the Sheets-Ish lease on the Combination. This latter lease was the cause of apex litigation between the Combination and Mohawk, which, however, was ended when both companies became part of the Consolidated. The Sheets-Ish people, however, took up the cudgel against the Kalfus lease and this was settled by the forming of the Mohawk Combination Leasing Company. When the lease had but four days left to run a serious cave occurred and the Consolidated shut the leasers from the premises and sued for damages. By agreement of both parties the matter was finally arbitrated, the Consolidated being awarded $9500 damages and the leasers being given four days to mine rock after a certain length of time granted for putting the workings in repair. A force of 120 picked men were put to work on three shifts and they extracted 900 tons of ore of an actual value of over $67,000 in the 96 hours allotted them.

Esmeralda County—Rawhide

Shipments have been made this week from the properties of the Rawhide Tiger, Coalition, Consolidated, Rector, and Queen. All the shipments were made by leasers.

Humboldt County

The San Francisco, Idaho & Montana railroad which is building from Caldwell, Idaho, to Winnemucca, has weathered the money stringency and is pushing work again. It is expected to start work northward from Winnemucca soon. This road will open up a rich mineral country.

Lander County

Austin Manhattan Consolidated Mining Company—This company has definitely outlined plans for its immediate future development. The 6000-ft. tunnel has already been cleaned out past the 2000-ft. station, and is being timbered by three shifts. The tunnel will be piped for ventilation and for compressed air and wired for electricity.

Nye County—Tonopah

Ore Shipments—The ore shipments over the Tonopah & Goldfield Railroad for the week ended June 25 to the Western Ore Purchasing Company, consisted of 90 tons from the Tonopah Extension. The Tonopah company sent 3550 tons, the Belmont company 700 tons, the Montana-Tonopah 1100 tons, the North Star 40 tons, the Midway 100 tons, the MacNamara 150 tons, and the West End 50 tons to the mills, making the total shipments for the week 5780 tons.

Tonopah Mining Company—At a meeting in Philadelphia this week the directors declared a dividend of 25c. per share, amounting to $250,000. It is stated semi-officially that similar dividends will be paid quarterly.

New York

Essex County

Cheever Mine—This iron mine, near Port Henry in the Lake Champlain district, has been closed down for the present. About 75 men were employed at the mine.

Oklahoma

ZINC LEAD DISTRICT

The Lincolnville district, south of Baxter, Kan., in Oklahoma, is pretty quiet, there being only three mills running. Eight miles southwest the Miami camp is booming. There are only four mills completed, but they are running full blast. This is the richest strike that has been made in this region. There are five more mills building and a sixth is to be bid on soon. The ore here seems to be more highly mineralized than that in the Lincolnville district, but it does not break so free from the gangue and so the mills are not making as good a recovery. A traction line is under consideration to run from the town to the mills, 5.5 miles. John Hall is the engineer in charge.

Pennsylvania

ANTHRACITE COAL

Lehigh & Wilkes-Barre Coal Company—A suit has been brought by the city of Wilkes-Barre and others, property owners, to enjoin this company from dumping culm into Solomon's creek, and to compel the company to dredge out the creek and remove obstructions already placed therein.

BITUMINOUS

Pittsburg-Buffalo Coal Company—This company has made an issue of $3,000,000 in 5-per cent. 30-year bonds. Of these bonds, $1,265,000 were used to retire old bonds outstanding; $735,000 to pay for new work and property; the remaining $1,000,000 being held to provide for future requirements.

BUTLER COUNTY

In the new McBride oilfield, the Hoffman No. 1 well, which was the first to draw attention to the field, is still flowing at the rate of 20 bbl. per hour. The Hoffman & Oesterling well, which gave only a small production at first, responded largely when shot. On June 30 a third well, the Shaffner, 125 ft. from the Hoffman, began to flow at the rate of 15 bbl. per hour. There is much excitement in the district, and preparations are being made to drill a number of wells.

South Dakota

CUSTER COUNTY

Hartford and Grand Junction—J. W. Van Leer, a mining engineer, has completed an examination of these two properties, which will probably be consolidated and operated jointly.

Minnie May—H. McClelland has had a number of men examining the property, and it is expected that announcement will shortly be made of a deal and resumption of work on the ground.

Wandering Boy—The owners have declined to extend the option to Wm. Gillespie, of Pittsburg, and no sale will be made.

Tennessee

[illegible]

Details are being worked out for the construction of the Knoxville & Sevierville railroad, which will be about 26 miles long and will penetrate the heart of the Sevier county iron-ore field. The plans include the opening of mines on a considerable scale.

Virginia

Pocahontas Consolidated Collieries Company—An order has been entered in the United States Circuit Court at Lynchburg, Va., dismissing at plaintiffs' costs the suit instituted in that court on Jan. 14 last, by a minority of the preferred stockholders of the Pocahontas Collieries Company against this company. The Pocahontas Consolidated Collieries Company, Inc., a corporation of the State of Virginia, was formed through a merger on July 1, 1907, of a company of the same name with the Pocahontas Collieries Company, with a capitalization of $2,800,000 preferred stock and $4,520,000 common stock, and an authorized bond issue of $20,000,000. The terms of the merger provided that the preferred stockholders of the Pocahontas Collieries Company should accept, in exchange for their stock the new bonds of the merged company. This exchange not having been made by all the preferred stockholders of the Pocahontas Collieries Company, a suit was instituted by those who refused to make such exchange, for the purpose of securing an appraisement of their holdings under the Virginia laws, or as an alternative, a receivership for the merged company. This suit is now dismissed.

West Virginia

RALEIGH COUNTY

White Coal Company—This company is pushing the work of development on its coal mines near Beckley. Many of the surface buildings are complete, and a contract for sinking the shafts has been let to Patterson & McNeil. Work is progressing on the branch line from the Virginian railway up Shockley creek to the mines. The company has an 11-ft. vein of coal at 280 ft. depth.

Wisconsin

ZINC LEAD DISTRICT

Further curtailment of zinc ore and increased production of lead ore are noticeable. The zinc-ore output of this district for the first six months of 1908 falls short only about 3000 tons of the figures for the corresponding period of 1907. During the first three months of this year the weekly average remained at 500 tons; in spite of continued restriction of output in many quarters, however, the production during the last three months has steadily increased and shows as large a total (13,334 tons) as any equal period in the history of the district. Moreover, the average grade of zinc ore now shipped out is considerably higher than was formerly the case.

Canada

[illegible]

British Columbia Copper—Some additional details have been published regarding the operations for the fiscal year ended Nov. 30 last. It appears that the company in that time produced from its smelter, 8,643,133 lb. of copper, 101,114 oz. silver, and 24,067 oz. gold, for which it received a total of $2,159,414. The copper was sold for 17.52c. per lb. Excluding the loss occasioned by the rapid decline in the price of copper, it would appear that the cost of production was about 13c. The first car of blister copper since production was resumed was shipped on June 8, and since then the converters have been turning out nearly a car a day. The mines have been producing 11,500 to 12,000 tons weekly, which would supply the smelter at nearly its full capacity of 2000 tons daily.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending June 27, were as follows: Buffalo, 42,680 lb.; Coniagas, 63,210; City of Cobalt, 116,400; Drummond, 40,000; McKinley-Darragh, 58,120; Nipissing, 62,400; O'Brien, 63,320; Right-of-Way, 60,480; Temiskaming, 120,000; Trethewey, 133,500; Watts, 60,160; total, 820,270 pounds.

Africa

RHODESIA

Gold production in May is reported 53,188 oz. fine, being 2470 oz. more than in April. For the five months ended May 31 the total was 251,083 oz., or $5,189,886. For the corresponding period in 1907 the total was 236,857 oz.; but the comparison is not accurate, as last year the reports were made in bullion, but this year nearly all the companies report in fine gold.

Other production reported for May was: Silver, 28,025 oz.; copper, 9 tons; lead, 113 tons; chrome ore, 556 tons; coal, 14,432 tons.

Europe

RUSSIA

A terrible explosion has occurred in the Rikovski coal mine near Yusovo, in the Donetz basin. The explosion was of gas, according to the accounts sent by cable, and the force was very great, many of the bodies recovered being badly torn and mutilated. The cable reports say that 267 dead bodies were taken out by the rescue parties, and 150 men were still in the mine when further work was stopped by fire in the mine, started by the explosion. It is hardly possible that any will be [illegible] over 400 in all.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 8. The coal trade in the West shows some signs of improvement. In Indiana the mines are more active and there seems to be a better demand for coal. There are also better reports from other quarters, and some manufacturing concerns are starting up, increasing the call for steam coal. The mines everywhere are running rather slack, but with no interruption from labor troubles.

In the East the bituminous trade is very quiet, with small demand reported in most places. Midsummer dullness has settled down on the anthracite trade, and there is little doing. The Coastwise trade is the lightest known for years, and many vessels are going out of commission.

Coal Traffic Notes

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year to June 27, in short tons:

	1907.	1908.	Charges
Anthracite	2,837,134	2,689,901	D. 147,233
Bituminous	18,735,831	15,690,393	D. 3,045,438
Coke	6,986,112	3,298,115	D. 3,687,997
Total	28,559,077	21,678,409	D. 6,880,668

Total decrease this year to date has been 24.1 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top road for the year to June 27 were 290,913 long tons; a decrease of 206,711 tons from the first half of last year.

New York

Anthracite

July 8—The market for hard coal is dull and inactive and sales are light. The Lake traffic shows signs of starting up in earnest. The independent dealers continue to cut prices 15@20c. below the circular for both prepared and small steam coal.

Prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

There is no activity in the soft-coal market and the only business seems to be among those consumers who must lay in large winter stocks. In New York harbor trade is at a standstill and good grades of steam coal fetch $2.45@2.50 with few takers.

Transportation from mines to tide is fair. In the Coastwise vessel trade there is little disposition to charter at the present rates. Freight rates are unchanged, as follows: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Saco, 90c.; Newburyport, 75c.; Portsmouth, 55@60c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c.; towages where usual.

Birmingham

July 7—The coal production in Alabama has been reduced some by the closing down of the commercial coal mines, the contract with the union miners having expired. The commercial operators have demanded of the miners that they be allowed the same mining wage as that which is paid at the non-union mines, 47½c. per ton, while the union miners have offered a flat rate for the year of 55c. per ton. A strike will probably be called this week. The union has between 3500 and 4000 members. There is a steady output at the non-union mines. None of the iron manufacturing companies in the Birmingham district recognizes the union, and there is a belief expressed that the commercial coal operators will now give the men a fight, the object being to drive the union from the mines of the State.

Coke shows a little improvement with the production about the same as reported two weeks ago.

Chicago

July 6—The coal market is in its usual summer condition, sales being light and fine coals in demand. Western coals especially run to fine sizes in general demand.

Standard quotations are: Illinois and Indiana lump or egg, $1.75@2.25; run-of-mine, $1.55@1.75; screenings, $1.50@1.65. Some lump is down to $1.60, and is not easily sold.

Eastern coals are weak. Smokeless and Hocking are 15@25c. under circular quotations with sales light and receipts heavy. Youghiogheny on contracts is firm at $3.15 for ¾-in. Anthracite is dull.

Indianapolis

July 6—The beginning of the second half of the year finds the coal-mining industry in an improved condition. The situation has been clarified by the settlement of the wage question, mine rules and the equalization of joint freight rates on several of the coal-carrying roads. The market has an encouraging outlook. On the whole the volume of orders at the mines is larger than for several years this early in the summer trade. The railroads have begun hauling large quantities of Indiana coal to dealers and consumers within and outside of the State. A slight increase in the price of coal at the mines, due to the increased cost of mining, is also assigned as a cause of better trade with dealers who wish to store a supply before another increase is made.

Pittsburg

July 7—About 80 per cent. of the railroad coal mines in the Pittsburg district are in operation and the bulk of the product is going to Lake ports for the northwestern markets. There is little local demand. Prices continue firm on the basis of $1.15 a ton for mine-run coal at mine. No shading is being done, as operators declare lower prices would not bring out any more business. Nearly all of the river mines are running and the coal is being loaded for a rise. Slack is a drug on the market. The large producers are still quoting it at 75c., but no sales are recorded that that price. What little was sold during the week went at considerably less, as low as 40c. being paid in some instances.

Connellsville Coke—There are strong indications of an improvement in the coke trade and operators are busy looking for men to take the places of the workers who left the fields when the depression came last fall. Many inquiries have been received during the past few days. Prices remain firm, furnace coke being quoted at $1.65@1.75 and foundry at $2.10@2.25 a ton at ovens. The *Courier* in its weekly report gives the production in both fields at 164,839 tons. The shipments were 6469 cars as follows: To Pittsburg, 2549; to points west of Connellsville, 3450; to points east of Connellsville, 470 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States five months ended May 31, long tons:

	1907.	1908.	Changes.
Anthracite	966,877	1,047,427	I. 80,550
Bituminous	3,463,013	3,034,870	D. 428,143
Total coal	4,429,890	4,082,297	D. 347,593
Coke	348,680	297,843	D. 50,837

Exports do not include coal furnished to steamships in foreign trade. Canada took this year 2,973,393 tons of coal, or

72.8 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, five months ended May 31, long tons:

	1907.	1908.	Changes.
Anthracite	13	15,023	I. 15,010
Bituminous	799,731	704,848	D. 94,883
Total coal	799,744	719,871	D. 79,873
Coke	**62,352**	**52,181**	**D. 10,171**

Canada furnished this year 445,489 tons of coal and nearly all the coke; Australia, 218,284 tons of coal. The greater part of the imports are on the Pacific Coast.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of June 27: Best Welsh steam, $3.90; seconds, $3.66; thirds, $3.54; dry coals, $3.84; best Monmouthshire, $3.36; seconds, $3.30; best small steam, $2.28; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 8—The present month is almost always a dull one, and it was to be expected that this year it would be duller than ever. There has been nothing new during the week, and no tendency in either direction can be detected. Matters have been simply drifting.

There has been some buying of pig iron, but in such small quantities that it would be hardly noticed in ordinary times. In finished material also, very little is doing. A few contracts for structural work are pending, but there is a disposition to hold back, probably because better prices are expected.

Judge Gary, of the Steel Corporation, has sailed for Europe, and it is hardly probable that any positive action about price changes will be taken in his absence.

Birmingham

July 6—The second half of the year starts off with the demand quiet, quotations firm, and the shipments of pig iron quite active. The stocks of iron on hand are being reduced steadily. The demand is in small lots and the inquiry is a little slack. The production is about 70 per cent. normal with preparations being made to improve these conditions. The iron quotations in the Birmingham district range between $12 and $12.25 per ton, No. 2 foundry, with carload lots, immediate delivery, bringing as high as $12.50. The home consumption is increasing. The resumption of operations this week at the rolling mills of the Tennessee Coal, Iron and Railroad Company at Bessemer, Ala., is the feature of the week. As far as possible, employment was given to the old labor. The steel plant of the Tennessee company at Ensley is doing well. The foundry of the United States Cast Iron Pipe and Foundry Company at Anniston, has been started up and will be followed [illegible] by other departments of the industry until the whole plant has been put back to work.

Chicago

July 6—[illegible] quiet, [illegible] condition of steady buying for needs of the next three months, chiefly in lots of [illegible] carload to 500 tons.

Northern iron is firm at $17@17.50 and Southern [illegible] Chicago, for No. 2. The demand for Northern is [illegible]. Southern iron for delivery within 30 days [illegible] but the market generally holds to the $12 minimum.

For iron and steel products the market generally is dull. Coke is selling well on contracts and rather lightly on spot requirements, with the best Connellsville at $4.90, Chicago.

Cleveland

July 7—The ore movement is still slow, the total for July being about 2,500,000 tons, or [illegible] tons less than last year. The shipments from docks to furnaces are also slow. Vessel capacity to move about 700,000 tons from Lake Superior ports has been contracted for at 65c., which is 10c. below last year's rate. Even 60c. has been reported, but not confirmed.

Philadelphia

July 7—The immediate outlook of the pig-iron industry has improved even with the intervention of a holiday. The features are, declining furnace stocks, increasing third-quarter requirements and [illegible]. Prices are steady. No. 2X runs close to $16@16.50; gray forge, $16 and basic the same.

Billets—The low prices have [illegible] some correspondence with large consumers.

Bars—The average business is done at 1.30@1.35c. Some business is [illegible] in car lots.

Sheets—The report given today shows no change. The larger consumers will not place orders until there is a stronger incentive than at present.

Pipes and Tubes—There is [illegible] ration of stock in some departments of the locomotive works. The boiler shops are working slack.

Plates—The Pennsylvania-plate mills are not booking new business of importance. A [illegible] bridge work is coming along.

Structural Material—No [illegible] improvement is in sight. So far as [illegible] demand is concerned it is not worth noting.

[illegible] some rails for quick delivery. Repairing requirements for traction lines are larger this year than ever before. Light rails are also called for irregularly.

Old Material—[illegible] three of them on the hunt for heavy steel scrap, which is quoted this week 50c. [illegible]

Pittsburg

July 7—[illegible] been put in operation at some of the plants of the Carnegie Steel Company. The placing of [illegible] Baltimore & Ohio Railroad last week is regarded as a starter for rail buying.

All the independent sheet and tin-plate makers have accepted the wage scales arranged by the Amalgamated and the leading producer. The only scale not adjusted [illegible]. The Amalgamated opened a conference in Detroit today with the Western Bar Iron Association. It is expected that a settlement will be reached and also that later the Republic Iron and Steel Company, which rejected the proposition of the Amalgamated will reopen negotiations. No one anticipates any labor troubles this year. The [illegible] get the mills started on a long, steady run.

Small orders continue to be placed in nearly every line and prices are being firmly maintained. Since the cut of $4 a ton was made in steel bars, contracts were [illegible]. This tonnage seems large, but the bulk of it is for deliveries extending over a period of one year.

Pig Iron—[illegible] as off-bessemer iron at $15.75 was really [illegible] holding firmly for $16 for third quarter [illegible] forge is firm at $14, Valley furnaces.

Steel—The crude-steel market continues dull, but prices are firm. Both bessemer and open-hearth billets are quoted at $25, Pittsburg. [illegible]

Sheets—Conditions remain unchanged [illegible]

[illegible] proved demand and indications point to higher prices before the end of this quarter. For prompt delivery at Pittsburg prices range from $46 to $47 per ton.

Foreign Iron Trade

German Iron Ore Trade—Imports and exports of iron ore in Germany for the four months ended April 30 were, in metric tons:

	1907.	1908.	Changes.
Imports	2,077,040	1,939,283	D. 137,757
Exports	1,443,134	1,171,759	D. 271,375

Imports are from Spain, Sweden and Russia. Exports are chiefly of minette ores from Luxemburg to Belgium and France.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 8.

At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908..	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended July 4: Gold, $305,343, principally to Germany; silver $380,928, chiefly to London. Imports: Gold, $130.611; silver, $69.468, both from the West Indies, Central and South America.

Specie holdings of the leading banks of the world July 4, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$306,623,600
England	$183,036,965	....	183,036,965
France	628,643,015	$188,530,840	817,173,855
Germany	178,440,000	73,950,000	252,390,000
Spain	78,075,000	134,920,000	212,995,000
Netherlands	38,517,500	21,373,000	59,890,500
Belgium	20,753,335	10,376,665	31,130,000
Italy	181,125,000	21,500,000	202,625,000
Russia	558,610,000	38,440,000	597,050,000
Aust.-Hungary	234,420,000	66,965,000	301,385,000
Sweden	19,430,000	....	19,430,000
Norway	7,265,000	....	7,265,000
Switzerland	18,170,000	....	18,170,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE

July.	Sterling Exchange.	Silver. New York Cents.	Silver. London Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
2	4.8695	53¼	24 13/16	6	4.8695	54	24⅞
3	4.8695	53¾	24 13/16	7	4.8695	53¾	24 11/16
4	......	...	24 13/16	8	4.8695	53¾	24 9/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to June 25:

	1907.	1908.	Changes.
India	£6,049,924	£3,929,158	D. £2,120,766
China	......	516,400	I. 516,400
Straits	544,012	90,510	D. 453,502
Total	£6,593,936	£4,536,068	D. £2,057,868

Receipts for the week were £178,500 from New York. Exports were £2000 to Egypt and £103,500 to India; £105,500 in all.

Indian Exchange continues steady at 15.91d. per rupee, with sales of 10 lakhs of Council bills in London.

The silver market has remained fairly steady during the past week at 24 13/16d. in London, but closes lower at 24 9/16d., on speculative sales in London.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
2	12⅝ @12¾	12 @12⅛	56½	27¼	4.42½ @4.45	4.45 @4.50	4.30 @4.35
3	12⅝ @12¾	12⅛ @12	56	27⅜	4.42½ @4.45	4.45 @4.50	4.30 @4.35
4	......	......	......	......	......	......	......
6	12¾ @12⅞	12½ @12⅝	57⅛	27½	4.42½ @4.45	4.40 @4.45	4.25 @4.30
7	12¾ @13	12½ @12⅝	57¼	27½	4.42½ @4.45	4.40 @4.45	4.25 @4.30
8	12¾ @13	12½ @12⅝	57½	28	4.42½ @4.45	4.40 @4.45	4.27½ @4.32½

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The better feeling on the part of American consumers reported in our last issue found continued expression this week in the transaction of considerable business, and it is particularly noteworthy that purchases have not, as heretofore, been restricted to early deliveries. The European consumers, too, have come again into the market. The demand was freely met by some of the producers so that prices as yet show little change, but that little is for the better. The market closes at 12¾@13c. for Lake, 12½@12⅝c. for electrolytic in cakes, wirebars or ingots. The average of the week for casting copper has been 12¼@12½c., the market being 12⅜@12½c. at the close.

The standard market in London has been strong and advancing, closing at £57 10s. for spot and £58 5s. for three months, or over £1 higher than last week. A large business was done.

For refined and manufactured sorts we quote: English tough, £60@61; best selected, £60@61; strong sheets, £72@73.

Exports of copper from New York and Philadelphia for the week were 6921 long tons. Our special correspondent gives the exports from Baltimore at 406 long tons.

Manufactured Copper—Sheets, cold-rolled, 18c.; hot-rolled, 17c. Wire, 14¾c. base.

Tin—In sympathy with the copper market, tin has had quite a good advance in London, where it closes at £127 5s. for spot and £128 5s. for futures, which is equal to an advance of £3 10s. from the low point reached. The New York market has closely followed the trend of that of London, with the exception of spot tin, which is again being concentrated, and for which a slight premium is obtained. Quotations are made at the close at about 28@28¼c. per pound.

Shipments of tin from the Straits, four months ended April 30: United States, 2689; Great Britain, 12,960; other Europe, 3017; India and China, 822; total, 19497 long tons, an increase of 1748 tons over last year.

Visible stocks of tin reported on July 1, long tons:

	In Store.	Afloat.	Total.
London	5,051	4,166	9,217
Holland	593	183	776
U. S., exc. Pacific ports	1,543	2,619	4,162
Total	7,187	6,968	14,155

The total shows a decrease of 1269 tons from the June report.

Lead—The demand for this article is good, but it continues to be supplied by speculators who bought at lower prices. Business is being done at 4.42½@4.45c. New York.

A better demand has developed abroad at the lower prices which were recently established. The market closes strong, with Spanish lead at £12 15s. and English lead at £12 17s. 6d. per ton.

Spelter—The market remains sluggish, and prices went off to 4.25@4.30, St. Louis, but at the close there was a little improvement, business having been done at 4.27½@4.32½c. St. Louis.

The European market, also, has declined somewhat, good ordinaries being quoted at £18 and specials at £18 15s. per ton.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—No sales have been reported, and the market is without interest. Prices remain unchanged at 8⅝@8¾c. for Cookson's, 8¼@8½c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Foreign metal is offered at rather lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic, and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—Prices remain unchanged at $23.50 per oz. for hard platinum, $21 for ordinary and $16 for scrap.

Imports and Exports of Metals

Exports and imports of metals in the United States for the five months ended May 31 are reported as follows, in the measures usual in the trade:

	Exports.	Imports.	Balance.	
Copper, long tons	139,793	30,461	Exp.	109,332
Copper, 1907....	65,179	53,793	Exp.	11,386
Tin, long tons ...	130	14,693	Imp.	14,563
Tin, 1907........	141	17,725	Imp.	17,584
Lead, short tons.	33,313	47,429	Imp.	14,116
Lead, 1907......	10,345	32,248	Imp.	21,903
Spelter, sh. tons.	1,555	338	Exp.	1,217
Spelter, 1907....	304	479	Imp.	175
Nickel, lb........	5,388,855	6,089,531	Imp.	700,676
Nickel, 1907....	4,781,163	8,265,284	Imp.	3,481,121
Antimony, lb.....	....	3,261,495	Imp.	3,261,495
Antimony, 1907.	....	4,361,187	Imp.	4,361,187
Platinum, lb.....	... .	1,198	Imp.	1,198
Platinum, 1907.	....	3,436	Imp.	3,436
Quicksilver, lb...	83,874	....	Exp.	83,874
Quicksilver, '07	223,338	....	Exp.	223,338
Aluminum, value	$162,681	..... .	Exp.	$162,681
Aluminum, 1907	131,147	....	Exp.	131,147

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. Zinc ores exported were 8071 tons in 1907, and 12,669 tons in 1908; zinc dross, 10,757,810 lb. 1907, and 10,599,983 lb. in 1908. Zinc ores imported this year, 7362 tons calamine and 6772 other ores, 14,134 tons in all; not reported in 1907. Antimony ores imported, 1,289,801 lb. in 1907, and 416,747 lb. in 1908. Exports given above include re-exports of foreign material.

Wisconsin Ore Market

Platteville, Wis., July 4—The highest price paid for zinc ore this week was $36, the base price ranging from $34 to $36 per ton of 60 per cent. zinc. The low and intermediate grades, comprising nearly the whole of the week's production, sold on the lower base. The scarcity of high-grade ore caused the advance for the better grades. Lead ore sold as high as $64 per ton.

Shipments from district, week ended July 4:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland..............	371,900	......	....
Platteville	223,600		226,735
Benton................	160,960	....	....
Days Siding...........	88,000	. ...	.. ...
Cuba City	69,560	175,740	..
Livingston............	50,000	.	.. ....
Strawbridge...........	....	48,550	
Total.................	964,020	224,290	226,735
Year to July 4.........	43,860,465	5,270,015	308,665

Hazel Green shipped about 600,000 lb. zinc ore and one or two cars of lead ore, the exact figures of which will be reported next week.

In addition to the above there was shipped to the electrostatic separator at Platteville, from Benton, 215,600 lb.; from Dodgeville, 78,300 lb.; shipped to the Joplin Separator Works at Galena, from Rewey, 67,000 lb.; shipped to the Enterprise roaster at Platteville, from Strawbridge, 206,300 lb. zinc ore.

Missouri Ore Market

Joplin, Mo., July 4—The highest price paid for zinc ore was $38 per ton, the assay base price ranging from $34 to $35.50, and the average price for all grades being $31.30, with a large silicate shipment. The highest price for lead ore was $65.50 in the bin, or $66 f.o.b., paid on deliveries of the previous week purchases, with week end offerings light at $62. The average all grades was $61.92 per ton. One sale of zinc for next week's delivery was made on a base price of $36 per ton.

On account of the Fourth of July every mine lost one day during the past week, and it is impossible to ascertain what mines will resume operations on Monday, there being so much undercurrent talk of a restricted output for two weeks.

Following are the shipments of zinc and lead from the various camps of the district for the week ending July 4:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	1,622,670	486,510	$41,043
Joplin..................	1,844,450	245,760	39,433
Galena.....	441,190	295,490	16,219
Prosperity	420,740	106,070	10,019
Alba-Neck	578,850	. ..	9,839
Duenweg...	621,330	68,560	9,479
Granby	476,920	34,170	7,500
Miami...........	350,500	68,780	6,912
Aurora	433,210	9,580	6,412
Badger............	220,190	..	3,853
Oronogo.....	135,860	44,660	3,833
Cave Springs .	200,270	.. .	3,404
Carthage.....	128,760	.. ..	2,252
Spurgeon.....	144,500	28,920	2,221
Carl Junction...	60,630	16,690	1,546
Sarcoxie	60,500		726
Totals	7,740,630	1,405,190	$164,691
27 weeks..............	248,011,310	38,682,430	$5,249,593

Zinc value, the week, $121,180; 27 weeks, $4,210,621
Lead value, the week, 43,511; 27 weeks, 1,038,972

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1907.	1908.	Month.	1907.	1908.
January ...	45.84	35.56	January ...	83.58	46.88
February ..	47.11	34.92	February ..	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April.......	48.24	34.08	April.......	79.76	52.47
May.... ...	45.98	33.39	May	79.56	56.05
June	44.82	32.47	June	73.66	60.48
July..	45.79		July........	58.18	.
August	43.22		August.....	59.54	....
September.	40.11		September.	53.52	. ..
October ...	39.83		October....	51.40	...
November..	35.19		November..	43.40	
December..	30.87	.	December..	37.71	.
Year	43.68		Year ...	68.80	...

Chemicals

New York, July 8—The market is quiet, but steady, and shipments have been light. There is little interest being taken.

Copper Sulphate—The market is quiet and dealers are conservative. It is reported that outside goods have been offered at $4.50 per 100 lb. Standard sulphate remains unchanged at $4.65 per 100 lb. for carloads and $4.20 for smaller lots.

Exports of copper sulphate from the United States five months ended May 31 were 5,656,755 lb. in 1907, and 6,404,042 lb. in 1908, an increase of 747,287 lb. this year.

Phosphates—Exports of phosphates from the United States, five months ended May 31, long tons:

	1907	1908	Changes	
Crude	394,933	526,989	I.	132,066
Other .	12,778	11,359	D.	1,419
Total . .	407,711	538,348	I.	130,637

The principal exports this year were to Germany, Great Britain and France.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on July 1 as follows, in long tons:

	1907	1908	Changes	
Stocks Jan. 1 .	13,050	5,900	D.	7,150
Arrivals, 6 months	133,045	124,950	D.	8,095
Total Supplies........	146,095	130,850	D.	15,245
Deliveries, 6 months....	144,595	120,170	D.	24,425
Stocks, July 1.........	1,500	10,680	I.	9,180
Afloat for U. S.	120,000	60,000	D.	60,000

Quantities afloat include all cargoes due to arrive at United States ports by Oct. 15 next.

Sulphur—Imports of sulphur and pyrites into the United States, five months ended May 31, long tons:

	1907	1908	Changes	
Sulphur	4,106	10,218	I.	6,112
Pyrites..................	134,845	176,817	I.	41,972
App. total sulphur	58,044	80,945	I.	22,901

Exports of sulphur for the five months, 2905 tons in 1907, and 5512 in 1908; increase, 2607 tons.

Heavy Chemicals—Imports of heavy chemicals into the United States five months ended May 31, in pounds:

	1907	1908	Changes
Bleaching powder	50,318,361	29,272,476	D. 21,045,885
Potash salts	[illegible]	[illegible]	D. [illegible]
Soda salts	9,916,075	4,627,256	D. 5,288,819

Exports of acetate of lime for the five months, 40,477,042 lb. in 1907, and 26,-[illegible] this year.

Mining Stocks

New York, July 8—The general [illegible] market took on some improvement after the holiday. It has been largely professional still, and the gain has been rather in quotations than in the volume of business.

The curb market in New York has been rather irregular, but stronger on the whole. There was more trading in copper shares, but it was confined to a few favorite stocks; these generally showed advances in price.

Conditions are rather favorable for speculation, so far as the money market is concerned; but the extreme heat, the [illegible] political uncertainties are on the other side.

Boston

July 7—A feeling of optimism pervades the air relative to mining shares, although it is not manifest to any great extent so far as prices are concerned. There has been material strength for the past 10 days or so, and although the volume of business has not been large, it is attracting attention. So far it is only sentimental.

The advance of Osceola to $106 supplied the incentive for a broadening interest in Lake stocks. The $2 dividend declaration lends encouragement, although the stock has fallen back to $100 in the mantime. There have been rumors of settlement or compromise of the Bigelow-Calumet & Hecla litigation, but so far there is nothing to it.

Amalgamated shows good strength, having risen $2.50. The declaration of the regular Anaconda dividend does not indicate any change in the former's rate. North Butte has been fairly active and rose $3 to $69. Utah Consolidated rose $1.50 to $42.50. Copper Range has been steady at from $72.50 to $73.25.

The curb is becoming more active and at better prices.

Salt Lake City

July 2—The volume of business transacted on the Salt Lake Stock and Mining Exchange in June broke all previous records. Sales for the month reached a total of 4,666,519 shares; the selling value of which was $2,848,580 in all.

STOCK QUOTATIONS

NEW YORK July 7		BOSTON July 7	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine		Adventure	4½
Amalgamated	68	Allouez	29¼
Anaconda	43	Am. Zinc	28
Balaklala	‡[illegible]	Arcadian	3¼
British Col. Cop.	4¼	Arizona Com	18½
Butte & London	....	Atlantic	14
Butte Coalition	22	Bingham	.30
Colonial Silver	½	Boston Con	12¼
Cum. Ely Mining	7	Calumet & Ariz.	110
Davis Daly	1⅞	Calumet & Hecla	655
Dominion Cop	1⅛	Centennial	25½
Douglas Copper	4	Con Mercur	39
El Rayo	2	Copper Range	72½
Florence	3⅛	Daly West	10¼
Foster Cobalt	41	Franklin	9½
Furnace Creek	14	Greene Can.	10¼
Giroux	3½	Isle Royal	20¼
Gold Hill	1/16	La Salle	14½
Goldfield Con.	6½	Mass	5
Granby	‡96	Michigan	9¾
Greene Gold	¼	Mohawk*	59½
Greene G. & S	25	Nevada	12
Greenw'r & D. Val.	75	North Butte	68¼
Guanajuato	1¾	Old Colony	‡.25
Guggen Exp.	150	Old Dominion	35½
Hanapah	‡20	Osceola	101
McKinley Dar.	75	Parrot	24½
Micmac	2¾	Quincy	87
Mines Co. of Am.	1½	Rhode Island	3¼
Mitchell Mining	¼	Santa Fe	1¾
Mont. Sho C.	.68	Shannon	13¼
Nev. Utah M. & S	3⅜	Superior	16
Newhouse M. & S	5¼	Tamarack	64½
Nipissing Mines	7¼	Trinity	13½
Old Hundred	½	United Cop. com.	7
Silver Queen	1.06	U. S. Oil	24¼
Stewart	1⅛	U. S. Smg. & Ref*.	35¼
Tennessee Cop'r.	35¼	U.S.Sm. & Re. pd*.	42¼
Tri-Bullion	1⅛	Utah Con*	42
Union Copper	¼	Victoria	4½
Utah Apex	3¾	Winona	5½
Utah Copper	34	Wolverine	134
Yukon Gold	3¾	Wyandotte	1½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agrl. Chem.	24½
Am. Smelt. & Ref	80
Am. Sm. & Ref. pf.	102½
Bethlehem Steel	‡13½
Colo. Fuel & Iron.	28½
Federal M. & S., pf.	81
Inter. Salt	18½
National Lead	67½
National Lead, pf.	100
Pittsburg Coal	12½
Republic I. & S.	18¼
Republic I. & S., pf.	68¼
Sloss-Sheffield	54¼
Standard Oil	605
U. S. Red. & Ref.	‡10
U. S. Steel	39½
U. S. Steel, pf	105½
Va. Car. Chem	24

BOSTON CURB	
Ahmeek	72
Black Mt	3¾
East Butte	‡5¾
Hancock Con.	‡5⅞
Keweenaw	‡6
Majestic	.56
Raven	.98
Shawmut	.41
Superior & Pitts.	11⅞
Troy Man.	‡.40

ST. LOUIS July 3

N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie.	.03	.02
Center Cr'k	2 00	1 50
Cent. C. & C.	68.00	67 00
C.C. & C. pd.	78 00	76.00
Cont. Oil.	110 00	100.00
Columbia	4.00	3.00
Con. Coal	18 00	16 00
Doe Run.	120 00	110.00
Gra. Bimet.	.25	.20
St. Joe.	15.00	12.00

LONDON July 8

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 6
Camp Bird	0 13 0
Esperanza	1 11 3
Tomboy	1 7 6
El Oro	1 6 3
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 8.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.15
Belcher	.19	St. Ives	.23
Best & Belcher	.50	Triangle	.03
Caledonia	.07	BULLFROG STOCKS	
Chollar	.15	Bullfrog Mining	.03
Comstock	‡.30	Bullfrog Nat. B.	.04
Con. Cal. & Va.	.56	Gibraltar	.03
Crown Point	.24	Gold Bar	.03
Exchequer	.15	Homestake King	.40
Gould & Curry	.12	Montgomery Mt.	.06
Hale & Norcross	.20	Mont. Shoshone C	.64
Mexican	.42	Original Bullfrog.	.01
Ophir	2.40	Tramp Cons.	.15
Overman	.08	MANHAT'N STOCKS	
Potosi	.08	Manhattan Cons.	.08
Savage	.21	Manhat'n Dexter	.05
Sierra Nevada	.21	Jumping Jack	.04
Union	.27	Stray Dog	.03
Utah	.02	MISCELLANEOUS	
Yellow Jacket	.35	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.05
Belmont	.87½	Lee Gold Grotto	...
Extension	.68	Nevada Hills	1 50
Golden Anchor	.01	Nevada Smelting.	.75
Jim Butler	.22	Pittsburgh S. Pk.	1 05
MacNamara	.33	Round Mt. Sphinx	26
Midway	.36		
Montana	1.35		
North Star	.06		
Tono'h Mine of N.	7.87½		
West End Con	.60		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.16		
Booth	.15		
Columbia Mt	.13		
Comb. Frac	.59		
Cracker Jack	.04		
Dia'dfield B. B. C.	.17		
Goldfield Belmont	.14		
Goldfield Daisy	.81		
Great Bend	.26		
Jumbo Extension	.40		
Katherine	...		
Kendall	.13		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.17		
Roanoke	...		
Sandstorm	.25		

COLO. SPRINGS July 3

Name of Comp.	Clg.
Acacia	5½
Black Bell	....
C. C. Con.	2⅞
Dante	5
Doctor Jack Pot.	6½
Elkton	56¼
El Paso	33
Findlay	24⅝
Gold Dollar	6¼
Gold Sovereign	‡3
Isabella	30
Index	...
Jennie Sample	‡3
Jerry Johnson	‡4½
Mary McKinney	25
Pharmacist	‡3¼
Portland	1 06
Un. Gold Mines	3
Vindicator	84¾
Work	8½

Assessments

Company.	Delinq.	Sale.	Amt.
Birchville, Cal	June 20	July 11	$0.02
Bullion, Nev	June 25	July 17	0.05
Butler-Liberal, Utah	July 17	Aug. 6	0.02
Chollar, Nev	July 8	July 30	0.10
Con. Imperial, Nev	June 17	July 9	0.01
Con. Virginia, Nev	June 12	July 3	0.25
Confidence, Nev	June 10	June 30	0.20
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev	June 30	July 20	0.01
Mountain Dell, Utah	June 24	July 13	0.02
N. Y. Bonanza, Utah	June 9	June 30	0.02
Oro Cobre, Cal	July 16	Aug. 3	0.02
Overman, Nev	June 19	July 10	0.05
Peruvian Con., Utah	June 22	July 7	0.01
Silver King Con., Utah	June 11	June 30	0.10
Spanish Ridge, Cal	June 1	July 1	0.05
Tomahawk, Nev	Julp 10	Aug. 12	0.01
Tonopah North Star, Nev	June 24	......	0.01
Union Con., Nev	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55 678	31.769	25.738
February	68 835	56.000	31.852	25.855
March	67 519	55 365	31 325	25.570
April	65 462	54.505	30.253	25.133
May	65 971	52.795	30 471	24.377
June	67 090	53.663	30 893	24.760
July	68 144	......	31.366	......
August	68.745	......	31 637	......
September	67.792	......	31.313	......
October	62.435	......	28 863	......
November	58 677	......	27 154	......
December	54 565	.....	25 362	.....
Year	65 327	......	30 188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	12.675	24.140	12.877	97.272	57.842
July	21.130	......	21 923	......	95.016	......
August	18.356	......	19.255	......	79.679	......
September	15.565	......	16.047	......	68.375	......
October	13.169	......	13 551	......	60.717	......
November	13.391	......	13.870	......	61.226	......
December	13.163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87 007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London. pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	......
February	42 102	28.978	August	37.667	......
March	41.313	30.577	September	36.689	......
April	40 938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19 828	14.469
February	6.000	3.725	19.581	14 250
March	6.000	3.838	19.703	13.975
April	6 000	3.993	19 975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	......	20.350	......
August	5.250	......	19.063	......
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4 513	6.582	4.363	27.125	20 563
February	6 814	4.788	6.664	4 638	25.938	20.875
March	6.837	4.665	6.687	4 527	26.094	21.075
April	6.685	4 645	6.535	4.495	25.900	21.344
May	6 441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	......	5.922	......	23.850	......
August	5.701	......	5.551	......	21 969	......
September	5.236	......	5.086	......	21.050	......
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	.....	5.812	......	23.771	......

New York and St Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, JULY 18, 1908. NO. 3

Ore Sampling by Machines

Conditions Necessary to Accurate Sampling. Disturbing Effects of Uncontrolled Gravitation. Control of Feed Would Be a Valuable Novelty

BY JOHN A. CHURCH*

In the JOURNAL of May 9, 1908, there were illustrations of the Great Cobar sampling mill, which, as well as can be judged in the absence of a detailed description, seems to be a good example of the prevailing design of such works. It is so good in fact as to offer a favorable opportunity for considering the operation of such establishments, and whether their arrangement is really the best that can be chosen. In this day of careful study of every branch of mining work it is unnecessary to offer excuses for my interest in this important branch.

The arrangement of the Great Cobar works is very common and is intended to meet the conditions of railway transport, heavy carloads and machinery, and a large supply of ore. The first crusher, of course the heaviest piece of machinery installed, is placed on or near the ground and its product is raised by belt elevator with about 60 ft. lift, to the top of the building, and falls first to a bin and then to a sampler. From this bin the ore falls through samplers and crushers alternately until the last cut, 1/1500 of the original ore, reaches the ground level. The works are planned to treat ultimately a mine output of 2,000 tons daily. Every fifth car goes to the sampling works which will receive 400 tons a day. I propose to examine the conditions which govern the passage of ore through a mill of this kind.

RETARDATION OF COARSE MATERIAL

The first crusher is a No. 5 McCully gyratory, set probably to 2 or 2½ in. discharge. (This and other details are not mentioned in the description, and where necessary I introduce figures that suit the magnitude of the operation.) The crusher receives, presumably in 10 hours, 400 tons, or 1333 lb. a minute, of ore which has been crushed previously to 6 in. All ore goes through it, and in this machine we find the first operation of one condition which is probably inimical to perfect sampling. I refer to retardation of part of the ore which results in separating one portion of the ore thrown into the crusher at one time from another portion.

Some of the ore is fine enough to pass through without change, while other portions are held back by the machine until they have been broken up. This is most noticeable in the first crusher, with its wide discharge opening. Probably one-half the ore is fine enough to go through without further reduction. Therefore 667 lb. runs through, some freely, some with slight detention, but most of it in advance of the ore coarse enough to require crushing. There is a noticeable difference even among the larger pieces, for with ore passing through at the rate of 11 lb. per second a 6-in. piece weighing 11 lb. will remain longer than a 3-in. piece weighing 1½ lb. The subject can be treated only in a general way, for each large piece chokes the crusher locally for a time and may hold back some fines. On the other hand, the crushing hight of a No. 5 machine is only 2 ft., so that when the path is free the fines can rush through with speed. On leaving the crusher retardation of the contrary kind takes place from the operation of another cause which is operative at every machine in the mill. Crusher spouts are inclined usually 50 or 55 deg., but even with that slope the finest ore does not go down with the speed of the coarse. It suffers retardation due to friction.

The real work of sampling begins with the bin into which the elevator discharges. The first sampler is a Simplex of 64 in. diameter, making 11 r.p.m. This sampler consists of a wheel on which two scoops are fixed on opposite ends of one diagonal. The ore comes down a chute and falls continuously to a lower chute leading to the reject bin, except when the whole stream is diverted to the sample by the passage of a scoop under the feed chute. The fall from the bin to the sampler is about 2 ft. 10 in., and the chute appears to have a slope of 58 deg. Retardation of the finer stuff is repeated here while the coarse rushes away from it. In fact, when a chute of this slope is not covered, it is common to see the larger fragments bound off at the top and make the rest of their fall in free air, while smaller sizes are retarded more or less according to size and density. Even the free fall in air of such mixed material is not the same on account of the great difference in surface and friction. A cubic foot of ore has its surface increased about 10 times when broken to pieces that will pass a 2-in. ring, more than 20 times for 1 in. and more than 40 times for ½ in., figures that indicate how great the increase is for still smaller sizes which are always our especial care in accurate sampling. While such calculations are vague, they impress upon us the fact that the retarding effect of friction increases as the kinetic value or weight of the fragment decreases, and a sampling mill is an excellent place to observe how positive and important this relation of size to movement is. Remembering that there is retardation whenever ore is transferred from one machine to another, we have the following repetitions of this action in the mill under consideration, after the elevator bin

Elevator bin to No. 1 sampler	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

EFFECT OF RETARDATION, UPON [illegible] WEAR.

The mode in which this partial retardation affects the work may be understood by studying the operation of the machines. In the simplex 64-in. sampler the stream of ore strikes the scoop at a mean distance of nearly 23½ in. from the center, giving a sampling circle of 147 in. circumference and with 11 r.p.m. the speed in this circle is 27 in., nearly, per second. For a 15-per cent. cut the scoop has a width on this circle of 11 in. and crosses the ore stream in 0.41 second. Assuming that, under whatever circumstances of retardation exist, the fall of the largest fragment occupies 0.5 second from the bin, and it enters the scoop squarely in the center, a movement of 5.5 in. will carry the scoop beyond the stream of ore. This will be done in 0.2 second, so that if a small fragment that left the bin with the large piece is retarded only 0.2 second it will not go into the sample with its former neighbor but will go to the reject. This separation of large and small pieces that began their progress together is repeated seven times in this mill as we have seen.

It may be thought that I am emphasizing too strongly the effects of gravity [illegible] by the small spaces into which the fall is broken.

---

*Consulting mining engineer, 15 William street, New York but one who watches the operation of sampling mills must acknowledge the positive character of this separation. In one works the mistake was made of giving the elevator a lift of 90 ft. and the drop between the various machines was so great that acceleration of gravity had full force and the larger fragments came down like bullets while the finer ore that should have accompanied them did not appear for seconds after. The superintendent said that the only good sampling he did was in the last step, which was preceded by rolls that were fed by a shaking apron. In another mill the sampler was set so far in advance of the chute that acceleration was actually depended upon to carry the ore over the gap! No wonder the manager was doubtful whether "mechanical sampling" was worth anything.

It is possible to correct, or at least to minimize the effects of retardation, but before advocating anything of the kind it will be well to consider the actual results of the present system and whether they are inimical to good sampling.

In hand sampling it is considered necessary to mix the sample thoroughly before coning, and though the particles do not fall alike in coning care is taken that whatever forces act on the different sizes shall be distributed equally on all sides of the cone, so that a cut taken anywhere from center to circumference will include all results of the coning. Separation of coarse and fine to different parts of the cone or to different times of sampling is not allowed and this is the main difference between hand and mechanical work.

Effect of Haphazard Retardation

In mill sampling the first question that arises is whether the practice of throwing all the ore, coarse and fine together, into the crusher hopper produces the good effects that are expected from it. There is a strong prejudice among practical men in favor of this practice, but I have shown that it does not prevent the dissociation and separate sampling of particles that enter the crusher together. If the fine were screened out and remixed with the coarse on the crusher spout the effects ought to be much the same except in one particular. By putting all through the crusher together, coarse and fine go through in due proportion but not necessarily in the same unit of time.

The second question is what effect does haphazard retardation have upon the operation of a sampler. I believe it to be bad and as the evil lies in the improper presentation of the ore to the machine I do not believe one sampler has any superiority over another in this respect. That is to say, not one of them can cure an evil that was completed before the ore reached the sampler. We now have machines that treat the stream of ore with uniform fairness. So far as their work is concerned we may say that not one grain goes into the sample that belongs in the reject and *vice versa,* but they have no power to correct errors.

Accuracy of Sampling

Having shown that there is a force operating effectively in all sampling works which has not been taken into account in the design of such works the third question to be considered is what effect this action has upon the accuracy of sampling. We owe to Paul Johnson the most valuable contribution on this subject. He published in the Journal, April 12, 1902, a table giving the comparative results of sampling and resampling 11 lots of ore, four of which contained gold and silver and seven had copper, gold and silver. The work was done in samplers of his own design, which have approved themselves in other places as well as in his mill. The result is summarized in Table I which has been calculated to exhibit the difference between the two samples and not the variation from a mean. The percentages are calculated on the higher assay so that each difference is represented as a deficiency.

TABLE I.

	Copper, %.		Gold, Oz.		Silver, Oz.	
	A	*B*	*A*	*B*	*A*	*B*
Total of assays......	21.73	21.56	2.615	2.480	50.47	51.25
Mean........	3.10	3.08	0.238	0.225	4.59	4.66
Difference...	......	0.02	. ..	0.013	0.07	... .
" per cent........	0.64	.....	5.46	......	.. ...	1.5

The table shows that in sample *A* the copper was 0.64 per cent. and the gold 5.46 per cent. higher than in sample *B,* while the silver was 1.5 per cent. lower. The original table is worthy of study in detail. If we had enough records of this kind it might be possible to establish the source of errors beyond dispute. Ten of the lots had less than 10 oz. silver per ton. In five samples *A* was 2.45 per cent. higher than *B*; in the other five *A* was 3.68 per cent. lower than *B*. The eleventh lot was the only one that approached in value the ores usually sent to custom smelters. It contained 25.7 oz. in *A* and 26.4 oz. in *B*, a difference of 2.65 per oz. and 0.31 oz., a difference of 6 per cent. I cannot find anything in the design of this mill or in the use of machinery which affords any other explanation of the discrepancies than fractional retardation and separation of fragments that ought to have kept together during the seven crushings and samplings to which the ore was conveyed through strongly inclined chutes by gravity alone (the last rolls being fed by an apron). The assays show that there was some cause of variation in the mill and the only variable discernible is the effect of gravity feed. Certainly it was not in Mr. Johnson's samplers which are of the best type. It is not likely that such a variation as 3 per cent. could occur in sampling ore above ½ in. diameter, and I attribute the differences to delayed sampling of rich fines apart from the coarse ore that belonged with them. The successive crushings were to maximum sizes of 3, ¾ and ¼ in. or 5, 1¼ and ½ in. but always containing fines and the behavior of dust and fine ore in long spouts with a slope of 55 deg. would be very different from that of coarse ore.

Sampling as a System of General Averaging

As now conducted sampling is a system of general averaging in which the correctness of an individual act is not asserted, but accuracy is made to depend upon an incessant repetition of these individual acts in the hope that their plus and minus errors will balance. A sampler making 11 r.p.m. and two cuts per revolution takes 1330 cuts in 10 hours, and if the feed is 400 tons the weight passing through is 60.6 lb. for each cut. With 15 per cent. cut 9.9 lb. goes to the sample and 51.51 lb. to the reject. Sampling as conducted now may be said to disregard the question whether the 9 lb. is a fair sample of the 51 lb., but asserts that 9 lb. × 1330 is a fair average of 51 lb. × 1330.

I consider it evident that sampling would be improved if the first of these assertions also could be made true and each 9 lb. be a fair average of the 51 lb. with which it entered the mill. I believe that accuracy can be increased by controlling the retardation of the ore so that two important improvements can be made. Separation of particles that ought to be associated can be lessened materially and equal quantities of ore can be delivered to the samplers in equal times —one revolution of the sampler for instance. The essential point is that the ore shall be moved to each machine (except perhaps the first crusher) by mechanical means instead of by gravity. There must be conveyance either by belts or shaking spouts or aprons, as any of these is more durable than screw conveyers. The changes required for such a mill are not objectionable. With belts it might be necessary to make the building longer, but its hight would be decreased more than correspondingly. Shaking spouts would probably be best for samplers and shaking aprons to distribute the ore to rolls. As to power required for these additions and expense of maintenance it would not compare with the power used in elevating the 15 or 20 ft. which would be saved in hight and the cost of repairs would not be a tithe of those an elevator calls for.

The dispositions necessary to introduce shaking spouts are neither expensive or intricate. Separate shafts and belts would often be unnecessary for crushing machines of all sorts can be designed so that shaking arrangements can be attached. The movement required is very small, since the spouts can be given any slope (less than the angle of rest) which is needed to pass the output of the machine while still keeping the spout properly loaded. The latter is an essential point, for this discussion is based upon the belief that good sampling is dependent upon keeping a body of ore in the spout so that there will be no intermissions in the delivery to the sampler. The slope must be adjustable so that the spout can be set to deliver a stream just large enough to dispose of the day's work. The most serious criticism to be made on the gravity system of feed is that regularity is impossible and in the mills I have seen it was only in the last cut, which was preceded by apron feed to the last rolls, that regular feed and a really fair sample were taken.

Suggested Improvements

I have never seen the subject of sampling discussed from the point of view I have taken and therefore I may be pardoned for repeating. (1) That particles of ore thrown together into the first (or any other except the last) crusher become separated (without the millman's cognizance) and subsequently are sampled apart from each other. (2) The results of this separation are not known, but I believe them to be adverse to good sampling. (3) I would correct this evil by introducing controlled feed in the place of the haphazard effects of gravitation which cannot produce regular action from the heterogeneous mixture of sizes and densities of ore as it is mined and crushed.

The effect of controlled retardation upon the general plan of a sampling mill may be understood by the changes which would follow the introduction of shaking spouts into the Great Cobar mill, which is a good example of the arrangement of a modern mill. Its elevations are not excessive and the effects of retardation are moderated, though not eliminated. The elevations needed would be:

Elevator headfall	6 ft
Collecting bin	3 ft
3 crushers	11 ft
4 samplers	6 ft
7 spouts	11 ft
Foundations	7 ft
	44 ft

The lift of No. 1 elevator would therefore be 45 ft instead of 61 ft, vertical, between centers. The allowance for the shaking spouts includes provision for slope adjustment.

Accurate sampling is one of the most important subjects before our profession. I think the statement so often made that the two samples by opposite cuts of one machine do not vary more than 0.5 per cent. and therefore the excellence of the work (usually the excellence of that machine's work) is proved has some basis in fact. Still it does not prove more than that there is a harmonious balance of the work and success achieved by much repetition. It disregards the fact that there is a multitude of unseen blunders and unknown errors going on all the time.

I have often been impressed by the fact that while gravity is the most common force in use its actual influence upon our milling has not been appreciated until recently. Its controlling effect upon crushing, and consequently screening, has been known for years, as pointed out for instance by Scobey (*Min. and Sci. Press*, June 1, 1901), but not always. If I remember aright Rittinger does not mention it, but he fed rolls from a shaking apron, or similar device, with a fall of 8 or 10 in. which gave a velocity that suited the slow moving rolls of his time. He knew nothing of sampling as it is done in our day and it is in this important work that the effects of gravity are erratic.

It may be thought that the improvement I suggest is rather belated for a novelty, since shaking aprons with their controlled feed have been used for a century at least and I have spoken above of two in sampling mills, but if there is a mill in which such devices are used to regulate the work at every step I have not seen nor heard of it. I believe the introduction of calculated control of feed would be a novelty and a valuable one.

Gems in New South Wales and Queensland

By E. S. Mance*

But little attention is now devoted to the mining of diamonds in New South Wales and the stones obtained are secured in the course of treating the stanniferous drifts. The stones are exceedingly small and, therefore, difficult to market. The yield recorded for 1907 is 2539 carats, valued at £2056.

The precious opal won in New South Wales during 1907 is valued at £79,000. The opal was chiefly obtained in the vicinity of White Cliffs. A new field is being opened up at Wallangulla in the Walgett division. A dark variety of opal, known as black opal, is obtained there and choice specimens bring as high as £30 an ounce in the rough. The deposits in the State of Queensland [illegible] an output valued at £3000 in 1907.

The sapphire deposits at Anakie in the State of Queensland were actively exploited and stones to the value of £30,000 are estimated to have been won during 1907.

The simplest way to treat waste sulphuric acid in a brass plant, states a writer in Copper and Brass, is to evaporate it to one-half its bulk, using waste heat from the furnace, which crystallizes out most of the copper sulphate.

---

*Department of Mines, Sydney, New South Wales.

Electrolytic Determination of Bismuth

F. J. Metzger and H. T. Beans (*Journ., Am. Chem. Soc.*, April, 1908, p. 589) describe a method for the electrolytic determination of bismuth which is said to be free from the difficulties encountered in previous methods. The metal is deposited in compact form and can be washed and dried without loss, and there is no deposit of peroxide on the anode when the electrolysis is complete.

The principles of the method are: the use of acetic acid to prevent the hydrolysis of the bismuth nitrate solution, the elimination of free nitric acid by the addition of sodium hydroxide, and the addition of boric acid to improve the character of the deposit and to prevent the formation of bismuth hydroxide without the addition of large quantities of acetic acid.

The bismuth is dissolved as nitrate in water containing 25 c.c. of concentrated nitric acid per liter. The desired portion of this solution is measured, and then sodium hydroxide is added, drop by drop, to alkaline reaction. The precipitate formed is dissolved in acetic acid and then two grams of boric acid are introduced. The solution is diluted, heated to 70 to 80 deg. C. and electrolyzed. A rotating cathode is employed.

Mining in French Guiana

In a commercial review of the colony of French Guiana, [illegible] Henry B. Kirk, of Paris, states that on account of the rush of gold hunters, agriculture has been almost abandoned. Concessions of from 100 to [illegible] acres) are given for periods of from two to five years, and are renewable almost indefinitely. A [illegible] regulates the prospecting and exploitation of the goldfields, and may be obtained at the Colonial Office in Paris. Permits are granted to anyone without regard to nationality. Gold, which was first discovered near the headwaters of the river Approuague, is today being exploited in the beds of all the principal rivers from the Oyapock to the Maroni.

Silver, copper, lead, iron and mercury are found at many points. [illegible] also been discovered. [illegible] to prospect for petroleum, which is said to exist.

According to E. M. DeGarston, British vice-consul at Santo Domingo, gold is found at the confluence of the [illegible] and the Yaque del Norte rivers, in the Dominican Republic. [illegible]

Notes from Mexico.

Special Correspondence

The La Union mines near Parral, Chihuahua, are being unwatered, and the new manager, Capt. Charles Blunt, hopes to begin converting the 30-stamp amalgamation mill into a modern fine grinding cyanide plant.

Experiments at the Pastitas plant of the Guanajuato Consolidated Mining and Milling Company have demonstrated that a slime filter or an increase in slime tankage will increase slightly the high extraction as well as save the small amount of cyanide now lost with the slime. The extraction reaches 60 per cent. by concentration with an additional 87 per cent. of the remainder by cyaniding, making a total of about 95 per cent.

JESUS MARIA MILL, LA LUZ, GUANAJUATO

BUSTOS 160 STAMP MILL, GUANAJUATO

GUADALUPE MINE, NEAR INDE DURANGO

EL BOTE MINE, ZACATECAS

EL CUBO MILL, NEAR GUANAJUATO

LA UNION MILL, VENCEDORA, CHIHUAHUA

The Guadalupe mine, near Indé, Durango, has electric power supplied from a plant a few miles distant on the river. This plant is a stone's throw from that of the Indé Gold Mining Company recently constructed under the management of C. J. Stone.

An increase in capacity of the Bustos mill of the Guanajuato Reduction and Mines Company is said to be contemplated. The mill now has 160 stamps with a full complement of vanners and Wilfleys. Two tube-mills regrind the sand for cyaniding. The additional plant will consist of more regrinders and additions to the slime treatment plant, including an increase of filter capacity.

Lawrence P. Adams, general manager for the Guanajuato Amalgamated Mines Company, has almost completed an additional number of sand tanks in order to increase the capacity of the cyanide plant. The ores of the mine have averaged, since the mill started, about $7 gold per metric ton.

El Cubo mill, near Guanajuato, is temporarily closed down while undergoing repairs and changes. The plant consists of stamps with sand and slime plant, slimes agitated with air and filtered on a Moore filter and concentrated on canvas tables.

Exhaustive experiments have been made recently at the mill of the Esperanza company, El Oro, under the direction of W. E. Hindry in a small plant, to determine the proper method of treating the large accumulation of sand tailings. The little plant contains two very small tube mills, a tank for mechanical agitation of the ground sand, two air agitation tanks of the Grothe type and a vacuum filter. On the results attained with this equipment it has been decided to place a number of tube mills and recyanide the sands.

The El Bote mine at Zacatecas under the management of J. S. Pattinson will change from amalgamation and lixiviation to the cyanide process, but without interfering with the operation of the present plant. Mr. Pattinson reduces 108 tons in 24 hours with six Chilean mills from ¾ in. to 85 per cent. through 150 mesh. He increased the tonnage per mill from 12 to 18 tons by changing the feed from 2 to ¾ inch.

Short Talks on Mining Law—IV

By A. H. Ricketts*

The United States Mining act, has incorporated in its provisions, the basic principles of the miners' rules, regulations and customs, that discovery and appropriation are the sources of title of a mining claim. That act provides, in terms, that "No location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." While this requirement is confined by the statute to what is generally known as a "lode claim," it has been extended by the decisions so as to require a discovery of a valuable mineral deposit (not in place) within the limits of a placer mining claim.

It would seem, from the language of the act, that "discovery" should precede an appropriation, but under the decisions the order in which these acts are done may be immaterial. Nevertheless, until both these requirements are fulfilled, the claimant has merely an inchoate right and his claim may be defeated by adverse location, peaceably and openly made. In possibly all of what may be called the "mining States" (particularly excepting California), statutes exist permitting a given time after location or taking of certain steps perliminary to the perfecting of the same for the making of discovery, and prescribing the character and extent of the work that shall be done. This protects the claim from adverse mineral location during the time fixed by the statute or local rule governing in the particular place in which the claim may be situated.

Actual Discovery of Mineral

The tendency of the courts also is to shield the claimant while he is engaged, in good faith, in such quest. However, it is essential, in order to obtain title to the claim, that the location must be based upon an actual discovery of mineral within the exterior boundaries of the land sought to be appropriated. The requirements of the State or Territorial law, or miners' rules, regulations and customs (when not in conflict with the Federal mining law) must be followed in all events as necessary acts of location, but the mere sinking of a shaft the required depth or the running of a tunnel a certain length, under such local statute or rule, without actual discovery therein, or elsewhere, on the claim, on otherwise unappropriated territory, is not sufficient to validate the location.

The discovery, as such, need not be of commercial value, but the courts are not in accord as to whether it is sufficient if it be such as to *justify* a person in spending his time, labor and money in its development, or such as to cause him to be *willing* to make such expenditures; or whether it may be based on mere indications of mineral or not. The locator need not be the first discoverer of the deposit. It is sufficient that it be known to and adopted by him. In the absence of an intervening adverse location, subsequent discovery, says the weight of authority, will validate the location as against the Government and subsequent claims from the date of discovery, but not of location. Hence, intervening rights would not be affected by subsequent discovery in a location not based on a valid discovery in the first instance.

Whether the discovery is sufficient to validate the location is a question of fact and may be raised in a controversy between adverse mineral claimants, or by the Government in patent proceedings. A discovery may be sufficient in either of these instances which would be insufficient if the attacking party is an agricultural claimant. In the latter case the test would be the commercial value of the deposit and not that of its mere existence.

Marking the Location

The mining act provides that, "the location (not its boundaries) must be distinctly marked on the ground so that its boundaries may be readily traced." That is that the location shall be so marked that its limits are clearly defined so that any person of reasonable intelligence may go upon the ground and by the marks thereon determine its lines. So notation [illegible] of the ground appropriated. The cited law does not prescribe the character nor num- [illegible] within which they shall be placed on the ground. Hence some courts hold that in the absence of a local statute or rule supplying such omissions that any physical marks whereby the boundaries of the location can be readily traced is sufficient and a reasonable time should be allowed for that purpose; while other courts hold that the marking should be immediate. Whether the location is sufficiently marked to comply with the paramount law is a question of fact and what is a reasonable time must be determined by the circumstances in each case. The courts are not in accord as to whether the marking of each corner and the end line centers with one or more notices of location is sufficient for the identification of the claim. However that may be, the fact still remains that marking corners of a location is no more than furnishing a means by which the boundaries can be traced and that can be done as well by posting a written notice of description at a point not upon the location at all. A location is not complete until the claim is so marked that its identification is certain. If the local statute or rule requires it to be marked in a certain way it must be so marked but that does not remove the possible doubt of non-compliance with the provisions of the mining act. The mere existence of boundary marks does not of itself prove that the location is either valid or subsisting. An adverse re-locator is not compelled to await a judicial determination of the question. He may make re-location peaceably in whole or in part and take his chances of subsequent litigation because of his action. Of course a valid location is not subject to re-location until the owner has forfeited or abandoned it. The boundaries of a location being once established control as to the rights to the surface and to the vein or lode upon its strike and the extra lateral right attached thereto. An effacement of the monuments is not fatal to the right to the location if not the act nor due to the fault of the claimant. If the question arises their former existence must be proved or at any time before that they [illegible] time of adverse re-location they may be adopted by the re-locator or he may build or place new ones in their stead. A re-location is not always adverse as it may be the act of the owner. For instance to correct error in the original location, so to change its relative position to the strike of the vein or lode or to increase the extent of the claim if without prejudice to the rights of others. Such acts are usually termed an "amended" or "additional" [illegible] lently made. If not the discovery [illegible] right to determine the particular excess by segregation without re-location or amended location.

---

*Member of the San Francisco bar, San Francisco, Cal.

The courts are not in accord as to whether it is necessary to mark the boundaries of a placer location when taken up in conformity with the rectangular subdivisions of the public land surveys. Some of the courts hold that the governmental marking of the particular land appropriated is a sufficient means of identification, while others take the contrary view. This subject is sometimes regulated by local statute. If the location is of an irregular shape the marking of the boundaries is compulsory under the mining act. However, it is not necessary to separately mark the boundaries of each 20-acre tract contained in a placer location made by an association of persons.

The Identification of the Claim

A natural object may be a bay, butte, creek, cañon, gulch, hill, lake, mountain, mountain peak, river, stump of tree, stream, the confluence of streams, an arm of the sea, tree, water fall or cascade; a permanent monument may be an adjoining or nearby claim whether patented or not or owned by the locator or not, a blazed tree, city or town, cut or other excavation as a drift, shaft or prospect hole, a government monument, a post or stake firmly planted in the ground, a road or the point of intersection of roads, a pile of rocks, a railroad depot.

The mining act declares that, "all records shall contain such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim." But no record need be made unless required by local statute or rule, but such addition to the act is not obligatory as a location is complete under the paramount law without the record but is defective if not made when required by such supplemental law or rule. Unless supported by local law or rule the record is not evidence. If a local rule makes a record necessary and the rule ceases to be in force and effect it may be disregarded. The object of the record is to secure a permanent definite description of the claim and prevent its swinging at the caprice of the claimant or to accommodate possible new conditions as well as to serve as a guide for others seeking to make locations in its vicinity. The course and distance from the natural object or permanent monument to some certain point of the location should be stated with reasonable accuracy, that is to state approximately the distance and direction from the starting point to some point on the claim, not necessarily, of course, with the exactness of a survey. The test is: does the reference fix the location with such certainty that by the aid of the record a person of ordinary intelligence can find the natural object or permanent monument and determine the boundaries of the location? The question whether the reference is sufficient is one of fact. The record is invalid if it is shown that the natural object or permanent monument does not exist as stated. The location is void if the record is silent upon the matter. The natural object or permanent monument may be on or off the location. The presumption will be indulged that if there was a natural object or permanent monument that would better identify the claim than that which is named it would have been referred to as the initial point. The record is usually liberally construed by the courts as they take into consideration that locators are not surveyors nor adepts in the law of conveyancing. What is denominated as the "record" in the mining act is usually called the "notice of location" or "certificate of location" and sometimes the "declaratory statement." In some jurisdictions it must be verified. The additional burden thus cast upon the locator is excused as being a safeguard from fraud. The "record" must always further contain the name of the locator, the name of the lode or placer claim, the date of location and such other recitals as local law or rule may require.

When the Location is Complete

The necessity for posting a notice of location upon the claim or making a record is dependent upon the local law or rule. Whether one act precedes the other is immaterial unless their order is expressly provided by the local law or rule. Even if not so required such acts add to the safety of the claimant although they are held to be devoid of legal effect in the absence of such requirement. So the recording of an instrument not authorized by law to be recorded does not impart construction notice, but the fact that a notice is posted or recorded generally by the miners in a certain locality is at least some evidence of a custom requiring such acts. It may be stated, in passing, that in these articles, for the sake of brevity, the word "rule" is used as equivalent to the term "miner's rules, regulations and customs."

The safe location of a mining claim demands an observance of the provisions of the mining act and of the local law and rules of which one cannot be assured except by a study of the same as a location is not complete until all the requirements of the same are compiled with. A patent is conclusive proof of a perfected location. The mining statutes of the various States and Territories are substantially similar but often differ in extent and detail. They provide, among other things, for a preliminary notice of location to be posted on the claim, give time for exploring and development work before the making of the record and provide what shall be stated in each, or that they may be identical as to contents. This intermediate period permits the locator to make sufficient excavations and development to ascertain whether the value of the deposit will warrant further proceedings; and, as in the case of lode locations the vein or lode is the principal thing, and as the locator secures only so much of the same as the location actually covers on its strike, the location should naturally be laid along its course whatever the character of the surface, whether level or inclined, such intervening time gives opportunity to better ascertain its strike before finally fixing the surface boundaries of the claim. The most practicable rule is to regard the course of the vein or lode as that which is indicated by outcrop or surface exploration or work. As has been said by one of the most eminent judges called upon to decide mining cases, "the mere posting of a notice on a ridge of rocks cropping out of the earth or on other ground that the poster had located thereon a mining claim without any knowledge on his part of the existence of metal there or in its vicinity would be justly treated as a mere speculative proceeding and would not itself initiate any right. There must be something more than a mere guess on the part of the miner to authorize him to make a location which will exclude others from the ground, such as the discovery of the presence of the precious metals in it or in such proximity to it as to justify a reasonable belief in their existence. Then protection will be afforded to the locator to make the necessary excavations and prepare the proper certificate for record. It would be difficult to distinguish a speculative location from one made in good faith with a purpose to make excavations and ascertain the character of the lode or vein so as to determine whether it will justify the expenditure required to extract the metal; but a jury from the vicinity will seldom err in their conclusions on the subject."

Record of Failure to Contribute

A provision is usually found in a local law for the establishing of record evidence of the "advertising out" of a co-owner who has failed to contribute his proportionate share of the annual assessment work. This is not even referred to in the mining act and there can be no valid record of the proceedings unless made the subject of local legislation. It may be an important link in the chain of title as the proceedings may or may not divest the title of the delinquent co-owner because of the insufficiency of the notice or because given by one not authorized by law to do so.

The Right of Possession

Prior to the passage of the first mining act (1866) mining on the public domain was a technical trespass and the right of the mineral claimant rested solely upon the right of possession and the forebearance of the Federal Government. This condition led to the passage of an act by Congress previous to that statute to the effect that, "no possessory action between persons in any court of the United States for the recovery of any mining title, or for damages to any such title shall be affected by the fact that the paramount title to the land in which such mines lie is in the United States; but each case shall be adjudged by the law of possession."

It has been held that the term "mining title" means the title obtained by compliance with the local rules and that the term "the law of possession" means the possession under local rules. Under the present mining act (1872) possession follows location with the paramount title remaining in the United States until patent issues. The possession may be actual or constructive; the latter alone is sufficient as a strict compliance with the act and local law or rule preserves the right. Discovery alone vests no right nor title in the location as it is but one step in acquiring title and must be followed by a performance of all other acts essential to location. Nor does possession follow location. Location unlawfully made initiates no right of possession. Without location the claimant's rights upon the public lands are confined to the place in which he is in the actual possession. Possession without adverse claim for the period prescribed by the local statute of limitations, say five years, for example, is equivalent to a valid location. So there may be a right of possession by virtue of a valid location or by virtue of the local statute of limitations. But there must be more than a loose, uncertain, scrambling and mixed possession of the claim to ripen into a right under such law. Mere possession will not avail against a valid location but possession alone is adequate as against a mere intruder or trespasser even without color of title, especially so as against one who takes possession by force and violence. A mere intruder and trespasser cannot make his wrongdoing successful by asserting a flaw in the title of the one against whom the wrong has been by him committed.

The right of possession may be transferred by deed before the location is completed. In an action growing out of an application for patent each party must not only prove his right of possession against his adversary, but also against the United States and the judgment may be in favor of neither on that point. An agricultural patent carries the title to all minerals found within the area described therein subsequent to its issuance and the possession of the holder cannot be disturbed by prospectors without his consent. If the land was in fact mineral at the time the patent was issued it is not subject to attack upon that ground except by the Government, unless it contained a "known mine." The term "agricultural" in the sense here used is not confined to land subject to cultivation.

John W. Mackay

The accompanying illustration shows the statue of John W. Mackay, which stands in front of the new mining building of the University of Nevada, a gift of his son, Clarence H. Mackay. It represents him, pick in hand, in the characteristic garb of the miner.

This is precisely as it should be, and the sculptor, Gutzon Borglum, has made the most of his rare opportunity. How unfortunate it would have been if John W. Mackay had been represented wearing a high hat and a frock coat! As a miner he laid the foundation of his fortune, and as a miner he will be remembered.

So many families of wealth try to conceal the humble employment of the founders of their fortunes, that it is a genuine surprise when the truth is actually gloried in.

Clarence H. Mackay will be esteemed all the more for his pride in the early deeds of his father; Mr. Borglum will win praise for his artistic perception and execution; and the University of Nevada will be congratulated upon having so noteworthy a monument.

The osmium filament takes 1.5 watts and the tantalum 1.7 watts for direct current, and somewhat more for alternating.

Quicksilver in Russia During 1907

[illegible]

Cinnabar, the source of mercury in Russia, is extracted only by one single concern, Auerbach & Co., whose work is in the Province of Ekaterinoslav, Bachmut district. The industry is in a state of decay, partly owing to exhaustion of mines and partly because of financial reasons. Therefore the production of mercury has considerably decreased lately. The production [illegible] in 1907, 8,055.4 poods.

On the other hand the consumption of mercury has not decreased in Russia and owing to the increased price in the world's market, the expenditure for the metal rose considerably. In St. Petersburg the price rose recently from 78 and 81 rubles per bottle of 76.5 lb., to 82 and 92 rubles.

Rumors have recently been afloat that the Auerbach & Co. enterprise would be purchased by a group of English capitalists, who intend to make new explorations to increase the output of cinnabar. Although English engineers have examined the property, the decision is still pending.

Cinnabar is found in Russia in a few other places, in the Ural, and in the Altay district, West Siberia, but these deposits appear to be of no present industrial importance.

By-profits of Gold Dredging

[illegible]

At Oroville, California, where such extensive dredging has been done, other profits than the gold won have resulted. The new rock-crushing plant of the Valley Construction Company has started up its first crusher on cobbles from the dredge-mining operations there, and three other crushers are to be installed. The crushed stone finds a ready market for road making and for concrete. The man who owns the land from which these dredge cobbles are being taken received $3000 an acre for the mining rights on 17 acres from the Nevada Gold Dredging Company, and will receive several thousand dollars from the rock-crushing company for the cobbles. After the cobbles are crushed and removed he expects to sell building lots in an addition to Oroville. This shows that dredge mining is often profitable to those not actually employed in operating the dredges.

The first commercial metallic-filament lamp was the osmium lamp, invented by Auer von Welsbach in 1898. It became of commercial importance in 1902.

Veta Colorado Cyanide Mill, Parral, Mexico

This Pioneer Cyanide Mill for Treating Silicious Silver Ores from the Veta Colorado Vein Will Use Fine Grinding, Agitation and Filtration

BY CLAUDE T. RICE

In the past the bulk of the ore from this long vein near Parral has been smelted, but some of the poorer ore has been roasted and lixiviated with hyposulphite. In fact the Refugio and Preseña mines are equipped with lixiviation mills, the Preseña with two and the Refugio with one, all of 80 tons capacity per day; at present these are shut down.

Lixiviation is expensive, since it necessitates the roasting of sulphide ores, and the percentage of extraction on ores of low grade is small. Therefore it has become necessary to devise some cheaper and more efficient mode of treatment. The Veta Colorado Mining and Smelter Company, which owns the Quebradillas and Santiago mines decided originally to follow the example of Guanajuato and treat these silver ores by cyanidation.

The Veta Colorado ores are highly silicious and strictly silver ores, for they contain little gold and that mainly in the pyrite. The silver occurs both as argentite and as silver chloride; the lead, zinc and copper content is very variable but never is greater than 1 per cent. lead, 1 per cent. zinc and only a trace of copper. The silica content is about 60 per cent. while the iron pyrites in the ore amounts to 2 or 3 per cent.

Treatment by Cyanidation

At first the company intended to treat the silver ore by decantation and to follow the general mode of treatment used at Guanajuato. In fact the mill site had been graded for such an installation and the tanks had been ordered, when it was decided, after consulting with Robert Allen of Kalgoorlie, Australia, to use fine grinding and agitation.

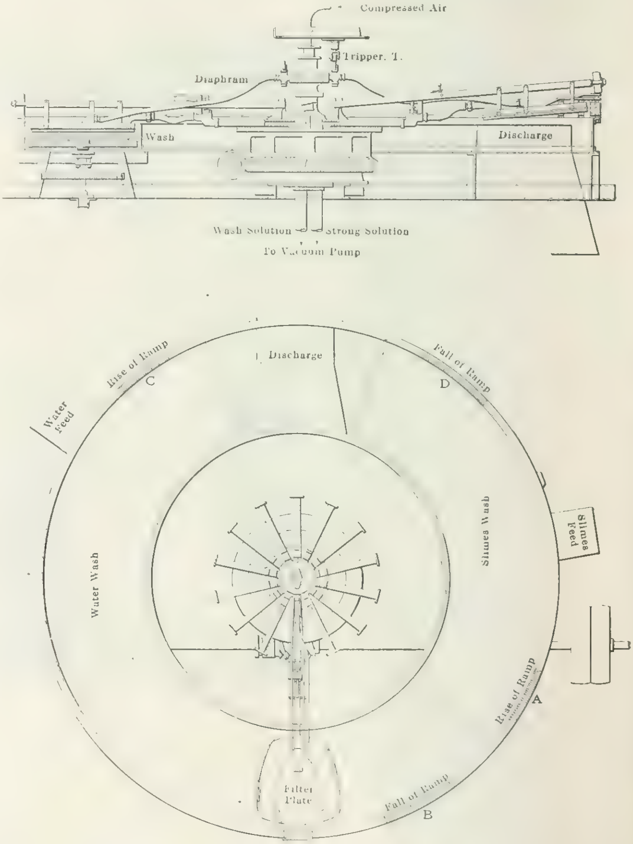
The plans were therefore revised, and the mill treatment was made to conform more nearly with the Australian method of treatment in this, the pioneer plant in the Parral district. This mill is not completed, but is almost finished and the machinery can be installed in three months The treatment therefore can only be outlined at present. Later it is hoped that a detailed description of the ore treatment will be given.

The ore is crushed in a separate breaker house in Blake crushers, the crushers being arranged in duplicate, and crushing in series as is indicated in the accompanying flow-sheet. The ore is then conveyed by a Robins belt conveyer to the bins above the stamps. On the way the ore is sampled and automatically weighed by a Blake-Denison weigher. The ore bin is divided into eight compartments, and the belt conveyer is provided with a movable tripper so that the ore in the different compartments can be kept uniform in composition. These bins have flat bottoms, and the sill timbers for the bin form part of the battery frame, so that the ore in the bottom of the bin not only is a reserve, but it helps by its weight to steady the battery frame.

Details of Stamp Batteries

The ore from the bins is fed by Challenge feeders to the stamps which weigh 1050 lb. and which drop in El Oro mortar boxes, weighing 9500 lb. Each group of 20 stamps is run by an individual motor from a line shaft placed near the floor. The mortar rests on a concrete mortar-block, and the cam-shaft floor is built separate from the battery frame, so that it will not vibrate.

The hight of drop will be about 7 in. and as 8- or 10-mesh screens will be used and the hight of discharge will be kept as low as possible, it is expected that the tonnage crushed per stamp per 24 hours will be about 6½ tons.

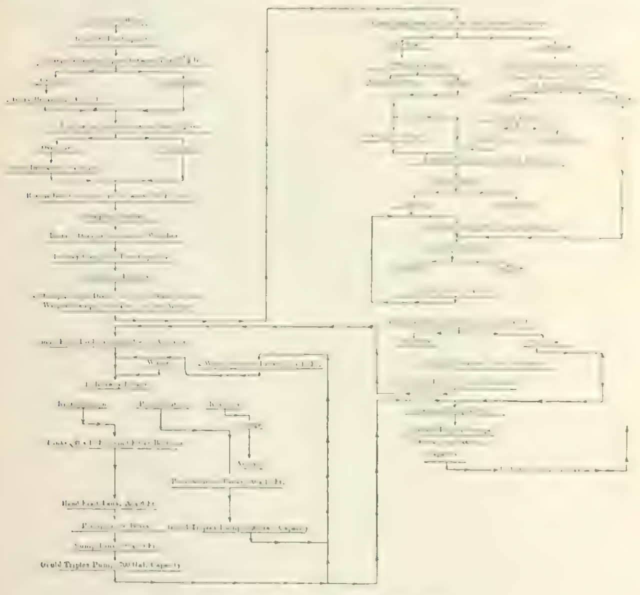


SLIME FILTER, VETA COLORADO MILL

The ore is crushed in weak cyanide solution, and the pulp from each 10 stamps is separated by two cone classifiers into coarse sand, fine sand, and slime. The coarse sand from each set of cones goes to a Wilfley table, the fine to a Card table, while the overflowing slime goes to four cone classifiers which separate the finest of the pulp for further grinding in the tube mills.

The tailings from the tables treating the coarse and fine sands go to eight Wheeler pans where they are reground and then elevated to eight Card tables.

The Wheeler pans are a modified form of the Australian type, in which the muller is suspended by gimbals from a yoke (sliding vertically on a feather on the vertical driving shaft) so that the muller can adjust itself to the ore. These pans are 5 ft. in diameter and 3 ft. deep; the discharge hole, 3 in. diameter, is about one-half way up the side. It is thought that each pan will have a capacity of 25 tons per 24 hours.



FLOW SHEET, VETA COLORADO MILL

The tailing launders from the tables are made in the solid concrete and are given a 6-per cent. grade so that there will be no danger of clogging.

The eight Wheeler pans are driven from the line shaft that runs the belt elevators, which raises the pulp to the Card tables and the tube mills, and one of the battery pumps. This line shaft is run by two motors, another motor being held in reserve.

The tailing from the secondary tables and the overflow from the four large classifiers are sent to five tube mills, 14 ft. long by 5 ft. diameter. These tube mills are mounted on hollow trunnions and are fed through these trunnions by large scoop feeders. Chilled-steel liners, 1⅞-in. thick, will be used in the tube mills.

SETTLING THE PULP FROM THE TUBE MILLS

The pulp from the tube mills is elevated then to the cones above the tube mills and is again classified. The overflow from the classifiers above the tube mills is then taken to a large settler 90 ft. long by 40 ft. wide and 6 ft. high (measured from top of tank to bottom of V-trough). The bottom of this tank consists of a series of eight V-troughs, 5 ft. wide and having an angle of 60 deg. at their apices. In the apices of these troughs are placed the discharge valves of the adjustable clamp type. The water in this settler is kept about 8 in. higher than the tops of the V-troughs, the sides being extended higher so as to protect the surface of the large tank from wind. An even distribution of the pulp is obtained along this long tank by splitting the feed into six parts, each part going to an iron trough having a perforated bottom, and divided by partitions into compartments 15 ft. long. Tanks similar to these, except that a series of pyramids forms the bottom instead of a series of troughs, are used at Broken Hill where they work well.

In this settler most of the pulp will be drawn off from the first two troughs and a clear overflow will be obtained which goes to a battery solution tank 36x10 ft., whence it is pumped by two Gould triplex pumps, one 700-gal. motor-driven and one 800-gal. belt-driven, to the solution tank above the batteries.

The underflow from the large settler is mixed with strong cyanide solution and then elevated to the 12 to 14 Pachuca tanks, in which it will be agitated for two days. Only seven of these tanks are being erected at present; they are 45½ ft. high and 15 ft. diameter.

The pulp at the end of that period is then taken to 10 Ridgway filters where the pulp is filtered.

FILTERING BY RIDGWAY FILTERS

Ridgway filters are being introduced at different mills in Mexico, and as they are rather new to American readers their mode of operation will be indicated.

The Ridgway filter consists of a series of 13 leaves, having a filtering area of about 4 sq. ft. each, suspended from a rotating framework, driven by a hollow central shaft, and supported on the circumference by wheels traveling on a track which forms the top of the outer side of the annular trough (outside diameter 13 ft. 2 in., inside diameter 8 ft.) over which the leaves pass.

The leaves of plates consist of a thin wooden box over the perforated underside of which is stretched canvas cloth; the top is connected by two lines of hose, one to the suction chamber and the other to the compressed-air chamber.

The trough is divided radially into three sections, in one part of which is the pulp, in another part the wash water and under another part is the hopper into which the washed cakes of residue drop when discharged from the filter. The parts of the trough containing the pulp and the wash solution have agitators in the bottom which keep the slime in the first and any overcarried slime in the second section from settling.

At the beginning of the cycle the leaf is immersed in the pulp, and with fairly silicious (sandy) pulp a cake, ⅜ in. thick is formed in 13 sec. during which time the plate is in the first compartment containing the pulp. As the leaf approaches the end of this compartment the rim or track (at *A*) gradually rises and therefore as the frame revolves the roller passing up this incline raises the filter plate out of the pulp. The strong solution is thus sucked from the filter for a brief part of the revolution; then the track (at *B*) again descends and the leaf passes into the wash solution which is in the second compartment. At *C*, the filter is again raised out of the solution and the filter sucked "dry" (the filter cake contains about 30 per cent. moisture) until when the section, under which the discharge hopper is placed, is reached, the connection with the vacuum cylinder is closed and connection with the compressed-air chamber is made by tripper *T*. This puff of air drives the cake off the filter and the cycle begins again upon the plate reaching the incline *D* where the leaf enters the pulp solution. As the 12 other plates are following the same cycle and as the rate of revolution is generally one per minute, 13 cakes are discharged each minute. The length of each portion of the cycle, when one revolution is made per minute, is 13 sec. in the pulp, 7 sec. passing from pulp to wash-water compartment, 30 sec. in the wash water, 7 sec. lifting and drying and 3 sec. discharging.

As has been said there is a chamber in the shaft, connected with a vacuum pump, so that the filtered solutions are drawn into it. In this chamber an adjustable but non-rotating diaphragm is placed. This diaphragm is one of the important features of this filter for this partition is so adjusted by experiment that the wash water is cut out at the point where it is too poor to pay to send the solutions to the zinc boxes to be precipitated.

PRECIPITATION OF THE SOLUTIONS IN ZINC BOXES

The weak solution goes to the two poor-solution sump tanks whence it is returned by a 300-gal. Gould triplex pump to the two head-solution tanks. The rich solution is taken to two sand-filter tanks whence the solution flows to a head-feed tank which feeds six zinc boxes where the silver is precipitated. The tail solution then flows to a sump tank whence it is pumped by a 700-gal. Gould pump to the two head-solution tanks or to the battery-sump tanks in case the head-solution tanks are full. The residues from the Ridgway filter are pumped with water and sent by launder to the *arroyo*.

In the clean-up a Dehne filter press, having 30 plates, 30 in. square, is used This is fed by a Dehne power pump.

As will be noticed, in this mill there are two circulations, one, the weak solution, in which the ore is crushed and the other, the strong solution, in which the ore is agitated. The weak solution is not taken to the zinc boxes for it is too poor to precipitate, but since considerable solution escapes from the upper circulation in the pulp going to the Pachuca tanks, the solution gradually works downward into the rich solution and is precipitated.

It is calculated that about 1½ tons of water will be used per ton of dry ore treated. The water used will come from the mine, for this mine water is fairly free from acids or detrimental impurities. At present no provision is made for cyaniding the concentrates, but later it is planned also to treat the concentrates by fine grinding, agitation and filtration.

The mill will be run by Westinghouse induction motors which are driven by a 3-phase 25-cycle, 400-volt current generated by one 200-kw. and three 380-kw. Westinghouse dynamos. The dynamos will be driven by four 200-h.p. Corliss horizontal-compound engines. A 10-drill Norwalk straight-line, compound-air, compound-steam compressor will furnish compressed air to the mine and to the agitation tanks. These engines are equipped with a barometric condenser, and the steam is generated by a battery of eight Heine boilers, two 100 h.p., two 150 and four 250 h.p. in capacity.

This mill will have a capacity when fully equipped, of treating 500 tons of ore per day, and will be used to treat custom ores as well as ore from the mines of the Veta Colorado company. By changing from fine battery crushing followed by cyanide leaching of the sands and mechanical agitation followed by decantation of the slimes, to total "sliming" of the ore followed by air agitation and mechanical filtering of the "slime" the treatment period will be reduced from about 18 days to two days, and more than double the tonnage will be treated with only little more than one-half the tank capacity. As the mill is built on a side hill very little elevating is necessary, but owing to the fact that the mill was not originally designed for sands and slimes treatment, the terraces made were much too large for the present "sliming" plant so that it covers more ground area than it would have otherwise.

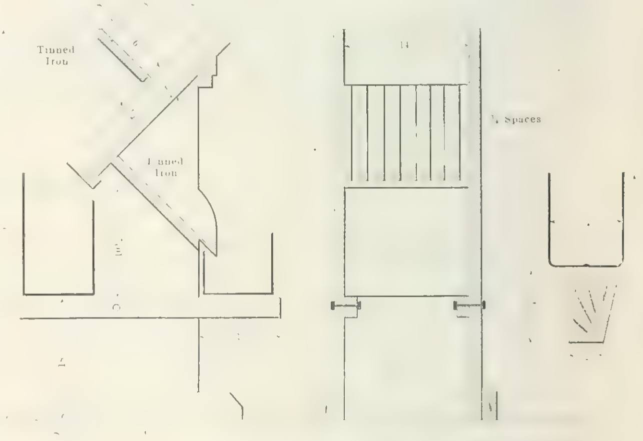
The mill as finally built has been designed and is being built under the direction of Robert Allen, of Kalgoorlie, West Australia, who is consulting metallurgist to the Veta Colorado Mining and Smelter Company.

As yet the mill is far from completion, but its operation will be eagerly watched by metallurgists, not only because it will be the pioneer cyanide mill to treat ore from the Veta Colorado vein, but also because it introduces to America so many principles of Australian cyanide practice.

A New Sampling Device

By A. Livingston Oke*

At La Gloria mine, Batopilas, Mexico, recently, the necessity was felt of some means of rapidly cutting down both mine and mill samples, in order to eliminate the laborious and (probably) incorrect quartering down on canvas sheets. The accompanying drawing is a sketch of a simple sampler I designed for the purpose; a Mexican carpenter built it in a few hours from wood and a couple of coal-oil cans. The drawing may be useful to some of your readers similarly situated. In connection with it I may point out that the portion of the sample taken for use falls through the spaces between the riffles, and therefore runs no risk of salting from a previous sample other than from imperfect cleaning of the two inclined surfaces. These are, however, covered with tinned-iron, as shown, to minimize this.



SAMPLING DEVICE AT LA GLORIA, MEXICO

This sampler permits the use of variously spaced grills to suit the size of sample being quartered down, and to this extent it seems to be an improvement on existing types, which are made in various sizes with the same object in view.

The detail to the right shows an enlarged section of the riffle-bar, which is made from tinned sheet iron doubled and supported underneath by a tapered strip of wood.

---

*Assistant manager, Mina la Gloria, Batopilas, Mexico.

The Yaqui War

Special Correspondence

The truce between the Mexican Government and the rebellious Yaqui Indians, in evidence from early in May to a few days ago, was broken by the Indians and hostilities are now raging more fiercely than before. A great deal has been written by parties more or less informed concerning the difficulties, but a plain statement of a war that has laid waste a district 100 by 200 miles, has resulted in the death of hundreds of Mexicans and some score or more of Americans, many of them prominent engineers of international reputation, and has proved too serious a matter for the government of the State of Sonora, may be interesting.

The Yaquis are a small tribe; when I was last among them there was not believed to be more than 500 fighting men among the hostiles. They have been waging a desultory warfare against the State authorities for many years. This was brought about by the determination of the Mexican government that their tribal lands, their patriarchal inheritances, should revert to the state, and they should be compelled to abandon their homes in central Sonora and live as best they might, among the Spanish inhabitants. For a long period their necessities did not compel them to commit any depredations against the few Americans traveling that region. These were prospectors, developers of mines and engineers sent there to report on what is conceded to be one of the richest mineral sections of northern Mexico. They looked with jealousy on this influx of "Gringoes," but did not dare to call down the vengeance of the troops, which they knew would have to follow if they shot foreigners. So long as they killed only Mexicans, mostly peons, the local authorities were somewhat indolent; the killing of Americans would, they thought, arouse the attention of the United States and force the Government to take them to more strict account. But they coveted the outfits of these Americans; their arms, ammunition and supplies were always more complete and elaborate than those of wandering Mexicans, or of the lone ranchers in the Yaqui valleys. Finally, about four years ago, a party of Americans headed by a well known engineer from Chicago, named Mackenzie, was ambushed and several of the men shot, including Mr. Mackenzie himself. No excess of vigilance, no demands from the American Government following this, the Yaquis became less careful, and since then sporadic cases of shooting Americans have followed. Americans going through the Yaqui districts were compelled to travel by night in the most careful manner, to cover their trails, to maintain watch, and were never permitted to make these trips without a warning by the Mexican authorities and a proffer, by them, of a guard of troops. This, of course, to diminish Mexican responsibility and to make the traveler himself liable in law for what might happen to him.

To this was added the absolute prohibition upon the importation of guns, revolvers or ammunition into western Mexico. Permits to carry these things across the line were obtainable only from the secretary of war, upon the recommendation of General Torres, whose headquarters were at Torin, southern Sonora; the discovery of an attempt to smuggle in arms would subject one to severe punishment and the confiscation of the articles. As it was unsafe to travel without arms, the number of Americans going in was cut down to a mere straggling few, who might either go in with permits or succeed in secreting what they needed. On one trip across the line, due for a long journey near the infested region, I smuggled over an armament of three rifles, three revolvers and 700 pounds of ammunition, although the custom house search was very rigid at the time. The reason given by the government for this prohibition was that the Yaquis were in need of such supplies, and would surely kill any Americans who might take them in. As a matter of fact, if Americans had been permitted to cross freely with ample armament, the Yaqui question would long ago have been settled, for Americans are good shots and not afraid to fight. Quite recently the Mexican government seems to have realized this latter fact, and the prohibition has been raised.

Some years ago the Yaqui leaders were invited to peace conferences, such as have recently been under way. They arrived at the scene of conference and were told to leave their arms behind when meeting the representatives of the state. This was done, and when they arrived they were [illegible] blood. It is the continuance of such acts that has made peace so difficult. The Yaquis may be treacherous, doubtless are, [illegible] their opponents. At one time it is stated the troops in one of their numberless raids against defenseless families threw the little Indian children on cactus spikes and set the plants afire. This story, with a good deal of elaboration, was told me by a prominent official who claimed to know. I have seen scores, yes hundreds, of "tame" Yaquis, that is, men of the tribe who had been living in some town, working quietly at their trades, rounded up by the soldiers, placed in the jails and kept there until there were enough for a shipload, then forwarded to Yucatan to work in the hemp plantations. I have seen the streets of Guaymas crowded for a block around the jail by the wives and children of these men looking their last on their male relatives, whose only crime was the Indian blood in their veins and that they were suspected, whether with or without reason made no difference, of furnishing assistance to their brethern in the field. I have seen, in the great state prison at Hermosillo, a prison of stone and concrete built by Yaqui labor, hundreds of women and children herded in open pens sunk in the ground, separated from their relatives, to be sent to Yucatan, as our own slaves were sometimes sent to work in the rice and cane fields of the far South. I have ridden through the trails of interior Sonora and frequently come to the swaying bodies of hanging Yaquis, who may have been suspended there for days, or for months. These gruesome reminders of war and retaliation are not uncommon in the district east and south of Hermosillo and around Ures. The crime for which these men were hung was the mere carying of firearms, which they may have needed for protection or for obtaining food. Everybody in that section carries guns. I have seen half a dozen Yaqui men stood up against a back wall of some city prison, or near some city gate and shot, after they had dug the graves into which they themselves were to fall. These things were so common and so much a matter of course through parts of Sonora that the curio stores of several cities up to a short time ago displayed photographs of the incidents I have mentioned! How such a condition of warfare hardens the heart and puts a callous on all feelings of humanity!

It is the universal testimony of employers of labor in northern Mexico, on the west side, that these Indians are the best workmen available; they will do more, are more intelligent and willing, and are more brawny and muscular than their peon compatriots. Many of them have drifted across the line and they are to be found in considerable numbers on mining locations and about the towns of southern Arizona. That they earn money merely to send it back to their fighting brethren, as is claimed by the Mexican officials, may be true; it does not detract from their value as workers. A recent proposition of the government that all Yaquis in the country, wild or tame, men and women alike, in town or camp, be rounded [illegible] once and the cry was, "where shall we get laborers capable of good work." A "tame" Yaqui is one who, at the moment, is not on the fighting line. It is generally supposed that he may be there next week [illegible] from the front. It does not tend toward peace of mind on the part of the American employer to feel that the man who [illegible] place made vacant by the desertion after pay day of some other Indian who has gone no one knows where, may have on his hands the blood of some Mexican [illegible]

It is hard to speak plainly of the causes of the apathy of the state authorities, but it may be said that graft, such as has been the bane of politics in the northern republic, has been at least one of the causes for the long delay in bringing this Yaqui matter to a focus. Many of the higher officials of Sonora are doubtless honest in their desire that the war shall cease and peace come to the state; but enough see in the continuation of the present disgraceful scenes the opportunity for theft and robbery which will make it very hard to end the struggle. It is not impossible, if the truth were known, that the breaking off of peace negotiations a week or two ago was due to some influences from this element. These negotiations were brought about by the demands of the government of the Republic that the state should get busy and do something. The war has been resumed and 4500 soldiers are in the field under command of Gen. Lorenzo Torres, of Torin, which is on the border of the Yaqui country; indeed, Yaqui outrages have been committed within sight of the fortress there. They have been committed on the orange groves of Gen. Luis Torres, six miles from Hemosillo, and not long ago the foreman of Governor Isabel's big farm, near the capitol, was frightfully mutilated and sent to town with a note to the governor that the Indians would do the same and more to him if he ventured out of the city. Thereupon Governor Isabel removed the seat of government from the palacio to his residence, and staid within doors.

As with the officers, so with the soldiers. I have said that the government demanded that Americans going into the interior take a guard of troops; very few did so, none more than once. The troops were no protection; for at the first sign of trouble they ran; in the meantime, they lived high in camp. They are largely renegades. There was no telling which party they might shoot when the occasion came, if they should stay to shoot anyone. However, it would make little difference except for the moral effect and the noise whom they shot at. Their marksmanship is not of the best.

Their marksmanship is not of the best.

ican Republic to make good in this matter. Here is a desultory war that a handful of poor men, goaded by oppresion and cruelty for a generation, has successfully waged against a great nation. Surrounded by troops, inclosed in a little region of rivers and cañons; shut off from many of their waterholes with arms, clothing, supplies, food, cattle carefully kept from them, yet they have for many years made the region a desert and terribly unsafe. The Mexican people are on trial before the civilized world and an accounting must come. They are passing through the struggles this nation fought out in the southwest in its Apache and Navajo wars and they have had ample time to conquer, if conquest was the desirable thing. It is against the genius of modern civilization that a mere handful of resourceless people like the Yaquis should longer terrorize a great state, paralyze its commerce, devastate its ranches, its mines, its haciendas, and set at naught the efforts of a great nation to maintain peace within its borders. The condition is intolerable and unnecessary. Sonora is a state of vast resources in agriculture, mines and timber; these are now valueless, traffic and travel are impossible, agriculture is ruined, mining is abandoned, ranches are destroyed and cattle are dead for want of care, their owners bankrupted. Capital is driven out, enterprise is dead. Such a condition is indeed strange for a civilized nation in the twentieth century.

Hundreds of these Yaquis have been deported to Yucatan; of these many have toilsomely worked their weary way back and are again in arms against the power that sent them to slavery and expected their death in the bleak and rocky peninsula. This policy might be of avail if the authorities could send out the right men; but these shipped have been chiefly women and children and men working quietly in the towns and cities and on occasional haciendas. The hostiles have not been deported, for they could not be caught. They have been hanging above the passes and on the brinks of cañon with finger on trigger and eye at sight. They have been watching and ready to swoop down on undefended ranches and haciendas in the absence of troops or guards.

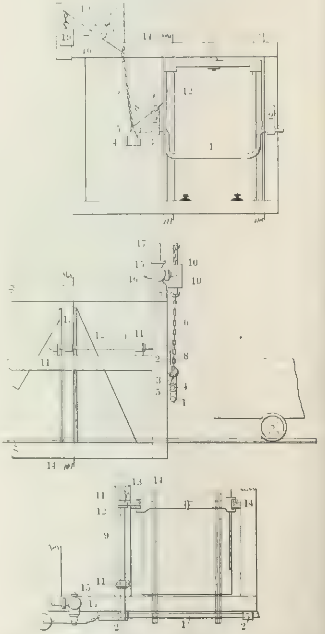
Today the state of Sonora is a hot-bed of hostile criticism of government methods. The feeling is very high, higher than ever on account of the hope that, a month ago, was in every man's heart that the scenes of bloody cruelty were over, and that peace was come. The disappointment is poignant. Criticism is going deeper than ever and extends to the causes of the situation, to the attitude of the central Republic government and to the alleged acts of many officials. June 15 was the date set for final signature of the treaty, and by August 1 the entire Yaqui region was to be safe. But today the border is alive with rumors of murders and crime.

In justice to both sides it must be remembered that a great many of the outrages alleged to have been committed by the Yaquis, have doubtless been by Mexican hombres, bad men, who have profited by the state of insurrection and are robbing and killing under cover of it, and with the expectation that their acts will be laid to the renegade Indians. Sonora never had so many of this despicable class as today, and an iron hand, such as Emilio Kosterlitzki's, will be needed to restore order after the Yaqui trouble has been set at rest.

It is said that old phosphorized copper tubes make gun-metal hard, and make good phosphor-bronze.

Safety Device for Landings

A device is described in *Der Bergbau*, April 30, 1908, which is designed to prevent a car from being pushed into the shaft before the cage is properly landed to receive it. The device, shown in the accompanying sketch, consists of the bent bar 1, supported at each end by the brackets 2, fastened to the two posts of the station framing. One end of this bar carries the rigidly attached lever 3 and pin, 4. On the latter is placed the loop 5, to which is connected the chain 6. The levers 8 and 10 are fastened to this same chain. The lever 8 is rigidly connected to the shaft 9, to the other end of which is fastened the lever 12, which plays through a slot in the wooden guide 14. The lever, 10 actuates the valve of the whistle 17, in such a way that when the weight 19, falls, it opens the end of the compressed-air pipe 16, and blows a blast on the whistle.



ARRANGEMENT OF STATION FRAMING, SAFETY LEVERS, ETC.

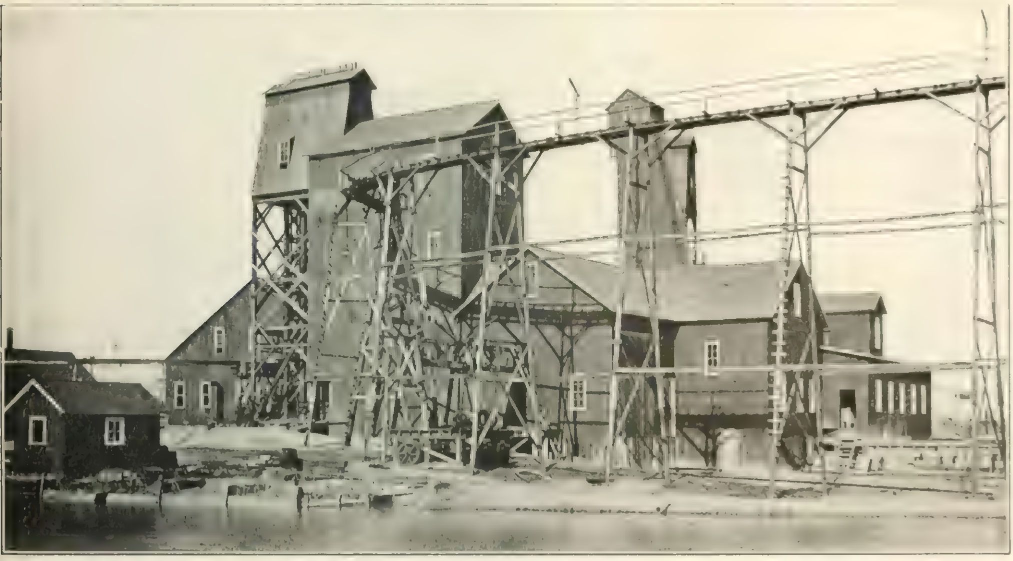
If, now, the bar 1 is raised sufficiently to permit the passage of a car under it, the cage not being at the station, the weight 19 lifts the end of lever 8, thereby throwing the lever 12 toward the shaft, and at the same time blowing the whistle. If the cage is standing at the station, the lever 12 cannot pass through and beyond the guide, whereby the weight is prevented from falling, even when the bar 1 is lifted, and the whistle remains silent.

Mill Construction in the Joplin District

Increased Capacity Has Introduced Changes in Practice and Probable Removal of the Building to a New Site Is Provided for in the Plans

BY OTTO RUHL*

The development of the lower-grade orebodies in the sheet-ore belts of the Missouri-Kansas district has resulted in the construction of mills of larger capacity. This increase in capacity from 100 ton plants to 200- and 1000-ton mills has taken place during the last four years and has greatly increased the importance of design and construction.



ORONOGO CIRCLE NO. 5, SHOWING HEAD FRAME, HOPPER AND FORM OF MILL

The increased capacity of the mills makes it necessary to employ larger and additional machinery such as rougher and sand jigs, screens, elevators, settling boxes and concentrating tables, with a corresponding increase in the power equipment; all requiring floor space and larger buildings. Since the introduction of natural gas and electric power, coal is seldom used and the room formerly occupied by coal bunkers provides the necessary room for air compressors and additional engines and boilers. The long rectangular form of building is preserved; both length and breadth have been increased. The power house is either an ell of the main building or entirely separate. The latter method is becoming popular when power production involves the use of boilers, for the separation of the buildings is a security against fire.

In addition to the typical form, there are a few mills of irregular design, a notable example of which is the gravity mill at the incline shaft of the Electrical Zinc and Lead Company north of Webb City. The ground plan of the Deacon mill shows the pronounced long rectangular type while the plant of the Oronogo Circle No. 5 shows a modification of the same form. The dimensions of the modern mills are from one-third to one-half greater in width and from one and one-half to twice as long as the older mills.

Foundations and Building

Larger machinery requires especially firm foundations. All rolls, jigs, elevators and tables are placed upon concrete foundations. The frame-work of the mill which must stand the strain of shafting is all supported by concrete piers. Even with the best of care the vibration of the mill is troublesome; it throws machinery out of alinement and loosens bolts and nuts. An improvement could be effected by manufacturers of machinery by putting in keys in bolts not subject to constant regulation.

Formerly the framework was mortised and spiked. Present practice avoids this as far as possible, substituting with ¾-in. bolts or lag screws. The purpose is to preserve the framework when it becomes necessary to remove the mill to a new site.

Trussed framework was formerly used as a support for both roof and shafting. The latest method involves the erection of a separate set of rafters to secure the roof. This does away with some of the vibration and renders it possible to make repairs in the shafting framework without interference from the roof structure. In the Mercantile mill, north of Webb City, the framework is made of steel; but the majority of the mills retain the wooden frame.

Another departure in recent building is the substitution of sheet iron and galvanized sheets as a covering for both sides and roof. This practice is widely [illegible] factory, embodying as it does durability, protection from fire, and ease of removal with small waste.

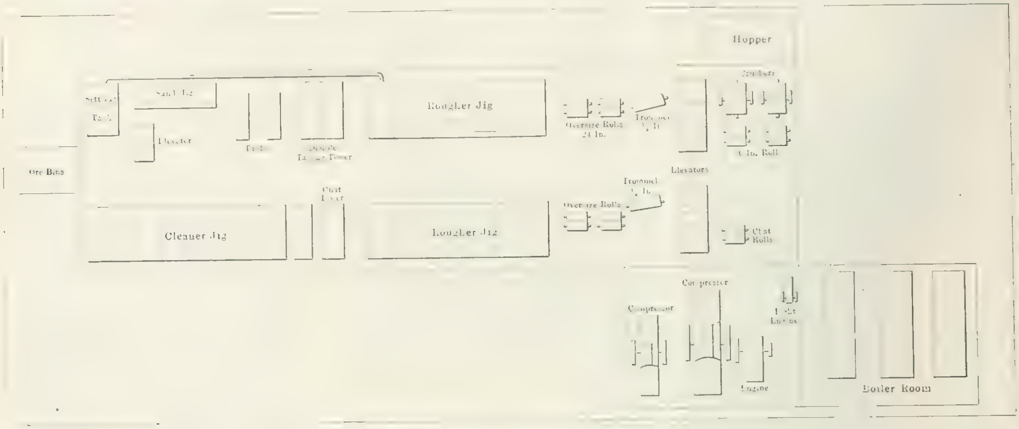
---

*Webb City, Missouri.

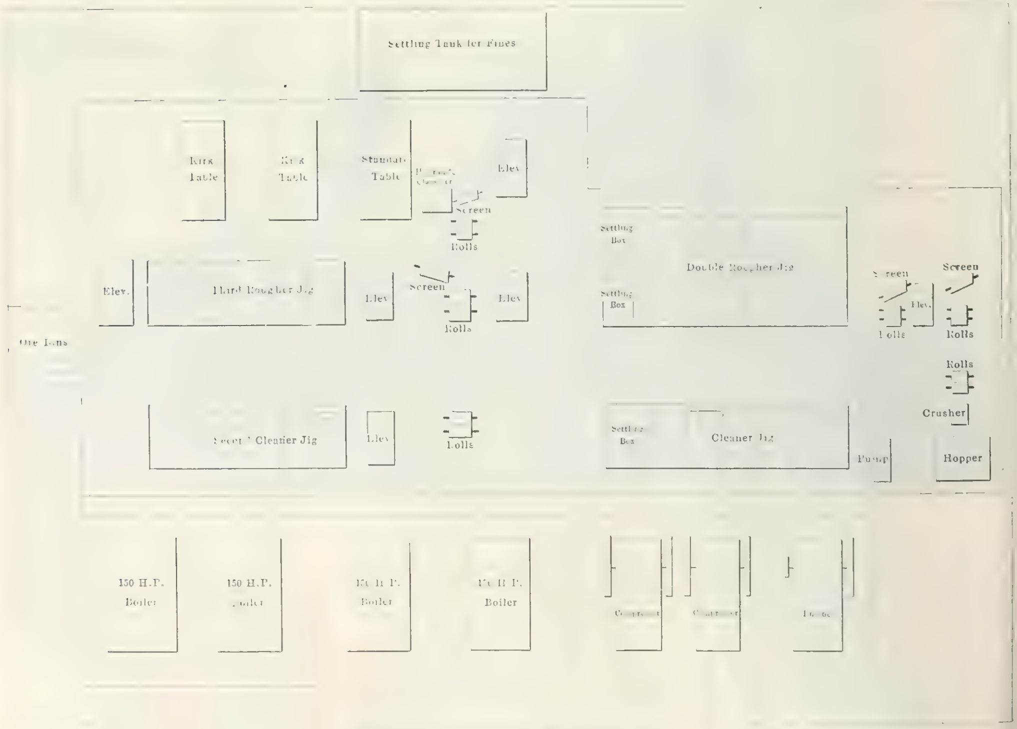
Jig Construction

The cells of the jigs used in mills of the old type have been enlarged from 28x30 in. to as large as 34x48 in. Another change has been the reduction in the number of cells in the rougher jigs in many of the later mills from five and six cells to four. The increased size and weight to be borne by these jigs has led to the abandonment of all methods of construction but one, that of laying the walls with 2x4-in. strips of planking well calked with wicking. For the same reason jig foundations are provided by building concrete piers under each end of the jig and often under the center.

The construction of mills having a capacity of 300 tons or more, calls for the installation of at least two rougher jigs. These will treat 300 tons of ore per day, and the product can in turn be handled in a six-cell cleaner jig with 28x42-in. cells. In this case, however, the chat product of the roughers must be provided



GROUND PLAN OF THE BEACON MILL



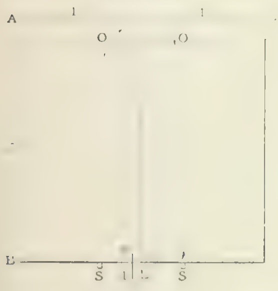
GROUND PLAN OF ORONOGO CIRCLE MILL NO. 5

for by the use of another jig or the first two roughers must be exceptionally large in proportion to the cleaner jig. At the Oronogo Circle No. 5, where the cells of the two roughers are 34x48 in. and those of the cleaner are 28x42 in., a second rougher and cleaner jig handle the chats; but at the Deacon mill, where the cells of the two roughers are 34x48 in., the cleaner cells are but 30x32 in. and the roughers rehandle all the chats.

The use of sand jigs has with few exceptions become the established practice in all places where large quantities of sandy ore are produced. These jigs are modeled after the rougher and cleaner jigs but have smaller cells. They have from five to seven cells which vary from 22x32 in. to 26x38 inches.

SCREENS AND FRAMES

The installation of more sizing screens is a new feature in local mill construction. In all the new mills the ore passes over a ¾-in. grizzly before going to the crusher. The undersize goes directly to the dirt elevator. This arrangement increases the capacity of the mill, and in sheet ground where blasting breaks the ore into fine particles, fully one-quarter to one-third of the dirt never passes through the crusher and first set of rolls; fully one third to one half of the undersize from the screen to the second set of rolls goes directly to the rougher jig.



PLAN OF SETTLING TANK

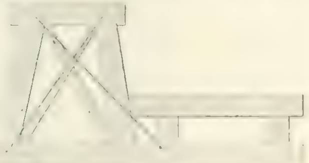
A screen is now universally placed after the chat rolls. The material sent to the sand jig is screened. The sands and slimes fed to the concentrating tables are passed through 1½-mm. screens; and in a very few mills hydraulic classifiers are installed. Formerly all screens were of the trommel type, but present practice favors the less bulky shaking screens.

The introduction of the grizzly at the head of the crusher, with the ore hoppers now used, has changed in a slight degree the old plan of arranging the crushing machinery. These two features have made it possible to lower the crusher and first set of rolls, which are usually on a combination frame, to a point where the discharge end of the rolls is just high enough to discharge into the boot of the elevator. This change gives the crusher a better foundation; which it needs, because the increased size of the crusher and the greater vibration are factors difficult to meet with the old high crusher frames. In some cases, where permanent structures are built, both crusher and rolls are set directly upon concrete piers with only one set of timbers intervening.

GRAVITY BIN FEED

The old crusher room where the ore was dumped and fed into the crusher by two to four shovelers has been entirely discarded. In its place has been erected a gravity bin much higher than the old room, requiring an elevation of the hoister house. The floor of the bin is sloped to a gate which discharges upon the grizzly. One man is necessary to keep this in operation. The bin is usually built to hold twice the capacity of the mill. To support the bin heavy timbers, 8x8 in. or 10x10 in., are used, set from 3½ to 4½ ft. apart and resting upon a concrete foundation.

At one side of the bin is the shaft and hoisting headframe. Often one set of timbers is used to support one side of both bin and headframe. The heavy timbering and the weight usually in the bin is of great assistance in steadying the hoisting room and controlling the vibration caused by the hoisting engine. The floors are made of 2x12-in. oak plank, often doubled and crossed. The walls are also 2x12-in. oak. In addition to heavy bracing, the walls are bound with truss rods.



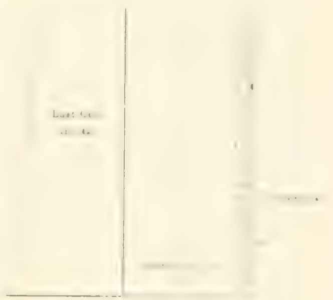
ROLLS AND CRUSHER FRAMES COMBINED

The advantages of these bins are manifold. They reduce the labor required from three and four men to one man. They increase the capacity of the mill. They provide material for the mill should the mines be idle for a short time, and storage capacity for ore in case the mill is shut down.

SETTLING BOXES AND TANKS

The mill practice of the district now makes some effort to save the [illegible]. The devices employed for this purpose are divided into two classes, settling boxes for jigs and general settling tanks for the [illegible] The type in most common use consists of a 2-ft. extension of the jig to which it is attached. It is as wide as the jig cell emptying into it. A partition divides the box into two portions at the top, the partitions extending only a portion of the way down, usually within 20 to 24 in. of the bottom of the box. At the bottom is a spigot to draw off the hutch while up the side of the box just above the bottom of the partition is the overflow orifice from which the water goes to a general settling tank. This method effects a separation of the coarse and fine products coming from the jigs. When the entire product is desired, as in the tails of the cleaner, the overflow does not occur at the bottom of the partition but at the very top of the box.

The general settling tanks are large, the larger the better for accomplishing their purpose. They vary from 20 to 50 ft. square, and are built of substantial timbers well braced and rod trussed. The floor is always sloped to a common point near the sand and slime elevator boot in the mill. They are usually built on the outside of the mill adjacent to the table room. The tank is subdivided into two equal compartments by a partition. At the end of each compartment is a common overflow launder. At the other end is a movable launder which brings the material from the jigs. From the overflow launder enough water is admitted to the filled compartment to wash the sand and slime to the sand elevator boot.



[illegible]

[illegible]

One of the most important features of present mill building is the method utilized to increase the capacity. Besides building larger machinery the principle of duplication is used with marked advantage. The limit in size of jig building is prob[illegible] rougher jig with 34x48-in. cells. Therefore to further increase capacity another jig must be added. This principle is also carried out with regard to crushing and screening machinery, which necessitates a new arrangement of the plant. In the Deacon mill the duplication is so arranged that the machinery forms a perfect duplicate mill up to the cleaner jig. If a break occurs at any point ahead of the cleaner jig, the whole mill is not shut down, but only the part in which the break occurs. In the Oronogo Circle No. 5 and the Yellow Dog, the duplication is differently arranged.

Moving the Plant

Since the average life of a mine is only five years in a larger part of the district, and since even in sheet ground the orebody is stoped out so far from the mill that the cost of tramming becomes too great a factor in the cost of production in from four to seven years, provision must be made for moving the mill to a new location.

In planning a mill it should be borne in mind that no mining is permanent in this field. Even on the sheet ground, the permanence of which has been the subject of a large amount of favorable comment, there have been at least four cases of mill removal in the territory north of Webb City in the last three years. It is therefore advisable to utilize every means to make easy removal a feature in construction. The removal and erection of mills used on other property forms a large part of the business of certain mill contractors. Many operators, especially where developing an uncertain orebody, buy a second-hand mill and remove it to the site desired. The cost is about one-third to one-half that of a new mill.

Cost of Construction

The cost of mill construction is a variable quantity depending upon location, kind of practice, capacity and material. The difference in the cost of the old 100-ton mill and the 100-ton mill of today is largely a matter of the increased cost of material alone. But with sheet ground, other factors arise that include additional items of expense. In the first place, 100-ton mills are unable to make a profit and capacity must be considered. The minimum capacity is 200 tons, the maximum 1000 tons. The cost of the mills will then be from $15,000 to a maximum of $160,000. There are essentials and nonessentials in mill construction, and in the building of any plant no estimate of cost should be attempted until the actual character of the ore, its quantity, water conditions and general location are known. With these conditions known the size of mill, type of mill practice, and cost can be very accurately determined.

Cast-iron freight-car wheels are sold under a guarantee of 70,000 miles. In actual service the average life is fully 100,000 miles.

Lateritic Decomposition

In a recent communication to the Société de l'Industrie Minérale, J. Chautard and Paul Lemoine gave the results of their investigations into the nature of laterization, showing particularly the way in which this decomposition process has been responsible for the formation of certain deposits of bauxite, of gold and of iron ores. By laterization is meant that superficial decomposition of feldspathic rocks, peculiar to the tropics, whereby a residue rich in alumina and iron but poor in silica is left behind. Its counterpart in temperate climates is seen in kaolinization, in which process the silica is not removed but enters into combination with the alumina, forming residual beds of clay. Kaolinization is also observed in the tropics. Laterization extends to depths of 100 ft. or more, and over immense areas so effectually alters the structure and appearance of the original rocks as to make their recognition almost impossible. Kaolinization, on the other hand, rarely extends to so great a depth.

The rocks on which the present investigation was made came from French Guinea, on the west coast of Africa, and were taken from a railroad cut on the line from Conakry to the Niger. The samples included undecomposed diabase and the laterite surrounding and resulting from it. The latter material retained its compactness, and the ferro-magnesian silicates in it retained their shape and appearance, but the feldspars were partly kaolinized. Analyses showed that, as a result of this first stage of decomposition, the lime, magnesia, soda and potash had almost completely disappeared, that the silica had been considerably reduced in amount, and that the alumina, iron and titanium had increased. In the case of another diabase and the laterite derived from it at a more advanced state of decomposition, it was found that the alumina had increased from 14.18 per cent. to 47 per cent. and the iron (metallic) from 9.7 to 27 per cent.

Similar investigations on ophites (fine-grained diabases in which the augite is in excess of the feldspar) showed that the process of laterization is less rapid than in ordinary diabases, suggesting that the texture of a rock has some influence upon its susceptibility to laterization. Finally, analyses of a phyllite and its decomposition product showed that the latter had none of the characteristics of a laterite, thus proving that only those rocks rich in feldspars and ferro-magnesian silicates are susceptible to laterization. Shales and slates, which are generally considered as an intermediate form in the decomposition of feldspathic rocks. do not seem to be subject to laterization.

The characteristics of laterization may be summed up thus: (1) Liberation of iron and alumina from their combinations with silica; (2) oxidation of iron from the ferrous to the ferric state; (3) liberation of silica and its various compounds; (4) loss of silica, alkalies and alkaline earths; (5) a residue greatly enriched in iron, alumina and titanium, and poor in silica.

Deposits of bauxite in various parts of the world seem to have been the practical result of lateritic decomposition. A recently discovered bauxite deposit on Boulanger creek, Guiana, carrying 64 per cent. alumina, and practically free from silica, is a notable example. Bauxite deposits in Europe and the United States can also be similarly accounted for. The bauxite deposits of Provence, particularly, show so marked variations in appearance and quality as to preclude any theory supposing them to have been formed by decomposition in place, under hydrothermal activity, by the action of aluminum chloride upon limestone, etc. It is easy to believe that these deposits may have been formed by the transportation and deposition of laterite derived from previously existing rocks. The Arkansas bauxites seem to have been formed by laterization of syenites in place.

Deposits of iron ore, ranging from limonite almost to hematite, are also attributable to laterization. Extensive deposits of this nature are found in tropical Africa, in Guiana, in Madagascar and in India. Some of these deposits might be profitably exploited even now, and will form valuable resources for later times.

By this same process, the gold contained in feldspathic rocks is set free, to be lodged ultimately in alluvial deposits. The gold in the streams of West Africa, Madagascar and Guiana may be accounted for on this supposition.

Duty on Hematite Iron Ore

In the case of certain importations of hematite iron ore made by the firm of Francklyn & Ferguson, the collector of the port of Philadelphia assessed the merchandise with which this case is concerned at 30 per cent. ad valorem as a pigment, under paragraph 58 of the tariff act of July 24, 1897. The importers claimed that it was properly dutiable as iron ore under paragraph 121 of that act at 40c. per ton. The Board of General Appraisers sustained the claim of the importers, and on appeal from that decision the circuit court entered an affirming decree, holding that the material in question was undoubtedly iron ore, not being a pigment unless submitted to further manufacture.

The estimated world's production of lead in 1907 was 964,910 metric tons, as compared with 968,174 tons in 1906.

"Lead and Zinc in the United States"*

By R. W. Raymond

This book is one which ought to have been written, and the work of writing it has fallen into the right hands. I pronounce that just judgment with some inward pain, as may be inferred from the following explanatory statement.

The book is not a scientific manual, but a history. As the preface declares it has been prepared at the request and with the assistance of the Carnegie Institution, as a part of the Economic History of the United States which that generously endowed and wisely administered body proposes to compile and publish. Having been actively engaged for 45 years in mining and metallurgical practice within the United States; and having furnished in the eight volumes (1868 to 1876) of my reports to the Government, as commissioner of mining, much historic material concerning the progress of these industries and the arts which they represent; and having been since 1867, as editor of the *American Journal of Mining*, and editor or special contributor of the Engineering and Mining Journal, in the position of chronicler and critic of the wonderful progress, "all of which I saw, and part of which I was;" and finally having been almost continuously since 1871 an officer of the American Institute of Mining Engineers (since 1883 its permanent executive secretary) and thus in contact with the leaders of American practice in mining and metallurgy, I have cherished the dream that I might some day bid for fame as the historian of those movements and enterprises in which I had been actor, adviser or observer. Since my professional career approximately coincides with the period of that conquest of the continent in which mining has taken the lead, this ambition was not unreasonable. But the subject has grown too large for the grasp of any single man—especially of one who, though old, is still busy; and the different departments of it are receiving treatment at the hands of younger men, upon whom I bestow, with a sigh of transient regret, my hearty praise. I am consoled to find, in this case, that Mr. Ingalls has made good use of much crude material, gathered and published by me many years ago.

I may be pardoned if I praise more particularly that part of his book which deals with the subject most familiar to me personally, namely the smelting of lead ores. It is in this line that American metallurgists (or to speak more accurately, metallurgists educated in Germany, but qualified by knowledge and temperament to cut loose from the traditions, while retaining the scientific principles of their previous training) took the lead in revolutionizing the accepted methods of the world.

Mr. Ingalls' admirable review of the progress of lead-smelting in the United States affects me in a peculiar way. I did not imagine that the simple history of an art could so arouse my emotions. But this narrative is marked throughout with names which recall to me old friends and colleagues, whose early struggles I watched, whose achievements I recorded and whose departure from earth I have been in too many instances called to mourn. I remember vividly, for instance, the situation in the Salt Lake valley 40 years ago, when a host of little shaft furnaces were running intermittently, each on the ores of its own mine; when it was good practice not to have oftener than once in eight days a "salamander," requiring the stoppage of smelting, the removal of part of the furnace wall, the forcible "yanking-out" of the salamander (sometimes with the aid of a yoke of oxen), and the rebuilding of the front, preparatory to a resumption of operations. In those times glancing around the horizon on any morning, I could infer from the absence of this or that column of black fumes (for nobody saved the flue-dust then) which furnaces were "bunged up" that day. I remember one furnace, the manager of which, ashamed of the great number of salamanders which lay around his stack, buried them all under the sage-bush in the neighborhood. Perhaps, centuries hence, when his operations shall have been forgotten, these strange half-metallic masses may puzzle the scientists of the future and lead to new hypotheses as to the genesis of ore deposits!

I remember also a furnace built on the north shore of the lake by an enterprising metallurgist experienced only in the cupola practice of iron foundries, which was provided with a hinged bottom-section, intended to be opened so that a salamander could be dropped out before it became so big that it would have to be dug out or hauled out.

And I remember that some of the leading managers, knowing that oxide of iron was useful as a slag-making material, and afraid of the possible effect of other constituents, brought a pure red hematite all the way from Wyoming Territory, and charged it into their furnaces as a flux, costing them $30 per ton.

The situation was characteristically American. A multitude of energetic and courageous, but ignorant men were attacking processes which they did not understand, attempting the impossible and the practicable with equally gay audacity, and getting their education rapidly, but at high cost. On the other hand, there were men on the ground, more or less thoroughly trained in foreign schools, but not able in practice to adapt traditional methods to new conditions. The leadership in substantial progress must be conceded to a few trained metallurgists, who combined a knowledge of "the state of the art," as they had learned it abroad, with the American spirit of bold adventure under novel surroundings. Among these I must name Augustus Steitz, whose untimely death in 1876 cut short a career of great professional promise; Charles A. Stetefeldt, who lived to impress his name indelibly upon the history of our metallurgical progress; and Anton Eilers, O. H. Hahn, Franz Fohr and August Raht, who still survive as leading practitioners, authorities or advisers in the art they have done so much to advance and perfect. Stetefeldt, Eilers and Hahn, as I am proud to recall, were among the young men who, more than 40 years ago, began their professional career in this country as assistants employed by the firm of Adelberg & Raymond, consulting mining engineers and metallurgists, of which I was the junior partner. They all came from the old mining school of Clausthal, in Hanover, as did other assistants of ours, notably Herman Credner, afterward professor at the University of Leipzig and director of the Royal Saxon Geological Survey. I bear hearty witness to the intelligence, skill and fidelity of the Clausthal men, of whom I have employed so many, and so many of whom have since achieved high professional reputation.

It was at the third meeting of the American Institute of Mining Engineers, held at Troy in November, 1871, that I presented a paper on the smelting of argentiferous lead-ores in Nevada, Utah and Montana, with the names of Hahn, Eilers and myself as joint authors. It is unnecessary to say that my share of the work was little more than to put together in coherent and logical form the material supplied [illegible]. I think I may safely claim for the paper that it constituted a clear statement of the best existing American practice, including some improvements, then new, but destined to be generally accepted, and some prophecies of progress which were afterward fulfilled. Mr. Ingalls has recorded with impartial intelligence the successive steps of ingenious invention or courageous advance upon existing lines, which eventually placed American practice in this department at the front. I need not repeat the history; but, without disparaging in [illegible] service which Anton Eilers, as the general [illegible] Lake, Leadville, Pueblo, Great Falls and [illegible] numerous metallurgical subordinates in [illegible] impossible for me to name all those who graduated from this practical school to achieve distinction elsewhere. But I may mention without unfair partiality Walter H. Aldridge, now at the head of all the mining and metallurgical operations of the Canadian Pacific Railway, and Arthur S. Dwight, long and favorably known as the manager successively, and always successfully, of several great metallurgical works, and for some time member of the "operating committee" of the American Smelting and Refining Company, and more recently distinguished as one of the inventors of an important improvement in metallurgy, which was described in the Engineering and Mining Journal of March 28, 1908.

---

*"Lead and Zinc in the United States." By Walter Renton Ingalls. Pp. 368; Illustrated. 6¼x9¼, in.; cloth, $4. New York and London, 1908: Hill Publishing Company.

I have lingered too long over that part of Mr. Ingalls' book which reviews my own personal reminiscences, but so much must be pardoned to an old veteran, stirred by the story of a great campaign, all of which he saw, and part of which he was.

Mr. Ingalls has treated the other branches of his subject with equal skill and thoroughness. Here too, I must confess, I have some slumbering memories of persons and events, which might easily awake and become clamorous. But I shall take care not to disturb them; and fortunately they are not so lively as those respecting which I have indulged in utterance above, and I may, therefore, say something in a general way without arousing them.

The story of zinc, as here told, is, in one particular, at least, even more dramatic than the story of lead. It is true that, in the early days, lumps of lead carbonate were thrown out of the gold digging sluices near Leadville as worthless nuisances. But lead was never regarded like zinc as a nuisance to the smelter, and no smelter ever made heavy deductions from the prices he paid for ores on account of the lead they contained. Consequently, the metallurgical and commercial improvements affecting zinc and its ores have largely transformed a dreaded and despised mineral into a welcome source of revenue, and the basis of an immense industry.

Mr. Ingalls' book thus becomes a double epic, and takes a well deserved high place in the grand new history which, coming from such skilful and sympathetic hands as his, is to instruct and inspire this generation.

The Smelters at Anaconda [*]

By E. P. Mathewson[†]

Marcus Daly selected Anaconda as the site for the smelter of the Anaconda Copper Mining Company on account of the good water supply. The Upper Works, on the north side of Warm Springs creek, were begun in 1883, under the direction of the late William McCaskell. They were designed to treat 500 tons of ore daily. They consisted of concentrator, hand roasters and small reverberatory matte furnaces. They were put in operation September, 1884.

These works were reconstructed in 1886, when steam stamps were substituted for crushers and rolls in the concentrator, following the practice of the Lake Superior concentrators. These changes were made under the direction of Otto Stalmann and the capacity of the plant increased to 1000 tons daily. Brückner roasting furnaces were introduced at this time and were a marked improvement over the old hand roasters.

As the mines increased their output, more smelting capacity became necessary; so, in 1887, construction of the Lower Works, about one mile further east, was begun. There was considerable delay in building, and fire destroyed the works shortly after they were built. It was not until late in the fall of 1889 that they were again put in commission. They had a capacity of 3000 tons daily and were, at the time of their construction, the best equipped copper smelting works in existence. The buildings were of iron and many new devices and appliances were introduced. As far as possible gravity and machinery were substituted for manual labor. This gave for the two plants a combined capacity of 4000 tons of ore daily.

The first converter plant was put in commission in 1889. The second converter plant, at the Lower Works, was built under H. W. Hixon's direction in 1892. The first experimental refining plant, built in 1888 under Mr. Thofern, was enlarged and improved in 1892. This plant was not required after 1903 on account of large refineries being built at Perth Amboy, N. J. It is hoped that it may soon be again in commission, as the newer portion is constructed and fitted out in the most improved style, while the older part can be brought up to date at slight expense.

About 1898 Mr. Daly decided to enlarge the smelters, but could not see how it could be done economically, so he changed his plans and chose the site of the present Washoe smelter for a new plant entirely. About this time F. Klepetko was given charge of the "Old Works," and he immediately set about planning the new Washoe smelter. The work of construction of this, the world's greatest copper smelter, was begun in 1900, and the first ore was unloaded at the new plant Jan. 23, 1902. A month later operations were begun in the concentrator. The plant was designed to handle 4800 tons daily in the concentrator and a thousand tons at the blast furnaces. The plant was soon found to be too small for the increased production of the mines. So changes and additions were made, until today it has a capacity of 12,000 tons of ore daily. It enjoys the distinction of being the largest copper smelter in the world, turning out 15 per cent. of all the copper produced in the world, or from 20 to 25 per cent. of all the copper produced in the United States. It employs 2000 men; its monthly payroll is $215,000.

In addition to the smelter the Anaconda Copper Mining Company operates a firebrick plant, installed years ago to make a refractory brick to take the place of the Dinas brick, which were imported from Wales at great expense. It has not only produced a substitute for the Dinas brick, but has driven the Welsh brick out of the market of the western copper-producing States. The brick manufactured at Anaconda are today acknowledged to be the best in the world. The plant employs 45 men.

The company, to avoid excessive charges on castings, etc., from San Francisco and Chicago, established what was first known as the Tuttle Manufacturing and Supply Company, afterward the foundry department of the Anaconda Copper Mining Company. This establishment is fitted up with modern metal-working machinery and employs at present about 175 men and does, practically, all the foundry, boiler and machine-shop work for the mines and smelter, besides outside custom work.

The late Marcus Daly is, of course, the central figure when Anaconda or its smelter is considered. He originated the whole business. His active mind and strong personality controlled everything in Anaconda from 1883 to 1890, when, owing to ill health, he was, most of the time, away from Montana.

There were numerous superintendents under Mr. Daly, the most prominent being Mr. McCaskell, who built the first plant and who died a few years later. Then Otto Stalmann from 1886 to 1893; then John S. Dougherty from 1893 to 1899. Mr. Daly died on Nov. 12, 1900. F. Klepetko was manager of the reduction works from 1899 to 1902, when, after a short time, during which period no regular manager was appointed, the writer took charge as manager of the reduction works, holding the position at the present time.

Anaconda has the distinction of having been the home, at some time or other, of nearly every man now living who is prominent in the copper-smelting world. Anaconda smeltermen are known the world over. Anaconda's smelters have always been of the largest, and the company's policy has always been to secure the latest improved appliances regardless of expense.

Reinforced cement for building chimneys gives good results provided the builder uses the proper knowledge and care in designing the chimney. Such chimneys should be constructed of wet concrete, trap rock and sand, and should be rich in cement. Due regard must be given to temperature stress.

---

[*] From "A Souvenir of Anaconda's Silver Jubilee, July 4, 1908."

[†] General superintendent of the Washoe works, Anaconda, Mont.

The Human Side of a Mining Engineer's Work *

By Edmund B. Kirby†

The human side of engineering is often neglected by mining engineers, although this neglect is apt to bring delay, disappointment or failure. The special work of an engineer is to apply the discoveries and methods of science to the practical business of the world. Often he forgets how many-sided a man must be for this end, and enthusiastic and absorbed in technical details he overlooks the fundamental requirements of life. I urge you, therefore, not to forget that the world is made up of things and of folks, and nine-tenths of your business is going to be with folks.

You will gradually learn what is wanted. The business world is not interested in the details of your education. It is generally understood that the completion of a course like yours indicates that the man has made good in his first test, that he has carried through successfully his first serious undertaking. This gives promise for the future, and the fact of technical training assures ease in breaking a new man into the business. But you do not yet know that the questions an employer asks are merely these: Has he good sense above the average? What is his personal bearing and address?

The Personal Equation

You will find that a diploma is of little interest to others, but a likeable personality is a passport, good for life and in all countries. In time you are to discover that tact and diplomacy solve more problems than engineering formulas. That a memory for names and faces will help you more than one for minerals and rocks. Sooner or later you will know that good sense, that ability to decide which of any two things is the more important, is an asset beyond price. You will awake to the fact that valuable as is skill in the higher mathematics, it will never push you to the front like the ability to write a letter which will really do its work. How will you deal with people if not through language, that means by which your thought and will may reach the consciousness of others, that delicate and subtle medium necessary for the most simple affairs of daily life, yet capable under a master's touch of swaying a multitude, of moving the world? How far have you learned its use? You have studied the reactions of chemistry, but how much have you learned of those subtle human reactions which break down indifference and create friendship? But [illegible] you say this wanders from engineering matters. These are the winning qualities for all men. I answer "Quite so; the successful mining engineer is the successful man."

The technical side of a mining engineer's work is and must remain its distinctive feature. Next to the fundamental requirements of life, its importance is conceded by all. It is well to recognize that the technical knowledge demanded by the mining world is broadening. The single-specialist of former days is now under a disadvantage.

The Technical Side

Mining is peculiarly subject to the caprices of fortune, to sudden changes and to the incessant shifting of conditions and of men. It is a varied and comprehensive business; at times so simple as to be within the powers of any man, again so complex as to demand every resource in the list of human attainments. It may call for profound and little known specialties of science, for the leadership of men and for the most skilled and experienced commercial powers. This wide scope and these incessant changes with their sudden promotions call for engineers who are broad enough to take advantage of the opportunities they present. What is most desired is the man with all-round training and general personal equipment, qualified to concentrate upon and acquire any specialty when necessary, but capable of being suddenly shifted and quickly adapted to any or all requirements of the business.

And now I would call your attention to the relations of a mining engineer to his profession. He will always owe it more than he can give, and the motives of obligation, as well as those of policy, impel him to do all in his power for its welfare. This duty is the more imperative because it is a young profession, only a generation old, and is not yet mature or fully organized. It has only of late been generally known or understood by the business world. During its growth, with advancing recognition, the professional spirit has steadily increased. The American Institute of Mining Engineers was the first and the most powerful means of collecting and uniting a number of scattered specialists into one self-conscious profession. Its great and long continued work has been ably seconded by the numerous local engineering societies throughout the world.

The Technical Journals

But what is not so clearly recognized is the remarkable work of the mining journals in developing the professional spirit of engineers and the feeling of fraternity among all those soldiers of fortune who constitute the mining world. Their prompt and thorough collection of news from the remotest mining districts, the eager search for every scientific and technical discovery which might be of use, their pressure for the interchange of views; these have been doing a constructive work for the entire mining world, of which it is yet hardly conscious. Today these journals stand foremost among the forces which are welding mining engineers into closer relations with each other, and with the business interests which they serve.

The growth of professional unity and interdependence has been fostered also by the continued spread of the modern idea that an engineer has more to gain than to lose by exchanging technical information with others. He parts only with what a single man can know; he receives the knowledge of a thousand men. A profession becomes powerful and is able to second individual effort only in proportion to the growth of the fraternal and helpful spirit. It is the best policy, as well as the duty, of every engineer to recognize this and to use his best efforts toward that end. Throughout your career aid your profession, its schools, its associations, its journals and its members, and for every hour, for every dollar you give it, you will receive a hundredfold.

And now a few suggestions about your life work.

Organization and Team Work

There are men who shut themselves up, and out of their inner consciousness evolve some great work, such as an invention, or a book. Occasionally also men go into the wilderness and discover a mine. But such individual play is rare and its chances are small. The real business of the world is done by team-work, and you must qualify for this. It is done by innumerable bodies of men, each of which is under some kind of organization, intended to combine its units into an efficient human machine, capable of the business on hand. Now, every such machine, whether it be a base-ball nine, a section gang, the force of a great steel plant, a railway system, or an army, works more or less badly. The individuals who compose it, from the general to the officers, from the [illegible] head to the lowest employee, have human weaknesses which are much alike, and the results are friction, loose joints, lost motion and sand in the gears. Nevertheless, the outfit goes creaking along, and usually gets there, often to its own surprise.

There are weak points in abundance, not only on the human, but also on the technical side of every business. There is a best way to do each operation, but it is not always done in this best way. Moreover, methods, processes and machines are constantly changing, constantly advancing. These two conditions, the imperfection of technical methods and the faults of human organization, will provide your openings. It is because of them that the world is so full of oppor-

---

*Slightly condensed from an address delivered before the graduating class of the School of Mines and Metallurgy, University of Missouri, Rolla, Mo., June 10, 1908.

†Manager, Federal Lead Company, Flat River, Mo.

tunities for men who have the combination of sound technical training and good sense.

How to Win Promotion

When, therefore, you hold a job, do not waste time in complaints and fault finding. You will continually see waste and loss; things which are wrong, things which need improvement. Others see them too. If you have sense you will notice everything, but will keep your mouth shut. Some day your chance will come. Your advice will be asked. Some day you will be given charge of a small piece of work, of a few men, and may then bring out your ideas by doing this work better and more cheaply than the man before you.

An able man will move up from any job and there are no rules for fortune. But in your profession the chances are generally somewhat better for those who are able to start as workmen, or in positions close to the working force. If the machine of which you are a part is too bad, get out, but while you are in any business organization be loyal to it, uphold the hands of those above you, and keep your own work as free as possible from the faults you notice elsewhere.

Your duty now is to get busy. Get into action somewhere. If you cannot at once find work in the line desired, take anything temporarily. Concentrate yourself upon your job until sure that you are holding it down, and then turn your attention to other men and other work. Beyond this you will play the game as fortune and your own will dictate.

The Straight Men's Association

Play it straight. This may sound easy to you, fresh from the wholesome influences of your homes and the fair play of boy democracy; but in years to come, when the passions of the fierce struggle take hold of you, when copy-book maxims fail, when you see men around you winning safety, fortune and power by unscrupulous methods, unless you have higher motives for honesty than the belief that it generally pays, you are quite likely to resign from the Straight Men's Association. It is gratifying to be able to tell you that you will find your profession much above the average in its percentage of clean men.

It may some time be of service to know that to be fired from a job is often the best thing that can happen to a man, if he is really built of the right stuff. It galvanizes him into life, jerks him out of a rut, tests his own resources and makes him start fresh in new surroundings and with new people.

Errors may not be Fatal

Throughout your career you will make errors and have occasional bad falls. Avoid the delusion that such occurrences are fatal. No error is serious, unless you fail to learn its lesson, or allow it to weaken your courage. Some of the most successful men I have known had failed so many times that they stopped remembering. Because they stopped, they succeeded. If by the caprice of fortune, any of you should eventually meet with disappointment, if you should fail to realize your hopes and ambitions, you will by that time have learned that your only failure has been to escape the common lot of man. You will by that time understand the Arizona saying, "Life ain't in holding a good hand, but in playing a poor one well."

Your destinies will be determined by the mingled influences of ability, hard work and pure luck. Capricious fortune will deal kindly with some of you and roughly with others. Some of you will reach wealth and power, others will not. As your head swells with success, do not forget how much of it is due to chance. Do not forget a struggling classmate. In a few months the petty differences and jealousies of your college life will have passed into oblivion, but the man who has rubbed shoulders with you through that experience has a grip and password that you cannot forget. Throughout the world, among the yellow, the brown, the black and the white, it is the law that the call of a comrade must be heard

---

The Jumau Copper Leaching Process

For several years Lucien Jumau, of Paris, has been developing a copper-leaching process which has been the subject of a large number of patents. The first was granted in France in 1905 and has been frequently amended.

It has long been known that when cupric sulphate is heated in solution with sulphurous acid, a salt of copper is precipitated and free sulphuric acid is formed. This reaction has been practically employed in the leaching of copper ore. Jumau observed that when a salt of copper is heated in a closed vessel under pressure in the presence of sulphurous acid, the copper salt is reduced to pure metallic copper and the sulphurous acid is oxidized to sulphuric acid. On this reaction he bases his patent claims.[1]

The process is carried out as follows: The sulphate of copper solution, obtained by leaching the ore, is treated with sufficient sulphurous acid to complete the equation

$$Cu\ SO_4 + SO_2 + 2\ H_2O = Cu + 2\ H_2\ SO_4.$$

The solution is then run into a digester made of copper or iron, lined with lead. The temperature is gradually raised as high as possible. Jumau finds that the yield of copper increases with the temperature and decreases as the concentration is increased. The increase of yield corresponding to increased temperature is shown by the following results. In all cases the original concentration was 25 grams of copper sulphate per liter: 140 deg. C., 47 per cent.; 155 deg., 62; 167 deg., 65; 190 deg., 79. When saturated solutions of sulphurous acid are used the pressure rises rapidly with the temperature owing to the tension of aqueous vapor corresponding to the concentration and temperature and to the pressure of the sulphur dioxide.

The pressure of the sulphur dioxide may be diminished by using only sufficient sulphurous acid to satisfy the theoretical equation, avoiding saturation, and by applying the heat gradually. Another method advocated by the inventor is to heat the aqueous solution and then gradually to introduce the sulphurous acid in gaseous form, under pressure, in such a way as to insure its conversion into sulphuric acid and to avoid saturation.

Sulphites may be used instead of the sulphurous acid. These supply another means of increasing the yield at a given temperature without having a pressure in excess of that which corresponds to the tension of aqueous vapor. If normal ammonium sulphite is employed the reaction is:

$$CuSO_4 + (NH_4)_2\ SO_3 + H_2O = Cu + 2\ NH_4\ HSO_4.$$

When ammonium sulphite is used it may be prepared by passing sulphur dioxide, produced during the roasting of the ore before leaching, into a solution of ammonia. The ammonia is constantly regenerated by heating the ammonium sulphate produced when the copper is precipitated by lime. Ammonium bisulphate may be reconverted into ammonium bisulphite by heating.

When an ore does not contain sulphur, copper sulphate may be directly converted into metallic copper by heating it under pressure with a sulphite or some other reducing agent other than sulphurous acid. Carbon monoxide, organic matter, sulphur and carbon are effective reducers. If carbon monoxide is employed the reaction is as follows:

$$CuSO_4 + CO + H_2O = Cu + H_2SO_4 + CO_2.$$

Carbon monoxide is not easily soluble and must be introduced as a gas under pressure. When it is used it is advisable to connect the digester to a vessel filled with lime or other absorbent of carbon monoxide in order to take up the superfluous gas. Water gas, coal gas or other hydrocarbons may be used instead of carbon monoxide. Any organic matter such as glucose or dextrine, organic acids, or sawdust, shavings and wood chips may be employed. The neutral or acid solution of copper sulphate heated with these materials in a closed vessel under pressure, yields metallic copper, sulphuric acid and carbon dioxide.

---

[1] U. S. patent No. 883,961, April 7, 1908

When the precious metals are present they may be separated by first treating the copper solution with sulphurous acid at a raised temperature, but under ordinary pressure. By this means the precious metals are alone precipitated in a metallic condition. The solution may then be treated under pressure, to precipitate metallic copper. The copper precipitate thus obtained may be fused or pressed into anodes and electrolytically refined.

The American Institute of Chemical Engineers *

By Charles F. McKenna†

A call for the organization of the chemical engineers has been heard at various times, abroad for 25 years and in this country for over 10 years past. It grew in clearness and volume during recent times, and has culminated in this gathering at Philadelphia. It was not without misgivings and hesitation that the answer to this call was first returned, but we are confident now that the misgivings were unfounded and the hesitation unwarranted.

It has been a subject of frequent remark, of an opinion almost unanimous, among those discussing this scientific society during the past year, that there appears to be enough of such organizations in this country. The followers of almost every conceivable study have some forum, some printed herald to the world, and mode of representation in council. Every active scientist feels the need of joining the groups with whose aims and ideals he is most in sympathy, and among whom he believes he can find the greatest incentive to his own progress; and, since the sciences have become diffused and intimately correlated, the societies which he feels almost compelled to join are both diverse and numerous. The tax upon him soon becomes onerous in consequence. The tax for loyalty in attendance, whether for performing duty or for mere encouragement of numbers, sometimes becomes as severe as the monetary tax for support. Then gradually comes a sensation of surfeit of journals, of meetings and congresses, and papers and reviews, until weariness ensues and a plaintive cry goes up that seems to indicate that the victim has perished in the deep.

It must have been something unusual, therefore, in the conditions surrounding our profession which led so many of its devotees in this county, while impressed with the aforesaid dread of plethora of societies, to say nevertheless that they felt convinced that in this case at least a new society was not only a desirable consummation, not unduly burdensome, but feasible, necessary and unavoidable. Still more: The entire body of adherents was impressed with the glory of the history of our other chemical societies and proud of their achievements. To the claim that these could do everything that could possibly be required to advance the interests of chemical engineering they paid due heed. Yet we find the demand still insistent for the formation of the independent new society. There must be something deep and powerful at work in the minds of chemical engineers to cause this movement; some force that will not down.

Let us examine the cause closely. At once we find that this will be an examination not only into the achievements of chemical engineering of today, but also into the duty to his nation and to mankind that lies before the chemical engineer of the future. Some will say that these are fine words, but that they mean nothing, or at least will lead to nothing. Can this be so when we who ought to know it best are convinced that chemical engineering is today, though unrecognized by the public, performing the greatest feats of economic salvation in the treatment of raw materials for the production of staples and by-products?

Is it not true that the chemical engineer has oftener served the public than the public is aware of, and that he often stands ready to do so without a taker in the market of public life? The President of the United States called together several hundred men, including statesmen, engineers and specialists of the most varied kinds and of the highest standing, to begin the study of the resources of our country, with a view to their conservation. Among the representatives of 40 or more societies and the engineering profession, it was a pleasure to see the names of Doctor Dudley, Professor Bogart and Mr. Ingalls, but nowhere else in the list, and nowhere in the National Conservation Commission since appointed, is there a chemical engineer or a chemist engaged in the treatment of raw material, yet the following are the words of our beloved President in forming the Commission:

"The work of the Commission should be conditioned upon keeping ever in mind the great fact that the life of the Nation depends absolutely on the material resources, which have already made the Nation great. Our object is to conserve the foundations of our prosperity. We intend to use these resources; but to so use them as to conserve them. No effort should be made to limit the wise and [illegible] these resources; every effort should be made to prevent destruction, to reduce waste, and to distribute the enjoyment of our natural wealth in such a way as to promote the greatest good to the greatest number for the longest time."

These words are almost a good defi- [illegible] representative of our profession was called upon, or even thought of. The mayor of a metropolis appoints a committee of experts to advise upon a new building code. There is not a chemist nor a chemical engineer among its members. The president of one of the largest chemical manufacturing companies in the world says in public that he would rather employ the engineer with a smattering of chemistry than the chemist with a smattering of engineering. Instances like this of either ignorance of the existence of a chemical engineer, or of his capabilities, or depreciation of his rightful place in the economy of affairs can be multiplied. I may add one other example in the appointment of a man unfamiliar with technology to the post of superintendent of the assay office in New York, an establishment built up to the best standard of a chemical factory that the world affords by the genius of the man who by age and infirmity was obliged to step down. What society was at hand to protest and demand the appointment of a successor similarly trained, if not similarly gifted.

Can this reference to the education of the chemical engineers of the future be idle when we know that half of the waste of effort in so-called scientific work today is by reason of imperfect preparation of the scholar by which he confounds the means with the end, does not know what the best purpose of his own science is, and in the practice or the teaching of its applications follows a lowly aim with a restricted view? Whence springs the reproach heard against technical education, leading some to call our school laboratories boiler-shops and some to call them brick-yards, if it is not the narrowness of teaching which, in essaying to make useful men and call them scholars, spoils the scholars and dulls the useful men. Whence too springs the reproach to the chemical engineer himself that the public, which he knows he can aid, is not well enough acquainted with him to consider him worthy of being called an adviser of primary importance.

Those who have most closely studied the situation have stated that the chemical engineer must be better recognized, that his talents must be better appreciated and oftener used; that his opportunities must be enlarged, his rewards increased, and above all, his sons and oncoming successors must be better educated. Chemists have been chemists, calling in the hydraulic engineer, the mechanical engineer or the practical man, as the field of work invited. Is it any wonder that the demand has come for a change and that the chemical engineer wants the world to know that he, with his deep seated knowl- [illegible]

---

*Condensation of the initial address at the organization of this society at Philadelphia, June 22, 1908.

†Consulting chemical engineer, 221 Pearl street, New York.

volved, and of the qualities of the raw materials, has also engineering knowledge enough to design his constructions, make his own hydraulic calculations, and knows the qualities and strength of every material which would be put in place under his own eye. That the chemical engineer will oftener be consulted in the future is a certainty, if for no other reason than the fact that in recent years we have seen some conspicuous demonstrations of the disasters caused by the failure to consult him or to yield to his teachings when large commercial undertakings were conceived and carried on in contravention of the warnings of science unheeded by engineers, whose eyes were fixed only on the plan of construction. Mistakes in selection of site, in choice of raw material or fuel, in supply of water, in mechanical equipment or in treatment of material have been so numerous as would constitute almost an indictment of modern engineering if it were not seen that the fault in such cases is individual.

Some have said that ours would be a society of "industrial chemists," and as there are several excellent societies already pledged and actively striving to do something for the "industrial chemist" a waste of effort is involved in our action here. But in that argument lies an error which needs only to be pointed out to bring conviction that we are now in the right position. This error is two-fold, and lies first in the misconception as to what constitutes chemical industry; and secondly, in the belief that outside of a narrow industry the chemical engineer would have no field of action. As a matter of fact there is a vast field for the chemical engineer not covered by mere common acceptance of what is covered as chemicals. We would have the great industry of illuminating-gas manufacture; coking and its by-products, sugar manufacture, paper, corn products, the silicate industries, the numerous industries of oils, fats and waxes, detergents and a great array of textile and paper industries. Moreover, outside of these industries, we have the field of what might be termed water-works chemical-engineering. We have also the field in which the chemical engineer is called when he becomes an adviser to a municipality.

A minor plea for the justification of our institute can be found in the hope of lessening the secrecy which invests much of the good creative work of our best chemical engineers in this country. It is difficult to estimate the proportion of this which is necessary, unavoidable and not unworthy, but as to what can be eliminated we are all agreed that "let there be light" is a command which, if followed, will be for the good of all and the benefit of our country. I am reminded of a circular once sent out by a committee preparing for the annual meeting of one of our chemical societies at Buffalo. It stated that the committee had not been able to obtain permission to "visit chemical works or industrial establishments in the vicinity of Buffalo, but that the use of the city tug for a trip around the harbor had been obtained." Of course, this was many years ago, and the liberality of the great works at Niagara has since fully equaled the brilliancy of the achievements of their founders.

But the noblest aim before us, the one which most amply justifies us before all the world, is our ambition for the enlightenment and ample equipment of our successors; that is, for the improvement of the training of the chemical engineer of the future. How to design a course in chemistry and chemical engineering I leave to other times and other places; this is not the occasion to go deeply into this subject, the mere mention of which conjures up the greatest list of culture, studies, sciences and arts to be mastered, and suggests the greatest variation of opinion among the masters themselves.

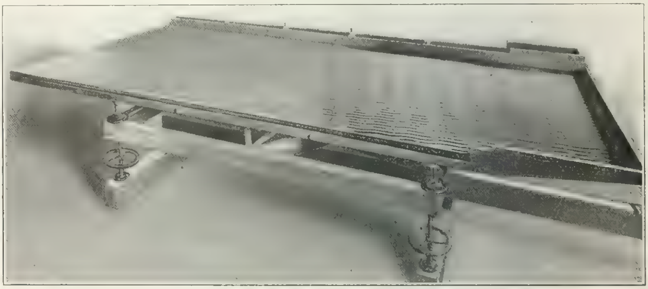
I will only ask for fair treatment for the student, and fair treatment for the young graduate who may not know that he has only really just become a student of this practical science. I have often thought that the preceptorial system should be begun in our profession, that the advanced student should be favored with the friendship of a practitioner, and that advice should be given to him as to the utilization of his opportunities and the construction to be put upon his experiences. Encouragement should be given to judicious generalization and a little "shifting in his jobs" should be encouraged within reason. Frequent transplanting is good for the root system of the young tree, but only an expert culturalist should oversee it.

Corundum occurs, in South Australia, in a matrix of schistose rock chiefly of mica. It consists of segregated crystalline lumps, rough hexagonal crystals and small irregular-shaped pieces disseminated through the rock. The formation is said to be extensive and to average in some places from 10 to 25 per cent. corundum.

The Hennig Concentrating Table

A new concentrating table, manufactured for Dr. Charles T. Hennig, 1620 New York avenue, Brooklyn, N. Y., embodies the following features: (1) the riffles consist of thin strips of sheet lead having a wavy form, accentuated at the head of the table and gradually straightening until, at the discharge end, they are almost straight. The curves are easily made by forming the riffles on a wooden pattern; (2) the feed trough, which extends the entire length of the table, is divided into a convenient number of compartments, separated by wooden gates of varying hights; each compartment has a number of small holes bored in the wall nearest the table surface, the level of the holes in one compartment being slightly higher than the level of the next set; (3) the table is mounted on a wooden frame by means of four ball-and-socket joints which impart a rocking motion in addition to the usual end-bump motion.

As the sands travel along the table their motion conforms to the wavy shape of the riffles; for this reason and because of the rocking motion of the table, the sands are in constant agitation. The feed trough is so constructed that the sands are classified before they flow upon the table. In the first compartment the level of the water is higher than in the next and the lighter grains are forced up and flow through the first row of holes. The heaviest grains pass under the gate together with the grains too heavy to pass out through the holes in the first compartment. In the second section of the trough a further classification is made and this operation is continued until finally only the heaviest particles remain and these are fed upon the lower or concentrating end of the table and flow almost straight across. By classifying the sands in this manner the burden on the table is evenly distributed and the bulk of the concentrate has only a comparatively short distance to travel. The ball-and-socket attachment imparts a motion similar to the motion of panning.



HENNIG CONCENTRATING TABLE

Mining in Flat Coal Seams under Heavy Cover

A Technical Consideration of Costs and Details of Operation. Economical Arrangement of Mule and Motor Haulage Systems

BY AUDLEY H. STOW*

One of the interesting subjects pertaining to coal mining is that of the mine car. The variations in detail of cars for underground use are too numerous to attempt even casual mention; perhaps the more important classification is that of weight, compared with hight of the coal, or rather compared with the hight of the mule that has to pull the car.

There seems to be, however, a tendency toward replacing the mule with the gathering motor; weight would then be of much less interest, admitting of the most substantial construction, with consequent lessened cost of repairs. Certainly also there would be less derailments or wrecks with heavy, than with light cars, although the former, when once derailed, are also put on with more difficulty.

Cost of Repairs to Mine Cars

If more data were available as to the cost of repairs for the different types of cars, it would not be difficult to decide approximately on the general outline of car equipment. Assuming that it requires two carpenters, one at $2.50 and one at $2, or $4.50 per day to keep in good repair 100 mine cars of light construction, costing, say, $75 each, the cost of repairs per year of 300 working days will total $1350; $50 additional per car would give a really well built car, and would amount to $5000 additional for the 100 cars. Allowing 6 per cent. interest and and 6 per cent. for depreciation (considering 12 years average life; the shorter length of life of the wooden portion being charged off against the longer life of the iron cars), would amount to $600 on the $5000 additional cost, leaving $750 saved per year by building the $125 car, provided there were no repairs on the $125 car. Unless it is the straight steel mine car, there are few cars built that will not cost at least $100 to $250 per year per 100 cars for repairs; at $250 per year, the net profit on an investment of $5000 would be $500, or 10 per cent.; at $750 saved per year, the profit would be 15 per cent. In addition to a seemingly clear net profit over and above all charges of, say, 10 to 15 per cent., there is also a material profit in the reduced number of expensive wrecks, with a substantially built mine car over and above those with the light, cheap car.

The general character of the haulage, whether straight mule, mule and motor, or gathering and haulage motor, as well as the type of car, will materially alter the [illegible] appeared clear that slight improvements could be made at an almost nominal increase in cost, that would materially reduce cost of repairs, as well as of wrecks. With mule haulage, if due attention is paid to the condition of the stock, there should be a fairly definite limit to the weight of the car.

One type of car seldom seen and that deserved a better fate, is the vehicle with wooden bottom, sheet-iron sides and wooden top side board; the additional cost is little, the weight small and the capacity considerable. The mine car with one loose and one tight wheel on each axle seems to merit more general use; with one loose and one tight wheel, the rolling friction on the short curves usually found on the mule hauls is no more than with both wheels loose, while the wheels and axles may be removed without removing the boxings, the wear being thrown on an inexpensive casting easily removed, instead of on the wheels. The common run of loose wheels would seem particularly defective in the length of the bearing on the axle; there seems to be some reason at least for inferring that the real merit of one form of patent loose wheel that has become popular in some sections, is rather the length of the bearing on the axle. For slow mule haulage, the common length of axle bearings is fairly well proportioned, but for fast haulage, the side thrust on the axle bearings on taking curves is heavy, particularly with high heavy cars. With both wheels loose, there results quick cutting away of the edges of the bearings, allowing the wheels to creel over; once the cutting away of the edge of the axle bearing becomes appreciable, the deterioration of the wheel becomes rapid, the car getting badly out of gage, the resulting wrecks becoming numerous. With one loose and one tight wheel, the movement of the loose wheel on the axle, on going around curves, is only that due to the difference in the length of the inside and outside rails; while the side thrust on going around curves is just the same with one loose and one tight wheel as with both wheels loose, the movement on the axle is so much less that the resulting cutting action, for the same length of bearing, becomes an almost negligible quantity. For long hauls without stops, the self-oiling wheel becomes ineffective owing to the oil being kept away from the axle bearing, due to centrifugal [illegible] tight wheel, practically no lubrication of the loose wheel is required on tangents, and almost none on curves; for long, fast hauls, the points in favor of both wheels tight on the axle would seem to be, largely at least, along the same lines as in the case of one loose and one tight wheel.

The question of latches and brakes would appear to be rather one of personal preference; there are a number of forms of each that seem to answer well, if kept in repair. The fixed end gate, were it not for the expensive and complicated dump required, would seem all that could be desired, the usual form of hinged-end gate, especially when the car gets old and badly spread, being a first rate distributor of slack and fine coal, almost equal to screen bars; center bumpers, while unquestionably preferable for mechanical haulage, add considerable to the weight.

Mine Track

The size of motor rail used by different companies under similar conditions, varies considerable; while unquestionably there is something saved on interest charges by using the lightest weight rail admissible for the size of motor, at the same time it is a serious question whether a heavier rail is not more economical in the long run. Motor haulways cannot always be kept surfaced up, drained, etc., as on railroads; the heavier rail will stand bad surfacing, wet road bed, and occasional bad ties far better than the lighter rail, and will often pay for the difference many times over, more particularly in the reduced number of wrecks.

The practice of tearing room track out of places that have to stand any length of time seems to be general and is clearly justifiable, although it is occasionally argued that it is economy to leave track in rooms in order to avoid the expense of tearing out and relaying again for the pillar work.

On the basis of one track man at $2.25 and a helper at $1.75 laying 150 ft. of track per day, the track will cost $2.65 per 100 ft., or $13.25 per room of 500 feet.

[illegible]

500 ft. of track, labor	$13 25
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
	[illegible]

Considering the common interest at 6 per cent. and 6 per cent. for depreciation, based on an average life of 12 years, these two items amount to $18.30 on an expenditure of $153. Estimating in this way, the loss from leaving track in rooms

---

*Consulting mining engineer, Maybeury, W. Va.

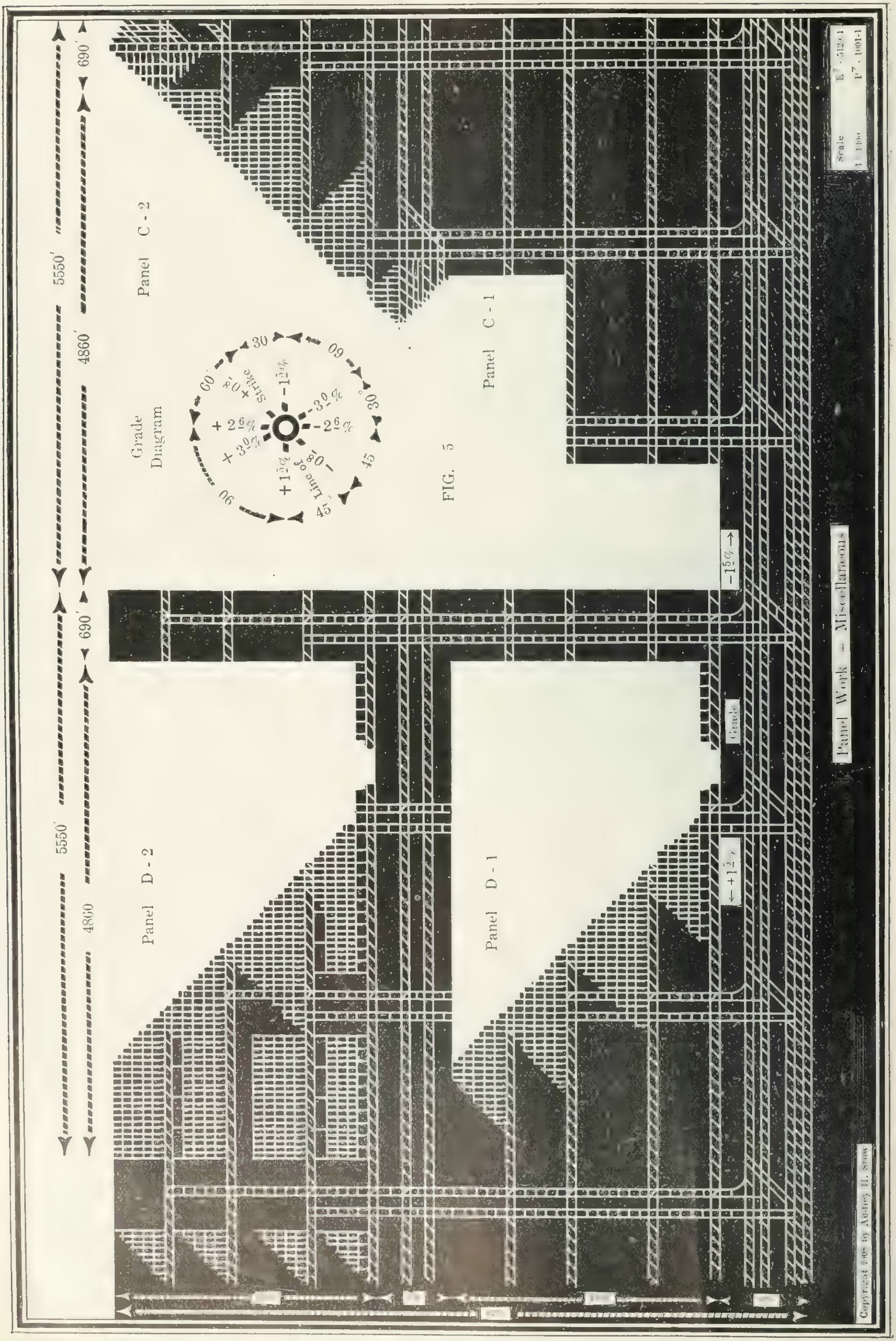


FIG. 5

GENERAL PLAN FOR DEVELOPING A FLAT COAL SEAM HAVING HEAVY COVER is $18.36 per year, to which should be added, say, $3 per year depreciation in ties, making a total of about $21

Figuring the cost of laying 500 ft. of track at $13 and tearing the same out at cost of $7 makes a total of $20 for tearing out and relaying for the pillar work; however, by tearing out the track, as soon as the room is driven up, it is possible to use the ties twice, making a saving of, say $7, so that the net cost of tearing out and relaying compared with leaving track in, is only $13. This means a loss of $8, the first year track is left in the rooms, and $21 each year thereafter, on the basis of a 12-year life of rail. The variable life of ties of different kinds of wood will change the figures somewhat, as will a different length of life for the rail; 16-lb. rail in place of 25-lb. steel, will reduce the interest charges materially, but will about balance the costs and interest charges at the end of the first year, making the second year a dead loss, not to mention the chance of losing the track from falls too heavy to clean up. If panels are, say, 1200x1200 ft., and consist of two entries and their rooms, the entries being 75-ft centers, this arrangement will make the rooms 525 ft. center to center; 500 ft. of track will ordinarily be sufficient to drive the rooms up, until they hole into the air course above

Intimately connected with track is the question of the average length of life of the rail; motor rail usually reaches an old age in hard service, while room rail does not last as long, although a few such rails seem to have been sentenced to life imprisonment, in old abandoned workings. Motor rail is usually of much heavier section in proportion to the maximum weight carried, than in railroad practice, although the few curves are commonly taken at slow speeds so that the actual wear seems less; extensive development work may mean considerable capital tied up in motor rail.

Assuming that the life of a rail is the interval of time between the date on which it reaches the drift mouth and the date on which it is caught by a pillar fall, this then becomes a separate problem not only for each mine, but varying from day to day, although for any given mine crew, it is possible a reasonably constant figure can be obtained, if averaged over suitable periods. This question of the length of life of room rail has been found a somewhat difficult one to determine, although a question that means considerable money in the run of a year; while inspections have been found a useful check on the careless loss of rail, it hardly seems practicable to attempt in this way to determine the exact amount, which would require practically one man's time on the pillars alone.

An exact inventory means no small amount of work, both field and office, for properties of considerable size, although their expense would seem to be justified, at least annually, if not quarterly, where there is reason for believing that there is a considerable loss of rail going on. In the absence of exact inventories, it would seem practicable to make rough approximations that might serve as useful checks; the amount of room rail required should bear some fairly definite relation to the output, provided there is no loss on the pillars.

A PRACTICAL EXAMPLE

A room 500 ft. long, 20 ft. wide and working a 6-ft. seam, together with five crosscuts or breakthroughs 40 ft. in depth each, contains 3100 tons of coal; the straight room contains but 2200 tons. Three two-ton cars one day and four the next, or 7 tons average per day for 300 days, will drive the room out in practically a year. The remaining pillar, practically 400x40 ft., will contain 3550 tons, which on an 85-per cent. recovery will yield 3000 tons; the pillars should easily average 10 tons per day per pillar; the 500 ft. of track necessary to start the pillar thus turning out the same number of tons per year as the room track; the quick loading on the pillars is offset by the additional tonnage from the crosscuts in the case of the rooms. On the assumed basis, 3000 tons per year from 500 ft. of track, considering pillars as well as rooms, 300,000 tons per year will require 50,000 ft. of room track, or 415 tons of 25-lb. rail. If we allow 20 per cent. for idle track and stock on hand, 500 tons would be the amount required for the output indicated; at the same time, only about 420 tons are in actual service, 210 in the rooms and 210 in the pillars; if 70 tons have been requisitioned for the year, it would appear that one-third of the rail in actual service on the pillars had probably been lost; if 35 tons have been requisitioned, the loss would appear to be one-sixth the pillar rail or one-twelfth the total rail in service, equivalent to a 12-year life of rail. Suitable allowance would have to be made for reserves of rail that could be proved. An unusual proportion of idle places would be a clear credit, and in the case of irregular outputs, the amount of rail required would be that for the maximum output; a gradually increasing output would make it necessary to charge requisitions in part to this account. While this method may involve many possible corrections, the requisitions for rail would seem to be the key to the loss of rail on pillars. A reduction in the number of tons per place means a serious increase in the amount of capital tied up in rail, and in depreciation in ties; in the instance taken, an average output of only five tons per place, due to absences and similar causes, would mean something like 1000 tons of room rail and 50,000 ties necessary. Interest at 6 per cent. on the rail, would amount to say $2000, and the depreciation [illegible]

Mine [illegible] creditably anxious to keep down expenses, but they do not generally appreciate the extent to which the loss of rail on pillars or in old abandoned workings, affects their working costs; 500 ft. of 25-lb. track, rail and ½ the life of ties, at present prices delivered, may be estimated at about $150; a loss of only one-fifth the pillar rail would amount to $30, or 1c. per ton for the pillar coal, or ½c. per ton for the entire output. One-fifth of the pillar rail is a reasonable enough loss, depending upon the top; 25-lb. rail is seldom seen on pillars, although the saving in using 16-lb. rail is in part offset by the higher price; 16-lb. rail, for the same proportional loss, would amount to say ¾c. per ton for the pillar coal, or ⅜c. per ton for the entire output. Any considerable amount of 16-lb. rail abandoned in old workings would easily bring the loss up to ½c. per ton for the entire output; larger losses of rail than one-fifth will increase the cost per ton proportionately.

Owing to the custom of keeping the track pulled out of an air course and the crosscuts, as fast as the advance of the entry admits such practice, 100 ft. of room track used in driving the headings, may be said to turn out the coal from 300 ft. of narrow work, practically equivalent to room work. Where the roof admits of crosscuts being driven room width with perfect safety, entry track may be said to turn out more coal than either room or pillar track.

Thoroughly practical managers and superintendents know well enough when requisitions for rail become excessive; it is necessary to know, however, not merely what amount each mine foreman has used, but what the actual bona fide minimum requirements are; neither does so many tons a year, on the face of it, give the average length of life of room rail, which is in part the object of this analysis.

MOTOR HAULAGE

Gross errors in motor haulage, such as having grades against the loads when the haulway might have been so located that the grades would have been in favor of the loads, are seldom, although occasionally seen; the practice, however, seems to vary considerably where motor hauls cross heavy local swags or dips, particularly in low coal where straight through grades would necessitate heavy top shooting. Common interest at 6 per cent., and 4 per cent. added for deprecia- [illegible] amount of money necessary to shoot top [illegible] fixed annual charge against the proposed improvement. In the case of a swag or dip 1000 ft. long, 8 ft. maximum depth, we may estimate the amount of top necessary to be shot at, say, 1500 cu.yd., which at 50c. a yard, depending upon the nature of the top, would amount to $750; surfacing track and gobbing slate in excess of that [illegible] the total cost over $1000. If the track has been in use several years, new ties would doubtless be put in, but should be charged to track maintenance. The yearly charge against the proposed improvement would be 10 per cent. on $1000, or $100. The increased cost of car repairs, depending somewhat on the car, and in part on the motor runner, would in many instances, pay a considerable part of the yearly charge.

If we figure the output at 300 cars of 3 tons gross weight (motor reduced to cars, included) per day, vertical lift 6 ft. (2 ft. having been deducted for the speed gained going down hill), we have 327 total horse-power required per day, equivalent to, say, ½ h.p. per year on a 10-hour basis, or, say, 1/5 h.p. per year on a 24-hour basis, costing probably in the neighborhood of $10 to $12 per year; this figure, however, becomes more interesting as the output is increased.

Where the grades are generally irregular, and it is impracticable to make them otherwise, the increased cost of motor cannot be properly charged to any one hill, and thus becomes a small item; where the grades are generally irregular and steep, rope haulage, either tail rope or endless, has several points of advantage, even where the grades are not past motor limits, more particularly in the better control of trips, and in the prevention of reckless speeds.

Where the dips or swags are on local hauls not likely to last more than a year or two, the case is quite different; it is then a question whether the various items heretofore spoken of as offsets against the yearly charge, will amount to as much as the entire first cost instead of the interest on same; even in this case, however, it is well to consider the question carefully; anyone who has seen trips turned loose by reckless motor runners on the down grades in order to climb the hill on the other side, cannot but admit that the wear and tear is considerable. The cost of wrecks does not always seem to be thoroughly appreciated or properly figured. Such damage to track, cars and motor should be added to the other items and appear on the cost sheets.

Mule Haulage

The panels as worked in many flat seams are 1200x1200 ft. and composed of two entries; the extreme limits of the mule hauls within the panel limits being 1800 ft., or an average of, say, 900 ft. one way per entry, where the panel is robbed retreating. It can be said that 900 ft. is near enough, the average length of the mule haul where the motor is shoved up to the partings within the panel, as soon as this can be conveniently done. While it may not seem far from the panel partings to the cross-entry partings, the former cannot be placed much closer than, say, 600 ft. for partings 400 ft. long, point to point of point of switch. If the cross-entry parting is retained in service until the heading within the panel under discussion is half driven up, this will make a total increase in the average length of haul of 300 ft., or an increase in the average length of haul of one-third.

The chances of killing or crippling mules would be just one-third more on the longer than on the shorter haul, not to mention the difference in the condition of the mule or mules at the end of a year's steady service.

It would seem fair to assume in a general way, that the number of mules killed is in direct proportion to the number of miles traveled; a one-third reduction in the number of mules killed in the run of a year, would be no small item for a large operation. It does not seem fair to charge up against this the cost of moving up the parting, as the latter has to be moved up off the cross-entry for the panel-pillar work, even if it is not thought necessary to do so for room work. Reducing the mule haul at the expense of drivers' wages, however, is not economy, compared with which the cost of maintenance and depreciation of the mule is a small item, although there is clear economy in decreasing the mule haul, where other costs are not increased thereby.

Drivers are to Blame

Figuring one 1200x1200-ft. panel of 6-ft. coal, as yielding, say, 250,000 tons, or 125,000 two-ton trips of 900 ft. each way will make 225,000,000 ft., or, say, 40,000 mule miles, one mule one mile one way; the 1200-ft. haul will make at least 50,000 mule miles, or 10,000 mule miles unnecessary travel.

Mule haulage is perhaps the next most important item in the cost of coal after digging and loading, the driver's wages being the most important item in the cost of the mule haul. Some progress seems to have been made in getting after the driver, although it is not at all uncommon to see him hitting the same old pace, sometimes in direct proportion to the number of apples, the amount of grub and tobacco, etc., given him by the miners, with oil and cash sometimes thrown in. The driver should be made to turn in the number of cars hauled, while in some sections the miners see that he keeps moving; at the same time, poor service from just a few drivers means a considerable additional cost, not merely in haulage, but in loss of output as well as loss of wages to the miner. It would not be unreasonable to require the driver to carry checks, say, of a special form, possibly lettered instead of numbered to be placed in the empty car when delivered to the miner; a bonus for all cars over a certain number might be a really good thing, and would necessitate the introduction of the driver's check.

Loss of Coal in Mining

Were the same methods applied to coal mining, as to most other lines of business today, managers would want to know the total number of tons of coal originally in the property, which in many cases can be determined with considerable exactness; it would also be asked, how many tons of coal are exhausted each year and whether all of this was in stumps necessarily left to protect the miner on the retreat; whether a considerable proportion was not on pillars too badly gobbed to be recovered, and whether suitable and timely timbering would not have prevented the falls until the pillars in question could have been recovered.

A pillar 40 ft. wide by 100 ft. long, with 7 ft. of coal, contains slightly over 1000 tons, and on an 85-per cent. recovery, should yield, say, 850 tons; two rows of props with 6-ft. centers in each row, equivalent to 3-ft. centers for one row, and costing say 25c. each in place, would amount to $8.50, or 1c. per ton. When a pillar is once cut off by falls, it may cost many times this amount to clean up the slate, even if it is not impossible to recover the pillar on the score of safety. Were it merely a question of losing an occasional small pillar, this would no doubt be cheaper than to add 1c. to the cost of all the pillar coal; but once a mine has been opened a sufficient length of time to develop the special peculiarities of the top to be met, it should be possible to decide whether the absence of all timbering is likely to result in only small local losses, or in a considerable percentage of loss. It should also be possible to determine whether the expense of such timbering as might hold the top would be justifiable. The mine foreman should be given a definite limit in cents per ton of coal or in fractions of a cent, as the case may be. He should also be required to clean up all falls under the limit. It is a comparatively easy matter at each mine to determine closely the average cost per cubic yard for cleaning up slate. Pillars can often be slabbed or split, thus avoiding the necessity of cleaning up such falls. Where considerable timbering would be required, a material economy may be effected by timbering every other room only, and then stumping right and left.

Mine foremen are too often judged solely by the cost of coal in cents per ton at the end of the year, and no questions are asked as to any of the various methods by which apparent costs may be kept down; a seemingly higher cost may in reality be a far more economical management.

Losses Resulting from Carelessness

While the percentages of coal recovered from the pillars by some of our more progressive companies are unquestionably high and promise to become even higher, in some of the newer sections, more particularly, there seems to be a sort of "there's plenty more where that came from" spirit abroad; many of our mining properties are so large, and have often been purchased almost for a song. Careless losses of coal on pillars is too often looked upon by many, stockholders sometimes, as falling upon another generation or two, whereas looked squarely in the face, it seems clearly in many instances at least, a direct present loss coming out of current dividends; the output of many companies—and it is needless to say that all dividends are dependent upon the output—is limited by the rate the headings can be advanced. Every 100 ft., or 1000 ft. that the headings are driven should mean so many tons of coal on board car, or so many dollars in dividends. If through careless robbing, only 60 per cent. is recovered when 80 per cent. might have been obtained, the loss may be said to be one-eighth of the entire output for the year, counting the pillar coal as one-half the output. The dividends are affected even more seriously than the output, the cost per ton usually going up as the production goes down. Where entries have been driven ahead of all possible future needs—which, however, is seldom the case—the loss is the shortened life of the property; in most instances, even with well-driven entries, the time comes when cars and men are plentiful, the output depending solely upon the number of working places available; then the bill for carelessness and ignorance becomes a sight draft, and must be honored.

In instances where the pillar work is not particularly evident on the surface, it is assumed by some that the overlying strata have choked instead of breaking clear to the surface; what is meant by a clear break is not necessarily more than a mere crack, with possibly not over an inch or two of a drop; this, however, should be sufficient to relieve the pressure, although not readily noticeable in rough countries, or in sections where the soil is deep. That the pillar work is not evident on the surface is in some sections, rather an evidence of poor recovery of the pillars.

A 1200x1200-ft. panel contains something over 30 acres; on the supposition that the overlying strata choke instead of breaking clear, say to an extent equivalent to 300 ft., the total cover being supposed to be 700 ft., there would still be over 30 acres with 400 ft. of cover, equivalent to, say, 20 acres of 700-ft. cover, to be supported by the surrounding coal, which hardly seems a tenable theory. In perhaps the majority of instances the choking quite likely amounts to more than half the thickness of the coal; in the case of 4-ft. coal with 700 ft. of cover, it is likely the choking will, in many instances, amount to, say, 3 ft. for 300 ft. of strata leaving the upper 400 ft. to drop only one foot, and where the pillar work has been poor, possibly a less distance. That the weight could be relieved without a clear break of the entire 700 ft. does not seem possible except in the case of strata sufficiently flexible to bend the requisite amount without breaking; it often happens that the weight is clearly off the coal, while no evidence of a break is seen on the surface, particularly in low coal.

It may be argued that the large number of barrier pillars shown in Fig. 4, May 2, issue of the ENGINEERING AND MINING JOURNAL, page 894, will result in increased loss of coal; while this is correct to some extent, the amount would seem negligible, compared with the heavy losses usually resulting from large areas of open work, with anything but an A No. 1 top. With even good top, slight irregularities in long break lines may easily result in heavier losses than should result from the number of barriers shown in Fig. 4, which are only essential to maximum output, from a given width; the full number is seldom if ever required, with the usual shortage in railroad cars, provided the entries are always pushed.

The proportion of barriers shown in Fig. 4, can be largely reduced by throwing the secondary panels—designated by numbers in Fig. 4—into primary panels, as in Fig. 5, the primary panels being designated by letters. On account of the size of the primary panels shown, and consequently the length of time necessary to drive them up, say, 6 to 8 years, it will ordinarily be necessary to rob advancing, instead of waiting until the primary panels are driven up, and then rob retreating, which would be almost ideal, could it be done. This would be practically the same scheme as in Fig. 4, on a larger scale, provided the entries were driven blank, for otherwise the amount of open work would be enormous. Much the same result can be obtained by pushing the entries as fast as possible, and robbing as few of the secondary panels as circumstances permit, as illustrated in Fig. 5, panel C-1. A portion of panel C-2 is also supposed to have been reserved for emergency output, but the requirements of the market have made it necessary to draw on the panel C-2 reserve, as well as to rob panels D-1 and D-2 advancing. If the breakline shown in panel C-2 can be carried continuously in the same direction across panel C-1, all barriers will be recovered on the favorable grades of the rise coal; the logical deduction from this is, never let your entries stand, drive them through dull times and panics (if finances permit). Require mine foremen to show up their entry driving, footed up month by month throughout the year, for this is just as essential as their cost sheets. Fig. 4 shows the maximum output for the minimum area of open work, requiring, it need hardly be said, the pillar work following at the same rate of advance as the entry work. Increasing the rate of advance of the entry work or decreasing the rate of following of the pillar work makes possible a reduction in the proportion of the [illegible]

With work laid off as in Fig. 4, it can be readily thrown into the forms illustrated in panels D-1 and D-2; while panel D-1 may seem preferable at first sight to panel D-2, and in fact is as far [illegible] D-1 may be seriously criticized as far as haulage is considered. The adverse grades against the loads on the mule hauls in the case of motor haulage on the cross-entries can be "swapped" for long relay mule hauls over constantly shifting routes; the grades in this case, however, being in favor of the loads, either solution may be the price paid for recovering the barriers shown in Fig. 4 on the usual favorable grades of the rise coal; the large heading barrier between the primary panels, as well as the cross-entry barriers between the primary panels, have still to be recovered, as well as the corresponding barriers in Fig. 4.

The long mule haul referred to in connection with Fig. 2, p. 505 of the ENGINEERING AND MINING JOURNAL [illegible] 7, 1908, should be more clearly evident in panel D-1, Fig. 5. For the dimensions shown, the extreme mule haul may be said to be 5300 to 5500 ft., or an average one way of, say, half a mile, which should call for at least one relay, if not two. Motor hauls can be arranged up the cross-entries, but involve, as should be evident from the figure, adverse grades against the loads on the mule hauls; the extra mules necessary for the adverse grades should at least furnish the relay mules on the straight mule haulage, so that the advantage of taking the motor off the main entry is not very evident. Panel D-2 has the advantage over panel D-1 on the score of haulage, in that say, half the coal, that is the room and entry coal, has been obtained on good grades with short mule hauls. Panel D-2, however, is open to the same criticism on the score of the large amount of open work as in Fig. 2, being in fact almost identically the same.

The number of fatal coal mine accidents in England during 1907 was 1239, an increase of 97 over the previous year. The deaths from falls of roof or side numbered 572, an increase of 25 over those of 1906. In one district five deaths occurred from falls of roof or side for every fatality due to an explosion of gas or dust.

A mixture which gives good results in preventing the rusting of machinery is one ounce of camphor dissolved in one pound of melted lard. Skim off the impurities and add black lead to give an iron color. Clean the machinery carefully and apply the mixture, which may be left on indefinitely, or if wiped off in 24 hours will prevent rust for some time. Polish the metal with a soft cloth after removing the mix-

The American Chemical Society

The thirty-eighth general meeting of the American Chemical Society was held in New Haven, Conn., June 29 to July 2, and was one of the most successful summer meetings ever held by the Society. Over 250 members were present and 174 papers were presented. The large number of papers made it necessary to hold more sectional meetings than usual and the Society met in six sections for the presentation of papers.

The Society met June 29 in the lecture rooms of the Sheffield Scientific School and the following nine papers were presented in general session before all the members: "Official Inspection of Commodities," by A. L. Winton, chairman of the agricultural and food section. "The Increasing Importance of the Rarer Elements," by P. E. Browning, chairman of the inorganic section. "The Analyst, the Chemist and the Chemical Engineer," by Wm. D. Richardson, chairman of the industrial section. "A Discussion of Some of the Methods Used in Determining the Structure of Organic Compounds," by Wm. McPherson, chairman of the organic section. "Our Present Knowledge of Plant Proteins," by T. B. Osborne, chairman of the biological and sanitary chemistry section. "Some Applications of Physical Chemistry," by Frank K. Cameron, chairman of the physical chemistry section. "Chemical Publications in America in Relation to Chemical Industry," by W. A. Noyes. "The Electrolytic Theory of the Corrosion of Iron as Applied to the Protection of Steam Boilers," by W. H. Walker. "The Research Chemist," by W. R. Whitney.

The physical section had an unusually attractive program containing some 45 papers, and greetings were received from Arrhenius, Emil Fischer, Roscoe, Ramsay, van't Hoff, Julius Thomsen, Lunge and von Baeyer. Papers were sent for the meeting by Svante Arrhenius on "Agglutination and Coagulation" and two papers by Emil Fischer on "Polypeptides" and "Micropolarization."

On Wednesday afternoon, July 1, an excursion to Ansonia was made by the visiting chemists for the purpose of visiting the works of the Ansonia Brass and Copper Company and the Coe Brass Manufacturing Company. On the evening of the same day the members met on the East Shore for a social outing and dinner.

The organization of the Division of Industrial Chemists and Chemical Engineers was a feature of the meeting and the following officers were elected: Chairman, A. D. Little; vice-chairman, A. H. Low; secretary, B. T. B. Hyde; executive committee, Wm. H. Walker, Wm. Brady, J. D. Pennock, W. C. Ebaugh, F. B. Carpenter. Twenty-eight important papers were presented before the division and marked enthusiasm was shown. A movement is also on foot for organizing the food chemists, the general and physical chemists and the fertilizer chemists.

The rapid growth of the society under the impetus of the organization of chemists into special groups and the continually improving quality of its journals was noted by all, 700 new members having been added in the last eight months.

Matters of decided importance were brought before the council and acted upon. A new section of the society was established with headquarters at Louisville, Ky. It was decided that the winter meeting should be held in Baltimore in affiliation with the American Association for the Advancement of Science, and that the summer meeting for 1909 should be held in San Francisco.

The Society having been represented by its president in the recent conference in Washington, it was voted that a standing committee on the conservation of our natural resources be established and that the American Chemical Society should attempt to point out how chemists could assist this movement.

W. D. Richardson was elected editor-in-chief of the new *Journal of Industrial and Engineering Chemistry* and the following were elected as associate editors: Henry M. Howe, metallurgy of iron and steel; A. H. Low, metallurgy of gold, silver and lead; Geo. C. Stone, copper, zinc and other non-ferrous metallurgy; Willis R. Whitney, applied electrochemistry; F. W. Lovejoy, photochemistry; A. E. Leach, foods; L. P. Kinnicutt, water, sewage and sanitation; F. B. Carpenter, fertilizers and soils; Robert Wahl, fermented and distilled liquors; Virgil Coblentz, pharmaceutical chemistry; T. J. Parker, heavy chemicals; J. B. F. Herreshoff, sulphuric acid; Karl Langenbeck, ceramics; G. E. Barton, glass; Ernest B. McCready, cement, mortar and building materials; Clifford Richardson, asphalt and petroleum; A. D. Little, cellulose and paper; Francis I. du Pont, explosives; E. G. Bailey, fuels; J. D. Pennock, destructive distillation; John Alden, textiles, bleaching and dyeing; P. C. McIlhiney, pigments, rosins and varnish; W. C. Geer, rubber; Ernest Twitchell, fats, waxes and soaps; W. D. Horne, sugar and starch; W. K. Alsop, leather; G. R. Underwood, glue; Edward Mallinckrodt, fine chemicals; M. C. Whitaker, gas; W. F. Hillebrand, pure and analytical chemistry; W. H. Walker, engineering chemistry; Wm. Campbell, metallography; W. C. Ebaugh and F. H. Thorp, miscellaneous industrial chemistry.

The committee on the Qualifications of Chemists made a preliminary report on the establishment of an Institute of Chemistry, which has been under consideration for the past two years, and it was decided on account of its great importance to refer this matter again to a representative committee of 15 for further consideration and report back to the council.

The committee appointed to consider the training and education of chemists and chemical engineers made its report and as a result a movement is under way to establish a section or division of chemical education within the Society, which shall especially appeal to teachers and shall study more particularly the existing standards and methods of instruction throughout the country and the possibility of improving same.

The Society adjourned July 2 after one of the best meetings in its history.

Annual Reports of the Coeur d' Alene Mining Companies

According to the annual statements of the larger mining companies operating in the Coeur d'Alene district, to the county assessor, 1,366,076 tons of lead-silver ore were shipped from the district during the year 1907, yielding a gross profit of $14,367,418, and a net profit of $4,810,522. The profits of nearly all the big companies were less than those of 1906, due chiefly to the depression in the metal markets. The statement of the Federal Mining and Smelting Company shows a reduction in profits of more than $1,000,000, as compared with the records of 1906. The more important figures of the various companies are included in the accompanying table.

SUMMARY OF REPORTS OF THE COEUR D'ALENE MINES FOR 1907.

	Tons Mined.	Gross Value.	Mining Costs.	Transportation, Reduction and Sale.	Improvements.	Net Profit.	Net Loss.
Morning....	297,500	$1,497,325	$ 680,132	$ 512,482	$ 70,835	$ 233,876	......
Standard & Mammoth..	287,300	3,193,320	1,085,131	865,828	38,345	1,204,016	......
Tiger..........	51,800	252,784	252,625	73,669	32,518	....	$106,028
Last Chance.....	163,600	1,242,048	569,824	387,009	28,372	256,843	
Bunker Hill & Sullivan..........	312,800	4,180,210	666,803	1,463,200	183,724	1,866,483	
Hercules..........	20,466	1,615,684	178,038	329,093	343,392	765,161	
Hecla............	117,430	1,244,685	440,282	333,349	33,864	437,190	......
Frisco..........	55,846	493,664	229,564	230,332	61,300	.	27,532
Gold Hunter.......	49,453	172,617	141,712	43,000	63,439	.....	75,534
Tamarack & Chesapeake.........	277	10,349	16,574	2,747	15,858	....	24,830
Success...........	7,262	211,884	54,132	81,168	35,781	40,803	
Pittsburg Lead.....	2,342	252,851	72,966	73,796	21,440	84,649	
Snowstorm........	95,435	1,396,258	216,393	569,684	155,892	454,289	
Stanley..........	122,979	.....	......	......	10,000	3,533	

According to the *Mining Journal*, July 4, 1908, the production of asbestos in the Urals in 1907 was 571,194 poods.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for June, 1908, *was* 41,000 *copies.*

July 4	16,000
July 11	9,500
July 18	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
Technical Degrees 141
The Prospective Mining Engineer 142
Machine Sampling 142
British Columbia Mining 142
*Ore Sampling by Machines *John A. Church* 143
Gems in New South Wales and Queensland. *F. S. Mance* 145
Electrolytic Determination of Bismuth 145
Mining in French Guiana 145
*Notes from Mexico 146
Short Talks on Mining Law—IV *A. H. Ricketts* 147
*John A. Mackay 149
Quicksilver in Russia During 1907. *I. I. Rogovin* 149
By-profits of Gold Dredging 149
*Veta Colorada Cyanide Mill, Parral, Mexico *Claude T. Rice* 120
*A New Sampling Device *A. Livingston Oke* 122
The Yaqui War 123
*Safety Device for Landings 124
*Mill Construction in the Joplin District. *Otto Ruhl* 125
Duty on Hematite Iron Ore 128
Lead and Zinc in the United States *R. W. Raymond* 129
The Smelters at Anaconda *E. P. Mathewson* 130
The Human Side of a Mining Engineer's Work *Edmund B. Kirby* 131
The Jumau Copper Leaching Process 132
The American Institute of Chemical Engineers *Charles F. McKenna* 133
*The Hennig Concentrating Table 134
*Mining in Flat Coal Seams Under Heavy Cover *Audley H. Stow* 135
The American Chemical Society 140
Annual Report of the Coeur d'Alene Mining Companies 140
Mining in Australasia in 1908 *F. S. Mance* 143
New Dry-air Blast Plants 144
Personals, Obituaries, Societies and Technical Schools 145
Special Correspondence 146
Mining News 149
Markets, etc. 154
*Illustrated.

Technical Degrees

This is an age of specialization; also it is an age in which the desire for titles appears to be increasing. The University of Arkansas seems to have gone to the limit in creating a new course of instruction for the completion of which the degree of "Bachelor of Science in Cement Engineering" is to be conferred. However, it is to be congratulated upon its moderation in refraining to call its new degree "cement engineer."

It is a pity that all of our technical schools and other institutions of learning will not confine themselves to simple degrees, such as bachelor of science, bachelor of philosophy, bachelor of engineering, and the corresponding degrees of master and doctor. Degrees are of only slight significance, anyway; they indicate nothing more than that the recipient has fulfilled certain requirements in a course of instruction. With the possible exception the doctorate, degrees have no commercial value.

The practice of the schools in giving vocational degrees, i.e., degrees corresponding with the names of occupations, such as mining engineer, mechanical engineer, etc., is to be deprecated. For one thing, the young man whom the school dubs "mining engineer" is usually not a mining engineer, but merely a prospective mining engineer; on the other hand, the mining engineer who has not had the advantage of graduation from a school, has a perfect right to call himself a mining engineer, and to abbreviate his vocational title by "Min. Eng." "M. E.," or in any other way that he pleases. Of course, the use of such an abbreviation as the latter is to be regretted, inasmuch as nine times out of ten it is intended to convey a false impression. Well known engineers do not need to put letters after their names; nor do they need to write themselves down as engineers of one kind or another.

On the other hand, it is a rather unfortunate young graduate who possesses the degree of C. E., which may stand for civil engineer, chemical engineer, or cement engineer; or he who has the degree of M. E., which may stand for mining engineer, mechanical engineer, mill engineer, marine engineer, metallurgical engineer, and perhaps some other kind of engineer. He is unfortunate because he possesses only the right to letters, which many may adopt upon their own volition, and the letters have not even the advantage of distinctiveness. He would be better off if he had the older and more significant degree of bachelor of science (or engineering). The administrations of the colleges ought to think about this.

However, to revert to our subject. Once there were but two kinds of engineering, viz., military and civil. The latter split up naturally into the great branches such as mining, mechanical, electrical, and the special kind of constructional engineering which we now know as civil engineering proper. Then other sub-divisions developed, such as hydraulic, sanitary, etc., but when we get so far as cement engineering the splitting process has become decidedly thin. He is not much of an engineer in these days who is not as well acquainted with the use of cement as with that of steel, while the development of cement manufacture has been managed quite well by the mechanical engineer and the chemist.

The Prospective Mining Engineer

The address by Mr. Kirby to the graduating class of the School of Mines and Metallurgy of the University of Missouri, of which a rather full abstract is published elsewhere in this issue, contains much good advice, not only to those just passing out of school, who are prospective mining engineers, but also to many who are actually in the practice of the profession. Coming from an engineer who has been so successful as Mr. Kirby in the management of large enterprises, the common-sense advice that he gives ought to be appreciated highly by the graduates of 1908. We think that the faculties which lead students through their collegiate course may also profit from what Mr. Kirby says.

Indeed, he says so much of importance that elaborate and valuable essays may be written upon many of the points to which he calls attention. For example, the disadvantage of specialization. Probably, he did not intend to decry the specialist, but many who have adopted the line of ultra-specialization have found to their sorrow that they have made serious mistakes through their lack of general knowledge. We do not want the specialist; nor the generalist; but rather the specialist-generalist, if we may be permitted to introduce that rather awkward term.

Another important point in Mr. Kirby's

address is the emphasis which he places upon the supreme advantage of a good general education, including the ability to use the English language properly; if we do not mistake his views, he puts this rather ahead of the purely technical education. This may be considered somewhat heretical, but the same views are held by many experienced engineers besides Mr. Kirby.

We feel naturally a great interest in Mr. Kirby's recognition of the "remarkable work of the mining journals in developing the professional spirit of engineers, and the feeling of fraternity among all those soldiers of fortune who constitute the mining world." This is a sentiment which we are bound to approve, inasmuch as the ENGINEERING AND MINING JOURNAL has been consistently preaching it for upward of 40 years, and will, of course, continue to do so.

Machine Sampling

The article by Mr. Church, which is published in this issue, opens for discussion a subject that is of supreme importance in the mining and metallurgical industries. The purchase of ores and the determination of technical results are based upon sampling, and it is essential that the methods of sampling shall conform to the soundest principles. We have seen the old method of quartering practically discarded because of its recognized liability to error, and the general introduction of machine sampling as not only more accurate, but also much cheaper. However, there are great differences among the methods of machine sampling, and even the best of them may be subject to error as Mr. Church lucidly points out.

In this connection it is proper to speak of the work of the late Henry A. Vezin, an engineer of sterling merit who did not receive in his lifetime, because of his modesty and unassuming character, the popular and professional recognition that he deserved. However, Vezin's name is indissolubly connected with the subject of machine sampling because of his invention of one of the first machines designed on sound principles, which has come largely into use. Vezin never patented this machine, but made a free gift of it to industry.

In designing sampling works, Vezin always laid great emphasis upon the proper coördination of the parts. His machine was carefully proportioned to the size of the ore to be sampled and other variable conditions, and care was taken to deliver the ore-stream to the sampler at just the right angle, etc. In some of his latest designs, showing two samplers in series, a mixing cylinder was interpolated between the two samplers. The first sampler discharged its cutting into the cylinder, which effected a thorough mixture before delivering it to the second sampler. Of course, this obviated the retardation of certain pieces of ore to which Mr. Church calls attention. The importance of thorough mixture before subjecting the ore to a new cutting has also been emphasized by other engineers, including Argall in his classic paper read before the Institution of Mining and Metallurgy.

British Columbia Mining

The report of the Minister of Mines of British Columbia for 1907, recently published in the JOURNAL, shows a substantial increase in values over previous years. This increase, however, was entirely in coal, coke and clay products, the metals being either stationary, or declining in quantities and values. This does not indicate, however, a serious condition of mining affairs in the Province, but more probably a change in conditions.

Placer gold, at first the attraction which brought miners to British Columbia, has been steadily declining for several years past, and 1907 was no exception. The lower Fraser and Thompson rivers have ceased to yield placer gold in any considerable quantities, while the Cariboo seems to have been rather a disappointment, notwithstanding the large sums spent in ditches and other preparatory work. In the Cassiar and especially in the Atlin district, work was suspended on some of the more promising placers, but may be renewed when the transportation conditions for supplies and machinery are more favorable.

Lode gold also showed a decrease, chiefly in the Rossland district, where the mines are now worked more for their copper than their gold values. About three-fourths of the silver won was in connection with the lead ores of East Kootenay and the Slocan, and this part showed a smaller production, as the lead output diminished in those districts, chiefly owing to smaller demand and lower prices. The remaining fourth comes from the copper mines of the Boundary district and the Coast. These copper mines for the greater part of the year made a large production; but the shutting down of the larger mines in the closing months of the year, owing to labor troubles and the drop in the copper market, prevented them from making the increase in copper and silver production which had been expected.

The coal and coke production, both for home consumption and for export to the Pacific Coast of the United States, was the largest ever reported; and to this was due the increase in total value. The coal industry is growing, and has room for expansion in both of the chief districts —Vancouver Island and the Crow's Nest Pass—while work has been begun on a promising coalfield at Nicola, in the Yale division. British Columbia has the advantage of possessing by far the best and largest supplies of coal on the Pacific Coast, and this is an important point in considering future mineral developments.

So far as metal mining is concerned in the future, much depends on the opening of the country by the new railroads now under construction. Some promising districts are now practically unworked owing to the difficulties of transportation, and most of these will be made more accessible by the building of the Transcontinental and the Grand Trunk Pacific lines. The production of copper in the future is likely to increase with the continued working of the large mines of the Boundary district, of which there is no doubt.

British Columbia possesses some deposits of iron ore which have been hardly touched, or even explored as yet, on account of their situation. The working of these also will be made possible by the new railroads; and with an abundant supply of coking coal, and the facilities for shipping finished products by sea, there is no reason why a considerable iron industry should not be built up in the Province in the next 10 or 15 years.

THE CONDITION of the iron trade in the past six months is shown by the Sault Ste. Marie lock reports. For the season to July 1 the decrease in traffic from Lake Superior was 66 per cent., due chiefly to the small iron-ore shipments this year. The ore shipments this season were only 21 per cent. of the quantity reported a year ago. There was also a heavy decrease in the coal traffic.

Mining in Australasia in 1908

Condition of the Mining Industry in the Southern Continent in the Current Year. Gold, Silver, Lead, Copper, Tin and Zinc

BY F. S. MANCE*

The condition of the mining industry of Australia during the four months ended April 30 shows a continued tendency to turn from the mining of gold to that of the industrial metals.

Gold

The returns of the gold yield of Australasia for the first four months of the year, indicate a decrease of 3 per cent. as compared with the corresponding term in 1907. The following are the figures, in ounces of fine gold:

State	1907.	1908.	Change.	
Western Australia.	[illegible]	[illegible]	I.	1,111
Victoria	[illegible]	[illegible]	D.	[illegible]
Queensland	150,936	[illegible]	D.	17,526
New South Wales	[illegible]	[illegible]	D.	[illegible]
Tasmania	[illegible]	[illegible]	I.	950
South Australia	5,000	4,500	D.	500
Total Commonwealth	1,034,162	984,271	D.	49,891
New Zealand	135,381	150,078	I.	14,697
Total Australasia	1,169,543	1,134,349	D.	35,194
Total value	$24,174,454	$23,446,994	D.	$727,460

It will be noticed that the State of Western Australia records a slight increase, a good recovery having been made during the month of April. The recent highly encouraging developments in the deeper levels of the mines at Kalgoorlie, taken with the improvements and economies effected in working, indicate that the present rate of production is likely to be maintained, and that the decline in the yield of this State has at last been arrested. The reports from the other States of the Commonwealth, however, are not as encouraging. The shrinkage is general, and the industry may be said to be in a depressed and stagnant condition. The question of encouraging deeper sinking on the Northern goldfields is receiving the earnest consideration of the Queensland government and the sum of £50,000 has been allocated with the object of assisting companies prepared to undertake the testing of the gold-bearing formations at a depth. In this connection it is interesting to note that the New Chum Railway Company on the Bendigo field, Victoria, is opening up a reef from the 4284-ft. level which averages about $5 gold per ton, while the Victoria Quartz Company in sinking a winze below the 4254-ft. level and meeting with encouraging prospects.

Both in New South Wales and Victoria dredging operations continue to be conducted with gratifying results. In the Bright district, Victoria, there are upward of 20 dredges in operation, and the dividends so far declared total £110,000, which amount exceeds the capital invested in the plants.

The returns from the Dominion of New Zealand are in contrast to those of the Commonwealth, and an increase of 14,697 oz. is shown. The Waihi Company, which ranks among the first six gold mines of Australasia, treated 86,306 tons of ore during the first quarter of the year for a return of over £200,000. The ore reserves in this mine at the close of the year 1907 were estimated at 1,300,000 tons of an average assay value of $13.18. The company has installed a gas-producer plant, and a considerable reduction in working costs is foreshadowed.

The value of the gold exported from the Commonwealth to the end of April is £4,104,537, an increase of £2,299,100 over the exports for the corresponding period last year.

Silver and Lead

Operations on the Broken Hill field in New South Wales are in strong contrast with the feverish energy displayed at the same period last year. That lead would fall in price was fully expected, but such a rapid and extensive decline was certainly not anticipated. This is particularly shown by the announcement made by the Broken Hill Proprietary Company at the end of last quarter that, owing to the decline in metal values and the additional costs of material and working, the results would not permit any dividend. For the first time in the history of the company a dividend has been withheld, and thus after 152 consecutive payments totaling £9,752,000 the continuity of the list has been broken. The position of the Proprietary Company is reflected in the reports of the other companies on the field, and so far they have not found it possible to adjust their economies proportionately to the fall in the prices of metals. The new customs tariff, as passed by the Federal Government, [illegible] while the increase of 12½ per cent. in wages granted to the men when lead was at a top price is for a fixed term and cannot be lowered at present.

Other matters have no doubt entered into consideration. It is generally understood that the Proprietary Company is desirous of increasing the smelting plant at [illegible] sition to undertake the smelting of the concentrates from some of the smaller mines on the field, which at present are exported to Europe. The South Company has in view the taking over of the works of the Smelting Company of Australia at Port Kembla, the returning charges of the foreign smelting companies being regarded as excessive. The companies were also to make joint provision to finance the auxiliary water supply known as the Umberumberka scheme, which it had been decided to carry out; but in the light of present events this proposal may now have to stand over. The large dividends declared at the end of the year exhausted the reserves and these have to be built up. Clearly the dividends should have been on a much lower scale. The extensive development work carried out during the period of high values has enabled the companies to shorten hands, and as several of the smaller mines have closed down the number of men employed is some 2000 less than in December last. The milling plants have either been reorganized or replaced by modern appliances, and operations can therefore be conducted at less expense and a larger tonnage dealt with. By curtailing underground development work, and the exercise of rigid economy, it is hoped that all the mines will soon appear again on the dividend list. As illustrating the extent to which the industry has been affected it may be mentioned that the value of the silver-lead, concentrates, etc., exported from New South Wales during the first quarter of 1908 is £650,000, or £232,700 less than for the same term in 1907.

The silver mines in the Zeehan district, Tasmania, have been materially affected by the closing down of the smelters of the Tasmanian Smelting Company. The government, recognizing the seriousness of the situation has recommended to Parliament the granting of a loan of £15,000 to the company, repayable in 10 years, and a rebate of railway freights, subject to the condition that operations are recommenced immediately.

[illegible]

The producers of zinc concentrates are [illegible] the negotiations for the formation of a convention by the European spelter producers. The companies here are already greatly handicapped by the high treatment charges on concentrates, the deductions made, and the fixing of the price of the metal on final settlement. The Broken Hill Proprietary Company is making headway with its zinc-smelting plant, and once the works are established on a profitable basis, Australia should, with its resources at command, become a factor in the world's output of spelter.

---

*Sydney, New South Wales

The Zinc Corporation at Broken Hill seems to have been much more successful since adopting the Elmore process. During the month of April 10,180 tons of tailings, assaying 18.5 per cent. zinc, 4.5 per cent. lead, and 7 oz. silver per ton, were treated and yielded 3090 tons of concentrates assaying 45 per cent. zinc, 7 per cent. lead, and 13.5 oz. silver per ton. In addition 70 tons of leady concentrate, assaying 57.5 per cent. lead, 37½ oz. silver, and 13½ per cent. zinc were obtained. It has been found that by burning off the oil and mixing the product with water, the lead sulphides can be easily separated by the Wilfley tables. It is represented that costs have been so reduced that a profit can be earned even at the present ruling price of metals, and although greater difficulty may be experienced in realizing on the product, still the prospects have been considerably brightened. The other processes in operation on this field are also responsible for the output of an increased quantity of zinc concentrate. The De Bavay plant on the North mine is to be increased to a capacity of 1500 tons. The plant is at present producing a concentrate assaying 48 per cent. zinc.

COPPER

When the unfavorable conditions of the metal market are taken into consideration, the report of the Mount Lyell Mining and Railway Company, Tasmania, for the half-year ending March 31 must be regarded as satisfactory. The ore dealt with during the half-year amounted to 202,000 tons, and is within a few hundred tons of the quantity treated during the preceding term. The output for the two half-years is as follows:

Half-year Ended	Blister Copper.	Contents. Copper, Tons.	Gold, Oz.	Silver, Oz.
Sept., 1907..	4,143	4,090	9,334	344,715
March, 1908	4,301	4,247	10,489	344,608
Year	8,444	8,337	19,823	689,323

The net profit earned during the half-year ended March 31 was £128,981, as against £128,728 for the preceding term. Working costs were slightly lower, amounting to $3.688 per ton of blister copper, as compared with $3.704 per ton for the September half-year. From the Mount Lyell mine 139,691 tons of ore were obtained of an average assay value of copper 0.87 per cent., silver 1.90 oz., and gold 0.069 oz. per ton, while 63,250 tons of an average value of copper 5.94 per cent., silver 1.49 oz., and gold 0.004 oz. per ton were drawn from the North Mount Lyell mine. This latter mine has opened up well during the period under review, and developments at the 1000-ft. level are such as to encourage the expectation that the orebodies will be encountered at still greater depths. The known ore reserves in the North Mount Lyell and the Lyell Tharsis mine are now greater than at any period in the company's history. The liquid assets of the company stand at £455,500, and the payment of £45,245 during the current month will free the company from the debenture liability, which was originally £140,000.

The copper production of the State of Queensland for the March quarter of this year was 2754 tons, valued at £163,498, as against 2602 tons valued at £279,694 for the same period in 1907. The Mount Morgan company continues to be the largest contributor, and during the month of May, 19,176 tons of ore were treated and 632 tons of blister copper containing 626 tons pure copper and 8216 oz. gold were produced. In addition, 6800 oz. gold were obtained from ore treated at the gold reduction works. The estimated value of the yield for the month, taking copper at £58 per ton, is £98,000.

The copper and ore exported from the State of New South Wales during the March quarter amounted to 2658 tons valued at £144,975. This value is £90,189 less than that of the same period in 1907. The bulk of the output is being supplied by the Great Cobar mine. The Nymagee and Burraga mines have been closed down, and other mines have considerably curtailed operations.

In South Australia, the Wallaroo & Moonta Copper Company has so far continued operations. This is somewhat contrary to expectation, as it was thought that the cost of production was too high to permit a profit to be earned at the ruling price of copper.

TIN

The production of the tin mines of Tasmania during the first quarter of 1908 was on a much greater scale than for the corresponding period last year, the figures being 1045 tons of black tin as against 586 tons in 1907. The Mount Bischoff company has furnished proof of the success now attending operations by declaring a dividend of 5s. a share. This makes the three hundred and seventy-fourth dividend, and brings the total amount paid by this company up to £2,139,000 or £178. 5s. 4d. per share. Some recently located orebodies are opening up satisfactorily, and the yield for the month of May was 76 tons. The output of the Briseis mine for April was 105 tons of black tin. The shares of this company have recently been the subject of violent fluctuations and heavy realization. This was in anticipation of an adverse report by the company's engineers, Messrs. Lake and Curny, who had been deputed to investigate the ore reserves. The report, which has now been made available, is to the effect that the present rate of output will probably be maintained throughout the current year, but there will be a considerable reduction during 1909 when all of the Briseis southern section, and the best part of the No. 1 property, will have been exhausted. No output can, in any circumstances, be expected from the Ringarooma property during the coming year, and it will probably be two years before sufficient overburden is removed to enable systematic operations on the drift to be commenced. The company's present financial position is a strong one, the reserve totalling £45,000, while the cash in hand exceeds £15,000.

The comparative returns of the tin-mining industry in Queensland emphasize the influence of the decline in the price of the metal. The following are the figures for the March quarter of each year:

	Alluvial Tin. Tons.	Value.	Lode Tin. Tons.	Value.
1907...	437	£51,848	882	£89,584
1908...	372	28,728	874	58,728

The bulk of the production is still drawn from the Herberton mineral field. The Vulcan mine is the largest individual producer. The output for April was 50 tons of black tin valued at £3100, good ore being obtained from the stopes at the 900-ft. level. Among the other important producing mines may be mentioned the Smith's creek, Stannary Hills, and Gilmore. The dredges at Stanthorpe have contributed a good quantity of alluvial tin.

The tin, ingots and ore, exported from New South Wales during the first three months of the year amounted to 547 tons, valued at £68,136, which is less by some £75,000 in value than for the corresponding period in 1907. The dredges in the new New England district furnished most of this, and the results secured are such as to prove that they may be looked to as a permanent and profitable source of supply

---

New Dry-air Blast Plants

The Cleveland-Cliffs Iron Company has decided to put in a Gayley dry-air blast plant at its Pioneer No. 2 furnace at Marquette, Mich. The work will be begun soon.

The Northwestern Iron Company has lately increased its capital, and has begun to make extensive improvement in its mines and its furnace at Mayville, Wis. Among these improvements will be a dry-air plant for the blast furnace.

It is reported that large deposits of manganese ore have been discovered near the village of Biaely Klyutch, in the district of Tiflis. The metallic content of the ore is stated to be more than 65 per cent

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. M. Howbert, of Colorado Springs, is in Chihuahua, Mexico, on mining business.

George A. Laird, of Bisbee, Arizona, has been appointed consulting engineer for the Commodore Mining Company.

George Mainhart has resigned his position as manager of the Champion Mining Company at Nevada City, California.

J. W. Bradley has resigned his position as superintendent of the San Martin mine in the San Juan district, Oaxaca, Mexico.

D. W. Shanks, general manager of the Rio de Plata Mining Company, Chihuahua, Mexico, is in Los Angeles, Cal., on business.

Isaac B. Hudson, of Joplin, Mo., has gone to Sonora, Mexico, to examine some copper properties for parties in Joplin and Memphis.

Sir Charles Craufurd, who is largely interested in South African mines, recently visited the Manitou Lake mining district of Ontario.

M. H. Yeandle has been appointed manager of the Rosario mine of the Alabama-Rosario Mining Company at Taviche, Oaxaca, Mexico.

H. R. Bellamy, of Seattle, Wash., has gone to Graham island, in the Queen Charlotte group, British Columbia, to open a coal mine there.

A. Bement, consulting mining and mechanical engineer, has moved from the American Trust building to 2114 Fisher building, Chicago, Illinois.

Floyd Harmon, formerly superintendent of the Temiskaming mine at Cobalt, Ont., is now in charge of the Cochrane mine in the same district.

Dr. Robert H. Richards is making a professional tour through Arizona, Utah, Colorado, Montana and Idaho. He expects to return to Boston late in August.

J. H. Plummer, president of the Dominion Iron and Steel Company has sailed for England in connection with the financial reorganization of the company's affairs.

M. C. Potter, chairman of the Southern department executive committee of the American Smelting and Refining Company, is in New York from Mexico on business.

W. G. Nichols, for some time assistant superintendent of the Taylor Iron and Steel Company, Highbridge, N. J., has resigned to take charge of manganese steel works in Chicago.

H. R. Conklin, for several years manager of the Missouri Lead and Zinc Company at Joplin, Mo., has taken charge of the Lluvia de Oro mine in Chihuahua, Mexico, as general manager.

Stewart R. Dow, president of the Franklin Mining Company, has been at the mine in the Lake Superior copper country, accompanied by H. M. Howard and Henry Tolman, directors.

Carl A. Allen and C. Lorimer Colburn have formed a partnership as mining engineers, with office at 614 Ideal building, Denver, Colo. They will conduct mine examinations, geological and topographical surveys.

T. J. Leavitt, formerly chief electrician of the Real division of the Real del Monte Company, at Pachuca, Hidalgo, Mexico, has accepted a position with the Benito Juarez Company, in charge of the mechanical and electrical departments.

C. S. Herzig, consulting engineer, of London, passed through New York this week on his way to Nicaragua, where he will be occupied in the examination of mines during the next three months. He will return to London by way of New York.

Edward K. Judd, formerly on the staff of the ENGINEERING AND MINING JOURNAL, has been appointed instructor in mining in the School of Mines of Columbia University, and will assume the duties of that position in September. Mr. Judd starts from New York for Colorado this week, on professional business.

Obituary

Charles E. Lyon, formerly connected with the Calumet & Hecla mines at Calumet, Mich., but for some time past superintendent of the Michigan Carbon Works in Detroit, died in that city July 5, aged 62 years.

Joy Pollard, who died at Murrietta Springs, Cal., July 5, aged 55 years, was born in Michigan, but had lived in Nevada 40 years, with the exception of a few years spent in Colorado. He was a pioneer in the discovery of several of the southwestern Nevada districts, and was widely known as a miner and prospector.

William Dwight Zehner died suddenly of apoplexy [illegible] Lancaster, Penn. He was 62 years old, and was one of the best known and most prominent engineers in the anthracite country. For 37 years he was superintendent and general manager of the Lehigh Coal and Navigation Company. He retired from that position in 1905, and since then had been consulting engineer for the company.

Societies and Technical Schools

Western University of Pennsylvania—A contract has been let for the new building of the School of Mines at this institution at Pittsburg. The building will be 85x130 ft., three stories high and will cost $175,000. Work is to be begun at once.

International Congress of Applied Chemistry—The seventh international congress of applied chemistry will be held in London, England, from May 27 to June 2, 1909. An organizing committee has been formed for the purpose of making all arrangements for the holding of the congress in London. This committee consists of representatives of many societies, including the Society of Chemical Industry, Iron and Steel Institute, Institution of Mining Engineers and Institution of Mining and Metallurgy. Previous congresses have been held in Brussels (1894), Paris (1896), Vienna (1898), Paris (1900), Berlin (1903), and Rome (1906). The work of the congress has steadily grown in importance, and it is hoped that the London congress may be a worthy successor to those which have gone before. The secretary of the committee is William Macnab, whose address is 10 Cromwell Crescent, London, S. W., England.

Canadian Mining Institute—A recent circular from the secretary gives the itinerary of the first and second stages of the summer excursion of the Institute; the third stage will be given later.

For Stage 1, the Nova Scotia and Quebec excursion, the start will be made from Quebec, Aug. 24, after a day spent in that city. Aug. 26 the party will arrive at Sydney, Cape Breton, and three days will be spent in visiting the coal mines of the Dominion Steel Company and the works of the Dominion Iron and Steel Company. One day will be spent at the Acadia Company's collieries at Stellarton, and another in visiting the asbestos mines at Thetford, Quebec, and vicinity and the Canadian Chrome Company's mines and works at Black Lake. The party will arrive at Montreal Sept. 1 and spend the next day in that city.

For Stage 2, the Ontario excursion, the program provides for arrival in Toronto Sept. 3, and a trip to Niagara Falls by steamer across Lake Ontario to Lewiston, and thence by gorge railway to the Falls, where the day will be spent. Sept. 4 will be spent in Toronto, where the party will be the guests of the Toronto National Exhibition. The train will leave in the evening and arrive at Cobalt Sept. 5. The principal mines of the district will be visited, the arrangements being in the hands of the Cobalt branch of the Institute. Sept. 6, leave Cobalt and arrive at Sudbury, and Sept. 7 a visit will be paid to the Moose Mountain iron mine. On Sept. 8 the party will be the guests of the International Nickel Company, whose Copper Cliff smelter and Creighton mine will be visited

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 10—Not long since two men named Reams and Lang from the agricultural regions of Solano county went into the mining regions of Yuba county and located a claim on what they supposed was vacant Government land. They struck ore of phenomenal richness, took it out, sacked and shipped some of it. Then along came J. C. Campbell, who said the claim—the Solano Wonder—was on his ground and told Reams and Lang to quit. They did not do so and he got out an injunction against them. After this they still sacked some ore and concealed other sacks previously mined. Then Campbell had them hauled up for contempt of court, while meantime another claimant for the mine appeared. This week the court purged Reams and Lang of contempt of court, deciding that there was nothing to prove that the men had hidden the ore in anticipation of an injunction, as they contended they had merely done this for safe-keeping. The burial of the ore was witnessed by several respectable residents of the neighborhood. Reams and Lang are still in possession and now a suit to determine the actual ownership of the rich ledge is to come up this month.

Manager S. W. Cheney, of the Pennsylvania Dredging Company, of Oroville, Butte county, which has been enjoined by the county of Sutter pending an investigation of alleged damages by mining tailings, states that he has no intention of violating any injunction or doing any damage to the river. He is about to confer with the Sutter supervisors and attempt to compromise the matter. This he can doubtless do by more perfectly land-locking his dredge, as has been done by either dredge-owners of the district, who have no fear of any trouble with the Anti-Débris people.

In this connection it has just developed that about two months ago a new or opposition anti-débris association was organized, the members of which did not believe that the old one was doing its duty in stopping infractions of the Caminetti law. It is this new association which has tried the plan of beginning suit against the mines instead of the owners. The fact is, however, that that plan was tried years ago and failed, because the companies disincorporated, and there was no company to sue, and it was impossible to sue and enjoin a mine which had no corporate existence. The citizens who have started the new organization deny that they have founded a new anti-débris association, but say they have merely joined the supervisors of Yuba county to lend moral support to the cause. Nevertheless, through their efforts the North American hydraulic mine at Whiskey Diggings, Sierra county, has been served with injunction papers by Yuba county, the suit being brought against the mine itself. How this will result is yet to be seen. The North American mine has been closed down in obedience to the order of the court, and a man was left in charge to see that operations are not resumed.

What is supposed to be the largest gold dredge in the world is in course of construction on the Marysville Dredging Company's grounds at Marigold, seven miles from Marysville, Yuba county. It will be known as Dredge No. 3, and will cost $150,000, taking eight months to complete. Not only is the company to build this big dredge, but it will make other improvements at Marigold. New cottages will be erected for the men and other improvements will be made that will entail an expenditure, all told, of $200,000, and give employment to an increased force of men. The operations of this company on the Yuba river are becoming more extensive, and it is using every known modern device and apparatus in the dredging business.

Title to part of the Five Pines group of mines between French Gulch and Trinity Center, is involved in a suit on trial in Trinity county. The issue is between a mineral location and a railroad patent. H. J. Van Ness located the Five Pines a few months before the railroad received a patent to a section of land that overlapped part of the group. John Roney and others, of Siskiyou county, bought the section from the railroad and went to mining on the ground. The question for the court to decide is, can a mineral location made prior to the issuance of a patent to railroad land hold the mining ground as against the patent?

The old South Eureka mine at Sutter Creek, Amador county, has at last come on a body of ore of good size and high grade. A large portion of the time of the 20 years in which the mine has been working it has been kept going by means of assessments on the stockholders. They have at times found small bodies of rich ore and large ones of poor ore, and the 20-stamp mill has kept going. Now, however, in view of recent developments 20 more stamps are to be added to the mill.

The United Gold and Copper Company has done considerable work on a quartz mine near Cherokee, Butte county, but dissensions among New York and Chicago stockholders caused a cessation of operations. For a time after this the salary of superintendent A. M. Wilson was paid regularly and then payments stopped. Recently he filed a complaint for a lien of $2615 for services rendered the company. The United Gold and Copper Company filed a demurrer, but Attorney Gardner, of Oroville, gave notice of a motion to set aside the demurrer on the ground that the defendants had no duly authorized agent in the State on whom a process of Court could be served, nor were there any documents on file in the State showing there was any such agent. Judge Gray granted the motion and set aside the demurrer. Judgment for the amount claimed and costs were given by default. The point raised by Mr. Gardner was a novel one, and the ruling of Judge Gray in his favor is a warning to corporations outside the State to maintain their legal standing by keeping a representative here.

The old Waterloo silver mill, for 20 years or more a familiar landmark of the desert at Daggett, San Bernardino county, has passed into history. The Borax Properties, Ltd., a company which is erecting a borax plant at Otis, has bought the mill and is moving it to the building site in Otis. All the machinery was sold to Robert Newell, a junk dealer, and he will commence blasting it up for shipment.

A new mining company was organized last month at Escondido, in San Diego county, which is to do a general mining business, and it has divided this up into four departments, each to be handled by a separate committee. One of the committees is on "Mines," another on "Finance," another on "Agencies," and another on "Advertising." This is rather a novel plan, especially the last named department. As a general proposition advertising does not receive much attention from mining companies, except such new ones as have treasury stock for sale.

The Landecker drift gravel mines, south of Placerville, owned by the Landecker Mining Company, have been sold at sheriff's sale to Thomas Clark, of Placerville, who brought the suit and who bought the property for the amount of the judgment and costs, amounting to a little over $20,000. As soon as permanent rights can be obtained it is likely that work will be resumed. The property includes some of the most promising gravel deposits in El Dorado county. While Mr.

Clark has not yet announced his intentions regarding the property, it is safe to say that he will not permit it to lie idle after the time for redemption has lapsed.

San Bernardino county has a new high-grade camp in the district of Kewanee, in the Kessler ranges, seven miles from Cima on the Salt Lake route, and six miles from Ivanpah on the Santa Fé route. More or less work has been quietly carried on for the past year, but only of late have developments attracted any attention. There are now six companies in the camp taking out ore; among them are the Kewanee Gold, the Kewanee Gold Extension, the Meadowville, the Sunnyside and the Chicho mining companies. The ores run from $20 to $80 per ton it is said, and some of the stringers in the veins are of very high grade.

The Boston Consolidated Mines Company, or old Esperanza mine, in Mokelumne River mining district, Calaveras county, continues to make phenomenal daily yields with only two men at work. It is a drift gravel mine near the Boston quartz mine. The gold is being taken out while drifting along the channel to find its length, no crosscutting having been done as yet. So far as proven the rich channel seems to be extensive. Clean-ups of the sluices are made every night.

It is reported that the several extensive gold-mining properties at Hedges in the Colorado river valley, San Diego county, have changed hands, and that the syndicate now in control plans renewed activities. Formerly there were several hundred men employed at the Hedges mines, and a railroad carried the ores down to the river for treatment. Now, it is said, the cyaniding plant will be moved up to the mines. At one time the Golden Cross mine at this place was the most productive gold property in Southern California.

The old Mineral King district in Tulare county, discovered in 1870, is about to be reopened by men who intend giving it a thorough prospecting with diamond drills. About a million dollars was expended at the camp in 1880 and a large mill built. The ore was refractory and finally a snowslide carried away the tramway and a number of buildings and the place became deserted.

Salt Lake City

July 11—Articles of incorporation of the Bingham & Garfield railroad, filed this week, created considerable interest here. While the document fails to give details concerning future plans, and officials of the Utah Copper Company, who are the incorporators, refuse to give further light, it is presumed the line is to be built in accordance with a plan to operate the Utah copper mine upon a much broader scale than at present. It has been officially stated that the capacity of the Garfield mill, which is equipped to treat 6000 tons of ore per day, is to be materially increased, thereby demanding more equipment to transport ore to the place of treatment. It has been declared by the management of the copper company, however, that the construction of the proposed line will in no way indicate the abrogation of the traffic contract with the Rio Grande Western Railroad Company. The copper company already has 10 miles of standard track which is to become the property of the new organization. The ultimate length will be 30 miles, situated in Salt Lake and Tooele counties.

The United States Smelting, Refining and Mining Company has again begun the purchase of ore for treatment in its lead smelter at Bingham Junction, which will be placed in operation during the latter part of the month

Goldfield, Nevada

July 7—George Wingfield returned this week from a long trip to San Francisco and set at rest several rumors about the Consolidated and his other interests. It is admitted that he has bought the Myers interest in the Combination Fraction. Wingfield says his purchase was for the Nixon-Wingfield interests and not for the Consolidated. The Combination Fraction is surrounded on the north, east and west by bonanza ground of the Consolidated and on the south by the Florence bonanza, and while it has produced a large amount extracted by leasers—notably the Loftus-Davis-Sweeney lease—it has never developed any of the high-grade ore which has been mined on all sides of it. Its purchase by Nixon and Wingfield is significant. So also is the election of Wingfield to the directorate of the Kewanas Mining Company.

The Supreme Court of the State has issued a writ of certiorari to the district court of this district and the presiding judge, directing the court to furnish copy of all proceedings in the matter of adjudging Tom Lockhart and the Florence company in contempt of court for refusing to deposit the $117,000 ordered impounded by the court. On petition of the Florence company the Supreme Court will review the case.

[illegible] electric power [illegible] Cal., about 113 miles west from Goldfield, which supplies Goldfield with light and power, will increase its capacity to 30,000 horse-power.

The Consolidated new mill is rushing toward completion. All the foundations will be completed within 10 days. Much of the machinery is on the ground and the balance is on the way. Part of the steel gang has arrived, and the first of the steel is expected any day. All rumors of J. H. Mackenzie's resignation as general manager are indignantly denied.

The Florence, which has been paying the old scale of wages, has this week reduced to the mine operators' or Tonopah scale

The Rogers Syndicate lease on the Florence company's ground has had an accident which prevented any hoisting throughout one entire shift, which means much to their lease which is hoisting picture rock and which expires July 11. The crosshead stuck on the 200-ft. level and hung until the bucket reached the 500. Then it fell 300 ft. and put the shaft out of commission. No one was hurt. The lease is expected to make a spectacular finish. Expert ore sorters are at work "sweeping" the old stopes and drifts for high-grade, which process is expected to net $50,000 or $60,000 of ore. The richest ore yet encountered in the lease has been struck in a winze from the 500-ft. level 85 ft. deep. The orebody here has been opened up for 65 ft. on its strike and it contains a high-grade streak about 2 ft. wide. This lease produces $10,000 to $15,000 worth of ore per day, at a total expense of about $700. The total pay roll contains only 85 names. The lease has produced more than $500,000 and has paid $245,000 in dividends. The lease ran all day Fourth of July, the miners receiving double pay. When the lease expires the machinery and equipment will be moved to the Baby Florence, which will be operated by the same management.

Butte

July 9—Production from the mines of the Boston & Montana company still continues to be reduced approximately 50 per cent., awaiting the repairing of the Great Falls smelter, which sustained severe damage during the floods in the early part of June. The management is taking advantage of the enforced curtailment by concentrating its energies on repair work. The retimbering of the Pennsylvania shaft is progressing rapidly. The miners in the camp were given a holiday July 4, only those whose work could not be dispensed with, such as pumpmen and hoisting engineers, being required to report. The annual spring exodus of miners who go out each year into the surrounding hills to prospect, has not been as marked as in previous years

Denver

[illegible] tunnel, the importance of which work was described in the JOURNAL of June 6, is being retarded by the "dog in the manger" policy of the few, who so often crop up to injure the interests of the many. These people would like their mines unwatered at the expense of others, but under the present policy of the Tunnel Company, this will not be possible, and it is, therefore, to be hoped that the obstructers will see their error.

In the Saratoga mine, in a lateral driven 2300 ft. from the Newhouse tunnel, [illegible] depth of 4400 ft. below the surface, is just reported.

It is stated that J. Parke Channing is making an examination of the dredging ground of the Breckenridge gold placers for New York people, and that on the result of the same depends the purchase of two large dredges.

Recent strikes in the Cripple Creek district at from 1100 to 1500 ft. prove the existence of ore at those depths and demonstrate the possibilities of its gold-producing area on the completion of the deep-drainage tunnel, the work on which is steadily progressing.

Scranton, Penn.

July 14—In the appeal cases of the coal companies from the tax assessments made by the county commissioners, the Lackawanna county court gave its decision on July 13. This decision, while it reduces the assessment materially, is not all in favor of the companies. In the preliminary proceedings an agreement was reached, under which the actual area of coal in the county could be computed. Excluding coal unminable on account of caves or squeezes, coal in veins less than 2 ft. thick and barrier pillars, the total in the county is estimated at 237,000 foot-acres, from which the court ordered one-third to be deducted for pillars to be left in mining. After carefully going over the evidence on both sides, the court held that the fair average value of coal in the ground is $150 per foot-acre. Applying the same rule as for surface property—assessing at 40 per cent. of value—the assessment on coal is to be $60 per foot-acre, the deduction for pillars to be made from all areas.

It is not probable that any appeal will be taken, as all parties agreed to accept the ruling of the court. The assessment as fixed by the court will, therefore, stand. It is larger than in previous years, but is only about one-third of that made by the county commissioners.

At the Hampton colliery the work of flushing ashes into the old workings, to support the roof and make the robbing of the pillars possible, is going on steadily.

The United Mine Workers are making a strong effort to bring back men who left the union during the past year, and to draw in non-union men. A special appeal has been made by President Lewis, and the initiation fees will be reduced from July to Dec. 1. There has been a large falling off in membership, and the efforts now are directed toward a restoration of the efficiency of the union.

Birmingham, Ala.

July 11—For the past two months the United Mine Workers of America have been very active trying to organize the non-union mines of Alabama, but without much success. Since the long strike, which ended about three years ago in the defeat of the union by the large iron companies, those companies, with the exception of the Alabama Consolidated Coal and Iron Company, have been operating non-union, as has also the Pratt Consolidated Coal Company, by far the largest commercial coal company in the State, and a few of the smaller commercial operators. Since that time and until very recently no attempt has been made by the United Mine Workers to reorganize the non-union mines, and in fact the Alabama Consolidated Coal and Iron Company, and a few of the commercial operators have broken away from the union and operated open-shop.

The contract between the commercial coal operators and the United Mine Workers expired July 1, and was not renewed, the operators demanding a reduction of 10c. a ton in the mining price and a corresponding reduction in the day wage scale; while the miners demanded 55c. per ton, which is a reduction of only 2½c. from the 57½c. price prevailing prior to July 1. As a result of the disagreement all commercial mines have been idle, with the miners on strike since July 1, except two very small companies, the Palos Coal Company and the Braehead Coal Company, which signed up at 55c. with the union.

The United Mine Workers are making a desperate effort to reorganize the non-union mines and have five national organizers from Northern States, besides large numbers of local labor leaders and organizers at work in the various coal districts. As stated above, however, they are meeting with scant success, owing to the fact that so many of the miners who went through the last strike are thoroughly disgusted with the way it was conducted, and the fact that mines in this non-union district have worked so much more steadily and peacefully since the strike than has been the case in union districts; in fact some of the former union leaders are now the most bitter against them. The movement at this time, following on the heels of the panic, has but little public sympathy in this section.

The Union has now called a strike of all non-union mines, effective July 6, but it is not thought that many men will quit work in response to the call, although threats of violence have already been made. The commercial operators expect to start their mines working open-shop shortly, and expect to have a normal output or nearly so by August.

London

July 4— The invitation to visit Canada, sent by the Canadian Mining Institute to the members of the Institution of Mining and Metallurgy, has been accepted by several members. The institution will be officially represented by William Frecheville and Hugh Marriott, both members of council. The secretary, C. McDermid, will also accompany the party.

The prospectus of the Boscaswell United Tin and Copper Mines, Ltd., in Cornwall, referred to in a previous issue, has been withdrawn.

The report of the inspector of mines for the Southern district of England, which includes Cornwall and Devon, for the year 1907 has been issued. The inspector calls attention to the failure of the efforts made in recent years to reopen some of the old Cornish mines, attributing the failure largely to insufficient development underground. Too much money has been spent, he thinks, on surface plant. It must, however, be remembered that in order to open a mine which has been abandoned for many years, efficient plant for winding and pumping must be erected before the old workings can be entered or explored. The real cause of the failure of the new companies and syndicates is mainly due to the lack of sufficient capital. The funds raised have put the mines in some sort of order, but have not been sufficient to enable them to be properly developed. Managers are not slow to carry on development work if they have the money. The fault lies generally with the promoters and their advisers, who commence work without sufficient capital to open out the mine so that it can be worked on economical lines with plenty of ore reserves developed. In the early days of Cornish mining, when workings were shallow, a small capital was sufficient to put the mine on its legs and after that profits provided the funds for further development. With deep mines, large pumping plants and heavy winding engines are required, while the expense of up-keep is high, so that unless a mine has ample cash, it may come to the end of its resources before it has been sufficiently opened up to enable profits to be earned.

The statistics for Cornwall record 88 mines at work, employing 4595 persons below ground and 3958 persons on surface, or a total of 8553.

Most of these 88 mines are doing little or no work, and very few—not half a dozen according to the inspector—are paying.

Another, large amalgamation of Rand mining companies is announced. A provisional agreement has been signed, whereby the Village Deep, Ltd., will purchase all the assets of the Turf Mines, Ltd., for 536,250 Village Deep shares. The new Village Deep will consequently have a capital of £1,060,677.

The scheme has been reported on by J. S. Curtis, an independent engineer, who allows 10 per cent. less ore per claim and 1s. less profit per ton for the Turf mines in calculating the terms of the amalgamation. It is announced that the Village Deep plant is to be increased to a crushing capacity of 41,000 tons per month. The Village Deep has a debt of about £150,000, and the Turf mines has about £600,000 in cash, which will now be used for paying off the Village Deep debt, and for increasing the mill and continuing the development of the Turf mines claims.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Republic Iron and Steel Company—This company has just blown in its No. 3 furnace at Thomas. This is the first time for over a year that all three of the stacks at this plant have been in blast at one time.

Woodward Iron Company—This company has completed its No. 3 furnace at Woodward, which has been under construction for nearly two years. It will be put in blast before the end of July.

Arizona

GILA COUNTY

Arizona Commercial—This company is planning to build smelting works of 300 tons daily capacity.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports that the production of its mines and works at Clifton in June was 1500 short tons of copper.

MOHAVE COUNTY

Treasure Hill—The shaft on this property is down 170 ft. at Stockton Hill. At the bottom a drift has been run off on the vein 85 ft., its ore showing the entire distance without a break. It is of a high shipping grade. The entire width of the drift is also in milling values, but a small streak of high-grade ore accompanies this wide body.

Union Basin Mining Company—This company, at Union Basin, has just shipped the second carload of zinc ore for the month to the smelter at Iola, Kan., for treatment. The first carload ran 50 per cent. zinc, besides some gold and silver. John Boyle, general manager, has a number of miners at work opening up the mine.

Last Chance—A drift is being run on this property at Wallapai Springs, to tap the vein below the water level. In the shaft there is a good body of ore of a shipping grade. O. D. M. Gaddis, of Kingman, is the manager.

Bonansa—James W. Guinn, owner of a number of claims in Bonanza Wash district, reports that he has cut the vein in his tunnel at 90 ft., but has found no walls.

Golden Gem—Work is under good headway on this mine at Cerbat and the timbering of the old shaft will be completed in about 10 days. J. W. Moore, manager, is now on the ground.

Goldflat Group—F. A. Whitard, of Goldflat, is in Los Angeles to close the deal on this group of mines and claims. Mr. Whitard will in a few days begin active operations. A big steam hoist is to be installed at once and the shaft sunk 300 feet.

Gold Eagle—S. A. Tyler has sold this property at Mineral Park to a Los Angeles company represented by F. P. Andrews.

YAVAPAI COUNTY

United Verde—This company is said to be producing about 3,000,000 lb. of copper monthly, running four furnaces.

California

AMADOR COUNTY

Amador Queen—The owner of this mine near Jackson, J. R. Phelps, has renewed the leases for another year to M. Thomas and others who have been successful in "pocket" hunting in the property.

Central Eureka—It has been decided to reopen this mine, and the old shaft is to be repaired to the bottom. E. C. Voorheis, of Sutter Creek, will have charge of the work.

BUTTE COUNTY

Cape Horn—The gravel mill at this property, C. M. Hendrix, superintendent, has been completely installed. The gravel is showing good pay.

CALAVERAS COUNTY

Calaveras—The owners of this mine at Indian creek have leased the South Bank claim, and machine drills are being put in.

Ritter—In this mine at Sheep Ranch they have 3 ft. of good milling ore at the 200 level, and have started up the mill.

EL DORADO COUNTY

Big Canon—At this property near El Dorado, A. T. Fuller, superintendent, a 60-stamp mill is to be erected.

INYO COUNTY

[illegible]—The Southern Pacific is building to Keeler and this will bring the old Coso district within 17 miles of railroad transportation. J. D. Nelson, owner of the Josephine, has a small mill on the property and intends erecting a larger one.

MONO COUNTY

Lucky Boy—Goldfield, Nev., men have purchased [illegible] mine on the Hawthorne Bodie grade, four miles from Hawthorne, and have commenced work upon it.

NEVADA COUNTY

Ethel—At this mine near Graniteville, which has been idle the past year, preparations are being made for a resumption of work. Albert Maltman is manager.

PLUMAS COUNTY

Johnson-Graham Mining Company—This company, Charles Stark, Jr., superintendent, is working the old Plumas Eureka mine at Johnsville, formerly owned by the Sierra Buttes Mining Company, and is now milling ore from the "76" claim.

Plumas-Mohawk—This company at Johnsville, is about to put in stamps, as the rock is becoming harder. At present two Huntington mills are in use.

Seneca Mining and Milling Company—This company, working the White Lily mine, has added 20 stamps to its milling capacity, and has put in a Pelton wheel and water hoist.

SAN BERNARDINO COUNTY

G. F. H.—This group of claims, eight miles north of Ludlow, has been bonded by G. F. Hale to Pasadena men, who have begun work on them.

Paradise Mountains Mining Company—At this property in the Paradise mountains, 22 miles north of Barstow, the mill is now steadily at work on satisfactory ore. H. Galeron is superintendent. Five stamps are to be added to the mill.

Hasson Group—At this group in the Ord mountains, 12 miles south of Daggett, there is a good hoist, compressor, etc., and a 10-stamp mill is to be put up. The ore has heretofore been shipped to the Peyton Chemical Company. Geo L. Hasson is president and manager.

SAN DIEGO COUNTY

[illegible] Mining and Milling Company.—This company, working in Grapevine district, 15 miles from Julian, is driving a long tunnel which is now in 870 ft. The ledge is a very wide one.

Dulzura—At this camp the Dulzura Gold Company, which has been operating in an open cut, has decided to sink a shaft. The active mines in the district are the Buckhorn, Artery Consolidated, Pasadena, Bee Farm, Eureka, Wounded Deer, Fiddler Gulch, Iron Crown, Katherine C. and Keene & Nelson. Only a few men are employed in each of the properties named.

SHASTA COUNTY

Brackett—This mine has been started up again. A gasolene engine operates a blower to force air into the tunnel and three shifts of miners have been set at work. H. O. Cummins is in charge again

SIERRA COUNTY

Alaska Mining Company—Two new transformers have been installed and the large centrifugal pump again started at this mine at Pike City, G. St. George, superintendent. A new shaft is to be started west of the old one.

Eastern Cross—This is the latest mine in the Alleghany region to record a strike of high-grade gold ore. Bovee Brothers are working the property.

Mongor—This company, working the old Young America mine at Forest, finds that the pay gravel extends beyond the old workings. The main tunnel is being extended.

SISKIYOU COUNTY

Fillipi—This mine at Hawkinsville, is reported sold to Francis D. Cooper for San Francisco and Chicago men. The water supply is now to be materially increased.

TUOLUMNE COUNTY

Riverside—Operations are about to begin on this mine near Soulsbyville under superintendency of J. F. Boggs. Twenty stamps will be added to the 10-stamp mill. A cyanide plant will also be put up.

Springfield Mining and Development Company—This drift gravel mine on the Table Mountain Channel, J. M. Buthenuth, superintendent, has put in new boilers and a rotary gravel crushing mill.

Wildcat—Superintendent R. L. Hendricks is putting up a hoist and other machinery at this mine above Soulsbyville.

Colorado

LAKE COUNTY—LEADVILLE

Baby Shaft—The lessees have sunk this shaft, California gulch, another 100 ft. and started two drifts east and west, locating the orebody, from which shipments will start during July. Another set of lessees is is working the ore on the dump by the old jig process and shipping concentrates that carry 60 per cent. lead.

Iowa Gulch—A great deal of prospecting is going on in this section of the district outside of the work that is being carried on in the shipping properties. A number of eastern parties owning ground in the gulch have visited their claims, and made arangements to resume work at an early date; the most prominent among them being George W. Thatcher, of Albany, N. Y., the sole owner of the Illinois, situate at the head of the gulch. The principal shippers in the gulch are the Lilian, Helena, Aurora and Anona, and the bulk of the ore shipped carries gold chiefly.

Lovejoy—A good grade of iron is being shipped from this property, Rock hill.

Progressive—This property, Fryer hill, is being worked by L. R. Johnston, of Denver, and during the week in the lower level, a rich streak of lead ore was caught, carrying some gold. The streak is being developed.

Star of the West—At Iron hill, recently, a good streak of iron ore was encountered in one of the lower levels and shows signs of leading to a separate orebody. The ore runs well in silver and carries considerable excess of iron.

[illegible] Tunnel—Thirty years ago this property, Iowa gulch, was worked, and from the surface considerable high-grade ore was shipped; since then it has been idle. James Hurley and associates secured a lease on the ground a few months ago, cleaned out the tunnel and then started an upraise at the breast, 300 ft. After going up several feet a vein of ore 4 ft. wide was caught and from this a carload of ore has been taken that will hold up to $20 per ton.

GILPIN COUNTY

Anchor—An air compressor plant has been installed at this mine in Willis gulch. Forbes Rickard, Denver, Colo., is manager.

Eureka—Oklahoma capital has become interested and will install a steam plant of machinery. J. G. Striffler, Tolland, Colo., is manager.

Galena—Detroit, Mich., and California people are interested and they are figuring on starting up soon. They are organized as the Alpha Gold Mining Company.

Hubert—After an idleness of about eight years, this property in Nevada district is being started up under the management of H. C. Bolsinger, of Bald Mountain, Colo. The top plant and buildings are being overhauled and as soon as some of the water can be taken out, leasers will be put to work in many of the levels.

Maryland Mountain Milling Company—Colorado and eastern people have taken over the Oliver mill in Chase gulch, and are going to run it on ores from the Adduddell property in Russell district. The capacity will be increased to 75 tons per day by additional equipment. B. E. Granville, Central City, Colo., is manager.

Paola—E. G. Watson and others, of Denver, have secured a lease and bond on this property in Leavenworth gulch and have commenced developments.

Saratoga—In driving the lateral from the Newhouse tunnel and at a distance from the tunnel of 2300 ft., a 4-ft. body of ore has been opened up which carries gold and silver. John Owen, of Idaho Springs, Colo., is manager of the Saratoga Development Company.

Siren—Colorado and Indianapolis, Ind., parties are interested in the Moon gulch section near Rollinsville, and they are installing a plant of machinery and putting up buildings. Louis C. Todd, of Rollinsville, Colo., has been appointed manager.

SAN JUAN COUNTY

Bandora—William Sullivan, owner of this mine near Silverton, has a force of men at work putting it in condition for the summer operations.

Cinnamon Pass Mining Company—This company has been organized by J. B. Ross, L. L. Haines, G. B. Pratt and J. S. Fox. The company is organized to acquire and operate properties in the vicinity of Cinnamon Pass. They are now working on the Isolde and other claims owned by the Dupree Mining Company. The results so far have been satisfactory.

Gold Mines and Power Company—This company has an electric power plant under construction on Bear creek. Burton A. Smead, Silverton, is manager.

Pittsburg & San Juan—Superintendent E. A. Smith has a force of men at work in this mine. The crosscut tunnel is now in a distance of 530 ft. from the entrance.

TELLER COUNTY—CRIPPLE CREEK

Comanche Plume—A steam hoist has been installed at the Baker & Co. lease on the Mountain Goat claim of the Comanche Plume Gold Mining Company, and the lessees have begun hoisting ore. A strong vein of oxidized ore is under development at 150 ft. depth.

Delmonico—Sinking is in progress at the main shaft on this mine on Bull Cliffs, near Altman, and a depth of 975 ft. has been attained. The shaft is to be continued to 1100 ft., and at this depth a crosscut will be carried in expectation of cutting the extension of the Vindicator No. 2 vein.

Idaho

SHOSHONE COUNTY

Charles Dickens—The new concentrator has been put in operation and a week's trial run made, in which the machinery has been proved entirely satisfactory. There has been but a small crew at work, and only a small amount of ore has been treated, owing to the fact that the Frue vanners and settling tanks have not yet been completed. In another week these will have been furnished, and the mill will be ready for full operation. There is already a large quantity of ore banked, sufficient to keep the mill busy at its normal capacity, 150 tons daily. This plant replaces a 75-ton mill that was burned last winter. The ore will all be sent to Salida, Colo., and shipments are expected to begin within a fortnight.

Hecla—This mine is now working at its normal capacity, turning out 350 tons of ore a day, which is being treated at the company's mill. Shipments to Salida, Colo., are being made regularly. A crew of 140 men is now employed on the 600-

and 900 ft. levels. The double compartment shaft is to be started this summer.

Indiana

CLAY COUNTY

Indiana Coal and Clay Mining and Fire Proofing Company—The company, of Brazil, has been incorporated to mine coal and clay and to manufacture all kinds of clay products. Charles R. McGaughey, Henry T. Tilsworth and R. L. Shattuck are directors.

Michigan

COPPER

Superior—Shaft No. [illegible] is being enlarged to accommodate two skipways. The shaft was sunk with a single compartment to a depth of 235 ft. and work was then suspended, awaiting further developments at No. 1 shaft; as soon as this enlargement has been made sinking will be resumed. No. 1 shaft is nearing the 10th level and from that point a crosscut will be driven to cut the lode. Drifts on the vein from the upper levels continue to yield good copper. A permanent rock house is to be erected and will be ready to furnish rock upon the completion of the railroad spur connecting with the Atlantic road.

Quincy—A new shaft is being sunk on the Pontiac tract. This shaft is to be known as No. 9 and is located about 2800 ft. north of No. 8, or Mesnard shaft, the present north shaft. This shaft commands the ground tributary to the tract purchased from the Arcadian company. The site was established last year and considerable work was done in clearing away for the surface plant, but all work was suspended during the winter. Drifts to the north from No. 8 shaft, and within a few hundred feet of the line of the proposed shaft, are yielding good copper rock.

Michigan—Work has again been suspended on the stamp mill being erected at Keweenaw bay on account of market conditions. The building is erected and practically all of the machinery is on the ground; had the force of men been retained the mill would have been ready for operation early in the fall.

Calumet & Hecla—Due to a breakdown of one of the large compressor engines, Nos. 17 and 18 shafts on the Osceola amygdaloid and No. 21 on the Kearsage lode are temporarily closed down for want of air. This shut-down will be only for a few days, as the two new 125-drill compressors that are being installed at the central plant, are practically ready to go into commission, and when in operation will furnish ample air. Production will not be decreased because No. 17 is the only producing shaft of the three, and its output is small. The pumps have been taken out of the Delaware shaft of the Manitou property and the shaft will be allowed to refill with water.

Mass—About 600 tons of rock are being shipped daily. Production comes principally from C shaft.

Missouri

ZINC-LEAD DISTRICT

[illegible]—This company has let the contract for a 300-ton mill on its 40-acre lease of the Horton land at Porto Rico. Seven drill holes show an 8- to 10-ft. face of sheet ore at 200 ft. depth. The double compartment shaft is nearly into the ore and [illegible] cans.

Lone Star—C. W. Eastwood and C. J. Tobias have purchased a half interest in the 10-acre lease, north of Knights station, from H. T. Keltner. Three shafts are in ore.

Pittsfield—This company has just completed sinking a second shaft to the ore on its lease south of Prosperity. The company has a 10-acre lease and a 150-ton mill and is mining sheet ore at 180 ft. depth.

Tenderfoot—This company is overhauling its mill and installing new equipment preparatory to starting up. The Tenderfoot is operating on the land of the New York & St. Louis Mining Company, at Porto Rico.

Wolfsheart—This company, on the Jasper County Royalty Company's land near Duenweg, has opened up 9 ft. of rich sheet ore in the shaft at 232 ft. depth. A large mill will be erected.

Montana

BUTTE DISTRICT

East Butte—The annual meeting of stockholders, after several postponements, was finally held on July 8 at Butte. Robert H. Gross, William F. Everts and Frank P. Son, all of Boston, were elected to succeed Patrick Wall and James Talbott, resigned, and Henry Mueller, deceased. It was further decided to remove the principal offices of the company to Boston, where the future meetings will be held. The choice of president to succeed Frank Sullivan, of Butte, will be determined at the first meeting of the new board of directors soon to be held in Boston. With the change in management of the company and its control by Boston stockholders, chief among whom is W. A. Paine of the brokerage concern of Paine, Webber & Co., it is expected that active operations upon the company's properties will soon be resumed.

North Butte Extension—It is reported that the financial troubles of the company, which led recently to several attachments of the company's claims, will soon be settled. A Chicago attorney, representing the interests of stockholders of that city, was in Butte several days during the past week and has since returned to report upon conditions. The indebtedness, so far as made public, amounts to some $18,000.

Montana Gold Mountain Mining Company—The trial of an action against the company for the purpose of foreclosing several mechanic's liens on the company's mill at German gulch is now in progress before the local district court. The amount involved is in the neighborhood of $3000.

Nevada

[illegible]

Ore Shipments—The total production for the week ended July 2 was as follows: The Nevada-Goldfield Reduction Works handled from the Little Florence 20 tons; Sandstorm No. 5, 25; Commonwealth, 25; Hays-Curtis, 30; Black Butte, 15; Mohawk Combination, 27. The Western Ore Purchasing Company handled from the Gem 27 tons; Baby Florence, 27; Van Riper, 90; Nevada Lease, 21; Rogers Syndicate, 492; Engineers' Lease, 187; Mushett, 72. In addition 15 tons were received from Hornsilver. Total, 1073 tons.

[illegible]

Big Injun—This mine, about 10 miles from Hawthorne and close to the old Bodie stage road, was sold by the United States marshall this week. The sale was for the purpose of quieting title to the property. The mine was discovered by Mexicans some 30 years ago and produced considerable gold from high-grade streaks, no attention being paid to low-grade ore. About two years ago a 10-stamp mill and an aërial tram half a mile long were constructed, but owing to financial dissension among the stockholders the machinery was never started. The sale of property by the court clears the situation, and the property is to be started up.

NYE COUNTY—BELLEHELEN

A 50-h.p. hoist and a seven-drill compressor have been shipped to the Brannick & Sweer property, just purchased by Denver parties for $60,000, 25 per cent. cash and the balance payable in September. Bellehelen is 65 miles in a straight line—about 100 by road—northeast of Goldfield, and about 50 miles east of Tonopah.

NYE COUNTY—TONOPAH

Ore Shipments—The ore shipments over the Tonopah & Goldfield railroad for the week ended July 2 to the Western Ore Purchasing Company, consisted of 130 tons from the Tonopah Extension. The Tonopah company sent 3460 tons, the Belmont company 750 tons, the Montana-Tonopah 1100 tons, the North Star 80 tons, the Midway 100 tons, and the MacNamara 150 tons to the mills, making the total shipments for week 5770 tons.

[illegible] the West End, this company has only a limited area in which to work; but from a block of ground about 100 ft. long in the westerly end of the 300-ft. level it shipped last week 150 tons of ore worth above $50 per ton.

[illegible]

stamps is treating regularly 1100 tons of ore per week, making a recovery of 91 per cent.

Tonopah-Belmont—Prospecting along the Mizpah fault on the 1000-ft. level continues with promising results. The Belmont shipped 700 tons during the week.

Tonopah Extension—Three raises will be put up from the 600 to the 500 level for mining and ventilation purposes. Gases impede the work on the 600 level.

Tonopah Mining Company—This company last week broke 187 ft. of new ground in the Silver Top claim and 214 ft. in the Mizpah claims, besides shipping 3550 tons of ore. Hereafter this mine will work only six days per week, closing on Sundays.

White Pine County—Ely

It is reported that the Nevada Northern railway will be extended from Ely to Pioche.

Steptoe—The first unit of the mill is said to be giving a capacity of 1500 tons per day, instead of 1300 tons estimated. The second unit will be started about July 15, and the third unit toward the end of August. The mill is said to be showing an extraction of nearly 75 per cent. of the mineral. The smelter has been put in operation.

Giroux Consolidated—Two hundred men will be employed two months on the long pipe line from Steptoe Valley to the concentrator at Kimberley. Foundations for the boilers and pumping machinery are about completed.

Oklahoma

Ottawa County

Kenwood—This company is preparing to build a concentrating mill on its Index lease at Miami.

King Jack—Developments at this mine, near Miami, have been so good that the owners, Chapman & Lennan, have decided to build a mill at once.

Southern Queen—This company's concentrating mill at Miami is nearly completed.

Pennsylvania

The Greene county court has practically decided that in Pennsylvania, county assessors have no right to assess land for values that may be below the surface. The decision, if upheld by the higher court, will have the effect of lowering the assessed valuation of coal lands throughout the State. The case on which the decision was rendered was an appeal from the valuation fixed by the county commissioners on land of T. A. Adamson. Adamson owns 77 acres in Franklin township. In the triennial assessment the assessors of Franklin township placed the value of the coal at $100 an acre. Adamson's farm was assessed at $200 an acre. Farms under which the coal had been sold were assessed at $100 and even lower. Later the county commissioners lowered the assessed value of Franklin township coal $50 an acre, reducing Adamson's assessment to $150. Adamson appealed. His attorney maintained the farm should not be assessed any higher, although the coal had not been sold, than neighboring farms, where the coal had been severed from the surface. The court concurred in this view and lowered the assessed value of the property to $100 an acre. It is understood the county commissioners will appeal the case.

Anthracite Coal

Philadelphia & Reading Coal and Iron Company—This company's statement for May and the 11 months of its fiscal year from July 1 to May 31 is as follows:

	May.	Eleven Mos.
Earnings	$3,075,764	$35,937,336
Expenses	2,901,967	33,502,846
Net earnings	$ 173,797	$ 2,434,490

For the 11 months there were increases of $519,317 in earnings; of $14,662 in expenses; and of $504,655 in net earnings.

Bituminous Coal

Merchants Coal Company—A controlling interest in this company at Boswell, near Johnstown, has been sold to the United Coal Company, of Pittsburg. The latter is said to have paid $200 per share for the stock, which is $100 par value. The company has $1,000,000 bonds outstanding and $1,000,000 stock.

South Dakota

Lawrence County

Golden Reward—The Chamberlain filter-press is still operating successfully, and the work of installing more of this type will shortly commence.

Homestake South Extension—The annual meeting to be held here July 14 may decide the question of a mill and the installation of electric machinery. Over 2000 ft. of drift work has been accomplished on the 150-ft. level.

Pennington County

Golden Slipper—The old ledge has been found during some prospecting work and shows well at a depth of 15 ft. in a new shaft. Operations are to be continued.

Golden West—Discovery of a new ledge of unknown quality has caused the management to order the use of a diamond drill to a depth of 500 ft. The new ledge is said to be richer than the old ones.

Provident—The Tykoon mill is being overhauled and some tests on bismuth ore from the mine are to be made, which if successful will mean the continued running of the mill.

Standby—It is expected to have the repairs on the mill and about the property in shape to commence treating ore in August. Work on the new 100-stamp mill will be commenced before that date.

Utah

Beaver County

Majestic Copper Mines Company—It comes from a reliable source that this company's smelter, near Milford, is about to be leased to a syndicate of Utah and Nevada mineowners who propose to install additional equipment and operate it as an independent custom plant. It is equipped with one lead stack and one copper-matting furnace. The copper furnace has been in use, but the lead stack is new.

Juab County

July 24 has been set as the date for blowing-in the new Tintic smelter in the Tintic district, that day being the sixty-first anniversary of the landing of the Mormon pioneers in Utah. Mormon capital being identified with the enterprise it was decided to plan an extraordinary program for the occasion.

Black Dragon—This mine and some adjoining claims in the Tintic district have been sold to Jesse Knight, of Provo, Utah.

Godiva—At a special meeting of shareholders of this company, operating in the Tintic district, the capital stock was increased from 100,000 to 1,000,000 shares. Following the plan adopted by other companies in the district, the mine is to be exploited at greater depth and the shaft is to be continued to 1200 ft. The Godiva is one of the oldest producing mines in Utah and at one time occupied a place in the front ranks. Although dividends were earned the exact amount has never been made public, the stock being in few hands.

Salt Lake County

Silver King—This group, at Alta, has been purchased by a Salt Lake syndicate, who will shortly begin development.

Summit County

American Flag—At a special meeting of shareholders on July 11, this company, operating at Park City, authorized the issue of $150,000 in bonds, the proceeds to be applied toward providing milling facilities.

Nelson-Queen—The new mine equipment ordered for this property recently is being installed.

Washington

The report of D. C. Botting, State mine inspector, for the year 1907 gives the coal production by counties as follows, in short tons: Kittitas, 1,523,618; King, 1,446,602; Pierce, 612,037; Lewis, 100,982; Thurston, 25,772; Whatcom, 3161; total, 3,712,172 tons, being 419,074 tons more than in 1906. The coke made was 49,797 tons, a decrease of 9619 tons. Shipments by water from the port of Seattle in 1907 were 539,380 tons; from Tacoma, 134,711 tons.

West Virginia

Harrison County

Haywood Coal Mining Company—This company has nearly completed its mining plant at Shinnston, and will soon begin to take out coal. The main office is at Pittsburg, Penn., with a branch office at Fairmont, W. Va. The capacity of the plant is 500 tons per day. Officers of the company are E. F. Gwynn, president; Seymour McIntire, vice-president; H. H. Myers, secretary; P. M. Chidester, treasurer; R. S. Monroe, general manager.

Wisconsin

Zinc-lead District

D. D. C.—The sale of the D. D. C. mine at Rewey was consummated July 9. O. S. and W. H. Picher, of the Picher Lead Company, together with Cincinnati parties, made the purchase. Consideration is not made public. The mining lease covers 160 acres; about 150 ft. of underground drift are opened up showing good disseminated ore, both jack and lead. A 50-ton mill is now in course of construction but enlargement will be made to 100 tons capacity. Other properties are being considered and those taken over will be controlled by the Joplin Ore Separating Company at Galena, Ill., a steady source of ore supply being thus assured for the big roasting plant.

Wisconsin Zinc Company—The consolidation of the mining properties at Platteville, previously mentioned in these columns, was permanently effected this week. The new company will be known as the Wisconsin Zinc Company and is incorporated under the laws of Maine with a capitalization of $1,000,000. The mines taken over are the Royal, Acme, Empire and Mitchell Hollow. These properties lie in one contiguous group and can be handled advantageously by one management. Work has already been started at the Acme and Empire plants on improvements. It is the intention to operate these mills double shift instead of one shift per day as formerly. Work will be started at once also at both the Royal and Mitchell Hollow.

The Wisconsin Zinc Company will not take over the electrostatic separator at Platteville as was erroneously reported. Its officers are H. S. Kimball, president, Fred Krog and F. W. Rogers, vice-presidents; C. W. Landrum, general manager.

Philippine Islands

Benguet Consolidated Gold Mining Company—This company's production from its mine in Benguet is reported at 358 oz. gold, or $7400, in April.

East Batan Coal Mines—The *Far Eastern Review*, of Manila, says: "The announcement is made by A. M. Betts, manager of the company, that over 80,000 tons of coal have been blocked out and a 30-h.p. engine is being installed to supply power for the cable which carries the product to the wharf from the interior of the mines. The output daily, heretofore, has been about 60 tons but this will be greatly increased with the installation of the machinery now under way."

Paracale Gold Dredging Company—This company reports the saving of gold from its dredge on the Paracale river at 1.73 oz., or $3576, in April.

Canada

Ontario Cobalt District

Ore Shipments—Shipments of ore for week ending July 4 were as follows: City of Cobalt, 46,870 lb.; La Rose, 62,240; McKinley-Darragh, 120,000; Nipissing, 111,340; O'Brien, 212,730; Townsite, 45,600; Temiskaming, 100,000; Hudson Bay, 60,000; Tretheway, 108,180; total, 866,960 pounds.

Cobalt Lake—Development is being steadily pushed with very favorable results; the silver taken out in shafting operations is sufficient to meet the entire expenditure. The plan of operations contemplates a network of tunnels beneath the lake. Five shafts have been sunk, two of them for ventilation. Tunnels have been run from the main shaft for 476 ft. to the north on the east side of the lake and 609 ft. to the south. Some promising veins have been encountered, including a 36-in. vein opposite No. 3 shaft. The company has ore valued at $50,000 ready for shipment.

Crown Reserve—A new vein 10 in. wide which carries considerable silver was found recently in crosscutting at 50-ft. level of No. 1 shaft. The vein runs parallel to the main vein about 5 ft. distant.

Coniagas—The concentrating plant is being improved; 30 stamps are being put in to replace the ball mill and Huntingdon mill now in use for fine grinding.

Silver Queen—The power house containing a 12-drill compressor and three 80-h.p. boilers was destroyed by fire on July 12. The building is a total loss and the equipment was partially destroyed.

Mexico

Guanajuato

The Mexican Central Railroad completed the extension of its road into the City of Guanajuato and established its terminal there on June 9 and regular scheduled trains are now leaving and arriving daily. This extension connects the City of Guanajuato with the main line of the Mexican Central at Silao. The Mexican Milling and Transportation Company's 36 miles of broad-gage railroad, now nearing completion, will within a short time receive freight from the Mexican Central road at the station and make delivery to any property in the district without transfer. This will effect a great saving in time and cost of transpor[illegible] freight between the numerous properties in the district, as well as freight coming into the district from outside sources. Two Shay geared locomotives have arrived at the Tepetapa station for the mineral belt railroad. The locomotives are 60 ft. long, they weigh 110,800 lb. and have six wheels to the side, all of the wheels drivers, being connected by gears to the driving shaft.

Africa

Transvaal

The gold output for June is reported by cable at 574,973 oz. fine, which is 8019 oz. less than in May, but 67,414 oz. more than in June, 1907. The decrease from May was due entirely to the shorter month, the daily average for June having been 19,166 oz., and in May 18,774 oz. For the six months ended June 30 the total was 3,138,732 oz. in 1907, and 3,399,957 oz.—or $70,277,111—in 1908; an increase of 261,225 oz. this year.

Australia

Western Australia

Gold production in June is cabled at 136,708 oz., an increase of 2753 oz. over May, and of 186 oz. over June, 1907. For the six months ended June 30 the total was 838,255 oz. in 1907, and 827,019 oz.—or $17,094,483—in 1908; a decrease of 11,236 oz. this year.

New Caledonia

Shipments of ores from the colony are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	April	Four Mos.
Nickel ore		[illegible]
Cobalt ore	[illegible]	[illegible]
Copper ore	[illegible]	[illegible]
Chrome ore	[illegible]	[illegible]

No nickel ore was reported for April, an unusual occurrence.

New Zealand

The Mines Department reports the exports of gold for the three months ended March 31 at 118,119 oz. bullion in 1907, and 134,100 oz. in 1908; an increase of 15,981 oz. The bullion reported this year was equal to $2,569,936, or 124,332 oz. fine gold.

Exports of silver in March were 101,550 oz. in 1907, and 89,038 oz. in 1908 a decrease of 12,512 oz. this year.

South America

British Guiana

Exports of gold for the five months ended June 1 were 25,397 oz. bullion in 1907, and 24,912 oz. in 1908; a decrease of 485 oz. The bullion reported this year was equal to $435,462, or 21,068 oz. fine gold.

Diamond exports for the five months [illegible] crease of 143 carats over last year

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 15—Coal trade in the West is again showing a slight improvement. It is slow, but there is no change for the worse. More steam coal is called for, and the mines are making rather better time. The Lake trade is increasing slowly.

The bituminous trade in the East is dull, with small sales and a continued light demand for steam coal. The anthracite trade is a little better, but the companies are reported to be curtailing production, as stocks at storage points are heavy. The seaboard trade is the lightest known for several years.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 4, in short tons:

	1907.	1908.	Changes.
Anthracite......	2,899,845	2,753,037	D. 146,808
Bituminous.....	19,269,270	16,267,127	D. 3,002,143
Coke............	7,211,513	3,418,434	D. 3,793,079
Total..........	29,380,628	22,438,598	D. 6,942,030

Total decrease this year to date was 23.6 per cent.

Coal passing through the Sault Ste. Marie canals for the season to July 1, short tons:

	1907.	1908.	Changes.
Anthracite.....	435,940	364,914	D. 71,026
Bituminous....	3,305,572	1,396,961	D. 1,908,611
Total.........	3,741,512	1,761,875	D. 1,979,637

The total decrease, which was chiefly in bituminous coal, was 52.9 per cent.

Anthracite coal shipments in June are reported at 5,704,852 tons, a decrease of 272,054 tons from June, 1907. For the six months ended June 30 the shipments were, in long tons:

	1907.	1908.	Changes.
Reading . .	6,751,398	6,080,172	D. 671,226
Lehigh Valley.	5,582,314	5,657,264	I. 74,950
N. J. Central. .	4,311,696	4,327,781	I. 16,085
Lackawanna . .	5,153,251	5,051,814	D. 101,437
Del. & Hudson	3,208,177	3,275,120	I. 66,943
Pennsylvania.	3,044,026	3,105,226	I 61,200
Erie.........	3,535,577	3,723,436	I. 187,859
N. Y., Ont. & Western	1,350,802	1,447,629	I. 96,827
Total......	32,937,241	32,668,442	D. 268,799

The total decrease this year was 0.8 per cent. The Philadelphia & Reading shows a considerable decrease and the Delaware, Lackawanna & Western a small one. All the other companies report increases, the largest actual gain being on the Erie, and the largest proportional one on the New York, Ontario & Western.

Anthracite shipments by Lake from Buffalo for the season to July 1 were 1,034,170 tons in 1907, and 1,073,110 in 1908; an increase of 38,940 tons.

Coal and coke tonnage, Chesapeake & Ohio Railway, 11 months of fiscal year from July 1 to May 31, short tons:

	Coal.	Coke.	Total.
New River............	5,179,340	187,851	5,367,191
Kanawha..............	4,117,164	77,936	4,195,100
Kentucky.............	245,343	......	245,343
Connecting lines.	157,773	50,679	208,452
Total................	9,699,620	316,466	10,016,086
Total, 1907.	8,981,269	415,089	9,396,358

Deliveries this year to points west of mines, 1,731,029 tons coal and 194,825 coke; points east, 1,445,378 tons coal and 121,641 coke; tidewater, 3,500,929 tons coal. Anthracite delivered to line points, 21,784 tons.

Coal receipts at Boston, six months ended June 30, reported by Chamber of Commerce, in long tons:

	1907.	1908.	Changes.
Anthracite...........	1,027,672	882,058	D. 145,614
Bituminous	1,515,777	1,522,880	I. 7,103
Total domestic...	2,543,449	2,404,938	D. 138,511
Foreign......... . .	275,105	223,950	D 51,155
Total...............	2,818,554	2,628,888	D. 189,666

The foreign coal comes chiefly from Nova Scotia.

New York

ANTHRACITE

July 15—Prepared sizes are easy and in light demand. Small steam sizes are in slightly better demand, owing to the curtailment of production. All sizes are being sold below circular prices and prepared sizes are quoted at about the April schedule. The large producers, however, are not offering coal below schedule.

Prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

The soft-coal market remains in the same lifeless condition that has existed for so many weeks. There is no disposition on the part of consumers to take on coal and production has been reduced to the lowest point. In New York harbor good grades of steam coal are offered at $2.45@2.50 with no takers. Poorer grades fetch as low as $2.25 per ton.

Transportation from mines to tide is up to all requirements. Many cars are idle and in need of repair, but the railroads are making no attempts to put them in condition. In the Coastwise vessel trade, captains are anxious to charter even at the low rates prevailing, but little business is being done. Freight rates are unchanged, as follows: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Saco, 90c.; Newburyport, 75c.; Portsmouth, 55@60c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c.; towages where usual.

Birmingham

July 13—Coal operations in Alabama have been interfered with some by the strike of the union miners. Quite a number of non-union men at work quit and joined the union. The mines are still running, though at some places the output is slack. Deputies are being sent to some of the collieries to prevent any possible interference. While there are no indications of trouble, this is being done as a matter of precaution. The demand for coal is looking up a little. The coke ovens are demanding a good quantity. The coke consumption is healthy as the iron production improves. The coal operators in this section do not look for much of a fight on the part of the union men as their ranks are down to the lowest number in years.

Chicago

July 14—Conditions in the coal market continue bad for the producer. Summer demand is light and runs to Western fine coals. Neither country nor city dealers will stock up on prepared sizes and large consumers find little use for such sizes. Anthracite business is almost at a standstill. There is much demurrage coal on tracks and shipments should be curtailed from western and eastern mines.

Illinois and Indiana lump or egg runs $1.65@2.15; run-of-mine, $1.50@1.75; screenings $1.45@1.65 Lump is very weak, quotations being merely nominal.

Eastern coals continue weak. Hocking and smokeless are 15@25c. under circular prices, much Hocking being obtainable at $3. Youghiogheny on contracts is unchanged.

The harvesting trade has already begun, but is not yet heavy.

Pittsburg

July 14—The coal trade shows no improvement, but operators continue to quote $1.15 for mine-run coal on contract and 5c. more on transient business. Slack continues to be a drug, and can be had as low as 40c., although some producers still quote 75c. About 90 per cent. of the railroad mines are running steadily, the product going to the Lake ports. There is plenty of railroad cars. The river mines continue to operate in full, and when the rivers are again navigable there will be an unusually large shipment to the Southern ports.

Connellsville Coke—Prices remain unchanged, furnace coke $1.65@1.75 and foundry $2.10@2.25 at ovens. The H. C. Frick Coke Company fired 500 idle ovens yesterday. The *Courier,* in its weekly report, gives the production in both regions at 165,472 tons. The shipments were 6449 cars as follows: To Pittsburg, 2703; to points west of Connellsville, [illegible] to points east of Connellsville, 406 cars.

San Francisco

July 8—On July 1 coal at the [illegible] in this city was reduced, wholesale, from $12 to $9 per ton, and a reduction in retail prices will follow. This reduction is expected to be permanent as the British Columbia mines are now in a position to supply the needs of this city without Australian imports. The reduced price has stimulated the demand for coal. Very little coal is now being produced in California, shipments from the Mount Diablo mines having fallen off materially since the use of fuel oil became common. The Stone Cañon coal mines in Monterey county are being extensively developed and a branch railroad to the Southern Pacific line is projected. This coal is of a better quality than that heretofore mined in this State. The output of these properties will before long be marketed in San Francisco and will have an important bearing on the local fuel supply. The Controller Bay, Alaska, coalfield will also be developed soon. The Alaska Petroleum and Coal Company owning mines in the Behring Lake coalfield, near Catalla, expects to secure the construction of a railroad line from Catalla to Behring Lake. There is reason to expect a supply from Alaska in another year.

Foreign Coal Trade

German Coal Trade—Imports and exports of fuel in Germany, five months ended May 31, metric tons:

Imports	1907	1908	Changes
Coal	4,486,581	4,437,176	D. 48,405
Brown coal	3,541,673	3,724,952	I. 183,279
Total coal	8,027,254	8,162,128	I. 134,874
Coke	184,174	207,488	I. 23,314
Briquets	65,845	76,690	I. 10,845
Exports			
Coal	7,949,197	8,200,114	I. 250,917
Brown coal	7,597	10,949	I. [illegible]
Total coal	7,956,794	8,211,[illegible]	I. [illegible]
Coke	1,505,152	1,540,571	I. [illegible]
Briquets	484,997	[illegible]	I. [illegible]

Coke exports this year included [illegible] tons to the United States. Imports of peat fuel this year, [illegible] tons; exports, 9200 tons.

Iron Trade Review

[illegible] July [illegible] market continues dull and quiet. There has been moderate pig-iron trading, and furnaces seem disposed to make concessions still for good orders. Foundry iron supplies most business, though there is some call for basic pig.

In finished material there is little new business. A good deal of structural work is talked about, but does not reach the contract stage. Some contracting concerns complain that the manufacturing companies are offering to take structural orders at prices which erectors who have to buy their material cannot meet.

Pig Iron Production—The monthly reports from the furnaces show a slight improvement. On July 1 there were 151 coke and anthracite furnaces in blast, having a total weekly capacity of 264,500 tons. This is an increase of 4000 tons over June 1; but a decrease of 263,500 tons from July 1, 1907. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the production of pig iron in June was 1,108,500 long tons; for the six months ended June 30 it was 6,866,600 tons. This estimate compares with 13,478,044 tons in the first half of 1907; a decrease of 6,611,444 tons, or 47.6 per cent. This is the sharpest reduction on record.

Lake Superior Iron Ore—Shipments of iron ore by lake from the Lake Superior region for the season up to July 1 are reported by the Cleveland *Iron Trade Review* as follows, in long tons:

	1907	1908	Changes
Escanaba	[illegible]	[illegible]	D. [illegible]
Marquette	[illegible]	[illegible]	D. [illegible]
Ashland	[illegible]	[illegible]	D. [illegible]
Superior	[illegible]	[illegible]	D. [illegible]
Duluth	[illegible]	[illegible]	D. [illegible]
Two Harbors	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

Total decrease this year, 76.7 per cent. This was pretty evenly distributed over all the ranges.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for May, and the five months ended May 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1907.	1908.	Changes.
May	$14,[illegible]	$11,[illegible]	D. $[illegible]
Five months	[illegible]	[illegible]	D. [illegible]

Leading items of export for the five months, in long tons:

	1907	1908	Changes
Pig iron	[illegible]	[illegible]	D. [illegible]
Billets, ingots & blooms	[illegible]	[illegible]	I. [illegible]
Bars	[illegible]	[illegible]	D. [illegible]
Rails	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
Wire	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]

Decreases are shown in all items except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, from [illegible] months ended May 31 are valued as follows:

	1907	1908	Changes
May	[illegible]	[illegible]	[illegible]
Five months	[illegible]	[illegible]	[illegible]

Leading items of import for the five months, in long tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The only increase shown here was a small one in tinplates.

Birmingham

[illegible] market is yet quiet, the furnace people appear to be satisfied. The production of iron in the Birmingham district may be delayed a little by the strike of the union coal miners, that is as far as an increased production goes. The shipments of pig iron are healthy. There is practically no iron on furnace yards in the immediate Birmingham district, though in the outlying territory, in Alabama, there is yet more than 50,000 tons. The quotations are firm above $12 per ton, No. 2 foundry. There is a denial that some iron was sold here at $11.50 or $11.75 No. 2 foundry basis.

Chicago

July 14—Aside from a few contracts from agricultural manufacturing establishments the pig-iron market continues quiet. Southern iron is weaker, selling at $12 for No. 2 Birmingham, openly, with reports of $11.50 Birmingham ($15.85 Chicago) common. There is said to be a heavy demand for Northern for implement purposes, charcoal iron being especially in demand. Northern No. 2 coke is quoted at $17.25@17.75, with charcoal iron at $20@20.50, for second-half delivery. Lots that must be moved quickly bring the lowest prices.

Sales of iron and steel products are in general dull. The tendency among consumers continues to go cautiously. Coke is somewhat dull at $4.90 for the best Connellsville.

Philadelphia

[illegible] couraging features one small one shows up—the sending in of orders to ship iron on contracts placed some time ago with the condition that the price was to be fixed by the rate prevailing at the time the order to ship was sent in. Apart from this feature there is really nothing deserving of comment this week. Not a single instance of a further cut in prices can be unearthed. In this sense prices are stronger. Very little is being done with reference to [illegible] 16.50; forge, $16, and basic about the same.

[illegible]

weaken and because very little stock is needed.

Scrap—The railroads have plenty of scrap which they hold at prices dealers will not pay. Heavy steel scrap is a accumulating with no buyers in view just now, but dealers know where they can find buyers if they will take buyers' prices—which they do not propose to do.

Pittsburg

July 14—While there has been no marked improvement in conditions, the situation is stronger and the outlook is regarded as brighter than at any time since the opening of the year. Inquiries for steel have been more numerous than for several months, but there is a temporary weakness in iron for prompt delivery. One of the favorable features of the week was the settlement of the wage scale for another year by the Amalgamated Association of Iron, Steel and Tin Workers and the Western Bar Iron Association. The adjustment of the scale was on terms better than had been expected, being a reduction from last year's scale of about 8 per cent. Arrangements are now being made to hold another conference with the Republic Iron and Steel Company. All of the plants of the Republic, 11 in number, are idle.

The talk of shading of steel prices lately is shown to be without foundation as on all inquiries the full prices were named. The railroads in the Pittsburg district are doing more repair work than usual, and it is certain that they soon will be in the market for material. Some fairly good orders for structural material have been placed. The mills in the Pittsburg district are running about the same as a week ago.

Pig Iron—Prices of pig iron for early shipment have slumped, but for fourth-quarter shipment quotations are 25 to 50c. higher. A number of sales of bessemer iron have been made lately at $15.75, Valley furnaces. In foundry iron the drop was greater, one or two sales having been reported at $14.50 at furnace for No. 2 foundry, but the quotation this week for prompt delivery is $14.75. Basic and malleable iron are quoted at $15 at furnace for July delivery, and gray forge is quoted nominally at $14. Of the 19 merchant furnaces in the two valleys nine are running.

Steel—There is more inquiry for billets. The price remains at $25 for both bessemer and open-hearth, with half the freight to destination absorbed by the seller. Plates remain at 1.60c. and steel bars at 1.40c.

Sheets—The market is unchanged. Black sheets are 2.50c. and galvanized 3.55c. for No. 28 gage.

Ferro-manganese—The market continues strong; prompt delivery ferro is $46 @47, Pittsburg.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 15.

At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908.	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver:			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended July 11: Gold, $3000, to the West Indies; silver, $1,404,290, to London and Paris. Imports: Gold, $57,655, from South America; silver, $21,000, from Mexico.

Specie holdings of the leading banks of the world July 11, are reported, as below, in dollars:

	Gold	Silver.	Total.
Ass'd New York	....	....	$301,491,900
England........	$188,838,040	....	188,838,040
France........	633,267,080	$182,914,435	816,181,515
Germany.......	184,345,000	76,395,000	260,740,000
Spain..........	78,230,000	134,135,000	212,365,000
Netherlands....	38,516,000	21,060,500	59,576,500
Belgium.......	20,956,665	10,478,335	31,435,000
Italy...........	180,765,000	21,375,000	202,140,000
Russia........	561,110,000	38,885,000	599,995,000
Aust.-Hungary.	234,010,000	66,680,000	300,690,000
Sweden.........	19,430,000	....	19,430,000
Norway........	8,160,000	......	8,160,000
Switzerland....	15,550,000	....	15,550,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in France, five months ended May 31:

	Imports.	Exports.	Excess.
Gold....	Fr.395,360,000	F.12,770,000	Imp. Fr.382,590,000
1907...	95,090,000	73,123,000	Imp. 21,967,000
Silver..	60,140,000	74,250,000	Exp. 14,110,000
1907...	65,313,000	64,325,000	Imp. 988,000

Imports of copper and nickel coins, 40,000 fr. in 1907, and 31,000 fr. in 1908; exports, 150,000 fr. in 1907, and 333,000 fr. this year.

Silver Market

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.	July.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.
9	4.8700	53½	24 11/16	13	4.8705	53⅝	24¾
10	4.8700	53¼	24[illegible]	14	4.8705	53[illegible]	24[illegible]
11	4.8705	53[illegible]	24[illegible]	15	4.8710	53	24

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 2:

	1907.	1908.	Changes.
India...	£6,301,774	£4,158,158	D. £2,143,616
China.....	......	516,400	I. 516,400
Straits.....	544,012	90,510	D. 453,502
Total......	£6,845,786	£4,765,068	D. £2,080,718

Imports for the week were £5000 from Argentina, £3000 from Chile and £87,000 from New York; £95,000 in all. Exports were £288,800 to India.

The silver market has been fairly steady the past week, the demand depending on purchases for the Indian bazaars. Although the rainy season in India seems to assure good crops it is not expected that the India mint will be a buyer for several months. The market closes steady at 24⅝d. in London.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Copper: London, £ per ton.	Tin: Cts. per lb.	Lead: Cts. per lb.	Spelter: New York, Cts. per lb.	Spelter: St. Louis, Cts. per lb.
9	12¾ @13	12½ @12¾	57⅞	29¼	4.40 @4.45	4.42½ @4.47½	4.27½ @4.32½
10	12¾ @13	12½ @12¾	57⅜	28¾	4.40 @4.45	4.42½ @4.47½	4.27½ @4.32½
11	12¾ @13	12½ @12¾	....	28¾	4.40 @4.45	4.40 @4.45	4.27½ @4.30
13	12¾ @13	12½ @12¾	57¼	28½	4.40 @4.45	4.40 @4.45	4.27½ @4.30
14	12¾ @13	12½ @12¾	57½	28½	4.40 @4.45	4.40 @4.45	4.27½ @4.30
15	12¾ @13	12½ @12¾	57¾	29¼	4.40 @4.45	4.40 @4.45	4.27½ @4.30

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The general position of the market is materially strengthened through the increase in the legitimate requirements of the American consumers, which is steadily reflected in a continuous demand. As a result some business is transacted from day to day, and as Europe is also participating in the purchases, the quantities taken for home trade and for export show more and more approach to a normal situation. Producers, as a general rule, are pursuing the policy of meeting the market from day to day, and prices on this account have hardly been affected as yet, but the close is steady at 12¾@13c. for Lake copper, and 12½@12¾c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 12⅜@12½ cents.

The better tendency in the standard market in London is largely due to a revival in the consumptive demand, which for a short time had been rather discouraging. Prices were well sustained throughout the week and close firm at £57 15s. for spot, £58 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £60@61; best selected, £60@61; strong sheets, £72@73

Tin—The London market, while fluctuating almost daily, has in the main maintained its firm tone, and the close is cabled at £132 5s. for spot, £133 7s. 6d. for three months.

American consumers do not put much faith in the London market and are holding aloof so far as future business is concerned. Spot metal is held at a premium, and quotations at the close are made at about 29¼ cents.

Lead—As is not unusual during the midsummer season, business in this metal is quiet. The floating supply—that is, the quantities in second hands—is still fairly large, and under the effort to [illegible] those who have missed the market, prices have given way slightly, and the close is weak at 4.40@4.45c. New York.

The position of the lead market abroad is righting itself. Consumers at last recognize the abnormally low level at which this metal has been ruling, and have taken hold more freely. Quotations in consequence have advanced to £13 for Spanish lead, £13 2s. 6d. for English lead.

Spelter—The market for this metal is neglected. Nothing of importance transpired during the week, and the close is uncertain at 4.27½@4.30c. St. Louis, 4.40@4.45c. New York.

From London, the reports are more encouraging. Production is beginning to suffer under the low prices which have ruled in Europe for such a long time, and stocks having been thoroughly liquidated, it did not take much of a demand to stiffen prices. The close is firm at £19 for good ordinaries, £19 5s. for specials in London.

The Lanyon-Starr Smelting Company will hold its annual meeting Aug. 11. Owing to the continued depression in the spelter market the dividend due July 15 has been passed.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—No sales were made during the week. Quotations remain nominal at 8⅝@8¾c. for Cookson's, 8¼@8½c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb. at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—Prices remain unchanged at $23.50 per oz. for hard platinum, $21 for ordinary, and $16 for scrap.

German Copper Imports and Exports

Imports and exports of copper in Germany for the five months ended May 31, metric tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	20,914

The large increase in net imports is probably due, not to increased consumption, but to the carrying of much larger stocks by manufacturers who bought metal at low prices. Exports of copper from the United States to Germany and Holland for the five months were 34,846 long tons in 1907, and 62,235 in 1908; an increase of 27,389 tons. Copper reported on our returns for Holland is included because nearly all of the metal shipped here to Rotterdam and Antwerp is intended for Germany. Approximately 90 per cent. of the German imports this year were from the United States.

Missouri Ore Market

Joplin, Mo., July 11—The highest price paid for zinc was $38; the assay base price was $35.50, ranging down to $30 per ton for sludge ores; the average price all grades was $32.30, an advance of $1 on account of very small silicate sales. The highest price paid for lead ore was $64 on purchases of the previous week, the high offering of this week being $61, medium grades selling at $58@60; the average price, all grades, is $60 per ton.

The large increase of production from the Oklahoma mines at Miami, and the resumption of operations by a number of mines temporarily closed down, raised the production of the week.

Following are the shipments of zinc and lead from the district for the week ending July 11:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	$76,933
Joplin	[illegible]	[illegible]	[illegible]
Badger	[illegible]	[illegible]	[illegible]
Miami	[illegible]	[illegible]	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	[illegible]	[illegible]
Alba-Neck	[illegible]	[illegible]	[illegible]
Granby	[illegible]	[illegible]	3,450
Spurgeon	[illegible]	[illegible]	[illegible]
Carthage	[illegible]		[illegible]
Aurora	[illegible]		2,175
[illegible]	[illegible]	[illegible]	[illegible]
Carl Junction	[illegible]		[illegible]
Sarcoxie	[illegible]		[illegible]
Playter	[illegible]	[illegible]	[illegible]
Cave Springs	[illegible]	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]
28 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week, [illegible]; 28 weeks, [illegible]
Lead value, the week, [illegible]; 28 weeks, [illegible]

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1907.	1908.	Month.	1907.	1908.
January	[illegible]	[illegible]	January	[illegible]	[illegible]
February	[illegible]	[illegible]	February	84.58	49.72
March	[illegible]	[illegible]	March	[illegible]	[illegible]
April	[illegible]	[illegible]	April	[illegible]	[illegible]
May	[illegible]	[illegible]	May	[illegible]	[illegible]
June	[illegible]	32.07	June	[illegible]	[illegible]
July	45.79	......	July	[illegible]	
August	43.22		August	59.54	......
September	40.11		September	53.52	......
October	39.83		October	51.40	......
November	35.19		November	43.40	......
December	30.87		December	37.71	......
Year	[illegible]		Year	68.90	......

Wisconsin Ore Market

Platteville, Wis., July 11—The base price for 60 per cent. zinc ore this week was $33@35 per ton. Lead ore, best grade, $63 per ton.

Shipments, week ended July 11:

[illegible]	[illegible] lb.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

In addition to the above there was shipped to the electrostatic separator at Platteville, from Benton, 168,150 lb.; to the Joplin Separator works at Galena, from Benton, 62,300 lb.; and to the Enterprise roaster at Platteville, from Strawbridge, 169,800 lb. zinc ore.

Hazel Green shipped last week—not reported July 4—763,650 lb. zinc ore and 72,400 lb. lead; Linden likewise shipped 40,390 lb. and Mineral Point 154,810 lb. zinc ore not reported last week.

Chemicals

New York, July 15—Few inquiries are received by dealers and the market has settled down to midsummer dullness.

Copper Sulphate—Some sales have been recorded. Some odd lots have been disposed of by independent dealers at cut prices. Quotations are unchanged at $4.65 per 100 lb. for carloads and $4.90 for smaller lots.

Nitrate of Soda—W. Montgomery & Co., Ltd., report shipments from South America to all parts, for the six months ending June 30 at 966,000 tons against 738,000 tons in 1907. The consumption in Europe during this period was 1,025,000 tons and in the United States, 318,000 tons. Quotations for spot 95 per cent. are 2.30@2.32½c. while for other positions of 1908 the price varies from 2.25 to 2.35c. according to quantity and terms of sale.

Phosphates—Paul C. Trenholm reports shipments of phosphate rock from Charleston, S. C., in June at 5500 long tons, [illegible]

Mining Stocks

[illegible] market has been rather stronger, but with[illegible] than a week ago.

The curb market has been dull, with no sensational changes. Copper stocks were only in moderate demand, but prices were [illegible]

Boston

July 14—Copper mining shares are on the mend and sentiment is improving. The continued strength of the Butte, or so called Cole-Ryan stocks, has inspired confidence and the good feeling is spreading. North Butte, Butte Coalition and Amalgamated Copper have been the features during the week. North Butte has been steadily bought and has advanced $3.50 to $73.25. A few months ago this stock sold as low as $30 per share. Butte Coalition has risen $2.50 to $25. Amalgamated crossed $70 last week, fell back to $68, and closed at $69.75 tonight.

A favorable feature in the situation is the large increase in the number of stockholders of the leading issues which makes the offerings limited. Arizona Commercial closed strong at $16.37½ tonight. This company is to issue $600,000 in 6-per cent. bonds convertible into stock at $25. The capital will be increased so as to take care of the conversion. The money is for the purpose of building a smelter.

The American Zinc, Lead and Smelting Company has organized the Wisconsin Zinc Company under Maine laws with $1,000,000 capital. The company will be a subsidiary, the American company controlling 60 per cent. of the stock and the former owners the balance. The property is in the Wisconsin zinc-lead district.

Montana Coal and Coke trust receipts have been put on the unlisted department of the exchange.

The curb has shown more activity, with hardening of prices.

STOCK QUOTATIONS

NEW YORK July 14		BOSTON July 14	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	½	Adventure	4½
Amalgamated	70	Allouez	30
Anaconda	44¼	Am. Zinc	‡28¼
Balaklala	¾	Arcadian	3¼
British Col. Cop.	5	Arizona Com	19½
Butte & London	....	Atlantic	15
Butte Coalition	25	Bingham	.75
Colonial Silver		Boston Con	12
Cum. Ely Mining	8	Calumet & Ariz.	113½
Davis Daly	2	Calumet & Hecla	660¼
Dominion Cop	1 1/16	Centennial	25
Douglas Copper	3	Con. Mercur	‡.39
El Rayo	2	Copper Range	74
Florence	3/16	Daly West	11
Foster Cobalt	43	Franklin	9½
Furnace Creek	.15	Greene Can.	10⅞
Giroux	3½	Isle Royal	20½
Gold Hill	½	La Salle	15
Goldfield Con.	5 11/16	Mass	6
Granby	†96	Michigan	9½
Greene Gold	½	Mohawk	61¼
Greene G. & S.	1/16	Nevada	12½
Greenw'r & D. Val.	.75	North Butte	73¼
Guanajuato	1¼	Old Colony	‡.25
Gnggen. Exp.	150	Old Dominion	36¾
Hanapah	‡.20	Osceola	100
McKinley Dar.	72	Parrot	24
Micmac	2¼	Quincy	87½
Mines Co. of Am.	1¼	Rhode Island	3
Mitchell Mining	¼	Santa Fe	1½
Mont. Sho. C.	‡.66	Shannon	14¼
Nev. Utah M. & S.	2 15/16	Superior	16½
Newhouse M. & S.	5½	Tamarack	65½
Nipissing Mines	7½	Trinity	13¼
Old Hundred	½	United Cop., com.	7
Silver Queen	1.05	U. S. Oil	24
Stewart	11/16	U. S. Smg. & Ref*.	36½
Tennessee Cop'r.	36	U. S. Sm. & Re., pd*.	44
Tri-Bullion	1 11/16	Utah Con*	43
Union Copper	13/16	Victoria	5½
Utah Apex	4	Winona	5
Utah Copper	34	Wolverine	133
Yukon Gold	3¾	Wyandotte	1½

*Ex. Div. †Ex. Rights ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24
Am. Smelt. & Ref.	83½
Am. Sm. & Ref., pf.	104
Bethlehem Steel	18½
Colo. Fuel & Iron	29¼
Federal M. & S., pf.	‡83½
Inter. Salt	18½
National Lead	70½
National Lead, pf.	101¼
Pittsburg Coal	11½
Republic I. & S.	18¾
Republic I. & S., pf.	69½
Sloss-Sheffield	59¼
Standard Oil	615
U. S. Red. & Ref.	‡10
U. S. Steel	42
U. S. Steel, pf	107⅞
Va. Car. Chem.	24¼

BOSTON CURB	
Ahmeek	‡72½
Black Mt	3½
East Butte	‡6½
Hancock Con.	‡5¾
Keweenaw	6¼
Majestic	.69
Raven	.95
Shawmut	.42
Superior & Pitts.	11
Troy Man	.55

ST. LOUIS July 11

N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.00	1.50
Cent. C. & C.	68.00	67 00
C.C. & C. pd.	78 00	76 00
Cent. Oil	110 00	100.00
Columbia	4.00	3.00
Con. Coal	19.00	16.00
Doe Run	120.00	110.00
Gra. Bimet.	.22	.20
St. Joe	14.00	12.00

LONDON July 15

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 6
Camp Bird	0 13 0
Esperanza	1 12 6
Tomboy*	1 3 9
El Oro*	1 3 9
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 15.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.16
Belcher	.19	St. Ives	.30
Best & Belcher	.45	Triangle	.04
Caledonia	.07	BULLFROG STOCKS	
Chollar	.15	Bullfrog Mining	.03
Comstock	.26	Bullfrog Nat. B.	.04
Con. Cal. & Va.	.57	Gibraltar	.05
Crown Point	.25	Gold Bar	.04
Exchequer	.17	Homestake King	.41
Gould & Curry	.11	Montgomery Mt.	.06
Hale & Norcross	.17	Mont. Shoshone C.	.70
Mexican	.45	Original Bullfrog	.01
Ophir	2.30	Tramp Cons.	.18
Overman	.07	MANHAT'N STOCKS	
Potosi	.10	Manhattan Cons.	.08
Savage	.20	Manhat'n Dexter	.04
Sierra Nevada	.27	Jumping Jack	.03
Union	.24	Stray Dog	.02
Utah	.05	MISCELLANEOUS	
Yellow Jacket	.34	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	.84	Lee Gold Grotto	...
Extension	.65	Nevada Hills	1.75
Golden Anchor	.02	Nevada Smelting	.75
Jim Butler	.22	Pittsburgh S. Pk.	1.04
MacNamara	.34	Round Mt. Sphinx	.26
Midway	.36		
Montana	1.25		
North Star	.06		
Tono'h Mine of N.	7.75		
West End Con.	.59		
GOLDF'D STOCKS			
Adams	.03		
Atlanta	.18		
Booth	.15		
Columbia Mt	.14		
Comb. Frac	.68		
Cracker Jack	.04		
Dia'dfield B. B. C.	.18		
Goldfield Belmont	.14		
Goldfield Daisy	.80		
Great Bend	.26		
Jumbo Extension	.46		
Katherine	..		
Kendall	.12		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.18		
Roanoke	...		
Sandstorm	.26		

COLO. SPRINGS July 11

Name of Comp.	Clg.
Acacia	6
Black Bell	....
C. C. Con.	3
Dante	7
Doctor Jack Pot	6¼
Elkton	56½
El Paso	31
Findlay	24½
Gold Dollar	6
Gold Sovereign	‡3
Isabella	27
Index	....
Jennie Sample	2¼
Jerry Johnson	‡4½
Mary McKinney	‡25
Pharmacist	2⅞
Portland	1 06
Un. Gold Mines	‡3½
Vindicator	85
Work	8⅝

Assessments

Company	Delinq.	Sale.	Amt.
Birchville, Cal.	June 20	July 11	$0 02
Bullion, Nev.	June 25	July 17	0.05
Butler-Liberal, Utah	July 17	Aug. 6	0.02
Chollar, Nev.	July 8	July 30	0.10
Con. Imperial, Nev.	June 17	July 9	0.01
Con. Virginia, Nev.	June 12	July 3	0.25
Confidence, Nev.	June 10	June 30	0.20
Helvetia, Ariz.	... ...	July 20	0.50
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev.	June 30	July 20	0.01
Mountain Dell, Utah	June 24	July 13	0.02
Oro Cobre, Cal.	July 16	Aug. 3	0.02
Overman, Nev.	June 19	July 10	0.05
Peruvian Con., Utah	June 22	July 7	0.01
Silver King Con., Utah	June 11	June 30	0.10
Spanish Ridge, Cal.	June 1	July 1	0.05
Tomahawk, Nev.	July 10	Aug. 12	0.01
Tonopah North Star, Nev.	June 24	... .	0.01
Union Con., Nev.	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55 678	31 769	25 738
February	68 835	56 000	31 852	25 855
March	67 519	55 365	31 325	25 570
April	65 462	54 505	30.253	25.133
May	65.971	52.795	30 471	24.377
June	67.090	53.663	30 893	24.760
July	68 144	......	31 366	......
August	68.745	......	31 637	......
September	67.792	......	31.313	......
October	62.435	......	28 863	......
November	58 677	......	27 154	......
December	54.565	.....	25 362	.....
Year	65 327	......	30.188	.....

New York, cents per fine ounce: London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	12.675	24.140	12.877	97.272	57.842
July	21.130	......	21 923	......	95.016	....
August	18.356	......	19.255	......	79.679	....
September	15.565	......	16.047	......	68.375	....
October	13.169	......	13.551	......	60.717	....
November	13.391	......	13.870	......	61.226	....
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	......
February	42.102	28.978	August	37.667	......
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32.620	......
May	43.149	30.016	November	30 833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3.691	19 828	14 469
February	6.000	3.725	19 531	14 250
March	6.000	3.838	19 703	13 975
April	6 000	3.993	19 975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20 188	12.600
July	5.288	.....	20.350	......
August	5 250	......	19 063	......
September	4.813	......	19.775	......
October	4.750	......	18 531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4 363	27 125	20 569
February	6.814	4.788	6.664	4 638	25.938	20.875
March	6 837	4.665	6.687	4 527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	......	5.922	......	23 850	......
August	5.701	......	5.551	......	21 969	......
September	5.236	......	5.086	......	21 050	......
October	5.430	......	5.280	......	21 781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20 075	......
Year	5.962	.....	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, JULY 25, 1908. NO. 4.

On Horseback in Western Chihuahua

Traveling Light without Pack-train or Camping Outfit among Mining Camps Where Sectionalized Machinery Is the Rule

BY MARK R. LAMB*

My fellow passengers on the train from Miñaca to Temosachic advised the purchase of a saddle mule and two pack animals, since I expected to be on the road at least a month, they said this would be much less expensive and more nearly certain than taking the chance of hiring outfits from one camp to another. Old George of the Greene company was ready with several horses and mules for my inspection and was also ready to drive a hard bargain. When told that the matter would be left entirely in his hands and that I was prepared to take his advice about the trip without question, he looked rather disappointed at being beaten out of a trade.

"Here is your outfit," he said, later in the afternoon, as he brought up a big, young, white horse with saddle and bridle. "Of course I should like to sell you two or three mules, but if you put it up to me, you do not need to buy mules here where they cost so much, when you are going right where the mules come from. Besides that, feed is so short and scarce now that if you take my advice you will get no pack animals at all, but make for any ranch that is handy every night. In that way you can rest while your meals are being prepared instead of being obliged to stop early, build a fire, carry water and cook for yourself. The food will be good; better than you can cook for yourself. Get two good heavy blankets, a slicker, some quinine, a forty-four and a broad hat and you are all right for the trip. Roll your underwear up in the blankets and tie the lot on behind the saddle. Keep your gun in plain sight and you will have no trouble anywhere in Mexico unless you look for it."

CONCHENO MILL, GREENE GOLD-SILVER COMPANY

I took his horse and his advice and had no cause to regret either decision. The horse was supposed to get his corn in the morning and at night and by no means in the middle of the day, but it took the Colonel about two days to [illegible] corn out of the pack every time we stopped to rest. Feed certainly *was* short. It was just at the beginning of the [illegible] [illegible] little dry grass was left. The Colonel earned his name by insisting on a drink every time we crossed water, which was many times in an hour on some parts of the journey. He was a little too spirited for a man not used to the saddle, where- [illegible] days. This had its advantages, however, as that tired feeling experienced each night was an excellent substitute for a mattress. The latter is merely a luxury of the pampered and is soon forgotten. It is a solemn fact that 95 per cent. of the Mexican race, counting the native Indians, sleep all their lives with only a [illegible] ground and are none the worse for it.

[illegible]

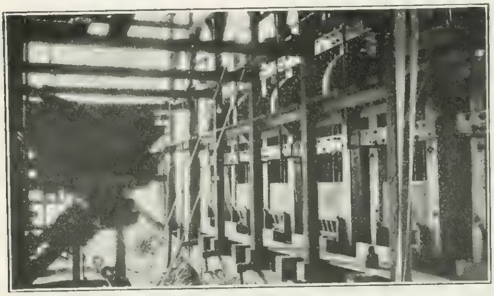
[illegible] big Norman horses. These big fellows [illegible] and from the stories told by the drivers, the experiment of importing them was a failure. One driver who was stuck at a bad turn on a grade was almost crying in disgust.

---

*Milling and cyaniding engineer, Guanajuato, Mexico.

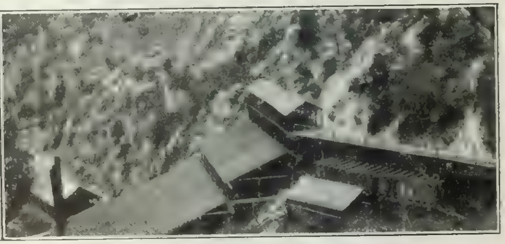
"What can they expect such elephants to do on mountain roads? They have all they can do to drag their own big feet up these grades, much less can they negotiate the big loads piled upon us! I've been driving for three months for this company and at least one of these poor fellows has died on every trip. They came from around sea level in the States and are expected to work up here, over a mile high. I can beat mules with a chain and with pleasure, but who could touch these willing beauties when they actually break their hearts trying?"

When I arrived at Concheño the camp was congested with laborers of all nationalities and one good-natured mill man insisted on kicking a couple of puppies off the last cot in the town, for me. How could I tell him I had rather sleep on a bed of pine needles under the trees? The 60-stamp mill was in the throes of reconstruction and it was difficult to get around in it. It is an old amalgamation mill remodeled, so there are many features which are unsatisfactory to the man who must make it go. The stamps are old and rickety. After concentration the sand goes to leaching tanks and the slime to settling pits, shown in the photograph. The thickened, or partially dried, slime is trammed back up into the mill and agitated in dinky little tanks about six by six. Several small iron filter-presses were being added to the slime end of the plant in an endeavor to save the dissolved metals. The framing for an additional 40 stamps was complete, but I hear that this lumber has since been used to build a carpenter shop. The whole plant is so old and tumbled-down that the company should insure and burn it. A good site would remain for a modern economical mill which could be built for less than the cost of partially repairing this one. At this camp my horse ate complimentary grass-hay worth about 100 pesos per ton and was on a very short ration of corn, that necessity being almost unattainable for man or beast.


PINOS ALTOS MILL

POTRERITO MILL

MILL AT SAHUAYACANCITO


PINOS ALTOS MILL

Pinos Altos

A few vague directions started me over the trail to Pinos Altos and warnings as to the danger of traveling alone were cheerfully volunteered. I have finally decided that the only danger in thus traveling without a *mozo* lies in the possibility of meeting with some accident with no help near. It is just as safe anywhere in Mexico as it is in San Francisco or Chicago. For lack of a guide I lost a little time on this ride, which should have required four hours. Instead of landing at the town I arrived at the mill and had the pleasure of the climb up the steep, winding trail over a thousand feet straight up. This climb gave my nerve and Colonel's strength a good test; *he* was equal to it. Mr. Ray took me in and regaled me with interesting stories of the mine, which is an old one with vast workings. The English company which formerly owned it obtained an increased concession covering an area of 27 square miles as a recompense for the death of a manager who was killed by the natives. It would take a full year to go over the entire property, so precipitous is its surface. The 50 stamps of the old mill have been remodeled into a "25" and cyanide plant, but is not running. A sawmill just completed at the end of the property has a world of pine to cut preparatory to the building of a hydro-electric power plant some miles from the mill and mines. There is ample water and wood is pretty well cut off from the neighborhood of the plant.

The mill engine is a duplex, tandem-compound, *sectionalized* marvel by Fraser & Chalmers and must contain a ton of nuts and bolts. Some vandal in trying to reduce engine friction, when less power was required on cutting out the pans and settlers and reducing the number of stamps, *cut both piston-rods* between high- and low-pressure cylinders instead of disconnecting one-half the engine.

Many Cornish miners were here employed in the mines 20 years ago and it is quite a shock to see faces of young people of this age who really belong in England but who do not know a word of English.

Ocampo

Several days were spent with a most delightful host and hostess who speeded me on to Ocampo, but not without advice to take a *mozo*. The trail from Pinos Altos soon turns into the broad Greene road running through Temosachic and Concheño to Ocampo. This is a magnificent undertaking, said to be 100 miles long and is about 50 years ahead of the country. Colonel Greene's name will be as much blessed by posterity for this road as it has been cursed by his fellow-operators in the neighborhood for the raise of wages made while building said road. (Note that the laborer is not complaining about the raise in wages.) The road is carved out of the sheer rock cliffs where it drops off the mountain ridge into Ocampo. The story runs that all the numerous old mills in the cañon which belonged to the company were dismantled and moved out of harm's way in order that large charges of powder might be used on the grade. The machinery of these mills lies there still.

The Watterson Gold Mining Company was just starting its mill after adding a cyanide plant and remodeling generally. It was the only plant actually working in the camp. Very good results have since been obtained by Manager Thompson, extending to the successful cyanidation of silver ore concentrates. Conditions in these out-of-the-way camps are very favorable to local treatment of this material as freight charges to the railway are excessive and will warrant heavy treatment charges at the mill.

An attempt has been made to recover "the fabulous amounts of amalgam and quicksilver which had escaped from the pan mills in past years," but the quantity of water was too much for the equipment provided, and the plant stood idle. This statement with slight variations can be applied to every old camp where mills have run. No fortunes have been made this way but there is always a good excuse, other than that there is nothing in the river. Ocampo ice supply is unique and ingenious and should be imitated in others of these western camps. A long tunnel, driven by some deluded prospector near the top of the mountains, is packed hard full of snow during winter, and furnishes ice for this hot camp when it is most needed.

MORIS AND EL SOCORRO

I left the camp late in the morning and climbed a slippery sandstone trail behind the town, quickly reaching the low summit of the divide and starting down hill toward Moris. Through all these mountains the trail no sooner leads one to the bottom of the cañon than it starts up the farthest highest mountain in sight. The range that is climbed last before reaching Moris opens up such a panorama that one is sure the Pacific Ocean must be visible on a clear day. Down, thousands of feet below, glistens the dry bed of the Moris river and the tiny, dice-like white houses of the town apparently prove that the host at Ocampo must have been wrong in allowing six hours for the trip. The horse had a bite of grass while I tried the impossible of getting a photographic record of the view, and we started down the *cuchillo*, the well-named "knife-blade" trail. We slid and skidded down the mountain for hours. I thought I would surely push the horn off the saddle. From the chill breeze of the top we gradually became submerged in the tropical, humid air of the valley. As we neared the bottom, both bathed in perspiration, we passed tiny orange groves, banana trees and such emblems of the tropics. This drop has been estimated at 2000 ft. as the river bed is only 200 ft above sea level. The river was nearly dry but we found several large pools and took a bath in each. Chocolate formed a major part of my lunches and as this resting time was appropriate for a lunch I opened the bag of corn and unwound my pack—to find chocolate, brushes, 'kerchiefs, films and underwear cemented into a cenozoic conglomerate. I also discovered that contact of this magmatic mass with cold water did not result in complete segregation. Going into Moris hot, hungry and heavy-footed, we were both treated royally. The Colonel had corn and alfalfa and I had the finest cool watermelon ever seen. Both diets were against all instructions, but I concluded to let the horse take care of himself. Moris is a town which has stood still for half a century. The people do not move. There is no reason for them to do so. Several baths and a good meal assisted me in remembering the hours of travel had been few that day, so early next morning we were en route to El Socorro, which is within sight of Moris though six hours away.

El Socorro is beautifully situated among [illegible] company has wisely refrained from cutting timber from around the houses. At the time of my visit the tunnel was progressing and the old mill was undergoing minor changes to fit it for [illegible] as possible. This is a very enticing and cosy camp. Cool shade in that country is the first and greatest blessing as the majority of the mills and plants are near the rivers which always spells fever.

The trail from El Socorro to Potrerito leads past El Pilar, the most prominent feature of the landscape. It is an immense [illegible]

LA REPUBLICA MILL

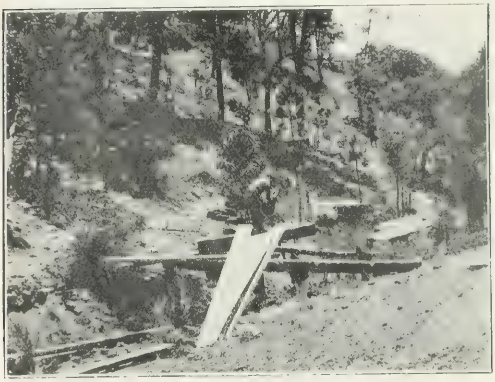
[illegible] MILL

sand feet from base to summit. It can be seen from the range above La Republica and from the trail far south on the way to Chinipas. What appears to be brush on its top is really a small forest of sturdy oaks.

Potrerito is a one-store camp. The mine is said to be rich. A Chihuahua banker agreed to build a mill if supplied with ores worth over 25 pesos per ton. The mill was built and the agreement resulted in the miner delivering ore worth barely 25 pesos, sorting out the high grade for shipment to the smelter, to the dismay of the banker. Now this mill is closed down and neither the miner nor the banker profits. This is an opening for a diplomat to bring the conflicting interests together.

Sahuayacancito and La Republica

An hour's ride over the hill brought us to Sahuayacancito, of which company Mr. Howard is manager. He took us in and made the obligation seem his in his pleasure in visitors. He has a 20-stamp mill and complete pan plant with concentrators, all sectionalized. Compound condensing engines with water-tube boilers, similarly sectionalized, supplied the power. The plant is idle and from the neighbors one gathers that the mine and equipment is just a toy or source of recreation for its Pittsburg owners. The Mexicans say that the mine has produced ore of very high grade and that they should like to take leases. Some good tailings have been caught, but owing to the limited area for storage, the tailings must now be sent into the river as fast as made. A good water-power which is to be harnessed is available, thus saving wood worth over 10 pesos per cord. All of these pan mills through this country could, by a slight expenditure on the pans, be made to grind fine a large tonnage for cyaniding. The pans could be adapted to a continuous feed and the addition of the few tanks needed in these days of air agitation could be made by building of local lumber, thus making a cyanide mill of a pan mill, at low cost and in short order, which would have greater capacity, require less steam and which would make better extraction at lower cost per ton. Such a change practically doubles the available ore reserve of the average mine.



PRIMITIVE SAWMILL

IN LIGHT MARCHING ORDER

Another climb up one side of the world and down the other took us to La Republica mine. Between these two mines are many places where the *arrastre* has flourished in the past and each old resident has tales of rich veins in the various mines known only to himself. A thunderstorm caught us here and it was my first experience of having the thunder and lightning arrive at the same time. The air seemed surcharged; spurs, harness buckles and even pocket knives sing in a most weird way, humming most loudly just before the lightning strikes. A touch of any metal gives quite a shock and it is a case of being just a little too close to one form of nature. Colonel had the same idea of the matter, only more so. These storms must be frequent, as a large part of the trees on the ridge are blasted.

Mr. Parker was just starting his 10-stamp mill and concentrators on high-grade silver ore. The mine is new, but has been developed rapidly, and as the vein of pay ore is large, the reserve is already extensive. The cyanide plant is now about ready to start and will have docile material to treat. This mill is, of course, sectionalized. Mr. Parker was building comfortable quarters and was having a garden planted for the mess, so that life in that pine-sheltered camp will be pleasant.

The day I arrived a drunken rancher had shot a judge to death. Another judge arrived the next day, tried the murderer and sentenced and started him to Chihuahua under a guard of *rurales*. The party was only a short distance on the way when the man attempted to escape and was shot. This is a convenient rite—getting the prisoner to try to escape. This prisoner had been wounded in his fight with the judge and was suffering agonies with his arm, so it must have been difficult to get him to run.

The Edge of the Plateau

From here it was necessary to cut across the country toward Chinipas over little-used trails, so this time it was easy to persuade me to take a *mozo*. I tried to insist on his taking a horse, fearing that we would lose time, but he gently explained to my American ignorance that he could out-travel any horse or mule in the mountains. What worried *him* was that I took no cooking outfit. It was well enough for him to get along on *tortillas* and beans, but for a gringo to be willing to take chances on getting only such food was unheard-of! I found that on the entire trip the lack of pack train caused me not the slightest discomfort, and saved me much time, discomfort and expense by permitting fast traveling. We would stop at a ranch house at night, buy the children's pet chicken perhaps, and have a good meal. In the morning we could rest until the last minute before breakfast and thus "let the women do the work." At daylight we rolled up the blankets and were off without the otherwise unavoidable delays of cooking breakfast, washing dishes and packing the outfit on mules which might or might not be near when wanted.

A long ride over a good trail finally brought us to the river where Don Benito Bourne lives. Melons were again in order; and after a heavy feed of corn, *tortillas* and beans we started up the cañon through a heavily mineralized country. Big, good-looking croppings were on all sides. The wash in the creek was practically all quartz spotted with pyrite and galena. We passed three little ancient mills which had been hypo-leaching establishments, and had seen two ruins on the river bank at El Rio. The machinery and stamps were light, but having been transported such a distance over such trails, when the nearest railway was at Chihuahua, made them pretentious structures. Nothing was doing in the mines but taxes were paid, probably in the expectation of later results. It appeared to be an excellent chance for a speculation—since all mining is, authoritatively, speculation. A good trail with little to break the monotony for two days led us to the ridge which we followed to within sight of Chinipas. Then followed another slow descent to the hot country. The difference in climates must be experienced to be realized. A native of the hot country is not comfortable in the mountains, and the *hombre frio* (cold man) will not live in the hot country. My *mozo* could tell at a glance to which country any passing native belonged. All

RIO PLATA TAILINGS AND RIVER

[illegible]

along the way these last two days we noted the crying lack of water. Cattle were dying for lack of both feed and water. Many were dead and dying around holes which had once contained water and we ran the risk several times of paying for cattle, by shooting them. It seems a more useless and unnecessary loss than when sheep are caught in the snow in the north. There was water in this river on bed-rock anywhere available by pumping. When the Chinipas river was reached the tropics began in earnest. Beautiful, long tailed green parrots, or mackaws with their ear splitting squawks, went past us in countless pairs. Mocking birds were plentiful and the little *perico*, the small talking parrot, appeared frequently.

The Palmarejo Company

We passed the intake of the large flume of the Palmarejo company. This flume, which is built for some distance just a little above the level of the river, is annually filled with gravel and boulders by some one of the violent floods of this country. One of the pictures shows the hight to which the river rises. The water reaches the mill in the flume under a head of [illegible] or less of limited water followed promptly by damaging floods. Chinipas is about 1000 ft. above sea level though surrounded by towering ranges, and it follows that the fever called *calentura* gets every one sooner or later, leaving them quite susceptible to another attack and not able to do much work even when comparatively well. The wonder is that with power unlimited most of the time, an ice plant has not been placed to supply the fever patients, if no one else. Such a plant using ammonia or methyl chloride would require perhaps two horse-power, 10 lb. of methyl chloride for a charge, make 200 lb. of ice per day and cost $500.

The new manager, Mr. Holmes, has the idea of changing the mill from its present site to the mine, several miles up in the mountains, generating power at the present plant and transmitting it electrically, thus saving heavy transportation costs incurred on the narrow-gage railway between the mine and mill with its constant locomotive repairs, derailments and wash-outs. There are places along the track where a car drops for minutes if it goes over the edge. After arriving at the bottom of the cañon it is unrecognizable and is never even looked for. This same remark applies to loaded mules which occasionally slip off the trail in this country. One sees them in all stages, down in the cañons, from bleached skeletons to recent arrivals. It costs more usually to get a load back up the [illegible] than the material is worth. There is a story of a pack-train of powder one mule of which was loaded with caps. When *he* stumbled and "went off" nothing but spots were ever found of mules, powder or muleteers. There is one load for a train of mules which insures against loss [illegible] coils of the rope are tied on each mule with a sufficient length between to allow clearance, and every mule with every load is sure to arrive.

The Zapote mill and cyanide plant of the Palmarejo company has been thoroughly described by Mr. Oxnam in the *Transactions* of the Institute. This also is an old amalgamation mill and one of the pictures shows the wear on the camshafts when crushing dry. The only changes of importance since his description are the cyaniding of concentrates and the purchase of a vacuum filter by the recent manager, Mr. Pomeroy. The method of treatment has been changed also, with a resulting increase in extraction.

[illegible]

The Guerra al Tirano mine, six hours forced march from Chinipas, is under the same management at present. A 10-stamp mill has been finished there recently and the mine has a very large reserve of gold ore of good grade. The mill is high in the mountains, among the trees. The mill was blessed by the priest when the first stamp was dropped. This pays. Candles and crosses and Virgins were distributed liberally around the building, the entire camp was commanded to appear at the [illegible] the priest told the men how particularly they would be damned if they stole amalgam or precipitates from this particular mill. This is a proceeding which the stockholder should insist upon at any mine in Mexico, as it is not expensive and is quite effective—for a while. When the effect, like paint, wears off, it can be applied again. Another good plan in this line is to provide a miracle, a Virgin, for instance, who appears and says that the spring is possessed of special healing virtues. Then the matter must be advertised. A page in the JOURNAL would not be of much service, but there are other ways. Your neighbor mine managers will be jealous, as you will always have an excess of labor, but it will be a scoop which it will do no good to try to imitate. One little mining town has a wooden image of the Christ which possesses the valuable ablity to distinguish between those who have confessed and those who have not. The image is small and light. A person who is "right" can easily lift the image, even small children. But one who is not, though capable of carrying a 400-lb. load from the mine, is unable to start it! These are facts—and they draw crowds—and incidentally it is easy to secure all the required labor. This image decided at one time to change its abode on account of the negligence of the management. The image walked in one night over the mountains in its bare feet to the rival town, 40 miles, but after considerable talk it was persuaded that the church was to be properly supported, so returned in the same way, its power unimpaired, though its feet were worn off some two inches! These are facts to be taken seriously into consideration by the mine manager in Mexico, and until some proper effort has been made in this direction, no sympathy should be extended to those who lack laborers.

From Guerra al Tirano to Rio Plata one can go via Guazapares, though this is a little out of the way. The little town is supported by those who work up small lots of "high-grade" in their primitive cupels or *vasos*. An engineer who was temporarily in the town told me that in the few days he was there, at least 2000 oz. of bullion had been offered him at very profitable figures. Some of the ores contain gold, but the bullion obtained is sold merely as silver. This high-grading is as impossible to stop in Mexico as it is in the United States. In Mexico, however, the native who steals ore is occasionally shot, but in the States he has an assay office to take it to which will buy it openly. It is much better in the States—for the high-grader.

Rio Plata

The Sangre de Cristo (Blood of Christ) mill near Guazapares has had a heartbreaking history. Three Americans who had been leasing successfully, so the story is told, took a fancy to this mine and took it over under bond. They organized a company, sold stock for machinery and had the machinery at the terminus of the railway when it was burned and destroyed in the station. More stock sales bought more machinery and increased their obligations and by the time the mill was ready to run they owed everyone in the country. The mill ran only a few months and was closed down by creditors who took the mine over because it was good. The mill is not for sale, though it has not run for years; the mine is caved and the creditors are still sure they have a good property, as are the Mexicans who have worked in it. The equipment consists of breakers, rolls, driers, screens, roasters and lixiviation tanks. All the machinery is sectionalized, and was made by Fraser & Chalmers.

Between Guazapares and Rio Plata is a little settlement of lepers. It is said that one man a century ago came to this little town and is responsible for all the leprosy. One sees considerable of this in Mexico, but it does not seem possible that it is contagious to the extent generally believed, as little attempt is made to segregate it, and if mere contact would convey it, every Mexican and American in the Republic would have it sooner or later. In some towns it is a municipal regulation that lepers can beg on the streets Tuesdays of each week. If germs were as powerful in Mexico as is claimed for them in the States or if Mexicans knew about such things, the country would be depopulated.

The Rio Plata company, under the management of Mr. Shanks, of Los Angeles, has arrived at the dividend point, though a very new concern, after much trouble in getting a mill built on time. Mr. Gracey, of "all over the West," was in charge of mill construction. The bond for the purchase of the mine required that the mill be in operation on or before a certain date under penalty of forfeiture, and in spite of delays in shipments of materials, the mill was in operation on the last day of grace. The plant consists of 20 stamps, concentrators, pans and settlers, and it is now proposed to add a cyanide plant to treat tailings. A photograph shows the mill and another shows the small space at their disposal for tailings, reservoirs and the necessity of building the cyanide plant promptly. The ore is high-grade and the concentrates run into "per cents" of silver. Plenty of water in the river the year around supplies a fine power, sufficient for a dozen such mills. At one point back of the camp is a water-fall which is just over 1500 ft. high during rainy weather. There are several other falls visible from the camp during this season. The difficulties in bringing the material in were very great, and this was strongly impressed on a visiting director from New York. After a long, painful ride (for a novice) from the railway, interspersed with long and almost equally painful walks, he looked at the 12 ft. rope sheave-wheel which drives the mill from the Pelton wheel, and could not realize nor believe that it had come over the same trail he had. He is still certain that he was taken a long way around for effect, having failed to note that the sheave was in sections.

Until the sawmill was ready, lumber was obtained as illustrated. It is a good way, but slow. The Orient railway will pass not far from this camp and will open up a dense forest of pine from its present terminus at Creel to the Fuerte river. From Rio Plata to Creel is three days riding through a much broken country, heavily wooded. It is interesting with its birds, turkeys, deer and wild hogs, but these are only shot with the camera if the trip is made in three days. One passes the brink of the Barranca de Cobre, a cañon which rivals the Grand Cañon of the Colorado in all except coloring. No photograph can do it justice and probably no painter-man has ever been near it. The line of the railway skirts the brink for some distance and in a year or so I shall probably be able to look out of the car window and see Colonel's hoof-prints within the grounds of a world-famous resort.

Electric Smelting Tests in California

SPECIAL CORRESPONDENCE

At the Heroult electric iron smelter on the Pitt river in Shasta county, California, a number of new types of electric furnaces are being tested on a small scale, instead of working with one large furnace alone, as has been heretofore the plan. A bank of transformers will be ready by the time the new Lyon furnace under construction is completed. The new furnace, of a capacity of 25 tons of pig iron per day, is on the same plan as the original experimental one. It is claimed that it will remove the objections found to the Heroult furnaces, first installed.

Transvaal Stope Drill Competition

With regard to this competition, which was mentioned in the JOURNAL, of June 27, page 1293, the Transvaal Chamber of Mines informs us that a number of copies of the rules governing the contest have been forwarded to the American Institute of Mining Engineers. Persons desiring to compete for the prizes can obtain copies of the rules from the secretary of the institute at No. 29 West Thirty-ninth street, New York.

An authority states that the best test for cylinder oils is to heat them in a current of air for one hour at the temperature corresponding to the steam pressure at which they are to work. The loss in weight should not exceed 0.5 per cent.

Cost of Producing the World's Supply of Copper

The Great Producing Mines Are Divided into Three Classes, and the Costs Per Pound of Metal for Each Class Are Compared

BY JAMES RALPH FINLAY*

An example of mine conditions and costs similar to those of Butte is furnished on the other side of the world by the Wallaroo and Moonta mines of South Australia. These mines have not been described with the definiteness one would like; but in a general way the first is a group of fissure veins in metamorphic schist and the second a similar group of fissures in porphyry. The production of the district has not been so large as that of Butte, and the mineralization is less intense. The mining costs are somewhat higher because exploration is more extensive, but in other respects the parallel with the great Montana camp is close and interesting.

These mines are described by the general manager, H. Lipson Hancock (son of the inventor of the Hancock jig) in a pamphlet issued at Wallaroo, in November, 1907. The mines were discovered in 1860. In 47 years these mines have raised and extracted as follows:

Dressed ore and concentrates	1,670,360 tons
Copper averaging 15 per cent in ore	248,993
Total value	£13,944,44[illegible]
Total cost	£11,285,809
Total dividends	£2,018,254
Average cost per ton of concentrates	£6 15s. 9d.

"The dressed ore of Wallaroo," says Mr. Hancock, "has throughout recent times averaged about 11 per cent.; that of the Moonta about 20 per cent. of copper, excepting that in later years it has been 2 or 3 per cent. lower. For a long time the vein stuff as raised to surface at both properties has contained on the average from 3 to 4 per cent. copper."

Port Wallaroo, the smelting point, is situated on the west side of the York peninsula. The Moonta mines are 12 miles south and the Wallaroo mines six miles east of the port. The ore comes from about 10 different veins in all. At the Wallaroo mines there are three large veins and several smaller ones in metamorphic mica schist supposed to be of Cambrian age.

Most of the work has been confined to one lode along which were occurrences of copper near the surface for a length of 10,000 ft., but at the depth of 2000 ft. the length of workable ground has contracted to 2500 ft. On the other veins the ores did not prove remunerative below the 1000-ft. level. At Moonta there are six veins of which only one is holding out below the 2000-ft. level. In both groups the copper is largely in the form of chalcopyrite mixed with iron pyrite. The ore occurs in rather short shoots, often where the vein is intersected by cross-courses.

The high cost for mining is easily explained. There are more than 80 miles of development openings, including shafts, drifts, etc. This work would probably cost at least $12 a foot, or $5,000,000. This accounts for $3 per ton of dressed ore, or approximately 75c. per ton of veinstuff hoisted. The actual stoping, including hoisting, pumping, etc., costs about $3.50 per ton. The ground is soft like that of Butte, probably softer, requiring close timbering as well as close filling. The granulated slag from the smelter is used for filling.

Sorting and milling in 1903 cost 75c. at the Wallaroo and $1.25 at the Moonta. These [illegible] work is done with extreme care.

COSTS OF OPERATION AT WALLAROO AND MOONTA FOR SIX YEARS

			[illegible]	[illegible]
General expenses	Interest and discount	[illegible]	[illegible]	$2.33
	Adelaide office	[illegible]		
	Special funds for employees	[illegible]		
	Depreciation and redemption	[illegible]		
Mining and dressing	Wages and contracts	[illegible]	[illegible]	[illegible]
	Materials and supplies	[illegible]		
	Fuel	[illegible]		
	Royalties	[illegible]		
	Water supply	[illegible]		
	General and development	[illegible]		
Smelting	Freight on concentrates		$2.[illegible]	[illegible]
	Wages			[illegible]
	Materials and supplies			1.33
	Fuel and flux			[illegible]
	Buildings and repairs			[illegible]
	General and other expenses			[illegible]
	Shipping copper			[illegible]
Total			[illegible]	[illegible]

In terms of short tons and American money I find that the average cost of mining, concentrating and smelting a ton of concentrates for the whole life of the mine has been $32.90. In recent years the cost has exceeded this by about $2 per ton. The increased cost is to be explained by the increased depth and a certain deterioration of the mines.

The accompanying table gives the cost of the complete operations for six out of the last 10 years. The reports are excellent.

Tennessee Copper Company

Only one mine of importance is found in the United States east of Lake Superior. It is owned by the Tennessee Copper Company, which works several large lenses of cupriferous pyrite. All the ore must be smelted in the blast furnace. For ores of this character I believe this company does the cheapest work in the world. Its reports are excellent and reveal not only the operating costs in detail, but also the plant expenditure and the ore in sight.

The external factors are favorable. Fuel is cheap and transportation to markets much less than for western mines. Wages are about 20c. an hour, [illegible].

The internal factors are favorable, with the exception of the necessity of smelting all the ore. This is a most powerful element of high cost. The ore yields only 32½ lb. copper to the ton.

The current operating costs for 1907 were as follows:

Mining	$1.[illegible]
Smelting	[illegible]
Administration, etc.	[illegible]
Total	[illegible]

To this I should add about [illegible] a ton for the use of the mining plant and 47c. a ton for the use of the railroad and the smelting plant, making a total of $[illegible].

In detail these costs are as follows:

Development	$0.[illegible]	
Mining, hoisting, etc.	[illegible]	
Crushing and sorting	[illegible]	
General	[illegible]	
Total per ton of ore	$[illegible]	$1.[illegible]
Add cost of [illegible]		[illegible]
Mining cost [illegible]		[illegible]
Transportation to smelter	$0.[illegible]	
Roasting	[illegible]	
Smelting [illegible]	[illegible]	
General	[illegible]	
[illegible]	[illegible]	
Total copper smelting cost		$[illegible]
Add [illegible]		[illegible]
Add [illegible] ing and selling expenses		0.49
Grand total		$[illegible]

On the basis thus figured, anything received above [illegible] New York [illegible] and anything above 14c. is net profit after allowing [illegible] money invested in the plant. These costs are higher than the average by from 5 [illegible] high on account of unfavorable economic conditions throughout the country. It should be explained further that in addition to the copper the sulphur is being utilized so that in future the property will not be wholly a copper mine its operations will be nearly equivalent to those of the Rio Tinto company in Spain.

---

*Consulting mining engineer, [illegible] street, New York.

Utah Consolidated

This company has mined since 1899 large deposits of cupriferous pyrite at Bingham, Utah, averaging by actual recovery for five years 60 lb. copper, 1.33 oz. silver and 0.104 oz. gold per ton. The silver and gold are worth about $2.88 per ton, so that with copper at 14c. per lb. there is a total metallic extraction equivalent to 80 lb. copper. The ore occurs in large lenses or shoots in limestone. It is approximately self-fluxing, there being a moderate excess of iron over silica. Most of the mining has been done through adit levels. The mining plant is not extensive. The ore is delivered to the railroad over an aërial tramway about 12,000 ft. long. It is transported by rail about 25 miles to the smelter.

The external conditions are, for the Rocky Mountain region, good, and the internal factors, with the single exception of the requirement of smelting all the ore, very favorable for cheap work. The ore is soft, uniform, and occurs in good-sized bodies. The stoping is done in square set rooms. The item of timbering must be one of the chief mining expenses.

There is nothing in the reports to show the mining or smelting losses; but with this exception the reports are excellent. They give the stockholders in brief, but sufficient outline, the costs and financial results of the business.

In the five years ending December 31, 1907, the costs were as follows:

COSTS PER TON FOR FIVE YEARS UTAH CONSOLIDATED.

	Per Ton.
Mining, 1,260,453 tons	$1 73
Development, 1,400,000 tons	0.30
Transportation, smelting and refining, 1,276,393 tons	2.80
General expense, 1,276,393 tons	0.23
Current construction, 1,276,393 tons	0.34
Amortization at 5 per cent. interest and 5 per cent. annual amortization of $1,232,274 invested in plant at beginning of period; this being sufficient to retire the investment in 15 years—proportion for five years	0 48
Total cost	$5 88

Recollecting that the ore contains in copper, gold and silver the equivalent of 80 lb. copper to the ton we get an average complete cost of producing copper of 7.35c. per lb. This may be divided as follows: actual operating cost 6.75c.; allowance for return of working plant 0.60c. Of course, everything received above 6.75c. for copper or its equivalent in New York goes to the stockholders as dividends.

Mount Lyell

The Mount Lyell company operates a cupriferous pyrite mine and a smelter in western Tasmania. The original Mount Lyell deposit was a great mass of nearly pure iron pyrite containing only 0.6 per cent. copper, but a portion of it had been enriched near the surface. This deposit has been mined almost wholly from an open pit. Another mine, however, called the North Mount Lyell, produces a much more silicious ore averaging 6 per cent. copper. This ore has to be mined underground. During the last four years, which will presently be reviewed, about 60 per cent. of the ore has come from the Mount Lyell proper and 40 per cent. from the North Mount Lyell.

The external factors are probably nearly average for English-speaking countries. The climate is rainy, but not more so than Cornwall or Scotland. The mine is situated near the coast, so that supplies must be reasonable in cost, and transportation of copper, even to England, must cost less than transportation of western American copper to New York.

The internal factors are, for a smelting enterprise, very favorable. The ores are mined, thanks to the large proportion obtained from the open pit, for less than $2 a ton. The smelting is largely pyritic and the proportion of coke used in the charge is said to be only one per cent.

In four years 1,690,531 tons were mined. In the same period the ore reserves diminished from 4,666,000 to 4,107,000 tons, a loss of 559,000 tons. At this rate of loss the property would last 30 years, but since (1) a large part of the low-grade pyrite which hitherto has been mined from open pits must be taken at greater cost from underground and, (2) there does not seem to be a first-class reason to believe that the rich ores of North Mount Lyell can be found in the same abundance for a long period, it seems safer to estimate a life of 20 years as the amortizing period of the investment. On this basis we may compute the costs as follows:

COSTS PER TON AT MOUNT LYELL.

Mining 1,690,531 tons	$1.05	
Stripping 1,690,531 tons	0.26	
Developing 1,131,258 tons	0.50	
Total mining		$1.81
Smelting 1,698,793 tons	$1.78	
Converting 1,698,793 tons	0 34	
Railway expenses	0 27	
Freight and marketing	0.72	
Total for smelting, refining and marketing		$3.11
General expense 1,698,795 tons	$0.25	
Use of plant; being 5 per cent. interest and 3 per cent. amortization for four years on average amount invested (£376,000)	0.35	0.60
Total cost		$5 52

The actual returns of metal from the Mount Lyell ores have been 34,210 long tons copper, 3,056,231 oz. silver and 91,815 oz. gold. The extraction has been 86 per cent. copper, 99 per cent. silver and 105 per cent. of the gold estimated by assay to be contained in the ore. There is no statement as to whether the ore treated is given in long tons or short tons, but it is probably safe to assume that the copper output is given in long tons. We have on this basis a recovery of 45.5 lb. copper, 1.8 oz. silver and 0.054 oz. gold per ton of ore treated. The gold and silver are worth $2.18 per ton, at average prices. This is the equivalent of 15½ lb. copper, and we may figure the metallic contents altogether as equal to 61 lb. copper. On this basis the cost per pound of copper is 9 cents.

Granby Consolidated

The Granby Consolidated Mining, Smelting and Power Company, Limited, British Columbia, has mined in three years, 1,995,948 tons and treated 2,088,381 tons. The ore yielded by actual extraction 24.2 lb. copper, 0.38 oz. silver and 0.06 oz. gold per ton. The silver and gold are worth $1.42 per ton equal to about 10 lb. copper. The total value, therefore, is equivalent to a little more than 34 lb. copper, and this may be taken as a safe basis for figuring the economic performance of the mine. The ore is chalcopyrite disseminated through porphyry altered by magmatic waters so as to form an approximately self-fluxing gangue. The ore will not concentrate, but is smelted in bulk. A large part of the mining has been done in open pits with steam shovels.

This company does not issue a good report to its stockholders. The statement is too brief; it contains no estimate of ore developed, nor does it give any intimation of the probable life of the mine. The reports give no figures about the capital invested in lands as distinguished from capital in equipment. On these accounts it is possible that the costs indicated may not do the property justice.

COSTS PER TON AT GRANBY.

	Per Ton.
Current operating cost; mining, smelting, refining and marketing for 2,088,381 tons treated	$3 39
Current construction 2,088,381 tons treated	0 36
Return of $14,000,000 invested in lands and equipment at 5 per cent. interest and 5 per cent. annual amortization; this being sufficient to extinguish the investment in 15 years with an output of 11,200,000 tons	2.00
Total	$5 75

On this basis copper or its equivalent costs in New York about 17c. a pound.

It is stated in the reports that a maximum capacity of 3500 tons a day, say 1,200.000 tons a year, has been provided. If this volume of operations can be maintained for 15 years the amortization charges on the invested capital may be computed at about $1.16 per ton on 18,000,000 tons. This will equal 3½c. per pound copper and the total cost required to neutralize the investment is 14½c. per lb. The idea can be expressed somewhat differently, as follows:

Cost of copper for current operation and construction per lb	11c
Profit per ton required to return capital in 15 years with 5 per cent. interest	3.5c
Total cost required at maximum output for 15 years to make the investment justifiable	14.5c

It is pertinent to remark that this is what I mean in all cases by amortization;

but in other illustrations I have attempted to amortize only the capital invested in actual plant, while in the case of the Granby the amortization covers the entire investment in lands and property besides plant.

General Considerations

We may divide copper mines into three classes, each presenting a different economical problem: I. Disseminated ores in which concentration is the all important thing, smelting being applied only to a fraction of the material mined. II. Quartz pyrite ores in fissure veins in which the ratio of concentration is low, the proportion smelted considerable, making the costs usually high. III. Ores that cannot be concentrated and must be smelted in bulk.

I. Disseminated Ores

The first class contains the Lake Superior copper ores in which native copper is disseminated, either in porphyry or in conglomerates derived from porphyries, in the proportion of from 1 to 4 per cent. These ores are concentrated in the mills (with 20 per cent. loss in milling) to from 1 to 4 per cent. of their original volume. This is the proportion smelted.

We have in this group also the disseminated porphyry ore of Bingham, Utah, containing 2 per cent. copper in the form of chalcocite. This ore concentrates with 70 per cent. recovery into 4½ per cent. of its original volume. The disseminated ore of Ely, Nevada, which concentrates into 12½ per cent., that of the Clifton-Morenci district in Arizona, which concentrates into 15 per cent., that of Nacozari, Mexico, which concentrates into 17 per cent., the ore of the new Miami Copper Company at Globe, Arizona; and the Braden copper mines of Chili, may all be included in this class.

The cost of producing copper from these ores will average about 9c. per lb. delivered in New York. These ores now produce a third and will soon yield one half of the copper of North America, and they may be described as the most important, most profitable and most promising source of copper.

On the basis of the ton mined these ores are far more cheaply worked than any other copper ores. The internal conditions for cheap mining are excellent. The orebodies are large, uniform and firm. There are some, such as Utah Copper, Nevada Consolidated and others, which present the great advantage of being accessible to open-pit methods of mining.

The cost of concentrating (including transportation to mills) is determined largely by the external factors of the cost of water, fuel, transportation and labor. The variation is between the figures of 40c. in Lake Superior to $1 in less favorable situations. The internal factor of the mineralogical complexion of the ores does not to my knowledge introduce in this class any great difficulties.

The cost of smelting, refining and marketing this class of ores presents the same external variables as that of concentrating. An internal factor of significance is the effect of concentration on the fluxing qualities of the ore. In terms of the concentrates smelted we have in general the following factors: (1) The cost and quantity of fuel and flux required for reduction; (2) the richness of the concentrate which determines, *a* the cost of converting or bessemerizing, *b* the cost of transportation to market, and *c* the cost of electrolytic refining.

Manifestly the cost per ton smelted is more a question of the richness of the ore smelted than of anything else. Thus in Lake Superior, where the external factors are extremely favorable, the cost of smelting, refining and marketing per ton of 70 per cent. concentrates is about $15, while the concentrates of Ely, Nevada, carrying 12½ per cent. copper smelted and sold under the most costly conditions are estimated to cost only $10.50 per ton.

Manifestly also the supreme factor of cost is the divisor which represents the proportion smelted. In the case of Lake Superior an ore producing only 2 per cent. concentrates divides its cost of $15 per ton by 50, so that, as spread over the ore milled, the cost is only 30c. a ton. In the case of Ely ores the $10.50 cost can only be divided by 8 and the resultant cost on ore mined is $1.31.

The salient fact regarding the cost of mining disseminated ores may be expressed in the accompanying table.

COST OF MINING DISSEMINATED ORES.

		Low.	High.
Mining	Open pit	$0.50	
	Underground	1.25	$2.50
Concentrating		0.40	1.00
Smelting, refining and marketing		0.15	1.30
	Open pit	$1.05	$4.80
	Underground	1.80	

At the average price of 14c. for copper these figures mean that under the most favorable conditions a Lake Superior ore, if it could be mined from an open pit, might meet expenses with a yield of only 7½ lb. per ton. If mined underground about 13 lb. is the minimum, while under the most unfavorable conditions a yield of 34 lb. may be required.

II

Quartz-Pyrites with Low Concentration

Of quartz-pyrite ores I have given the conspicuous examples of Butte and of the Wallaroo and Moonta. There is substantial agreement on the following points:

(1) A high mining cost, owing, *a* to high development cost due to searching for ore shoots through much larger volumes of barren vein material; *b* considerable selection of ore in the process of mining; *c* [illegible] ground requiring [illegible] timbering and filling.

(2) A high concentrating cost, due in part to the use of hand sorting, but particularly to the careful milling methods required to prevent undue losses.

(3) Smelting costs are high because first, a low degree of concentration gives a large proportion to smelt (from 25 to 50 per cent.); second, because the silicious [illegible] of the gangue renders smelting rather difficult; third, because the ore [illegible] is necessarily of [illegible] grade.

The external conditions in Butte are somewhat less favorable than at the Wallaroo and Moonta, but in neither case are [illegible]. I believe that high costs are inherent to quartz-pyrite ores in fissure veins.

	[illegible]	[illegible]
Mining	$4.68	[illegible]
Milling	[illegible]	
Smelting, refining and marketing	2.37	4.62
General expenses	0.58	
	[illegible]	[illegible]

Applying to these costs [illegible] lb. copper or its equivalent in order to pay expenses. As a matter of fact, Butte ores have averaged for the last 13 years [illegible] and perhaps 12c. At the Wallaroo and Moonta [illegible]

Other mines of this class are, I believe, [illegible] of Globe, Arizona, and in part, at least, those of Cananea, Mexico. Whatever [illegible] may be appropriate, the economic results are similar [illegible] fissure veins are essentially high-cost ores at every stage of the process.

III. When All Ore Must Be Smelted

I have given as examples of the third class [illegible] all the ore must be smelted: [illegible] dated, Granby Consolidated and Mount Lyell. To this list might be added the Rio Tinto pyrite mines of Spain and Portugal, the mines of Shasta county, California, United Verde in Arizona, Cerro de Pasco in Peru and others [illegible]

Economically we may make the following distinctions in this class:

(1) Cupriferous pyrites in an advanced [illegible] that only a small part of the original

mass can be mined. In this case mining costs as well as smelting costs are inevitably high. Bisbee, Arizona, is a good example

(2) Cupriferous pyrites in their original state or moderately enriched. In this case there is usually presented a large mass of homogeneous ore easily mined and easily treated. Tennessee Copper, Utah Consolidated and Mount Lyell are examples. At these properties the cost per ton is from $4.20 to $6.

(3) Disseminated, self-fluxing ores not very pyritic. Granby Consolidated is an example.

Speaking generally it must be admitted that mines of class III produce a goodly proportion of the world's copper. The list of big producers includes the Rio Tinto, the Copper Queen, Calumet & Arizona, United Verde and many other mines not so big but very profitable. Rio Tinto seems to produce the cheapest copper in the world, but, I believe, this is due to the fact that the sulphur is also utilized to an important extent. Leaving out this case, in which copper only costs 5c. per lb., it does not seem probable that copper from these ores is produced at an average of less than 10c. per lb.

Short Talks on Mining Law—V

By A. H. Ricketts*

As previously shown, mining claims cannot properly be located within the United States, unless in accordance with the mining act and State or Territorial legislation, and the local rules, regulations and customs of miners, if such local statutes or local rules exist. If not, the requirements of the act are alone to be fulfilled, as it is not essential that there be either of the latter. In most of what may be called the "mining States," laws have been enacted regulating the manner of location, recording, the doing of assessment work, etc. Such laws generally supersede the local rules and are effective when not in conflict with the paramount law. But miners may still make rules and regulations or indulge in customs not in conflict with the act or local legislation.

Sources of Mining Law

The statutory mining law within the United States consists of acts of Congress and the legislation of the mining States and Territories. The Federal law invites such supplementary legislation, as well as that of the miners themselves, whose rules, regulations and customs are deemed the common law of mining in the United States. The only provision attached to such right of elaboration in either instance is that they shall not be in conflict with the Federal laws. If repugnant thereto, such addition is void.

It would be beyond the scope of these articles to present herein more than some general principles and practical suggestions to aid the miner in the acquirement, preservation and perfecting of his title, without entering into matters of detail. A locator cannot pay too close attention to the law and rules prevailing in the locality in which he intends to make his location, or has his claim, as the validity and right of possession thereto depends thereon.

The decisions on the law and the practice thereunder may be found in the reports of the United States Supreme and Circuit courts, the decisions of the Land Department, of the courts of last resort in the different States, Territories, and District of Alaska, and in the rules and regulations of the Land Department. In case there is a want of harmony in the decisions of the United States Supreme Court with those of other appellate courts in matters affecting the public domain, the former prevail. In other words, such decisions are mandatory, not persuasive, authority. The courts have no revisory power over the rulings of the Land Department upon questions of fact, except in cases of fraud, etc., which permit any determination to be re-examined. Its rules and regulations may be avoided by judicial decree and its decisions upon the law set aside by the courts.

Miners' rules, regulations and customs were introduced into the United States by the early miners of California, who obtained them in their principal features from various foreign sources. The absence of statute law regulating mining and the use of water on the public domain was the cause of their establishment, and they present the curious anomaly of great armies of adventurers, who were governed, in vast property interests, by no higher law than that made and enforced by themselves. The validity of a local rule, regulation, or custom does not depend upon enactment nor formal adoption, but upon observance by the miners of the district. If they fall into disuse, or are generally disregarded, they are void.

The student of the United States mining law will discover that there is much conflict in the reported cases, and in some instances that they are not consistent with others emanating from the same source; this may be accounted for in a way, by the fact that the mining act is not free from ambiguities and that it does not always confer what it seems to give. Cumulative and often cumbrous local legislation further tends to prevent uniformity in the operation and application of the provisions of the act.

The production of iron pyrites in the United States during 1907 was 201,871 long tons, valued at $851,346.

Separation of Silica and Alumina in Iron Ores

T. G. Timby (*Journ.* Am. Chem. Soc. April, 1908, p. 614) compares four methods of determining silica and alumina in iron ores and arrives at the conclusion that at least three of the standard methods are not universally applicable.

The following methods were employed:

(1) Sodium carbonate fusion: one gram of the sample was treated with concentrated hydrochloric acid and evaporated to dryness twice, then dissolved in hydrochloric acid, the solution filtered and the residue fused with sodium carbonate. The fusion was treated with hydrochloric acid and evaporated twice to dryness and the silica determined as usual.

(2) Double dehydration of ore in hydrochloric acid: Solution in same, ignition of the insoluble residue in platinum and re-solution in hydrochloric acid, and silica determined.

(3) Ignition of ore in porcelain with sulphur, solution in hydrochloric acid, and silica determined.

(4) Ignition of ore in porcelain without sulphur, solution in hydrochloric acid containing one gram of stannous chloride in 225 cc., and silica determined.

Alumina was precipitated as phosphate. The ores used were those encountered in routine work and were as follows: (a) brown hematite-limonite mixture; (b) brown hematite; (c) red-brown hematite mixture. The following percentages are averages of numerous determinations:

	(*a*)		(*b*)		(*c*)	
Methods.	SiO_2	Al_2O_3	SiO_2	Al_2O_3	SiO_2	Al_2O_3
(1)......	7.70	3.11	5.52	1.44	13.31	4.00
(2)......	8.90	2.49	6.01	1.15	13.76	3.70
(3)......	8.92	2.37	6.00	1.07	14.07	3.44
(4).	8.71		6.17		14.17	

The following figures show the amounts of alumina soluble in hydrochloric acid before the ignition in method (2), and the amounts liberated by the ignition:

Ore.	Alumina, Per Cent.	
	No. 1.	No. 2.
(*a*)........................	0.97	1.53
(*b*)	0.62	0.59
(*c*) ..	1.48	2.21

Three different ignition temperatures for method (2) were tried on ore (a). A low red heat, barely sufficient to redden the crucible bottom, was applied until the filter was carbonized and about half consumed; this gave results as follows: silica, 8.92, alumina, 2.48. A moderate red heat, sufficient to redden the crucible (15 g.) clear to the top, and applied until the filter was entirely consumed, gave: silica, 8.88, and alumina, 2.51. Igniting to bright redness gave figures much higher on silica and lower on alumina and so discordant as to be totally worthless.

The production of fuller's earth in the United States during 1907 was 34,039 short tons, valued at $323,275.

---

*Member of the San Francisco bar, San Francisco, Cal

Lead Mining at Mechernich, Prussia

Galena Occurs as Fine Grains in Immense Flat Beds of Sandstone. The Great Deposits Are Mined without the Use of Any Timber

BY LUCIUS W. MAYER*

The center of the lead-mining operations of the Mechernicher Bergwerks-Aktien Vereins, is situated in the neighborhood of the town of Mechernich, 31 miles southwest of Cologne, in the province of Rhenish Prussia, Germany. Mechernich is in the heart of a mountainous plateau, the surrounding country being known as the Eifel, a name applied to the district lying between the Moselle the Rhine and the Roer rivers.

Geologically the strata of the Eifel are Devonian. Lying above are sandstones and conglomerates known as *Bundsandstein.* These are red, green and white in different horizons. In Mechernich the sandstone particularly, and occasionally the conglomerate, has been impregnated with nodules of galena known as *Knotten* which might better be called *Knotchen,* for the crystals of galena are generally very small, and are to a certain extent so finely disseminated in the rock as to be invisible.

The ore is usually in appearance a cream to white sandstone of a sugary texture, the grains being apparently independent and well defined. Under a microscope the rock as a whole appears very much like a lump of sugar, except in color. The grains of lead mineral interspersed through the sandstone are also separate; the soft ores may be taken in the hand and crumbled and the lead *Knotten* cleanly separated from the sandstone. The lead mineral is not all visible to the eye. It is estimated that 25 per cent. of the lead [illegible] in the form of disseminated particles, and it is to this material that a large proportion of the extraction losses are due. The extraction of lead is given at 66 per cent.

The Ore Deposits

The lead-bearing formation is sharply faulted, and the volcanic action which occurred after the deposition of the *Bundsandstein* produced considerable distortion. The strata outcrop strongly on the surface. The dip averages from 6 to 7 deg. The faults, which are very steep thrusts, account for the gain in depth of the mining operations.

The overburden is a [illegible] sandstone which, in general, is soft and is worked off with bucket excavators in open-cast operations. Below this comes the conglomerate, the sands, and the ore. These bands often repeat themselves in certain sections, as many as five veins being worked one below the other. Below the ore-bearing formation lies a rock known as *Grauwacke* which belongs to the lower Devonian, and has the appearance of gray sandstone.

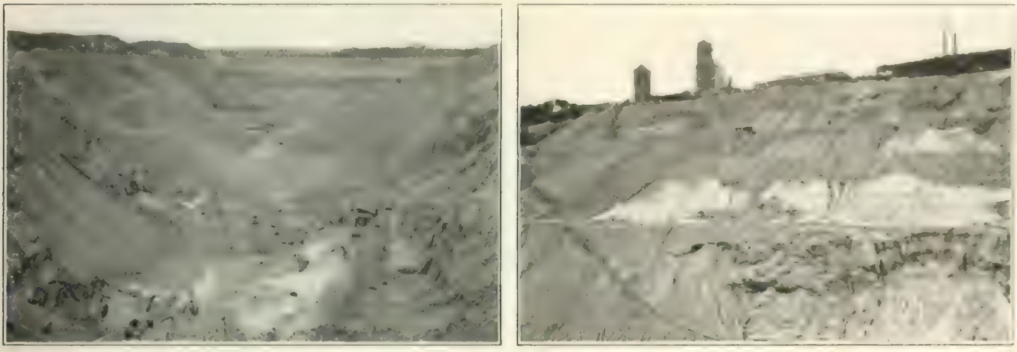
The ore averages between 2 and 3 per cent. lead, the lead carrying 13.14 gram silver per 100 kg. Pockets of copper bearing rock are sometimes encountered, and small shipments are made monthly. The copper stain is sometimes marked, but the lead ore is usually clean and white, speckled with particles of galena. While in general the ore has little resistance to [illegible] Occasionally harder sandstones, red and white in color, are encountered.

[illegible]

The mining operations which in this district date back to the time of the Romans, have been carried on both by *Tagebau* (open cast) and *Unterirdischgebau* (underground mining). Veins within 150 ft. of the surface are mined entirely by the open-cast method. The two modes of mining supplement each other, the stripping being in all cases dis[illegible] is sent down small shafts or chutes connecting the ore horizon of the open cut and underground workings below, and thence hoisted to the surface and distributed to the concentrator. All the ore but that from Callumtherberg and Gute Hoffnung finds its way to *Forderturm* (hoisting shaft) Schafsberg.

There are five mines in operation, three having both open-cast and underground workings, and the other two underground only. These properties are known as follows: Schafsberg, Unterirdisch, Tagebau Bachrevier, Tagebau Virginia, Unterirdisch Virginia, Neu Schunk Ollgschlager, Tagebau Callumtherberg, Unterirdisch Callumtherberg and Unterirdisch Gute Hoffnung.

During my visit, about 1600 men were employed, 558 underground, mining 2000 tons of ore daily, or 3.58 tons per man. The daily pay averages about four marks for eight hours' work for the underground men, and for ten hours for surface men



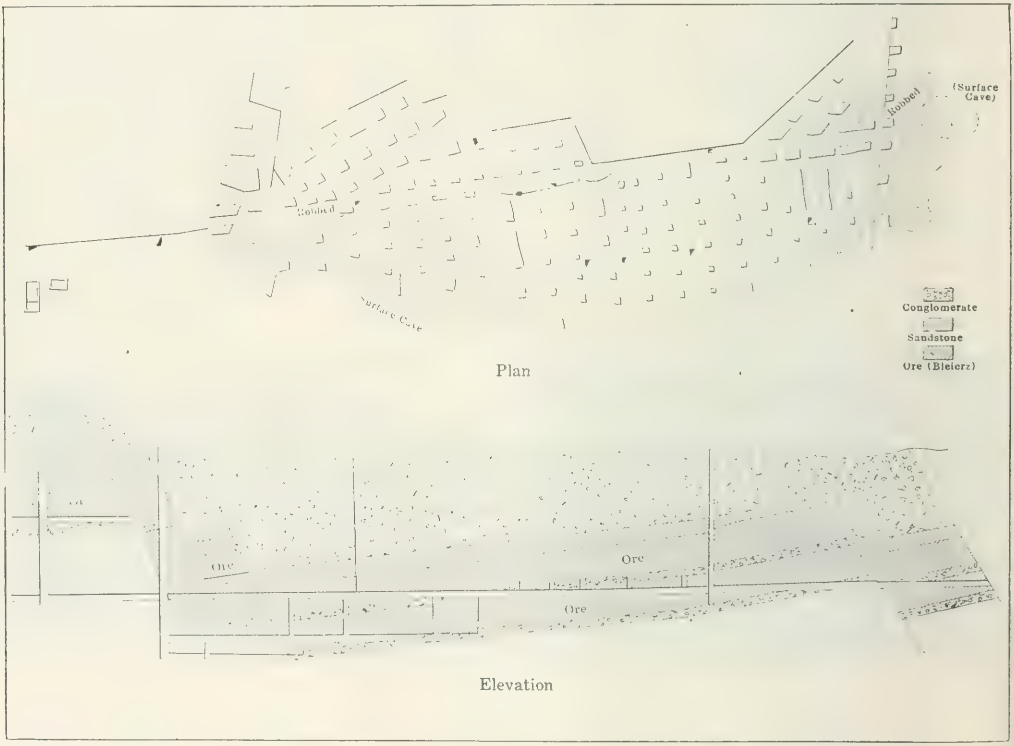
OPEN PIT AND HOISTING SHAFT, MECHERNICH

---

*Mining engineer, 193 Pearl street, New York City.

It appears that the higher wages paid in Essen and Dusseldorf attract the men there, so that there has been more or less difficulty at Mechernich in obtaining labor.

The tonnage produced in the Mechernich lead mines has been greatly reduced; the mines formerly turned out 3500 tons per day. In open-cast mining it is estimated that three tons of overburden are removed per ton of ore won. As the open-cut work widens, the ore is opened at the bottom of the excavation. When a depth of 450 ft. has been attained, open-cast operations cease, and the work is carried on by undergorund methods.



PLAN AND ELEVATION OF OLD WORKINGS AT GOTTESEGEN

The bucket excavators running on three tracks remove the overburden at the rate of 1000 to 3000 cu.m. per 10 hours, men barring down the material to feed the buckets. Light steam locomotives haul side-dump all-steel cars of 1 cu.m. capacity. From the Callumtherberg mine to Schafsberg the ore is hauled in trains on the surface by means of a steam-storage locomotive, the steam being charged into the boiler under a pressure of eight atmospheres. The capacity is sufficient to make the return trip of 6 km. from Callumtherberg to Schafsberg. The engine is rated at 128 h.p. capacity.

The seams vary from 4 to 20 m. in thickness, and while dipping at the maximum not much more than 7 deg., often become quite horizontal, thus resembling in certain features the Cambrian limestone lead-bearing formation of southeast Missouri. The Flat River formation is, however, in general much harder and tougher than the Mechernich rock. According to figures given, 1 lb. of explosive breaks 3.25 tons rock. In Mechernich diamond-drill prospecting has not proved successful, the operators being unable to obtain cores. I do not know whether or not the sludge method was tried.

Centrifugal pumps are largely used at these mines. One pump raises 2662 gal. per min. against a 50-m. head; the suction and column pipes are 300 mm. in diameter. The pump operates at 1000 r.p.m., the motor requiring 5000 volts and 17½ amperes.

The methods of underground mining employed by the Mechernich company, which has absorbed all the important mines in the district, involves three distinct kinds of work: (1) square work and caving; (2) pillar robbing, as carried on in old workings; (3) square work and pillar robbing in conjunction with sand filling, as carried on in Gute Hoffnung.

In the first method drifts are extended laterally in the bottom of the seam until a fault plane is encountered, from which point mining proper is begun. Drilling is done by air drills, hand hammer, or jumper drilling. The average advance for a 2x2-m. drift is 60 m. per month, in three shifts, excluding Sundays, with power drills; 40 m. per month is given as an average for hand drilling.

The use of air drills in this rock is in interesting contrast to the use of the hand rotary drill in the harder rocks of the Cleveland district, England; the wisdom of the policy in both instances appears open to question.

The method of mining is shown in the accompanying plans and sections. Drifts *a a* are driven approximately 2 m. square at intervals of 8 to 10 m., and cross-drives *b b* of similar dimensions, connect these parallel drifts. These cross-drives are shown driven at an angle of 45 deg. to the main drives; this feature is dependent on the grade; where a horizontal formation is met cross-drives will be 90 deg. to the main drives, also at intervals of 10 m. This work of blocking out pillars is done entirely in the lower two meters of a seam the entire thickness of which is perhaps 20 meters.

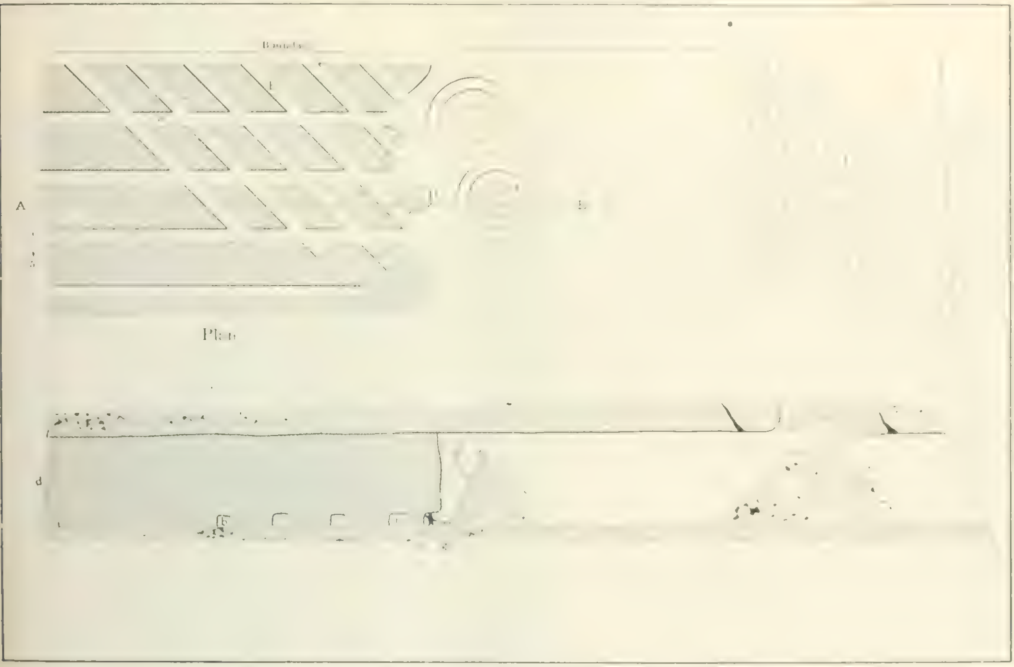
Stoping

When the main drives have encountered a fault the drifting is discontinued; by this time the blocking out of the pillars by the cross-drives has already made considerable progress. The cross-drives having blocked out the pillars nearest the fault, the work of bringing down the upper part of the seam is now commenced. The manner of attacking the pillars in the lower part of the seam is a development of long experience. In the early days *Sicher Pfeilern* (pillars of safety) were left. At that time these pillars were not disturbed, as shown in the plan of the old workings, the pillars being left with more or less regularity. To-day, however, the extraction of ore-bodies is as complete as may be expected.

The rock for the most part is soft and friable, although under uniform and constant pressure it is remarkably firm. The ground is much cut up with slips and horses, which are not favorable to safe mining. In spite of this, no timber is used whatever, even for temporary support. The only wood seen in the caving operations, in the methods here described, are for ladders and the long poles used in cleaning the high back and bringing down loose rock.

In attacking the two-meter pillars which are to be removed in order that the overlying rock may cave, undercutting may be begun on all sides, but usually the work is advanced on three sides in the direction of the retreat. As an overhang is produced, this rock is immediately attacked, every endeavor being made to cave everything above the area of the pillar which has been undercut. If this ground does not cave without forcing, the men first test it with poles before proceeding with the work of bringing it down by means of explosives. If drilling is to be done well up in the face and sufficient hight cannot be made by standing on the broken ore piled up from a previous fall, the men drill from ladders, jumper or hammer drills being used. A stump of a pillar is sometimes left to insure a firm support for the roof to aid the work of cutting an adjacent pillar. The men constantly test the roof and make it safe by means of the ladders and poles fitted with iron shoes at one end.

In the illustration showing the method of breaking down, the ore has been piled up at *e*, and the men are barring down irregularities in the roof. At *g* is a car into which the men shovel the ore pro-vided that the roof overhead is sufficiently safe. At *h* is a machine drill operating on the pillar. The pile of ore *e*, is not entirely withdrawn until it is certain that no further testing of the roof at this point is necessary. This artificial method of obtaining hight, which may be 50 ft. or more, is part and parcel of the process. The drifts originally extended to the fault *i*, from which stoping has been carried back as seen in the figure. The roof has stood over a large area before the conglomerate fall, *f*, of the main roof occurred. The parting between roof and load ore is well defined and there is little mixture of the two.



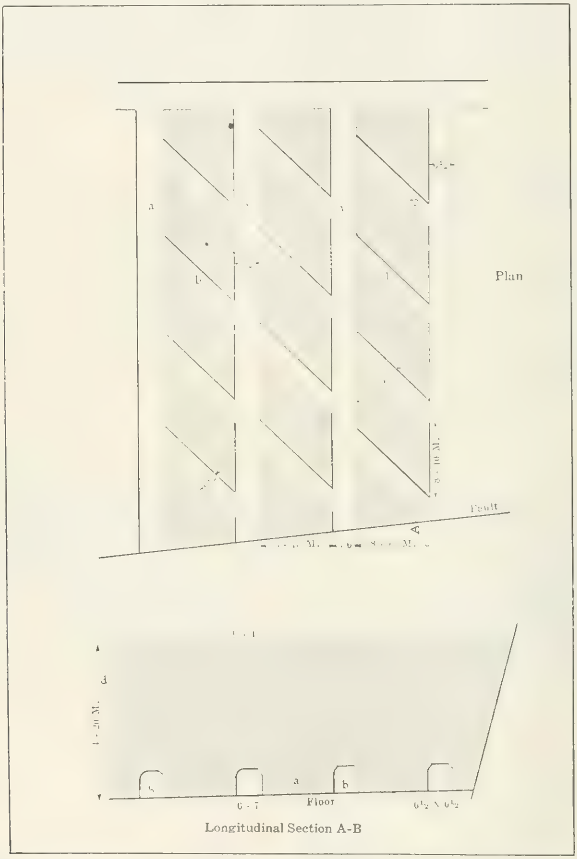
SECOND STEP OF WORKING THICK SEAM AT MECHERNICH, REMOVING THE [illegible]

Wide Unsupported Areas

In one place I saw an unsupported area approximately 40x80 m. in extent. In this place, which was considered small, the hight of roof above the floor was about 30 ft. and there was no sign of an impending roof fall; the men showed no hesitancy in walking about the area, which was constantly being enlarged. The floor all about was perfectly clean, which fact is evidence that the roof had originally been properly cleaned and was not scaling off.

When a roof fall is anticipated the men exercise more than usual care. Being trained to the condition, they know at what moment to take refuge in the drifts which are at all times within easy [illegible] on the roof are exposed to danger, warning of which is invariably given by the roof itself in the form of falls of pieces of rock.

The walls of the stopes are so formed as not to cause right angles at the intersection of wall and roof, but rather broad arches to prevent shearing. This point is extremely important, and one which, I believe, admits of wider spacing between pillars because the arching effect produced affords better resistance to roof pressure.



Longitudinal Section A-B

BLOCKING OUT PILLARS IN WORKING THICK, HORIZONTAL SEAM AT MECHERNICH

The old Gottesegen mine, shown in plan and section in one of the accompanying illustrations was worked years ago. The present company was not involved in the original exploitation, but is now engaged in robbing operations. Directly above the uppermost band of ore is a formation called *Taubesandstein*, which lies under the conglomerate cover. Between the two horizons of ore is a band of conglomerate also found as a floor of the lower ore seam. When this mine was worked the two bands of ore were taken as one with the intervening conglomerate band. At present where this conglomerate becomes too thick, it is left as a floor for the upper seam of ore. When there is sufficient thickness, pillars need not necessarily be left one directly above another.

In this mine pillars attained a hight of more than 75 ft., and the method of robbing is in a measure quite similar to that employed elsewhere by the company. The men work about the bottom of the pillars without fear of scaling off in the roof. The pillars at the limit of the stope are attacked first, drilling being done mostly in the bottom of the pillar, which may be attacked from all sides. As undercutting proceeds and shots are fired, the rock in the upper part of the pillar is constantly tested and barred down. The entire pillar is not necessarily removed at once, nor are the pillars necessarily attacked one at a time. However, the work is not done without regard to the pillars near that attacked; the work on one bears a definite relation to the condition of its neighbors. Perhaps one-half of one pillar may be cut while the last stump of a third will be removed, before the part left in the second is taken. In each case the men climb upon the fallen ground and bar the roof to as safe a condition as possible.

The work of removing the pillars, and in fact mining according to the system here described, is a matter of confidence on the part of the men, who work under what appear to be dangerous conditions in the most matter-of-fact way.

The cost of mining in Mechernich was given at 8 to 10 marks per ton of rock, delivered at the top of the shaft. The total cost of producing lead was said to be 24 to 25 marks per 100 kg., equivalent to about 3c. per lb. of lead.

Profit Sharing in the Comstock Mines

Special Correspondence

People in San Francisco have always been interested in the Comstock mines, which for years poured so much wealth into the city, and they have continued for a long period to pay assessments which made it possible to continue mining operations though no profits resulted. They are pleased now to see improvements in methods of conducting the companies being carried out; an important one of which was the reduction of "topheavy" expenses by cutting down salaries and reducing force in the city offices, as recently mentioned. Added to this the plan has been adopted of paying a percentage of the profits of the companies to the miners actually engaged in the work of developing the properties. One of the announcements posted at the mine is as follows:

"In the hope of stimulating a still greater interest in the search for paying ore in our mines, as well as to encourage all reasonable speed in taking the same out, the board of directors hereby makes the following announcement: That until further notice they will (in addition to the regular salary, wages or pay earned) divide one-tenth of the net value of ore produced exceeding $50,000 in any month among the officers, miners and other employees of the Ophir company in proportion to the amounts earned by such officer, miner or other employee during that month."

Similar notices have been posted by the Consolidated California & Virginia, the Sierra Nevada, Union Consolidated, Mexican and Andes mining companies, with the exception that the latter named companies allow 10 per cent. over all net proceeds—omitting the $50,000 clause. This is an entirely new departure, but should be productive of good results, in stimulating interest in hunting for paying ore.

The Cochiti Mining District, New Mexico

A Low-grade Gold-silver Camp Which Has a Reputation for Failure, but Which Possesses Many Promising Though Unexplored Veins

BY PERCY E. BARBOUR*

In certain quarters renewed interest has recently been shown in the old Cochiti mining district in New Mexico and some effort to revive mining operations there has been made. The town of Bland, the center of the district, is about 30 miles west of Santa Fé and about 50 miles north of Albuquerque. It is reached by a 25-mile stage ride from Domingo (formerly Thornton), a station on the main line of the Santa Fe railroad, 37 miles northeast from Albuquerque. A railroad was projected when this camp had its boom and the grade was surveyed and staked the entire distance from Thornton to the camp, but no work on it other than this was ever done.

Leaving Thornton, the stage road runs along the sandy river bottom of the Rio Grande, for 10 miles, to the Mexican adobe town of Peña Blanca, thence across the river by ford, the bridges having been washed away; then through the Cochiti Indian Pueblo and then across the foothills to the mouth of [illegible] cañon. These foothills are the result of erosion on a low flat mesa of volcanic ash and the total rise in elevation is only about 500 ft. From the mouth of the cañon to Bland, about seven miles, the rise in elevation is about 1200 ft., Bland being [illegible] ft. above sea level.

THE TOWN OF BLAND, N. M.

NATURE OF THE COUNTRY

There is a series of nearly parallel cañons, running from the northwest to southeast toward the Rio Grande river, which are from 800 to 1000 ft. deep and are generally very narrow. They were eroded from a mesa formed by successive flows of lava, volcanic ash, and volcanic tuff, superimposed, which made a broad, nearly level table-land. The cañons are separated by narrow mesas about half a mile wide called *potreros*. Beginning on the west these cañons are called Peralta, Colla, Piño, Media Dia, Cañada de Cochiti, etc. Of these cañons Peralta and Media Dia have creeks which run water all the year; the other three have water only during the winter and spring. All these cañons and mesas were very well timbered, but Colla and Piño have been heavily drawn upon for mining operations.

At the head of these cañons [illegible] into an irregular series of mountain peaks attaining hights of 10,000 and 11,000 ft. above sea level. All these mountains are well timbered and some are now within the Government forest reserve.

The Cochiti mining district is a volcanic country and has [illegible] of active volcanism, evidenced by flows of pure lava, now existing in black porous sheets, and volcanic ash, cinder and pumice. A great variety of both crystalline and non-crystalline igneous rocks occur, but there are no sedimentary rocks in the district. In Peralta cañon is a natural park of several acres containing many pinnacles and monuments showing some of the most beautiful results of weather erosion to be seen in the United States. The formation here is a white volcanic tuff filled with particles and fragments of pumice of varying size. The pinnacles are of all sizes and some of very fantastic shapes, several of them being nearly 100 ft. high.

---

*Mining engineer, Goldfield, Nevada.

In Calla cañon is a very interesting belt of opal formation in which a show tunnel has been run. Some few very fine specimens of opals have been obtained there.

Mines of the District

The district is divided into two distinct sections. The western section contains the Albemarle mine of the old Cochiti Gold Mining Company, which was exploited in Boston about 12 years ago, and after a more or less meteoric career ended in bankruptcy. This mine, situated in Calla cañon, was opened up by a two-compartment shaft to a depth of 800 ft., and during its operation produced more than $1,000,000. It was equipped with steam and electric double-drum hoists, air drills and the finest of mining machinery. The gallows frame was a very elaborate one of steel.

A cyanide mill of 250 tons capacity was erected wholly of structural steel, and while the judgment shown in this was perhaps questionable, the engineering required to transport and install this plant under the then existing conditions was deserving of great credit.

A high-tension power plant was erected at Madrid, 40 miles away, at a cost of about $250,000, and the power transmitted to the mine at 10,000 volts. The enterprise was a colossal failure, said to be due to the diminishing value of the ore at depth. The mine is now caved and the old records burned, so this statement cannot be gainsaid, but the geological and underground conditions of the rest of the camp seem to cast a reasonable doubt on the statement.

Eastern Section

That part of the district now under notice is the eastern half in or contiguous to Piño cañon. Here a series of porphyry dikes has intruded the overlying volcanic flows and is first seen when coming up the cañon about two miles below Bland, where they outcrop in the roadbed. They become more marked farther up the cañon until at the town of Bland, the west mesa is entirely dike mass, the overlying tuff having been wholly removed by erosion. On the crest of this outcrop is located a U. S. mineral monument."

STAMP MILL AND CYANIDE PLANT, BLAND, N. M.

The east mesa just above the town has been forced into an anticline with a very thin capping of tuff still present over the main dike. This dike has a general north and south strike and a nearly vertical dip, and seems to be the eastern boundary of the mineral zone of the district. The dike rocks are various forms of diorite varying from the coarse-grained, granitoid texture of the green-speckled white variety to the compact, fine-grained dark greenish-gray type.

The geologic age of this section is not great. The volcanic flows are considered to be of late Tertiary age, the dikes are more recent and the ore deposits still more recent, so that geologically they are rather young.

Mines of the Eastern Section

There are four well defined independent veins, practically parallel, which define the vein system as generally north and south. Beginning on the east these veins are the Washington, the Iron King, the Lone Star and the Crown Point. Each vein has been opened up more or less by a mine of the same name, and from each considerable ore has been shipped to the smelters at Pueblo. The Washington vein dips west; the Iron King is nearly vertical; the Lone Star dips east; and the Crown Point dips west.

The Iron King is opened up by a single adit with a 100-ft. winze on the vein which shows a width of 8 ft. throughout the workings and underhand stopes. The Crown Point is opened up in a similar manner, but the workings are in bad shape for examination. It was recently bonded to an English syndicate. The Washington group is next to the Lone Star in importance, but it has been tied up by litigation which has been continuous for nearly 13 years. The difficulty, has recently been reported settled.

The most important group in the district is the Lone Star group. This property is opened up by six adits all in one, which are connected by raises. Lower down on the other side of the mountain a working adit was driven to tap these workings. This adit for an expected output of but 100 tons per day was driven with a cross-section of 10x10 ft. in the clear and double-tracked with 56-lb. rails. The Lone Star vein in some places attains a width of 70 ft. and will average 25 ft. An analysis of the ore gave the following results:

	Per Cent.
Gold	0 00062
Silver	0 04200
Iron sulphide	0 09000
Antimony	0 19000
Tellurium	0 24200
Sulphur	0 61020
Silica	98 10300
Copper	Trace
Total	99 27782

This district received such an unenviable reputation through the failure of the Cochiti and Navaho undertakings that it has been very difficult to reopen the camp.

The Question of Value and Depth

The assertion that the value did not continue with depth was made to account for these failures. The theory was advanced that the ores were the result of deposition by descending hot waters and that therefore the value grew less with depth. That this theory is without foundation is evident from even a casual examination of the facts. The Iron King mine which adjoins the Lone Star has the deeper workings by 100 ft. or more, and had good ore in the deepest winze. The workings in the Star ran off the pay shoot. Furthermore, the mineral-bearing zone, as previously stated, is formed by a series of porphyry dikes intruding the overlying volcanic tuffs. Descending waters would have had to traverse this tuff capping to reach the fissure in the porphyry. No traces of water courses exist in the tuff and there were no subsequent igneous rocks laid on top of it and no trace of any mineral has ever been discovered in this tuff formation.

On the other hand, one kind of the porphyry forming the country rock is mineralized. The source of the magma was below, as evidenced by the dike itself, and it unquestionably provided the course for "ascending" waters carrying mineral.

Therefore, if time and development should prove that the ores do not continue with depth, some other reason than descending waters must be found to account for it. Bland is a low grade camp, the ores averaging $10 to $15 with the value about evenly divided between silver and gold, but the district has a great deal of merit and it is to be hoped that this renewal of interest in it will be productive of results.

The Development of the Delprat and Potter Flotation Processes

By W. R. Ingalls

Among the recent methods introduced for the separation of the mineral components of mixed sulphide ores—magnetic processes, electrostatic processes, pneumatic processes and flotation processes—the last mentioned occupies the premier place in point of commercial application up to the present time. I feel justified in making this statement in view of the fact that the greatest recent addition to the world's supply of zinc ore has come from Broken Hill, New South Wales, and the largest producer in that district has been the Broken Hill Proprietary Company, using a flotation process. The success of the Borken Hill Proprietary Company in this direction led many investigators to study the theory of ore flotation, which is now generally believed to be a function of surface tension, and the results of their investigations have created surprise that the bearing of well known phenomena had been so long overlooked. Every chemist is acquainted with the tendency of mineral particles, put into a breaker for digestion, to float upon the surface; and everyone who has walked on the seashore has observed the flotation of particles of mica when the incoming tide wets the sand. Yet thousands of scientists failed to draw any useful conclusion from these well known facts.

It was natural that in the introduction of these new processes there should be disputes as to priority of invention. This appears to be inevitable when an invention is sufficiently valuable to be worth a contest. It is one of the curiosities of economic history that most of the important inventions have been the result of study wherein two or more persons have approached [illegible] The [illegible] tion to this experience. The process originally introduced by the Broken Hill Proprietary Company was patented by G. D. Delprat, the general manager of that company. However, a similar process had previously been patented by C. V. Potter, of Australia, who died a few weeks ago. Potter claimed that the Proprietary Company was infringing his process, and a long litigation ensued, which was settled, in 1907, by the Broken Hill Proprietary Company recognizing the Potter patents, paying the owners thereof a large sum for the use of them in lieu of any further royalties and assigning the Delprat and other patents to the company owning the Potter patents.

In an article published in *The Mineral Industry*, Vol. XV, I said, "the Potter process was the original flotation process. The Delprat process is a slight modification of the Potter, being designed to evade the patents on the former." Mr. Delprat took some umbrage at this statement, which he considered to be a reflection upon him, although I did not intend to imply any illegality, wrong or impropriety. The evasion of a patent implies legality, else there would be no evasion; and a design to evade a patent does not imply anything illegal, wrong or improper. The only implication in my remark was that Mr. Delprat did not originate the acid-flotation process. In this it appears that I was wrong, inasmuch as it appears that he did originate it independently of Potter.

In a letter lately received from Mr. Delprat, he communicates some very interesting history respecting the origin of his patents, and I think that I am justified in quoting some paragraphs from his letter, although he has not specifically authorized me to do so. Mr. Delprat says:

"I quite admit that Potter's patent was taken out six or 12 months before mine, but my point is that I did not know anything of Potter's existence until my patents were applied for, and that consequently my patents could not have been designed so as to evade Potter's. This has clearly come out in the evidence given at the trial, and is public property. To say, therefore, that my patents were designed with a view of evading Potter's patent, is not only an inaccuracy, but furthermore puts me in a very unfavorable light with any right-thinking men.

"Although not affecting the point at issue, I may add that my invention was purely accidental; that in fact I was experimenting in quite a different direction at the time, and that during these experiments, in boiling tailings in a solution of acid saltcake, one of my assistants drew my attention to the fact that a heavy scum formed on the top of the solution, which [illegible] canted and then it struck us that the separation [illegible] all we were really in search of, and appliances were designed to carry the idea into practice; and it was only after applying for the patents that the existence of Mr. Potter was revealed to me.

"I am not writing to you to claim any [illegible] without whose help the process would [illegible] efficiency. What I do most strongly object to is that anyone should have a right to say that I designed my process in order to evade another man's process; in other words to reap the benefit of another man's work without adequate remuneration. Such a proceeding, is in my opinion mean and contemptible and is an action I hope never to be guilty of."

It is, of course, a pleasure to me to correct an unintentional and involuntary error, and also to make it a matter of authoritative record how the flotation process was first introduced at Broken Hill. No one should desire to do any injustice, least of all to so distinguished an engineer as Mr. Delprat, to whom no one has ever denied the credit of developing the acid-flotation process into a great commercial success. I was not previously aware of the early history of Mr. Delprat's discovery, as to which I am now informed, and accepting his statement, as I am bound to do, I freely admit the error in my remark in *The Mineral Industry*, Vol. XV, and tender him my apology.

The Hancock Jig at Palmerton, Penn.

The New Jersey Zinc Company, at its smeltery at Palmerton, Penn., is using a Hancock jig to treat the residue from the oxide furnaces. From this material the jig yields a zinc ore containing 16 to 18 per cent. zinc oxide, which is sent back to the oxide furnaces; iron-manganese clinker, containing 40 per cent. iron and [illegible] spiegeleisen furnaces; and unburned coal containing 65 per cent. carbon, which is used in the charge for oxide furnaces. The only waste is 2 per cent. of ash. The [illegible] more.

At Creede, Colo., strong fissure veins, occurring in igneous rocks, carry galena and blende with a quartz gangue, the minerals being separated by jigging. The ore is easily milled, affording a high-grade lead, and a high-grade zinc product. This district was discovered in 1892, since [illegible] tinuously.

Atlanta Gold District, Idaho

By Robert N. Bell*

The gold production of Idaho, since the first placer discoveries at Pierce City in 1860, has amounted to fully $250,000,000, of which probably 70 per cent. has been derived from placer mining, and 75 per cent. of the remaining 30 per cent. from the silicious milling-ore deposits contained in porphyritic formations, geologically related to the Nevada deposits, of which the State has afforded some notable examples and bonanzas.

The ores of this class of deposits are invariably associated with more or less silver, and the richer surface horizons, which produce largely a high-grade ore, were treated by the expensive roasting and pan-amalgamation process. After the exhaustion of the shallow surface deposits of secondary enrichment, extensive reserves of lower-grade ore were left by the early-day operators; these remained for modern metallurgical methods to utilize at a profit. Notable results have been obtained in the treatment of this class of ores in Idaho at the Lucky Boy and Custer mines, in the Yankee Fork district, and at the Trade Dollar and Delamar mines in the Silver City district, where former milling costs of $16 to $20 per ton have been reduced to about $3 per ton by more modern wet methods of treatment.

The latest success in this line of development in Idaho is in the Atlanta district, where the Bagdad-Chase Gold Mining Company, of Rochester, N. Y., operates the Pettit mine, which has recently been equipped with a new milling plant, comprising a 20-stamp mill, 16 Frue vanners, 8 Dimmick slime tables, 10 Callow dewaterers, a Callow screen, and Dimmick sizers, a 16-ft. tube mill and a Pierce amalgamator.

The ore is a massive white quartz, yielding about 1 per cent. of high-grade concentrates, consisting of iron sulphides, rich in gold and antimonial silver minerals, and involves very fine grinding and close concentration. The ore is crushed at the mine, transported by aërial tramway 3000 ft. to the mill, stamped, and then run over 12 ft. of copper plates, which are broken every 2 ft. with a ½-in. drop. The pulp then passes over Callow dewaterers and vanners, the slimes going directly to slime tables, and from the first vanners to Callow screens, with the over-size to tube mill; the fines pass to Callow dewaterers and Dimmick sizers; the tube-mill product, after grinding, passes over a Pierce amalgamator, thence to the Dimmick sizers. All material is distributed from the Dimmick sizers to vanners and slime tables.

The high-grade concentrates will be roasted and cyanided, which gives a very high extraction. The ore of this district has always been looked upon as difficult to treat; but the present installation seems to have solved the problem both in the matter of cost and of extraction. This means an important addition to Idaho's gold yield, for the ore resources of this district are extensive. The crude ore now supplied to the mill averages $10 to $12 per ton, and the concentrates run about $200 per ton, the ratio of values being about 85 per cent. gold and 15 per cent. silver.

ATLANTA, IDAHO

The mill began operation about the end of February, 1908, in extremely cold weather, and has run satisfactorily without any serious difficulty. The results thus far obtained show that a saving of about 85 per cent. of the total values in the ore is being made, about 40 per cent. of which is recovered on the plates.

The power used is transmitted as electric current from the company's water-power plant, situated a mile from the mill, on the Middle Fork of the Boise river. The flume is covered and gave no trouble, even in extremely cold weather. The machinery of the power plant embraces a 200-h.p. Trump water-wheel, under 50 ft. head, with a 200-h.p. dynamo and exciter. The capacity of the mill is about 70 tons in 24 hours.

---

*State inspector of mines, Boise, Idaho.

Mines of the District

The Pettit mine is operated through adits to a depth of 500 ft., with extensive underground connections, developing ore to the estimated value of $2,000,000. The vein is from 5 to 27 ft. wide and stands nearly vertical in walls of porphyritic granite. The ore course is clearly defined, but is accompanied by a mineralized condition of the wall rocks, which carry small quantities of gold and silver for a width of 25 to 50 ft. on each side of the main quartz vein. These combined constitute the great Atlanta lode.

The holdings of the company embrace 5600 ft. of the Atlanta lode, which is so situated that it can readily be developed to an additional depth of 1000 ft. by adits on the course of the vein. Recent development in the present lowest level of the property has shown a marked expansion in the width of the orebody, and it seems likely that the property may develop into one of the big mines of the West that will produce a very large tonnage of ore, and can be very cheaply worked, even in its somewhat remote location, 80 miles from railroad transportation.

The milling costs with the present equipment are $3.50 per ton. The mill building has been built with a view of adding further machinery, as the mine promises to warrant an output of several hundred tons per day. With increased capacity it is believed that the milling costs can be reduced to $3 per ton, and probably less.

Adjoining the Pettit mine to the west, on the same lode, is the Monarch mine, owned by the Atlanta Mines Company. This property is developed through a 600-ft. vertical shaft with six extensive levels, and has an ore reserve aggregating about $5,000,000 in estimated value, of about the same average grade as that of the Pettit. This property has a new milling plant of 200 tons daily capacity nearly completed, and will follow the same lines of treatment as the Pettit plant. This property has also installed a hydro-electric plant of ample capacity for its own use. It is expected that this mill will be completed and producing within the next 90 days.

There are several other promising properties in the Atlanta district, which already has a bullion record of $5,000,000 from shallow surface ores, and seems destined, through the application of modern metallurgical methods, to take a prominent place in the gold production of Idaho.

Heating of Conductors by Electric Currents

By Sydney F. Walker*

The two formulas, upon which nearly all electrical calculations are based are

$$C = \frac{E}{R}\text{, and } W = E\,C.$$

The first of these formulas means that the current passing in any circuit depends directly upon the pressure available in the circuit, and inversely upon the resistance. By transposition it becomes $E = C\,R$. This last form is the formula that is employed in the calculation of cables. By it may be calculated how much resistance, and therefore what size a cable must have, that has to carry a certain current, with a certain pressure available for driving the current through the cable. The second formula is the usual electrical-power formula in which power equals pressure multiplied by the rate of flow. By substituting the first value of C in the second formula, it becomes $W = \frac{E^2}{R}$, and by substituting the value of E in the first formula, the second formula becomes $W = C^2 R$. W is used for power, or rate of doing work, and the above formulas are used for measuring the power delivered by a generator, the power entering a motor, the power wasted in cables, etc.

In certain parts of the circuit, in the cables for instance, the only work done is in generating heat, and the formulas for power or work, are then written

$$H = E\,C = C^2\,R = \frac{E^2}{R}.$$

In this form, when the pressure is given in volts, the current in amperes, and the resistance in ohms, H is in watts: 746 watts equal 1 h.p., and 1 watt equals approximately 44 ft. lb.

Taking the B.t.u. as 778 ft. lb., this gives 17.58 watts per B.t.u., and the above formulas may be written:

$$H \text{ (heat units)} = \frac{E\,C}{17.58} = \frac{C^2\,R}{17.58} = \frac{E^2}{17.58\,R}.$$

If X is the number of lb. of copper contained in the cable, the formula becomes

$$H \text{ (in heat units per pound of copper)} = \frac{E\,C}{17.58\,X} = \frac{C^2\,R}{17.58\,X} = \frac{E^2}{17.58\,R\,X}.$$

The last formula gives the rate of heating. For any given length of copper $R\,X$ is a constant quantity. If the size of the cable is halved, its resistance is necessarily doubled. If a cable has a sectional area of 0.25 sq. in., and a certain length, say a mile, it has a certain resistance. If the cable is reduced to a sectional area of 0.125 sq. in., the length remaining the same, the resistance becomes double, and the weight one-half. Further, for lengths of conductor of one mile, the product $R\,X$ equals 859 approximately, and therefore the last formula may be written as follows:

$$H = \frac{E^2}{17.58 \times 859 \times l^2}$$

Where l is the length of the conductor in miles.

It will be seen that halving the length of the conductor, quadruples the number of heat units per lb. of copper, and *vice versa*. But taking 0.095 as the specific heat of copper, 1 B.t.u. will raise the temperature of 1 lb. of copper, approximately 10.5 deg. F., and therefore the formula may be written:

$$T = \frac{E^2 \times 10.5}{17.58 \times 859 \times l^2},$$

where T is the number of degrees Fahrenheit that each individual lb. of copper is raised. The formula becomes in its simplest form:

$$T = \frac{E^2}{1438 \times l^2}.$$

To my mind the importance of the formula lies in the fact that it shows so clearly the effects of the length of conductor, and of a short-circuit. In ordinary work the highest possible rise of temperature is practically negligible; but if a short-circuit occurs—if a connection is made between the positive and negative conductors of a service—the heating effect will depend inversely upon the square of the length of the conductor, between the generator and the connection. Thus it may happen that a short-circuit at the end of about two miles of double cable, with four miles of cable in circuit, may not do any serious harm to the cables themselves, whereas a short-circuit within a short distance of the generator, may raise the temperature of the conductor to the melting point. The formula also shows clearly the effect of the pressure and how the dangers of excessive heating increase with the pressure. The pressure may rise in two ways: (1) higher pressures may be used on the general service, where, say, 3000 volts is employed, instead of 500; (2) owing to a connection or partial connection between the positive and negative conductors.

The formula for the heating effect of alternating currents would simply be a modification of the foregoing formulas.

At temperatures of about 2000 deg. C. absolute, each increase of temperature of 10 degrees increases the resistance of a tungsten filament about 0.45 per cent.

---

*Consulting engineer, Bloomfield Crescent, Bath, England.

Determination of Lead in Spelter and in Ores

A New Method for the Wet Assay of Lead by Means of a Hydrogen Peroxide Reaction with Potassium Permanganate Titration

BY ERIC JOHN ERICSON*

The JOURNAL of July 27, 1907, contained an editorial calling attention to the unreliability of the fire assay for lead and recommending the wet assay, without mentioning any specific method. Other journals have also called attention to defects in assay methods for lead. C. A. Cooper, in the *Mining World*, Sept. 21 states:

"One has deplored the unreliability of the Alexander method for low-grade ores, without explaining the defects; another says the fire assay is worthless; another says all known methods are imperfect."

After showing that the fire assay gives from 2 to 3 per cent. lower results than Alexander's method, he says further:

"Another curious fact which I have not seen mentioned and therefore advance with apprehension, is this: A standard solution checked on 200 milligrams of lead foil and used on a 5-per cent. ore will give results 1 per cent. too low, the principle being squarely opposed to that held to obtain in the zinc assay. An apparent, but deceptive explanation lies in the failure of our filter papers to perform according to schedule, a 30-per cent. ore seeming to clog the pores more completely and to render the loss proportionately less. Anyone who has stirred filtrates from lead-sulphate solutions has noted the loss to be equally great on respectively 5-per cent. and 30-per cent. ores and that more decantations to the original filter are necessary in the case of low-grade ores, two or three being usually required for a perfect saving, while one or two are sufficient for ores high in lead; however, even when extreme care in this respect is observed in standardizing, the difference above stated will be found. Four tests were made respectively upon 200, 100 and 50 milligrams of chemically pure lead foil, enough, with careful work, to base an opinion upon. Within parentheses, I may say that the same thing has probably been done a few thousand times by others, but if variations were found and published, I have failed to see them. Nevertheless, the use of 200 and 100 milligrams gives practically the same factor, and from the recollection of some experiments made several years ago, I am inclined to think there would be no appreciable difference when using 500 or even 600 milligrams. In checking on 50 milligrams of lead a surprisingly different factor was obtained which suggests the possibility of a still greater variation on ores running under 5 per cent. In the absence of better knowledge regarding the behavior of very low-grade ores, it seems the safer plan to use enough ore to bring the percentage handled to five or more and within reach of a reliable factor. If reliable, this evidence indicates the impossibility of a correct standard table based upon two extremes."

NECESSITY OF ADDING ALCOHOL

This quotation shows the present unsatisfactory state of affairs, especially in regard to low-grade ores. The necessity of adding alcohol to cause the complete separation of lead as sulphate seems to be disregarded or overlooked. The accompanying table of analyses shows its necessity:

LEAD ANALYSES WITH AND WITHOUT ALCOHOL.

	With Alcohol. Per Cent. Lead.	Without Alcohol. Per Cent. Lead.	Per Cent. of Total.
Calamine......	0.14	0.07	50.00
Zinc blende...	0.39	0.24	61.30
Zinc blende...	0.92	0.75	81.50
Calamine......	3.82	3.68	96.30
Calamine.. ..	7.15	6.78	94.80
Mixed ore.....	16.40	16.20	98.70
Galena	84.30	84.30	100.00

It would seem that lead concentrates require no addition of alcohol. This point will be investigated further. The method here described gives the same factor on 50, 150 and 300 milligrams lead foil, thus showing its adaptability for all kinds of ores, both of high and of low grade. It is pre-eminently well suited for low-grade ores, and gives more accurate results than any other method. It is not as rapid as Alexander's, but the loss of speed is compensated by the greater accuracy obtained. Alexander's method is accurate, if lead is properly separated and if lime is absent. As practically all zinc and lead ores carry lime, this limitation is its chief defect. In this method lime does not interfere, nor such traces of iron that the lead sulphate might carry—two important advantages over Alexander's.

THE NEW METHOD

The fundamental principles of my method were described in the *Journal* of the American Chemical Society, Sept., 1904. The scheme for its application to spelter and zinc ores has been evolved in the Edgar Zinc Company's laboratory, where it has been in continuous use for two years with very satisfactory results. Its application to spelter involves a radical departure from the existing methods in vogue. The new method is both rapid and accurate. Duplicate assays check mostly to the point, or within one or two points. The value of a rapid and accurate method for lead, the chief impurity in spelter, can hardly be over-estimated.

Briefly the method is as follows: After the lead is obtained in solution as a nitrate, free from sulphates and chlorides, the solution is made alkaline with ammonia and the lead peroxidized by means of ammonium persulphate, probably according to the following equation:

$$Pb\,(NO_3)_2 + 4\,NH_4OH + (NH_4)\,S_2O_8 = PbO_2 + 2\,NH_4NO_3 + 2\,(NH_4)_2SO_4 + 2\,H_2O.$$

The resulting lead peroxide is filtered off and washed (with hot dilute 10-per cent. ammonia in presence of copper and zinc) with hot water. The filter with the precipitate is thrown back into the vessel in which the precipitation was made. Then an excess of acidulated hydrogen peroxide is added which decomposes the lead peroxide, as follows:

$$PbO_2 + H_2O_2 + 2\,HNO_3 = Pb\,(NO_3)_2 + 2\,H_2O + O_2.$$

and the excess of hydrogen peroxide decomposed by standard potassium permanganate, as follows:

$$5\,H_2O_2 + 2\,KMnO_4 + 6\,HNO_3 = 2\,KNO_3 + 2\,Mn\,(NO_3)_2 + 8\,H_2O + 5\,O_2.$$

Hence

$2\,KMnO_4 = 5\,H_2O_2$ is equivalent to 5 Pb.

As the theoretical factor $\frac{5\,Pb}{10\,Fe} = 1.851$ gives too low results, the empirical factor 1.92 was chosen, agreeing exactly with the standard gravimetric sulphate method.

Solutions required: hydrogen peroxide of a suitable strength for spelter and zinc ores is made by the addition of 8 to 10 c.c. hydrogen peroxide of U. S. pharmacœpial strength, and 50 c.c. concentrated nitric acid to every liter of water; standard potassium permanganate solution—dissolve 0.568 gram of Kahlbaum's or Merck's "Reagent" (some other makes require more) potassium permanganate to every liter of distilled water and standardize in the usual manner (0.35 gram ferrous-ammonium sulphate should require 49.9 c.c. permanganate; 1 c.c. equals 0.0010 gram iron and 0.00192 lead on a 1 gram sample, and 0.10 per cent. lead when 1.92-gram sample is taken, hence each 0.1 c.c. equals 0.01 per cent. lead).

---

*Chemist, Edgar Zinc Company, St. Louis, Mo.

METHOD FOR SPELTER

Dissolve 19.2 grams drillings in 60 c.c. water and 60 c.c. concentrated nitric acid in a No. 6 beaker. Add the acid gradually and then boil 5 to 10 min. Cool, transfer to a 500-c.c. volumetric flask and dilute to the mark with distilled water. Shake thoroughly, pipette off 50 c.c., equal to 1.92 grams, into a No. 3 beaker or a casserole of 350 c.c. capacity, add 40 to 50 c.c. water, 30 c.c. concentrated ammonia and by means of a horn spoon, 3 to 4 grams of solid ammonium persulphate; boil five minutes, and remove to a cooler part of the hot plate for 10 min. Filter while warm through a 11-cm. filter. Use double filters if lead appears high. Wash four times with hot 10-per cent. solution of ammonia and finally five times with hot water, taking care to wash the beaker thoroughly free from ammonia.

Transfer the filter with the precipitate back into the beaker in which the precipitation was made and add 25 c.c. hydrogen peroxide solution of the strength described, and stir frequently until dissolved. Then add 15 c.c. nitric acid (1.20 sp.gr.) and about 50 c.c. water, and titrate with standard permanganate until pink color appears. Assuming the hydrogen peroxide blank to require 18 c.c. and the sample 15.5 c.c then lead equals 18 — 15.5 equals 0.25 per cent. If the sample is uniform, 1.92 grams may be dissolved in 12 c.c. nitric acid (1.20 sp.gr.) boiled, diluted with water, ammonia and ammonium persulphate added, etc., as previously described. Manganese, if present, would interfere and cause too high results, but as it is hardly ever present, and if at all in very minute quantities, it need hardly be considered.

METHOD FOR ZINC ORES

Blendes—Weigh 1.92 grams into a casserole of 200 c.c. capacity, dissolved in 15 c.c. concentrated nitric acid, and after a few minutes add 7 c.c. concentrated sulphuric acid; cover with watch glasses; boil until copious fumes of sulphur trioxide are evolved, and the nitric acid is expelled.

Calamines (Silicates and carbonates)—Weigh 1.92 grams of the sample into a porcelain casserole of 300 to 350 c.c. capacity; moisten with water; add 10 c.c. concentrated hydrochloric acid, 2 c.c. concentrated nitric, 2 c.c. hydrofluoric acid to carbonates, and 4 c.c. to silicates, then gradually 7 c.c. concentrated sulphuric acid. Put on the hot plate and after five minutes cover with watch glasses and boil as in the case of blendes. From now on proceed alike for blendes and calamines, as follows:

Cool; add 30 c.c. water; heat to boiling, and maintain for a few minutes until the soluble salts are in solution; cool, add 30 c.c. 95-per cent. alcohol (wood alcohol will do); stir the mixture and allow to stand over night. Filter off insoluble lead sulphate on a 11-cm. No. 100 Munktell filter, add a little pulp and apply gentle suction, wash twice with the solution of 25 per cent. ethyl alcohol and 2½ per cent. sulphuric acid by volume and once with cold water (one filtration is usually sufficient). Transfer filter with the precipitate to a funnel 2¾ in. diameter and place the casserole under the stem. Make small hole in the apex of the filter and wash the lead sulphate into the casserole with hot water, using a fine jet. Wash twice with 5 per cent. carbonate of ammonia and finally again with hot water; lift the folder to see that nothing remains. The object of the ammonium-carbonate wash is to break out any lead sulphate that might stick tenaciously to the filter. Now add to the casserole 3 grams solid ammonium carbonate and boil a few minutes; cool and filter on a 11-cm. No. 100 Munktell filter, or its equivalent, washing the casserole and filter twice with cold 5-per cent. ammonium carbonate and twice with cold water. Reject the filtrate, and place the casserole under the stem. Now add on the filter 10 c.c. dilute nitric acid (1.20 sp.gr.) and wash immediately with hot water around the edges of the filter, so that the dilute acid will come in contact with all parts of the filter. Wash four times more and reject the filter paper.

To the solution of lead nitrate in the casserole add 15 c.c. concentrated ammonia, and about 3 grams solid ammonium persulphate; boil five minutes and allow to settle, filter hot and wash five to six times with hot water. Transfer the filter with the precipitate back into the casserole in which the precipitation was made; add 25 c.c. hydrogen-peroxide solution and proceed exactly as described for spelter.

For zinc ores running several per cent. of lead, a hydrogen-peroxide solution about two to three times the usual strength is employed, and if 25 c.c. fails to dissolve the lead peroxide, another 25 c.c. is added and a blank run on the same amount of peroxide.

METHOD FOR LEAD ORES AND CONCENTRATES

Make a potassium-permanganate solution of three times the strength used for zinc ores, i.e., 1 c.c. equivalent to 0.0030 gram iron. Make the hydrogen [illegible] peroxide and leave a fair excess for back titration.

[illegible] low-grade concentrates, and 0.5 gram of high-grade concentrates and galena, in the usual manner according to the nature of the ore. Add some hydrofluoric acid to ores carrying silica, and the sulphuric acid after decomposition has been effected; then proceed throughout as directed for calamines, except that 20 c.c. dilute nitric acid is used in dissolving the lead carbonate on the filter, then 25 c.c. concentrate ammonia and about 4 grams ammonium persulphate. Use double filters, 12½ cm. for concentrates. The iron value of the permanganate solution multiplied by 1.92 x 100 and dividing by the weight taken equals the per cent. of lead. It may be advisable to check this factor on a standard ore, especially when used for concentrates. Pipettes and burettes with automatic overflow have proved a great aid to accuracy as well as facilitating work.

[illegible]

I stated earlier in this paper that this method gives the same factor on 50, 150 and 300 milligrams lead foil. While uniform, the factor came out higher than the iron value of potassium permanganate multiplied by 1.92 or, in other words, using this factor only an average of 98.43 per cent. lead was indicated of the weight taken. The lead foil was tarnished and it was suspected that the failure to obtain 100 per cent. might be due to surface oxidation. This was subsequently verified, by procuring Kahlbaum's lead in sticks (100 gram original package) and cutting off fresh pieces for analysis, when an average of 100.02 per cent. was obtained. These were all direct determinations, without previous separation as sulphate.

COMMERCIAL CHEMICALLY [illegible] LEAD FOIL

Weight Taken Mg.	Weight obtained Mg.	[illegible]	
50	[illegible]	[illegible]	[illegible]
150	[illegible]	[illegible]	
300	[illegible]	[illegible]	

KAHLBAUM'S LEAD IN STICKS [illegible]

50	[illegible]	[illegible]	[illegible]
150	[illegible]	[illegible]	
300	[illegible]	[illegible]	

If the sample of lead foil employed in this analysis may be considered typical of what reputable dealers sell, it is evident that the commercial article is un- [illegible] surface oxidation. Foil of this kind is used extensively for standardizing in Alexander's method. Lead in sticks, cut off in small pieces as needed, is better [illegible] justing the weight. These anaylses demonstrate again the correctness of the factor 1.92 which gives the lead factor by multiplying the iron factor of potassium permanganate.

Transvaal Notes

Special Correspondence

The feeling on the Rand is distinctly more hopeful than it has been for months past. Money is more plentiful on the markets of Europe, and thousands of investors, attracted by the improved conditions in the Transvaal, are buying the shares of the gold mines. There has been no boom, for which everyone is thankful, but a steady rise in values. What strikes one as most peculiar about Kafir shares is the way that some of the leading stocks keep up, even after paying dividends for several years. One of the popular shares of the Rand is a good example of this. It is a small mine, but rich; about 3½ years ago the public paid between £4 10s. and £5 for these shares. Since then large dividends have been paid out, and, of course, the life of the mine has been very much reduced, but the price of the shares are still £4 10s. to £5. Buyers seem to look only at the rate of interest, and do not appear to ask how long the payments will keep up.

Many of the advances in prices are justified, but the upward tendency has carried forward much rubbish. Some of the professional gamblers are shouting out the merits of their trash, and no doubt unwary persons will be caught in their nets; but after the experience of the past few years, people should know better than to go into wildcat schemes.

One of the most popular horses on the race course of the share market seems to be Randfontein. These shares have gone up from 20s. (the price a few months ago) to 33s. at the present time. There are ample reasons for this increase in price. The Randfontein group should have a brilliant future. Besides the mines which are now turning out gold, there are large areas still to be developed. It is proposed to erect two huge batteries of 300 stamps each, with tube-mills, to deal with the ore from these undeveloped claims. At the Randfontein Central mine a 300-stamp mill is to be erected; the plant to have a crushing capacity of near 63,000 tons per month, on which it is expected that a profit of about 10s. per ton will be earned. A central power station has just been erected for supplying electrical energy to the Randfontein mines.

Another stock that has received a lot of attention from the public is the Modderfontein. This mine has made a most excellent showing during the past few years. It was not so very long ago that the monthly profits were about £4000. Today, with a larger plant and more efficiency, they are making a profit of about £20,000 per month. The mine has one of the largest claim areas on the Rand so that a long life is assured. The quotations have gone from £4 15s. to £8 10s. per share.

The rumor that several idle mines are to start up is good news. Before the end of the year there should be a number of new producing mines to enter the list. Besides the idle mines, at least two new producers will commence turning out gold on the West Rand, where a large mine—the West Rand Consolidated—will make a beginning; and on the East Rand, that huge deep-level proposition, the Simmer Deep, will start crushing. If only the labor holds out, the future of the Rand for the next few years appears satisfactory.

The returns for the month of May have just been published, and they show a total output of 558,992 oz., or £2,472,143. Of this the Rand contributed 558,243 oz., or £2,371,265, while the outside districts produced 23,749 oz., or £100,878. During May there were 8920 stamps at work in the Transvaal, of which 8475 were crushing on the Rand. Of the individual producers the largest was the Simmer & Jack mine, which produced 26,551 oz. of fine gold. Second on the list was the Robinson mine, with 26,190 oz., while the Robinson Deep was third with an output of 20,646 oz. fine gold.

Parliament meets in Pretoria in a few weeks, and there are many matters of vital importance to the mining industry to be discussed. One of the most important is the new gold law. Next to that is the recommendations of the Mining Industry Commission, which advises the running of the mines by white labor

Dominion Iron and Steel Company

This company owns large steel works at Sydney, Cape Breton; iron mines in Nova Scotia and Newfoundland. Its report is for the year ended May 31, 1908. The company has $20,000,000 common stock, $5,000,000 preferred stock, and $9,368,833 bonded debt.

The profit on sales for the year was $2,613,825, an increase of $366,289 over the previous year. Against this profit was charged $766,525 for interest and sinking fund, and $1,376,831 for contingent account; a total of $2,143,356, leaving a balance of $470,469. Adding the balance from previous year made a total surplus of $789,178 at the close of the year.

The report of the directors says, in substance: "The earnings have again to be considered in the light of the judgment against the Dominion Coal Company, which entitles us to recover from them the cost of coal in excess of the contract price of $1.28 per ton. As in the previous year all coal used has been charged against the operation of the contract price, and on this basis the earnings for the year were $2,613,825. From this amount we have transferred to contingent account $1,376,831, to offset the sum which we have charged to Dominion Coal Company for money paid during the year in excess of the contract price for coal. The remainder has provided for the sinking fund on the first mortgage bonds, and the maturing installment of the second mortgage bonds, $250,000, leaving a balance of $220,477. The gross earnings during the past four years increased from $500,000 to $2,613,815.

"The various departments of the company's works have been carried on steadily throughout the year, with increased production and lessening costs. The output of steel for the year reached 290,953 gross tons. In 1907 the output was 238,000 gross tons. The floating liabilities are larger than usual, but the increase in the amount as compared with last year is more than covered by the further increase in the value of raw and finished materials on hand. A considerable portion of the finished materials are merely awaiting shipment.

"In view of the larger working capital we are henceforth likely to require, your directors think it well that a scheme for the reorganization of the company's finances should now be under consideration. As a preliminary step you will be asked at the annual meeting to consider, and, if approved, to authorize an increase in the capital stock of the company, and the creation of consolidated mortgage bonds.

"The appeal of the Dominion Coal Company to the Privy Council against the judgment rendered in our favor by the Supreme Court of Nova Scotia, cannot be heard until after the summer vacation, owing to the time consumed in completing the record. The claim against the coal company up to May 31, 1908, exclusive of interests and costs, was $2,923,808.

"Efforts have recently been made by friendly intermediaries to bring about a settlement of the dispute, but without result. No definite offer has ever been received by the steel company, and the most favorable arrangement which has been put forward as likely to be acceptable to the coal company—in other words, the best settlement which it appears open to us to make—is not one which your directors could recommend for your acceptance."

A recent pamphlet issued by the industrial agent of the Mexican Central Railway states that 48 per cent. of the freight carried over the rails of that system consists of products of the mines and of mining supplies. This is a fair index of the relative importance of the mining industry in Mexico at the present time.

Cornish Tin Mining

Special Correspondence

A correspondent of the London *Mining Journal*,[1] in discussing the financial condition of the tin-mining industry of Cornwall and Devon, tabulates the output and the cost of producing one ton of black tin at six of the leading tin mines for the last eight years. The mines discussed are the Dolcoath, Carn Brea, Basset, Grenville, East Pool, and West Kitty, together affording about 84 per cent. of the total output of the district, exclusive of stream works.

The following table summarizes the discussion, giving the total output of each mine, in long tons, for the eight years, 1900 to 1907 inclusive, and the average cost of producing one ton of black tin throughout the same period:

	Total Output	Average Cost
Dolcoath	14,543	$278 58
Carn Brea	5,165	394 00
Basset	5,436	353 46
Grenville	5,455	358 72
East Pool	5,164	325 26
West Kitty	3,074	387 62
Total and average	38,837	$330 32

The average price received for the output of these mines during the same period was $390.96 per ton, whence the average net profit to the mines was $60.64 per ton, equivalent to about 18 per cent. of the working cost, or 15 per cent. of the price received. It is apparent, however, that this profit was not participated in equally by all mines, since operations at Carn Brea have been conducted at a loss, and at West Kitty at practically no profit. As is to be expected, the mine with the largest output has the lowest working cost. On the basis of the tin ticketings on May 18, 1908, when the average price received by all mines was $384.56 per ton, a still larger number of the mines are seen to be working at a very narrow margin of profit, Dolcoath being the only one to make a fair return at the current quotations.

The unequal participation of the several mines in the average net profit is further affected by the variation in the grade of product afforded by the different mines. Thus the Dolcoath product generally commands a premium of $7.25 over the average price quoted at the ticketings, while the output from Carn Brea, for example, was sold lately for $36.15 less than the average quotation.

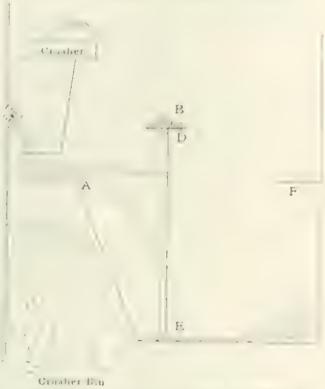
The most obvious criticisms of the Cornish tin-mining industry as a whole seem to be that a sufficient proportion of the net income has not been applied to the maintenance of plant and equipment nor to the development of the orebodies, and also that the economy of large-scale work has not been appreciated. Practically all profits have been realized from the fortuitous discovery of [illegible] shoots, or from temporary high tides in the tin market. The Carn Brea mine, for example, has had unfortunate disasters with its underground workings, but, taking the industry as a whole, the high cost of production has been the result of operating on a meager scale, with only spasmodic attempts to maintain or improve equipment.

---

[1] May 30, 1908.

An Automatic Ore Sampler

The automatic ore sampler in use at the Tasmania gold mine, Beaconsfield, Tasmania, is described by C. S. Heathcote (*Monthly Journal* of the Chamber of Mines of Western Australia, March 31, 1908). The ore from underground is delivered to bins, from which it is fed automatically by eccentric-driven screens to two Blake-Marsden breakers, which reduce the ore to pass a 1½-in. ring. The crushed ore from each breaker, together with the fines from its feeding screen, falls through an opening 1 ft. wide and 2 ft. long, the latter being the length of the breaker opening.



DETAIL OF AUTOMATIC ORE SAMPLER

The samplers, of which there is one to each crusher, consist of a revolving arm making 3¼ r.p.m., which cuts through the falling stream of ore. This arm carries a swinging bucket of radial shape, the width at any point being 1/112 of the circumference of the circle traveled by that point; this proportion insures a width of at least 3 in. The length is sufficient to cover more than the opening. This swinging bucket tips automatically at each revolution.

The bulk sample is approximately 20 lb. per ton. It is quartered and broken down in the usual way, and the result multiplied by the daily tonnage passed through the breakers. The attention required by the apparatus is practically nil; it is necessary only for the crusherman to see three or four times a day that it is working properly. Occasionally the pivot pins of the bucket require tightening slightly [illegible] horizontal, while passing through the stream of ore. To insure its working at all times [illegible] from the main driving shaft in the breaker house. The hight lost by installing the sampler is only 3 feet.

The following is the result of a 16-weeks' run: Tons of ore in stock at the beginning of period, 443; tons of ore in stock at end of period, 809; sampled, [illegible] crushed, 18,504 tons (averaging 12.9607 dwt.); the difference between the two samplings was only 0.1416 dwt. per ton.

In the accompanying sketch *A* is the bucket; *B*, the pinion on belt-driven shaft; *D*, crown wheel; *E*, step bearing; *F*, tippler.

Anti-Debris Action in California

Special Correspondence

The board of supervisors of Yuba county, California, has adopted resolutions calling upon the district attorney to begin suit at once against certain hydraulic and ground-sluice mines which are alleged to be dumping débris into the Yuba river. The action will be instituted against the mines, and not the owners, as in the past. The owners either transferred the properties or leased them, so new suits had to be commenced by the Anti-Débris Association. A number of members of this association have, within the past six months, been secretly securing evidence against those miners who they allege have been violating the Caminetti law, and are now proceeding against them. In this matter there is a new departure in two respects. The first is in bringing suit against the mine itself and not the miner, but it is probable that such mines as are incorporated will disincorporate, as has been done in the past under similar circumstances, and thus avoid trouble in the courts. The second is the bringing suit against mines which are not hydraulicking, but are ground sluicing. How this will work is yet to be seen. The ground sluicers do not violate the Caminetti law. That law prohibits hydraulic mining in the drainage basins of the Sacramento and San Joaquin rivers—hydraulic mining to be understood as defined in California. The State Legislature adopted an official de[illegible] plication of water, under pressure. [illegible] In ground sluicing the gravel is not worked in any such manner, or by any such means. The only way to reach these men, therefore, is not through the provisions of the Caminetti law, but by showing they are doing material damage to the property of other persons, by letting their tailings flow onto land owned [illegible]

A Modern Coal Washery in New Mexico

One of the largest and best arranged coal-washing plants in America has recently been completed by the Dawson Fuel Company in connection with its coal mines and coke operations at Dawson, New Mexico. As this plant washes the entire coal supply for 570 coke ovens, of the under-flue type, and has a capacity of 2400 tons of coal in 10 hours, a brief description of its operation will be of interest.

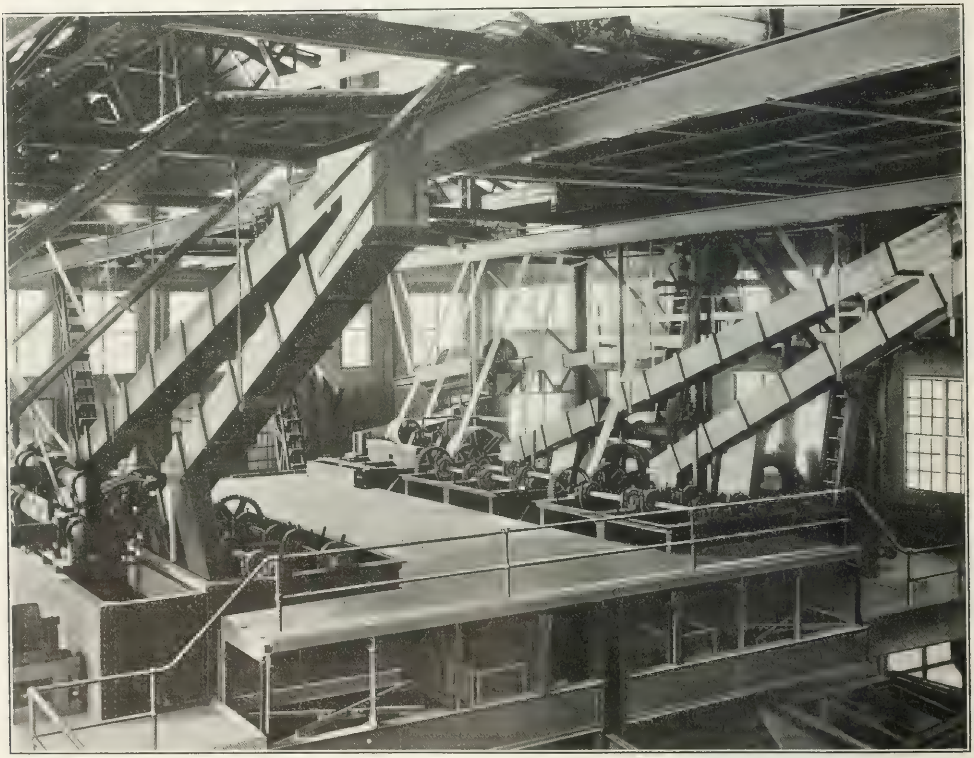


FIG. 1. PARTIAL VIEW OF JIG FLOOR SHOWING REFUSE ELEVATORS FROM STEWART JIGS ON RIGHT

After a primary screening and crushing, the raw coal is carried by a belt conveyer from the coal tipples to two cylindrical steel bins, 40 ft. diameter by 40 ft. high, marked *A* on the accompanying general view. Each bin has a capacity of 1000 tons, and the coal is discharged through eight rocker-gate feeders at the bottom of the bins onto two parallel belt conveyers which carry it to the crusher building, marked *B* on Fig. 2.

Equipment of Washery

In the crusher building at the head of the conveyers, are two 6x12-ft. shaking screens with 1½-in. round perforations, as shown on Fig. 6. The oversize from each screen is discharged into a roll crusher, by which it is reduced to the equivalent of the undersize from the screens. The combined product of the screens and crushers then passes over an automatic weighing machine located just outside the crusher building, after which it is carried by a belt conveyer to the third floor of the washery building, marked C on the general view, Fig. 2. Here it is delivered to a distributor located in a dust-tight room, from which it passes through launders to eight Stewart jigs on the second floor.

These jigs are arranged in batteries of four jigs each, on opposite sides of the room. Each battery consists of two pairs of jigs connected by a water-supply tank. These jigs differ in construction from the usual Stewart type, inasmuch as both the jigs and supply tanks, instead of being of wood construction, are of ¼-in. steel plate with a 4-in. concrete lining. The hutches of each pair of jigs taper toward the bottom and are connected by two 8-in. pipes with a No. 5 Luhrig elevator which handles the combined refuse from the two compartments (see Fig. 4).

General Method of Operation

The two refuse elevators from each battery discharge into a launder leading to a 4x8-ft. refuse trommel with 5/16-in. perforations. The oversize from each of these trommels passes directly to a circular steel refuse bin located at one end of the building, and arranged to discharge directly into electric refuse cars. The screenings from the refuse trommels, which are to be rewashed, pass through launders to four Luhrig fine-coal jigs, one pair of which is located on either side of the building. These are of the same general construction as the Stewart jigs, and are placed in line with the latter, as shown on Figs. 1 and 3. Each pair of these rewashing jigs is provided with a No. 5 Luhrig elevator which delivers the final refuse into the bin mentioned above.

The combined washed coal from both the Stewart and Luhrig jigs is carried by launders under the operating floor to four 4x12-ft. dewatering trommels, two of which are located on either side of the building, directly over the settling tanks (see Fig. 5). The oversize from these trommels passes through chutes to two 60-in. disintegrators located on the first floor, and the undersize is recovered from the settling tanks by two perforated continuous bucket elevators, as shown on Figs. 4 and 5. The washed coal from the disintegrators and settling tanks is then carried by a belt conveyer to four circular steel bins, 26 ft. in diameter and [illegible] ft. high, marked D on the general view, Fig. 2, and is distributed by a belt conveyer operating above the bins. From these bins the coal is taken by electric larries to the coke ovens.

[illegible]

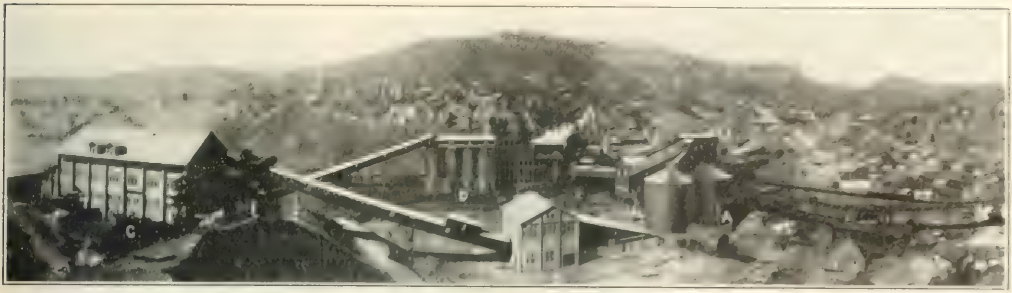


FIG. 2. GENERAL VIEW OF [illegible]

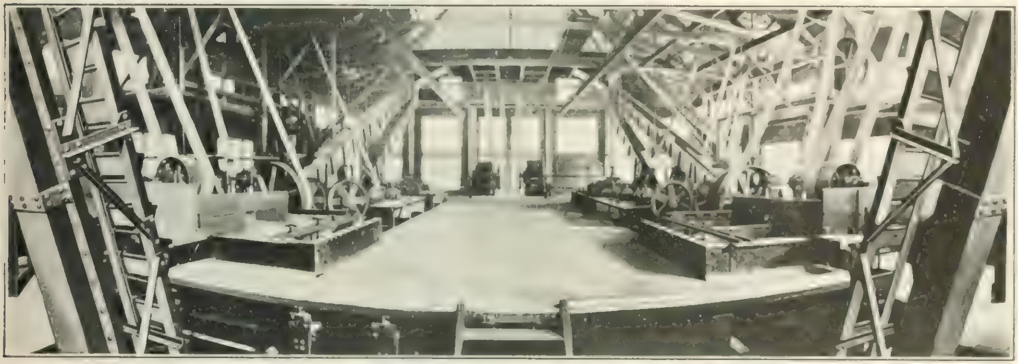


FIG. 3. VIEW OF JIG FLOOR, SHOWING LUHRIG JIGS IN FOREGROUND AND STEWART JIGS IN BACKGROUND

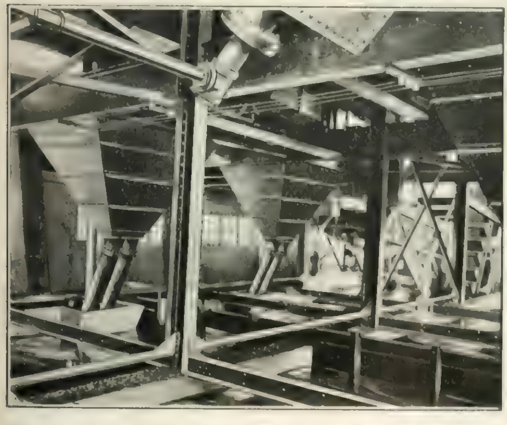


FIG. 4. SHOWING HUTCHES FROM FOUR OF THE STEWART JIGS, AND S IN DISCHARGE PIPE THROUGH WHICH THE REFUSE PASSES

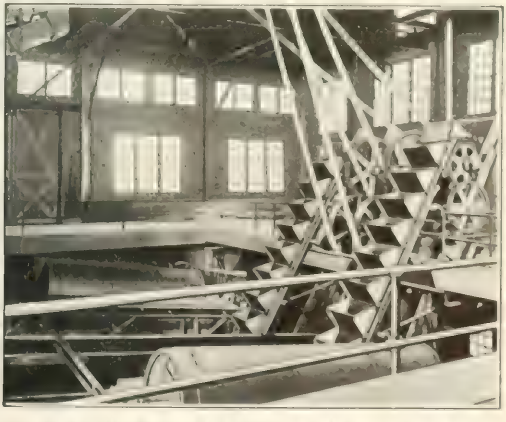


FIG. 5. [illegible] DISINTEGRATORS [illegible] WASHED COAL PASSES

building contains a thoroughly equipped laboratory for conducting tests and analyses.

Owing to the complicated arrangement of the water system employed in this plant, and the necessity for preparing a complete flow sheet to illustrate its operation, we have omitted that feature of the equipment from the foregoing description. All washing machinery proper, used in the plant, including the screens and crushers for raw coal, and the jigs, trommels and elevators for handling the washed coal and refuse, was built and installed by the Jeffrey Manufacturing Company, of Columbus, Ohio. The entire system was designed by Dr. D. L. Ricketts, consulting engineer for the Dawson Fuel Company.

Owing to the recent completion of the plant, definite records of the results secured are not yet obtainable. It is stated, however, that the entire operation of the plant is highly satisfactory to the company; when further records have been completed they will be made the subject of a later announcement.

FIG. 7. WASHERY BUILDING

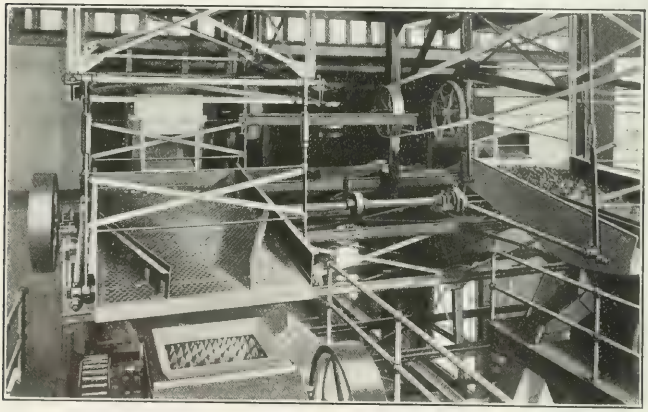


FIG. 6. INTERIOR OF CRUSHER BUILDING SHOWING SCREENS AND ROLL CRUSHER

During the year 1906, only 11 per cent. of the fatal accidents in West Virginia mines were due to explosions, while over 66 per cent. were caused by falls of roof and coal. These figures are approximately true over a period of 30 years in this coalfield. Because the more recent mine disasters were of such magnitude and were attributed to dust explosions, they have attracted much attention, but the fact remains that during most years, a far larger percentage of accidents must be attributed to roof falls. Bearing these figures in mind, the proposed free use of water as a preventive of dust explosions, while more or less effective in this direction, may add greatly to the already high percentage of deaths from roof falls.

Combustion of Coal upon Grates*

By E. G. Bailey†

The heat balance of a boiler test as given usually includes the following distribution of the total available calorific value of the coal: (1) heat used for evaporation of water in boiler; (2) loss due to latent heat in moisture formed from the combustion of coal; (3) loss due to products of combustion, or sensible heat of gases produced exclusive of excess air; (4) loss due to air excess, or sensible heat of unused air leaving boiler; (5) loss due to unburned gases, consisting of carbon monoxide, hydrogen and hydrocarbons; (6) loss due to unburned coal or coke dropping into the ash pit or passing through flues or up the stack; (7) loss due to radiation from boiler setting and absorption by brick setting.

The relative magnitude of the losses depends upon the kind of boiler, furnace, rate of combustion, and method of firing. The results recently determined from 18 evaporation tests on a 200-h.p. return tubular boiler, hand fired, give some idea of the relative importance of the various losses as they occur in a stationary plant.

The average of the above tests is as follows:

DISTRIBUTION OF HEAT IN 200-H.P. STATIONARY BOILER PLANT.

	Per cent.
1. Heat used for evaporation......	66.7
2. Loss due to latent heat.........	2.7
3. Loss due to products of combustion	8.5
4. Loss due to air excess..........	8.5
5. Loss due to unburned gases.....	0.8
6. Loss due to unburned coal......	2.4
7. Loss due to radiation and absorption	10.4
Total heat....................	100.0

The extent to which the losses may be reduced is dependent upon the kind of coal, method of firing or supply of coal and air, conditions under which combustion takes place, and extent and conditions of heat-absorbing surface. The amount of gases produced from the combustion varies almost directly with the calorific value of the coal, so that the percentage of loss due to this factor is practically constant except for variation in the flue temperature. The temperature depends upon the rate of combustion, area of boiler heating surface and cleanliness of the same.

Air Excess

This loss is one of the greatest importance, for it causes a loss of 30 per cent. or more. It not only carries away sensible heat, but reduces the furnace temperature, thereby reducing the efficiency. This loss may be affected to some extent by the character and quality of coal burned. A non-coking coal generally lies closer together and is less apt to allow holes to burn in the fire than a coking coal; also the formation of clinkers causes the air to pass through the fire in streams, thus causing high velocity in certain parts. The fireman is largely responsible for the loss due to air excess because he does not keep the fire to the proper thickness for the draft, or he may fire the coal unevenly, allowing holes or thin spots to form.

The best method of determining the extent of this loss is by analyzing the gas leaving the boiler. This is usually done with the Orsat apparatus, but the automatic continuous recording CO_2 machines now on the market make it much easier for the fireman to keep his fire in good condition, and the effectiveness of his work is permanently recorded. One per cent. of CO_2 means about 20 per cent. air excess, or 2 per cent. loss under average conditions. The air excess as determined at the uptake from a boiler or at the bottom of the stack does not always show what the fireman is doing, as the air leaking through cracks in the brickwork, around clean-out doors and even the porosity of the brickwork is often as great as or greater than the excess air passing through the furnace.

Unburned Gases

Usually the analysis of flue gases gives the carbon monoxide as the only unburned gas, but there are undoubtedly other gases of higher calorific value than CO that are not completely burned. With the CO_2 about 10 per cent., the loss due to 1 per cent. of CO means about 5. per cent. of the calorific value of the coal. Under the same conditions, 1 per cent. of CH_4 means a loss of 16 per cent., and 1 per cent. of C_2H_4 causes a loss as great as 30 per cent. These and other hydrocarbons are very likely present in many furnaces where conditions are not favorable to complete combustion. Smoke is an indication that these losses are occurring to a greater or less extent, but a smokeless stack does not necessarily indicate complete combustion.

---

*Abstract of a paper read before the Boston Society of Civil Engineers, December 18, 1907.

†Chief of coal department, Arthur D. Little Laboratory, Boston.

An internally fired boiler is the most extreme case of violating the laws governing economical combustion with bituminous coals. It is practically impossible to prevent smoke under such circumstances, as some of the burning gases are extinguished by the lowering of temperature when the flame comes in contact with the water leg or enters the tubes.

Gas coal can be burned without smoke if the laws of combustion are properly considered and the furnace constructed so that they can be carried out. I had occasion to spend a month at a copper smelter in northern Michigan some years ago and there saw a case of complete smoke prevention. A reverberatory furnace 30 ft. long and 17 ft. wide smelted ore with the heat from a grate 8 ft. long and 11 ft. wide, separated from the hearth by a bridge wall only. Gas coal was burned containing about 35 per cent. of volatile matter. The method of firing was to put in 80 to 100 shovelfuls at hourly intervals. This is equivalent to firing 25 to 30 lb. of coal per square foot of grate per firing. A secondary air supply above and in the bridge wall gave perfect conditions for smoke prevention as the right amount of oxygen had plenty of time for thorough mixing in the furnace, in which a temperature of about 2400 deg, F. was maintained.

Had a steam boiler taken all of the products of combustion from the furnace, the boiler efficiency would probably not have been very high for a larger amount of heat would naturally be radiated from so large a firebrick combustion chamber. However, it is evident that complete and smokeless combustion can be obtained by applying the Dutch oven principle to the boiler furnace. Many hand-fired and stoker-fired furnaces are being used with a great deal of success so far as smoke prevention is concerned by making use of this feature in furnace construction. The more rapid the mixture of the oxygen and volatile gases, the shorter need be the firebrick combustion chamber, for the length of flame from various coals depends more upon the rapidity of mixture than it does upon the per cent. of volatile matter contained in the coal. The flame from anthracite coal and coke often extends 40 ft. from the bed of fuel.

The volatile matter is driven off from coal very rapidly after it is spread over an incandescent bed of coals. Some experiments were once made to determine the rate at which the gases were given off and the rate of generation of heat when coal was fired. A gas coal developed 30 per cent. of its total heat during the first five minutes and the volatile was reduced from 36 per cent. to 15 per cent. A semi-bituminous coal developed 15 per cent. of its heat during the first five minutes and the volatile was reduced from 20 per cent. to 11 per cent. At the point of maximum liberation of volatile from the gas coal it was developing 1000 B.t.u. per minute. From these data the great variation in air required for complete combustion can be realized, and it is very doubtful whether there can be sufficient oxygen present at the critical time when coal is fired intermittently. The more uniformly the coal is supplied, the better the opportunity for complete combustion.

UNBURNED COAL

In a stationary plant this loss is confined almost entirely to the coke or partly burned coal passing into the ash pit or drawn out the fire door with the ashes and clinkers. It varies with the opening in the grate, also with the per cent. of ash in the coal. The higher ash coals require more slicing and more frequent cleaning, and as the loss of partially burned coal varies with the working of the fire, it would naturally be greater. Some kinds of mechanical stokers are very wasteful in this respect unless careful attention is given to the part of the grate where the ashes fall off or are dumped intermittently. This loss from a chain-grate stoker amounted to 16 per cent. in one test. In a locomotive the partially burned coal drawn through the flues is a very great loss; in some cases it was found to exceed 20 per cent. of the heat value of the coal.

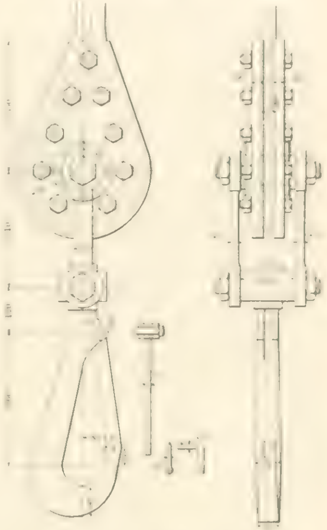
RATE OF COMBUSTION

With the same difference in draft below and above the bed of fuel the rate of combustion varies with the proportion of volatile matter in the coal; the character of coal, whether coking or not; and upon the amount and nature of the ash. In a high-volatile coal a large per cent. of its weight is driven off regardless of the flow of air through the bed of fuel. A coking coal gives less area of opening through the fuel bed. Ash that does not clinker apparently reduces the rate of combustion little. However, if this ash fuses at a comparatively low temperature, the clinkers formed reduce the amount of air passing through the grate by reducing the effective grate area by an amount equal to the area covered by the clinker. The more plastic the clinker the greater is this reduction in the rate of combustion, which is sometimes 50 per cent. within 8 hr. after the fire has been cleaned.

Hoisting-rope Connection

In the February *Bulletin* of the Societé de l'Industrie Minérale, G. Beuret gives a number of details of operations in connection with the sinking of the Sancy shaft. The hoisting rope was composed of six strands of 19 No. 12 steel wires. Its total diameter was 27 mm., its weight was 2.58 kg. per meter, and its breaking strength was about 34,000 kg., affording a safety factor of 9.65 at least.

W[illegible] sary to recap the hoisting end every month, but after fitting on the arrangement described below, the feature of which was the large radius of curvature around which the rope was bent, it was found unnecessary to cut and recap the end oftener than once in two months.



HOISTING-ROPE CONNECTION
Dimensions in Millimeters

The apparatus consisted of two sheet-iron plates, 30 mm. thick, put face to face, with their adjoining edges rounded to receive the rope. The radius of curvature was 150 mm. After putting a loop of the rope around the groove, the two plates were firmly drawn together by nine bolts. The [illegible] of the plates [illegible] carry a pin, from the outer ends of which were suspended two links 20x50 mm. The [illegible] hook, free to turn in the yoke. A great degree of freedom was thus secured for the hook in reference to the rope.

The hook was also a recent device. In the hook used previously the safety pin was not held at its lower end by a cotter, but [illegible] attached to the hook shank. The spring [illegible] pin to rattle and become unsafe.

Colliery Notes

The English Royal Commission on "safety in mines" has decided that the only breathing apparatus practical for rescue work is that of the regenerator type.

Tests have shown that steam jackets are useful for slow revolution, but not for quick revolving engines, and their efficiency is doubtful when applied to triple or quadruple expansion engines.

A Davy lamp used without a shield ceases to be safe in an explosive current when the velocity exceeds 5 ft. per sec. A Clanny lamp is unsafe in an explosive current which exceeds a velocity of 10 ft. per second.

Hydraulic wedges and hydraulic cartridges are both effective as a means of gaining coal without the use of powder. Only a comparatively small amount of water is necessary; 1½ pints for one operation, the resulting pressure being 3 tons per square inch.

Twenty-seven coal companies of Lancashire and Cheshire, England, have united in the establishment of a place in which men can be trained in the use of life-saving apparatus. It is hoped that before long all the coal companies in the district will be united in this work.

The depreciation of water softening plants is an item worth consideration. Wooden tanks depreciate rapidly, and unless their first cost is much lower than steel, they should not be used. With reasonable care steel tanks do not show more than 5 per cent. depreciation per year.

The advantages gained by the use of pulverized coal in furnaces are: (1) complete combustion without excess of air and resulting high temperature; (2) no expensive stoker machinery to be kept in repair; (3) the possibility of using cheap and fine fuels that cannot be used in ordinary furnaces.

Horizontal suction pipes if of considerable length, should be larger than vertical suction pipes in order to overcome the friction between the water and the pipe. They should also be uniform in grade to prevent the formation of air pockets, and all bends should be of large diameter. Every suction pipe should be equipped with a strainer to prevent débris lodging under the valves.

In boilers which have riveted seams exposed to the action of the fire, cracks caused by the unequal expansion of the metal often result, and generally extend from the rivets to the center of the plate. This cracking can be temporarily repaired by drilling a hole in the extremity of the crack, thus drilling out the crack, then, if the fracture is less than 3 inches long a wrought-iron gas plug may be inserted in the hole. There the cracks are of greater length, the best method is to put in a new plate.

The life of wire ropes is largely dependent on good or bad management. Where ropes are kept in stock they should be placed on a raised platform of planking and covered with brattice to prevent oxidation, rust and corrosion. Every care should be taken to keep them free from damp and dirt. Careful estimate should be made of the work the rope is required to perform so as to decide the kind of rope required, the size, weight and strength. The factor of safety should not exceed one-tenth of the breaking strain.

Some idea of the density of the vegetation that formed the present day coal beds and the time required for their formation, may be obtained from the fact that it has been estimated that 100 tons of vegetable matter, the amount produced per acre per century, if compressed to the specific gravity of coal and spread over an acre, would form a layer less than 0.6 of an inch thick; four-fifths of this would be lost by the evolution of the gaseous products, therefore, the resulting accumulation per century would be ⅛ of an inch or one foot in 10,000 years.

Much of the strength and efficiency of mine timber depends upon the method of storage. All mine timbering should be stored in alternate layers upon a platform of narrow boards, just sufficient to keep the bottom layer of props off the ground. Upon these boards place a layer of timber, then another layer at right angles above the first layer. Build up the pile in this manner for 5 or 6 ft. and as there is a clear air space between each layer, the wind can percolate through the space between and so keep the props in a dry condition, which is essential to maintain good results.

Recent surveys of the nation's coalfields indicate an area for the more accessible coals of 327,000 square miles. This is four times the area of the known coalfields of the rest of the world. In these vast coalfields, the nation has available nearly 2000 billion tons of coal, mineable under present conditions, or twice the tonnage estimated for the rest of the world. It is therefore evident that America's fuel supply is so great as to render immediate alarm unnecessary; however, if the present phenomenal rate of increase in consumption is maintained, the supply of easily and cheaply mined coal will be gone before the middle of the next century.

The new English fuel, coalite, is the residue produced by subjecting coal to partial distillation. It is practically smokeless, capable of producing sufficient heat for household purposes with a minimum of dirt and ash. It requires less attention while burning than does coal, it ignites readily and insures clean flues, burns with a cheerful glow, and is said to be more economical, radiate more heat and deposit less soot than coal. It is formed by distilling coal at a low temperature; this distillation removes all volatile smoke-producing matter without burning away the carbon. The process does not break down the hydrocarbons. Most of the calorific value of coalite is converted into sensible heat.

Lime cartridges are often used in Europe in powderless mining. Pure carbonate of lime ground to a fine powder is made up into a cartridge 3 to 4½ in. long with a groove ½ in. in diameter on one side. An iron tube ½ in. in diameter, and perforated on the upper side, is inserted the whole length of the bore hole. This tube is inclosed in a calico bag which covers the perforations and one end of the tube, the other end is fitted out with a tap. The cartridges are then pushed to the back of the hole drilled for them and tamped as if they were gun powder. A small force pump is connected with the tap at the end of the tube by means of a short flexible pipe, and water equal in bulk to the quantity of lime used, is forced in. The water escapes through the perforations as it passes along the groove and the lime in the cartridge is saturated, the tap is closed, steam is generated and the combination of generating steam and expanding lime brings down the coal.

A new safety fuse which has given good results in French mines and has proved of material help in reducing the number of misfires, aims to ignite the blasting charge along its whole length by means of a leaden detonator tube charged with tri-nitrotoluene. This substance is not very sensitive to external conditions and the fuse is safe to handle. The ignition is caused by a detonator composed of one gram of fulminite. Tests have shown that 28 in. of fuse can be ignited safely in an explosive atmosphere; ignition of the gases occurring only with a length of 6½ ft. of fuse. As the shorter length is more than sufficient to fire 1 lb. of explosive, it is claimed that this fuse can be used in fiery mines without risk. With the narrow fuse, as much as 10 yd. could be ignited without setting fire to the gas. This detonating tube is said to have the following points of superiority over the ordinary method. It enables the use of certain high explosives, such as mixtures of ammonium nitrate and napthalene, that have hitherto been unsuitable on account of the difficulty of insuring satisfactory detonations; it also enables slow powders to act as high explosives and thereby removes the only obstacle in the way of their use in safety explosives. Furthermore, it seems probable that this fuse will permit ammonium nitrate to be used as a blasting charge. Another advantage claimed is that the detonator being outside the shot hole, can be replaced with less risk in event of a misfire.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec'y
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of The Engineering and Mining Journal.

Our circulation for June, 1908, was 41,000 copies.

July 4	16,000
July 11	9,500
July 18	9,500
July 25	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
Consumption of Copper in the United States in 1907 187
The Resumption at Cananea 188
A New Precedent in the Conferring of Degrees 188
Reform in the Comstock Mining Companies 188
*On Horseback in Western Chihuahua *Mark R. Lamb* 159
Electric Smelting Tests in California *Special Correspondence* 164
Transvaal Stope Drill Competition 164
Cost of Producing the World's Supply of Copper *James Ralph Finlay* 165
Short Talks on Mining Law—V *A. H. Ricketts* 168
Separation of Silica and Alumina in Iron Ores 168
*Lead Mining at Mechernich, Prussia. *Lucius W. Mayer* 169
Profit Sharing in the Comstock Mines *Special Correspondence* 172
*The Cochiti Mining District, New Mexico *Percy E. Barbour* 173
The Development of the Delprat and Potter Flotation Process *W. R. Ingalls* 175
The Hancock Jig at Palmerton, Penn. 175
*Atlanta Gold District, Idaho *Robert N. Bell* 176
Heating of Conductors by Electric Currents *Sydney F. Walker* 177
Determination of Lead in Spelter and in Ores *Eric John Ericson* 178
Transvaal Notes *Special Correspondence* 180
Dominion Iron and Steel Company 180
Cornish Tin Mining *Special Correspondence* 181
An Automatic Ore Sampler 181
Anti-Débris Action in California. *Special Correspondence* 181
*A Modern Coal Washery in New Mexico 182
Combustion of Coal Upon Grates. [illegible] 184
*Hoisting Rope Connection 185
Colliery Notes 186
Justice for the Miner in Timber and Mineral Land Decisions 189
Sampling and Buying Ore in the Joplin District *Evans W. Buskett* 190
Patents 191
Personals, Obituaries, Societies and Technical Schools 193
Special Correspondence 194
Mining News 196
Markets, etc 202
*Illustrated.

Consumption of Copper in the United States in 1907

[illegible] copper in 1907, these statistics representing the production of the smelters, and corresponding substantially with the production of the mines. We pointed out in the discussion that those statistics represented the metal shipped from the Western smelteries during the year ending Oct. 31, or even earlier, and not the amount of metal turned out by the refiners in final marketable form. We now give the production of refined copper in the following table:

Kind	Pounds
Lake	220,417,000
Electrolytic	844,441,000
Casting	47,857,890
Pig, exported	40,032,000
Total	1,152,747,890

This table includes not only the copper from ore, both domestic and foreign, but also the amount of old copper re-entering the market by the refining of scrap and other waste products and junk. The total amount of this old copper was in round numbers 39,350,000. This was treated not only by the smelters who make it their sole business to rework such material, but also by nearly all of the refiners, whose chief business is the refining of blister copper. The latter refiners pass the old material through the same kind of treatment as the new, and out of it produce both electrolytic and casting copper of virgin quality. Pig copper, low in gold and silver, from Arizona, California and Tennessee is also marketed as casting copper.

In the refining of blister copper, a portion thereof is recovered and marketed in the form of bluestone. In 1907 the refiners produced 34,550,000 lb. of bluestone, equivalent to about 8,300,000 lb. of copper. Adding this to the production of refined copper, plus the pig copper exported, the total is 1,161,047,890 lb. Deducting 39,350,000 lb. derived from old material, the production of refined copper and the copper content of bluestone in 1907 was 1,120,097,890 lb. This total is not very different from the total of the production of the mines of the United States, viz., 870,241,766 lb., plus the imports of copper in ore and matte (60,022,415 lb.) and the imports in pig and scrap (192,001,267 lb.). These figures give a total of 1,132,705,448 lb., which must be diminished by [illegible] copper imported into the United States.

The stock of copper on hand at the re- [illegible] determine precisely. For obvious reasons, the refiners are reluctant to disclose the whole truth respecting their stocks, [illegible] lished for six months later. On the basis of reports, which we know to be reliable, accounting for a fairly large portion of the stock on hand, and estimating the remainder, we compute that the amount of refined copper on hand at the end of 1907 was about 120,000,000 lb., of which 80,000,000 lb. was electrolytic and casting copper, and 40,000,000 lb. was Lake copper. In comparison with the production, the stock of Lake copper was proportionately much greater than the stock of electrolytic. These statistics do not include the metal in process of treatment at the refineries.

The United States imports a small amount of refined copper. Of course the importation of refined copper into the United States is like carrying coals to Newcastle, but there are times, such as occurred in the spring of 1907, when a species of arbitrage transactions may show a profit. In this way the United States in 1907 imported some "best selected" copper from Great Britain, some casting copper from Japan, and reimported some American electrolytic copper from Japan and China. In the aggregate these imports may have amounted to 5,000,000 lb. (No precise statistics are available.) The exports of copper from the United States in the form of pigs, bars, plates and cathodes amounted to 508,920,401 lb. With these data the domestic consumption is computed to have been about 538,000,000 lb., as appears in the accompanying table.

	Pounds
Stock, Jan. 1, 1907	[illegible]
Imports of refined	[illegible]
Production	[illegible]
Total supply	[illegible]
Exports	[illegible]
Remaining in U. S.	[illegible]
Stock, Dec. 31, 1907	[illegible]
Domestic consumption	[illegible]

In previous years our estimate of the [illegible] and exports, the production of the do- [illegible] per in first hands, including copper in transit and in process of refining, the lat- [illegible] last quarter of the year, reckoning Lake copper as being in transit an average of 20 days, and blister copper in transit and process of refining an average of about 60 days. Computing in this way, the total stock at the end of 1907 was 221,260,000 lb., and the consumption of copper in the United States was 531,510,118 lb. This figure is not very different from the consumption computed on the basis of the refined copper as above. The basis of refined copper is without doubt the more accurate. It is to be remarked that this is the first time that any attempt has been made to base the statistics of consumption on the production of refined copper including material derived from scrap, and consequently there are no corresponding figures for 1906 with which comparison may be made.

We received reports from most of the refiners covering the first eight months of 1907. Comparing those returns with the returns for the full year, it appears that there was no great reduction in the output of refined copper during the last quarter of the year. The mines had curtailed their production, but because of the copper in transit and in process of refining, the refiners had to keep on at about the same rate as previously, the result of which was, of course, a great accumulation of stock. This throws considerable light upon the situation in the market at the beginning of 1908. It was not until after the end of 1907 that the refiners were able to restrict materially their output.

The Resumption at Cananea

A noteworthy event was the resumption of work at Cananea on July 11. It required a good deal of nerve on the part of the management to suspend operations and practically disband the organization of a great mining camp, but, as it is always easy to say after such a step has been taken, it was the correct and obvious thing to do. The future of the Greene-Cananea company depends upon its ability to produce copper at a much lower cost than heretofore. By the introduction of improved methods of mining and the modernization of the smelting works, the management now expects to be able to compete successfully with the other big copper-producing companies. The management of the Greene-Cananea company is of the ablest character, and we have no doubt that its present expectations will be largely realized.

However, in this connection, it is only a matter of simple justice to refer to the previous management of A. S. Dwight. Memory is short and the glorious sun of yesterday is forgotten in the brilliancy of today's, just as the old cry used to be, *"Le roi est mort, vive le roi!"* Mr. Dwight fully recognized the glaring defects of the Cananea practice and was making rapid progress in correcting them, though greatly hampered by adverse conditions other than technical that finally led him to tender his resignation, which adverse conditions were subsequently eliminated. However, it was he who introduced the caving method of mining, that has been of immense importance at Cananea, and inaugurated other economical systems of operation which have been ably carried out by the present management. It is, moreover, fair to remark that his management was coincident with the only period in the history of this great property when dividends were continuously earned and paid.

A New Precedent in the Conferring of Degrees

Lehigh University during its 45 years of existence has granted only four honorary degrees, namely, two doctorates of science, the first to Dr. Rossiter W. Raymond in June, 1906, the second to Dr. Arthur Arton Hamerschlag, director of the Carnegie Technical School, of Pittsburg, on Feb. 22, 1907; and two degrees of master of science, the first in June, 1907, to the eminent electrical engineer, L. B. Stilwell, of New York, a graduate of Lehigh's electrical course in 1885, and the second to Horace Field Parshall, who has made so great a name for himself as an electrical engineer in England, although he is an American. Mr. Parshall is a graduate of Lehigh's electrical course in 1887. His new degree has been conferred under circumstances which constitute a precedent; it may be called the granting of a degree under power of attorney.

Last June the board of trustees of Lehigh University voted to confer upon Mr. Parshall the honorary degree of master of science, but important duties before a parliamentary commission in London made it impossible for him to come to this country to receive the degree. Through the interest of Sir William Ramsay, a special congregation of the University of Liverpool was held for the purpose of the admission of Mr. Parshall to the degree of master of science on behalf of Lehigh University. The University of Liverpool was given a power of attorney over the seal of Lehigh University, duly attested, authorizing it to confer this degree. When the matter was brought to the attention of A. W. W. Dale, the vice-chancellor of the University of Liverpool, it impressed him favorably, and in a letter to Dr. Drinker, president of Lehigh, he wrote: "So far as I am aware, no precedent or parallel for such an act can be found in the history of British universities. But it is our business to make precedents as well as to follow them, and we trust in so doing our act will be regarded as an expression of fellowship and sympathy with kindred institutions carrying on similar work."

Reform in the Comstock Mining Companies

In the Journal of July 11, one of our correspondents related how an experienced mining man of Pennsylvania, who recently secured a controlling interest in several of the Comstock mines, has stirred things up in the San Francisco offices of those companies. He suggested that salaries should be largely reduced and other reforms instituted, which suggestion "met with the unanimous approval of the directors of the several companies affected." This was certainly kind of them. They have not been so receptive of economical ideas during the many years that such have been suggested by minority stockholders and the mining press. However, our correspondent illuminates the situation when he says that the new interest expects to make money by mining, and not in the San Francisco offices. It is to be hoped that a real reform is now to be instituted upon the Comstock, where for many, many years operations were a scandal.

The Index to Volume LXXXV of the Engineering and Mining Journal is sent out as a supplement with the present issue. It is, as usual, a complete guide to the varied contents of the past volume. Subscribers who do not receive this index are requested to notify the office promptly.

Justice for the Miner in Timber and Mineral Land Decisions

An important decision of Secretary of the Interior James R. Garfield, in the latter part of May regarding the inspection of mineral lands by Government agents affects the mineral interests of the West. A conference was called at the suggestion of Lewis E. Aubury, State mineralogist of California, including the following men: Chief Forester Gifford Pinchot, Commissioner of the General Land Office Fred Dennett; Director Smith, of the U. S. Geological Survey; F. H. Newell, Director of the Reclamation Service; and L. E. Aubury.

The first matter considered was the patenting of mineral claims in forest reserves. Mr. Aubury stated that cases had been brought to his attention in which patents had been applied for mineral lands in the reserves, and that the owners of the claims had asserted that forest assistants who were not qualified to pass upon the mineral character of the lands had turned the applications down. Without questioning the truth of these claims, he admitted that the forest service had sufficient cause for looking with suspicion upon many applications for mineral patents, particularly where a fine growth of valuable timber was found on the ground. He was of the opinion, however, that in some cases, overzealous forest assistants had worked a hardship upon legitimate miners by refusing to report favorably upon their applications.

Another point raised by Mr. Aubury was that while forest officers were probably capable of administering the affairs of the service in forest matters, and occasionally such officers might possess a practical knowledge of mining, there were many who were not qualified to make a mine examination. The adverse opinions rendered by some of these forest officers had aroused an antagonistic sentiment toward the Forest Service from certain directions, and it was with a spirit of assisting Mr. Pinchot in his work and to preserve the friendly interest of the miners in forest work that the suggestions referred to in the following paragraphs were made.

Ignorance of Special Agents

In regard to the matter of reports of examinations made by special agents of the General Land Office on mineral lands, Mr. Aubury contended that these agents, with but few exceptions, were entirely ignorant on the subject of what constitutes mineral land, and said that Eastern men who, even if they did have some knowledge of mining, when sent West to report on mineral conditions, were dealing with conditions entirely unknown to them.

"Give us practical men to report upon conditions, and appoint them from the State or Territory where examinations are to be made, and I believe there will be no further trouble," he said. "Occasionally it may be found that the appointment of local men may not prove to the best interests of the Government, but on the whole, much greater progress would be made, and a fairer adjustment of controversies between the miners and other claimants would be obtained."

In the complaints made to the State mineralogist by many miners, it has been asserted that Government agents had refused to consider as mineral ground any which did not show pay ore practically from the commencement of development. The injustice of such a decision against the miner is apparent to anyone having mining experience, for in probably 90 per cent. of the mines which have been opened in the West, thousands of dollars have been expended in development before ore in paying quantities has been discovered. "Were such a decision to be upheld," said Mr. Aubury, "we might as well quit mining. In many districts, and particularly in Nevada, there are bodies of ore far below the surface, which show no sign of mineral on top. It is necessary for the miner to sink expensive shafts and crosscut before these orebodies can be uncovered. But Nevada is extremely fortunate in that there are no valuable growths of timber upon the surface; neither are there small portions of the ground upon which a few vegetables might be grown, thus giving an opportunity to file scrip, timber, homestead or agricultural entry upon the miners' ground. In California, conditions are different; likewise, in a few other western States; but while the Government applies one rule to Nevada, Arizona, or Utah, this ruling is not observed in other western States."

Mr. Aubury also called the attention of Commissioner Dennett to the action of homestead entries on mineral ground, particularly to those entries which had been made upon the ancient river channels of California, the chief source of placer gold.

Injustice of Some Decisions

Special agents had reported favorably on homestead entries against the miner, in spite of the decision of Secretary Garfield made in May, 1907, in favor of the miner. The courses of these channels are plainly marked. Their surfaces are covered with lava and entirely unfit for cultivation or grazing in most instances. They carry large volumes of water, and it is necessary for the miner to run long and expensive bedrock tunnels to tap the gold-bearing gravel; yet homestead and other entries have been filed upon and over the miners' claims, while they were prosecuting work upon their tunnels endeavoring to reach the gravel. Until such tunnels had pierced the gravel, the miners could not prove to the satisfaction of the special agents that their land was mineral, and notwithstanding the good faith shown by the miners, decisions have been made against them.

Mr. Aubury cites one case in which upward of $80,000 had been expended by the miner in running a long bed-rock tunnel; he was prosecuting work upon it when a timber and stone entry was filed over his claims. Thanks to Secretary Garfield, his decision reversed that of the then commissioner of the General Land Office, who had decided in favor of the timber and stone entry.

[illegible] against the miner can be found in our Western States and Territories, and this has been brought about by the misinterpretation of the laws by special agents, who, in the opinion of Mr. Aubury, were not qualified to pass upon the lands in controversy; and it was the reports made by these agents that caused most of the trouble between the miners and the different departments at Washington.

[illegible]

Mr. Aubury suggested to those attending the conference, that he believed the remedy for these conditions might lie in the appointment of practical mining men, to be selected from the different States and Territories where controversies existed, to make the necessary examinations. This suggestion was adopted by the conference, and it was decided that a special corps should be selected to act under the direction of the Secretary of the Interior, such appointees to be available for service to report on cases both for the Forrest Service and the General Land Office. Secretary Garfield and the heads of the different departments showed great interest in the matter, and it is believed that earnest cooperation will be given toward a peaceful and satisfactory solution of the problem. "I believe that the Secretary will do all in his power to see that the miners secure a 'square deal,'" said Mr. Aubury. "While there have been some complaints against the Forest Service, I am satisfied that Mr. Pinchot will see that the evils are rectified if the facts are placed before him. The affairs of the General Land Office also promise, under the direction of Mr. Dennet, the new commissioner, to give the miner an even chance, something he has not had under some former administrations."

A Correction

In the article on "Ore Contracts from the Smelters' Standpoint," by Clarence A. [illegible] confusing and erroneous statement appears under the diagram on page 74. The sentence, "Fig. 3 covers the same conditions except that the ore contains 22 per cent. lead," should read, "Also tracings representing the same conditions except that the ore contains 22 per cent. lead."

Sampling and Buying Ore in the Joplin District

By Evans W. Buskett*

The system of buying ore in the Joplin district is full of advantages to the mine operator, especially to the operator with but little capital, for in no other mining district can such quick returns be realized from the ore. Often ore that is mined and milled Saturday morning is bought, loaded, sampled, assayed and paid for by Saturday night.

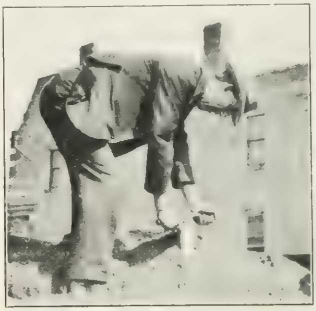
There has been no evolution in the system of buying ores during the last 15 years and a tightening of the lines between the miner and smelter are apparent. In the early days of the district the ore was bought on a flat bid. None of the smelters employed a chemist in the ore-buying office and few had one at the smelter. The whole business was run by guess. Every week the jack-buyer visited the mines, looked at the ore and made an offer for it. The price ranged from $15 to $18 per ton. If the ore was bought, as soon as the buyer was out of sight the seller brought out a hose and a stream of water was turned into the bin until the ore was saturated. More or less of this water remained to be weighed and paid for as ore. The ore was shipped to the smelteries where the methods were equally lax. But during the last 10 years there have been noteworthy improvements.

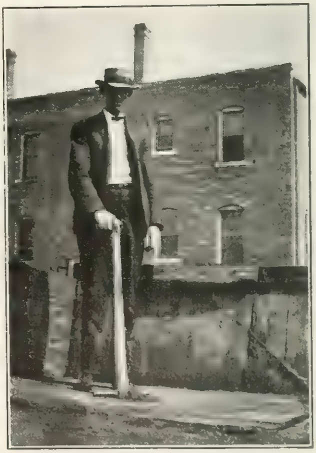
The ore is now bought on a basis of 60 per cent. zinc with a dockage of $1 per unit for iron over 1 per cent. Some buyers make a similar deduction for lead and lime. A premium of $1 is paid for each unit of zinc over 60, and for each unit below 60 a deduction of $1 from the basis price is made. Thus if an ore carries 59.7 per cent. zinc and 3 per cent. iron it would be docked $2.30 and the price on a $40 basis would be $37.70. Nearly all buyers now determine the actual moisture on a sample taken from the car.

The jack-buyer has a more or less regular program which he follows every week. Monday he does his bookkeeping, loads any ore that was left out the week before, and makes settlements for it. Tuesday afternoon and Wednesday he is taking samples and having them assayed. He is also keeping his eyes and ears open to find out how the market will be. He tries to find the basis price that other buyers are expecting to pay and in every way aims to learn the amount of competition he will have. Thursday morning he calls up his customers on the telephone and makes his bids; if he is lucky he gets the amount of ore his company has ordered him to buy and withdraws from the market. More often, however, he fails to get his supply on account of higher bids. In this case he must take more samples and the assayer has his hands full of rush work, especially if the order is large.

As soon as the first ore is bought the teams begin to haul and the ore is loaded as fast as possible. Some buyers buy on a flat bid, making the price on the ore according to their assay. Others make a basis price and settle for moisture and metallic content on a car sample.

The sampling is done with a horn or "gun." This is an instrument made of sheet iron. It tapers from about 4 in. at the large end to 1½ in. at the small end. The handle is at the large end and is made of a piece of split pipe.


TAKING THE SAMPLE


SAMPLING HORN OR "GUN"

In using this sampler it is grasped by the handles and driven into the ore. It is then loosened and with a quick upward jerk, followed by a heavy downward push, it is driven further into the ore. This pumping action is continued until the bottom of the bin or car is reached. In this manner a bin 4 ft. deep may be sampled with a gun and a fair sample of the ore from top to bottom secured. When the gun has been driven to the bottom it is pulled out of the hole and inverted over a cloth or clean board.

In sampling a car at least 18 samples are taken, which are then mixed on a cloth and two screw-top cans, holding about 2 lb., are filled. One of these cans is taken by the miner, who is generally present at the sampling, and the other by the buyer. They are taken to their respective assayers, who determine the moisture, zinc, iron, etc. This is called a split sample.

The difference of assays on split samples has been responsible for a system of split pulps which is growing in popularity. In this case the buyer and miner take one of the cans to an assayer who dries the sample and grinds it to a pulp. The pulp is then thoroughly mixed and divided, each party taking a few ounces for assay. The other can is divided and run for moisture by the respective assayers, or the moisture determination made by the assayer who splits the sample is accepted. This is the most satisfactory method of sampling that has been used in this district and is perfectly fair to both parties. There is seldom any important difference in the assays of the split pulps, whereas where the split sample is taken there is often a difference of over 1 per cent. in the zinc content as assayed by the two chemists. There is seldom any difference in the moistures on a split sample.

It is likely that in a few years the ore in the Joplin district will be bought and sold on an umpire system similar to that in use in the West. Already some of the smelting companies have developed such a system and are making contracts for ore five years ahead with a regular system of sampling and settling.

Two of the smelting companies buying ore in this district have adopted a system of sampling and assaying ore which seems to handle the matter very well indeed. Three samples are taken from the car and put into air-tight cans. One of these cans is taken by the seller, another by the buyer and the third is filed away for reference. If the assays on the two cans of the buyer and seller do not agree, the third can is taken to an assayer mutually agreed upon and assayed by him. The settlement is made on the middle assay of the three. This method has so far proved very satisfactory to all parties concerned and will no doubt come into general use. The buyer for one of the companies using this method has stated that it saves much time and trouble in settling, and that, after several months of trial it has been found that the middle assay corresponds very closely with the results obtained in sampling and assaying the ore at the smelter.

---

*Metallurgical engineer, Rolla, Mo

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

SOLDERING FLUXES. Improvements in and Relating to Fluxes for Aluminum Solders. Harry D. Willey, Bloomfield, Neb. (Brit. No. 15,943 of 1907.)

CEMENT

MANUFACTURE. Improvements in the Manufacture of Cement. Sherard O. Cowper-Coles, London, S. W., Eng. (Brit. No. 10,366 of 1907.)

COAL AND COKE

BITUMINOUS COAL BURNING. Process for the Treatment of Bituminous Coal to Render it Practically Smokeless when Burning, and for the Recovery of By-Products Therefrom. Walter Dixon, Glasgow, Scotland. (Brit. No. 10,804 of 1907.)

COAL WASHER JIGS. Mechanism for Controlling the Gates of Coal-Washer Jigs. William M. Duncan, Alton, Ill. (U. S. No. 891,610; June 23, 1908.)

COAL-SCREEN. Frederic S. Converse, Lyons, N. Y. (U. S. No. 892,406; July 7, 1908.)

COAL TIPPLE. Steam Tipple. Freeman R. Willson, Jr., Worthington, Ohio, assignor, by mesne assignments, to Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 890,321; June 9, 1908.)

COAL TIPPLE. Ross M. Bickley, Pittsburg, Penn., assignor to Heyl and Patterson, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 891,760; June 23, 1908.)

COKE OVENS. Apparatus for Coke Ovens. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 891,355; June 23, 1908.)

COKE EXTRACTOR. George B. Foust, Masontown, Penn. (U. S. No. 802,042; June 30, 1908.)

COKE-OVEN APPARATUS. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 891,850; June 30, 1908.)

COKE QUENCHING—Machine for Quenching Coke. Paul H. Douglas, Cleveland, Ohio, assignor to the Wellman-Seaver-Morgan Company, Cleveland, Ohio. (U. S. No. 892,032; June 30, 1908.)

CONVEYING APPARATUS—A New and Improved Conveying Apparatus for Use on Slides for Transporting Coal in Mines. Josef Parusel, Laurahütte, Germany. (Brit. No. 25,613 of 1907.)

CONVEYING APPARATUS. Improvements in or Relating to Combination Carriages and Conveyors for Coal. Gardner Inglis & Co., Ltd., Lanarkshire, Scotland. (Brit. No. 3470 of 1908.)

DISTILLATION of Coal and Other Carbonaceous Substances. Thomas Parker, London, W., Eng. (Brit. No. 1972 of 1907.)

GRINDING APPARATUS. Apparatus for Grinding Coal. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 890,625; June 16, 1908.)

MINING-MACHINE. Alexander Palmros, Columbus, Ohio, and Edward L. Hopkins, Erie, Penn., assignors to The Jeffrey Manufacturing Company, Columbus, Ohio, a Corporation of Ohio. (U. S. No. 889,149; May 26, 1908.)

MINING MACHINE. David N. Osyor, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. (U. S. No. 889,148; May 26, 1908.)

MINING MACHINE. Rufus D. Secoy, Athens, Ohio. (U. S. No. 892,904; July 7, 1908.)

RESCUE APPARATUS. Improvements in Respiration Apparatus for Use in Coal Mines and Other Places. William Edward Garforth, Normanton, Yorkshire, Eng. (Brit. No. 11,367 A.D. of 1907.)

WASHER AND CONCENTRATOR. [illegible] and Ore Washer or Concentrator. William [illegible] (U. S. No. [illegible]; June 16, 1908.)

COPPER

ELECTROLYTIC COPPER. [illegible] Method [illegible] and Apparatus [illegible] (Brit. No. [illegible])

ELECTROLYTIC RECOVERY. [illegible] Recovering Copper from Copper-Bearing Solutions. Luis Amenabar, Coquimbo, Chile. (U. S. No. [illegible]; June [illegible], 1908.)

LEACHING. Method of [illegible] From [illegible] Henry M. W[illegible] [illegible] Ill., assignor [illegible] (U. S. No. [illegible]; June 16, 1908.)

GOLD AND SILVER

AMALGAM PRESS. Anthony [illegible] Lead, S. D. (U. S. No. [illegible]; June [illegible], 1908.)

CONCENTRATOR. Dry [illegible] Homer F. Curtis, Denver, Colo., assignor to The Curtis Dry Placer Machine Company, Denver, Colo. (U. S. No. 891,409; June 23, 1908.)

ORE TREATMENT. Process of [illegible] Crushed Auriferous Ore Products. William A. Caldecott, Johannesburg, Transvaal. (U. S. No. 891,159; June 23, 1908.)

SLIMES TREATMENT. Improvements in Means or Apparatus for Treating Slimes and Other Substances with Air and Other Fluids. Communicated from Benito Solis, Guadeloupe de los Reyes, Mazatlan, Mex. (Brit. No. 12,726 of 1907.)

STAMP MILL. Francis L. Matthews, Oakland, Cal., assignor to Oakland Stamp Mill Co., Oakland, Cal., a Corporation. (U. S. No. 891,497; June 23, 1908.)

TUBE-MILL LINING. Improvements in Linings for Tube Mills and the Like. Peter Arthur Walsh, Johannesburg, So. Africa. (Brit. No. 6934 of 1907.)

IRON AND STEEL

BLAST-FURNACE PRACTICE. Improved Means for Drawing Away Heat to Protect the Brickwork of Certain Parts of Blast Furnaces. Lawrence F. Gjers, Middlesborough-on-Tees, Eng. (Brit. No. [illegible] of 1907.)

BLAST-FURNACE PRACTICE. Preparing Fine Particles of Iron Oxide for Use in Blast Furnaces. Utley Wedge, Ardmore, Penn. (U. S. No. 889,563; June 2, 1908.)

BLAST-FURNACE GASES. Improved Process and Apparatus for Purifying Blast Furnace and Other Gases. Francois Sepulchre, Liege, Belgium. (Brit. No. 254 of 1908.)

BLAST-HEATING APPARATUS for Furnaces. William A. Wheeler, Workington, England. (U. S. No. [illegible]; June 23, 1908.)

HARDENING. Improvements in Method of Hardening Steel. William A. Painter, Pittsburg, Penn. (Brit. No. [illegible] of 1908.)

CAST-IRON PURIFICATION. Improvements in, and relating to, the desiliconizing or purifying of cast iron which can be utilized in the manufacture of basic open-hearth steels and for other purposes. William Muirhead, Shettleston, Lanarkshire, Scotland. (Brit. No. 7946 of 1907.)

INGOTS. Method of Forming Ingots. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,235; June 9, 1908.)

LADLE for Molten Metal. Gustav A. Hasset, McKeesport, Penn., assignor to Pittsburgh Steel Foundry, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 891,542; June 23, 1908.)

OPEN-HEARTH FURNACE PRACTICE. Dog House for Open-Hearth Furnaces. Adam Cruickshank, Chicago, Ill. (U. S. No. 889,962; May 26, 1908.)

ORE TREATMENT. Method of Treating Ore. John T. Jones, Iron Mountain, Mich., assignor [illegible] George A. St. [illegible] (U. S. No. [illegible] 705; June 23, 1908.)

STEEL INGOTS. [illegible] (Brit. No. [illegible] of 1907.)

LEAD

ALLOYS. Process of Recovering Gold, Silver, Copper, and Platinum from Lead Alloys. William Morrison, Des Moines, Iowa. (U. S. No. [illegible]; June [illegible], 1908.)

ELECTROLYTIC REFINING. [illegible] Anson G. Betts, Troy, N. Y. (U. S. No. [illegible]; June [illegible], 1908.)

ELECTROLYTIC REFINING — Treating [illegible] Anson G. Betts, Troy, N. Y. (U. S. No. [illegible] 395; June 23, 1908.)

WHITE LEAD. A Process for the Production of White Lead [illegible] Frank W. Morris, Victoria, James B. Raine, Vancouver, John Kerr, Vancouver, and Charles McLachlan, Vancouver, B. C. (Brit. No. [illegible] of 1907.)

TIN

SLAG TREATMENT. Process for the Treatment of Slag from Tin-Smelting Furnaces. [illegible] London, England. (U. S. No. [illegible] 477; June 23, 1908.)

ZINC

ELECTRODEPOSITION. Improvements in the Electrodeposition of Zinc. Heinrich [illegible] Vienna, Austria. (Brit. No. [illegible] of 1907.)

ORE DRESSING

CENTRIFUGAL MACHINE. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden. (U. S. No. 891,271; June 23, 1908.)

CENTRIFUGAL MACHINE. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden, a Company. (U. S. No. 891,845; June 30, 1908.)

CLASSIFIER or Separator. Creighton Churchill, U. S. Navy, assignor to The Churchill Company, Boston, Mass., a Corporation of Massachusetts. (U. S. No. 890,[illegible]; June 16, 1908.)

CLASSIFIER. [illegible] William L. Card and Francis W. Bosco, Denver, Colo., and Clarence L. Glassbrook, San Francisco, Cal. (U. S. No. [illegible]; June 16, 1908.)

CLASSIFIER. James R. Holmes, Santa Monica, Cal. (U. S. No. [illegible]; June 16, 1908.)

CLASSIFYING. Apparatus for Classifying Solid Materials. René E. Trottier, Hussein-Dey, Algeria. (U. S. No. 888,767; May 26, 1908.)

CRUSHER. [illegible] Los Angeles, Cal. (U. S. No. [illegible]; July 7, 1908.)

CRUSHERS AND PULVERIZERS. Milton F. Williams, St. Louis, Mo. (Brit. No. 3091 of 1908.)

CRUSHING. An Improved Crushing and Pulverizing Machine. Abraham Martin and [illegible] (Brit. No. [illegible] of 1908.)

[illegible] New York, N. Y. (U. S. No. [illegible]; June 16, 1908.)

ORE CONCENTRATOR. Frank G. Janney, Salt Lake City, Utah. (U. S. No. 892,057; [illegible])

ORE CONCENTRATION. Improvements in Ore Concentrating Machines. George Edwin Woodbury, San Francisco, Cal. (Brit. No. [illegible])

ORE TREATMENT. [illegible] Method of Treating Ores by the Precipitation Process by Means of a Superheated Liquid Reacting [illegible]

ORE TREATMENT.—Improvements in Apparatus for Washing and Separating [illegible]

Lake Charles, William and George K Craig, Sacriston, Eng. (Brit. No. 20,622 of 1907.)

PULVERIZING MILLS Improvements in Pulverizing Mills. Levi Dee York, Portsmouth, Ohio. (Brit. No. 3557 of 1908.)

PULVERIZING MILLS Improvements in Pulverizing or Grinding Mills James Wheeler Fuller, Jr., Catasaqua, Penn. (Brit. Nos. 24,392 and 24,393 of 1907.)

SEPARATION Improvements in and Relating to the Separation of Solids from Liquids. Henry Thomas Durant, Bulawayo, Rhodesia (Brit. No. 15,350 of 1907.)

SEPARATOR Robert W Jessup, Oakland, Cal., assignor of one-half to Fairfax H Wheelan, Oakland, Cal. (U. S. No. 891,424; June 23, 1908.)

SEPARATOR. Henry Ruddick, Dallas, Ore (U. S. No. 889,811; June 2, 1908.)

SEPARATORS—Feed for Grain, Ore and Mineral Separators. William Gray, Lincoln, Neb (U S No 891,688; June 23, 1908.)

SLIME CONCENTRATORS Improvements in Slime Concentrators Isaac Willey, Helston, and Charles D Battle, Tuckingmill, Cornwall, Eng (Brit No 9415 of 1907.)

METALLURGY—GENERAL

ALLOY—A Metallic Silver-like Alloy. Eduardo Barraia, Palermo, Italy. (Brit. No. 5451 of 1908.)

ALLOYS Process of Producing Low Carbon Alloys Frederick M Becket Niagara Falls, N. Y., assignors to Electro Metallurgical Company, a Corporation of West Virginia (U. S No. 892,211; June 30, 1908.)

ALLOYS Process of Making Low Carbon Metals or Alloys Frederick M Becket Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia (U. S No. 891,898; June 30, 1908.)

ANNEALING, HEATING ETC A method of Annealing, Heating or Melting Oxidizable Materials Without Causing Oxidation Thereof. Victor Stobie, Sheffield, Eng (Brit. No. 10,187 of 1907.)

ELECTRIC FURNACE METHOD. Frederick M Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia (U. S. No 892,212; June 30, 1908.)

ELECTRODEPOSITION Improvements in the Electrodeposition of Metals Sherard O Cowper-Coles, London (Brit No 11,471 of 1907.)

ELECTRODEPOSITION — Improvements Relating to Apparatus for the Electrodeposition of Metals Sherard O Cowper-Coles, London, Eng (Brit. No 27,385.)

ORE TREATMENT Improvements in or Relating to the Treatment of Ores and Metal-bearing Solutions for the Separation of Metals Contained Therein Communicated from Frederick C. Brown, Komata, N. Z (Brit No 17,779 of 1907.)

PHYSICAL PROPERTIES OF METALS Process for Improving the Physical Properties of Metals and Their Alloys David Lamon, Denver, Colo (U S No 892,269; June 30, 1908.)

PURIFICATION—Device for the Purification of Metals. Charles T. Knipp, Urbana, Ill. (U. S. Nos. 891,264 and 891,265; June 23, 1908.)

SINTERING PROCESS—Improvements in and Relating to Ore Roasting and Sintering Processes. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. 17,344 of 1907.)

SMELTING—Process of Smelting Ores. Frederick L. McGahan, St. Louis, Mo. (U. S. No. 891,630; June 23, 1908.)

SMELTING-FURNACE. Eugen A. A. Grönwall, Ludvika, Sweden. (U. S. No. 891,248; June 23, 1908.)

MINING MACHINERY AND APPARATUS

CONVEYERS—Filling Apparatus for Conveyers. Charles W. Hunt, New York, N. Y. (U. S. No. 891,698; June 23, 1908.)

CONVEYERS—Improvements in Endless Conveyers. Percy R. J. Willis, Kingston-on-Thames, Eng. (Brit. No. 11,542 of 1907.)

DREDGING APPARATUS Dumping Mechanism for Dipper-Dredges. William Clifford, Duluth, Minn., and Walter Ferris, Milwaukee, Wis.; said Ferris assignor to The Bucyrus Company, South Milwaukee, Wis. (U S No 889,292; June 2, 1908.)

DRILLING MACHINES Improvements in Portable Drilling Machines. Edward C. R. Marks, London, Eng. (Brit. No. 11,326 of 1907.)

HOISTING APPARATUS Improvements in or Connected With Mine Hoists, or Hoisting Apparatus and the Like. (Ernest Douglas, Pemberton, Eng. (Brit. No. 17,396 of 1907.)

HOISTING AND CONVEYING APPARATUS. John McMyler, Cleveland, Ohio, assignor to The McMyler Manufacturing Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 891,631; June 23, 1908.)

HOISTING-ENGINE DEVICES Improvements in and Relating to Controlling Devices for Electrically Operated Winding Engines Allegemeine Elektricitats Gesellschaft Friedrich Karl, Berlin, Germany (Brit. No 10,171 of 1907.)

HOISTING-ENGINE DEVICES—Improved Construction of Safety Devices for Preventing Overspeed and Overwinding with Drop-Valve Winding Engines. William Thomas Bell and Arthur J. W. Graham, of Robey & Co., Ltd. Globe Works, Lincoln, Eng. (Brit. No. 14,077 of 1907.)

MINE-CAGE Cager and Automatic Sump Guard. Grant Holmes, Danville, Ill., assignor to Robert Holmes and Brothers, Danville, Ill., a Corporation of Illinois. (U. S. No 889,307; June 2, 1900.)

MINE-CAGE SAFETY APPLIANCE—Improved Safety Appliance for Mining Cages and the Like George J Richardson John H Richardson, Frank R. Simpson and Edward T Cheesman, Ryton-on-Tyne (Brit. No. 20,593 of 1907.)

MINE-CAGE SAFETY APPLIANCES—Improvements in Pit Cage Safety Appliances. Charles McCully, London, and William Farnsworth, Nottingham, Eng. (Brit. No. 18,264 and 18,265 of 1907.)

MINE-DOOR. John Wack, Canton, Ohio. (U. S. No. 892,632; July 7, 1908.)

MINER'S LAMP. August Husson, Oshkosh, Wis., assignor to John A. Thompson, Chicago, Ill. (U. S. No. 892,836; July 7, 1908.)

MINING-CAR-WHEEL BEARING. William C. Fownes, Jr., and Robert J. Gardner, Pittsburg, Penn., assignors to The S. Jarvis Adams Company, Pittsburg, Penn., a Corporation of Pennsylvania (U S No 888,700; May 26, 1908.)

MINE-PUMPS—Valve for Mine-Pumps. Robert W. Murray, Rendville, Ohio. (U. S. No. 890,997; June 16, 1908.)

ROCK-DRILL. James S. Harlow, Mineral, Va. (U. S. No. 888,492; May 26, 1908.)

ROCK-DRILL. Moses Kellow, Penrhyndendraeth, England. (U. S. No. 890,065; June 9, 1908.)

ROCK-DRILL—Turbine-Driven Rock-Drill. Moses Kellow, Penrhyndendraeth, England. (U. S. No. 888,506; May 26, 1908.)

ROCK-DRILL — Percussion Rock-Drill. Robert Anderson, Johannesburg, Transvaal. (U. S. No. 890,012; June 9, 1908.)

ROCK-DRILLING EXPLOSIVE-ENGINE. August B. Wittmann and George L. Rork, Denver, Colo. (U. S. No. 890,546; June 9, 1908.)

ROCK-DRILLING MACHINE or Engine. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 888,497; May 26, 1908.)

ROCK-DRILLS—Improvements in percussive rock drills, whereby the valve piston travels as short a distance as possible, and the compression of the normal air is reduced to a minimum. Edward Allan Ironside, London, E. C., Eng. (Brit. No. 24,778 of 1907.)

ROCK-DRILLS—Valve for Operating Rock-Drills. George A. Fowler, Georgetown, Cal., assignor of one-half to Edward J. Wilcox, Denver, Colo., and one-fourth to Frank V. Goetz, Clear Creek county, Colo. (U. S. No. 891,472; June 23, 1908.)

ROCK-DRILLS Improvements in or Connected with Rock Drills. Henry J. K. Keymer, Gorleston on Sea, Yarmouth, Eng. (Brit. Nos 10,248-49-50 of 1907.)

ROCK DRILLS Improvements in and connected with Valves for Percussion Rock Drills, Pneumatic Hammers, Direct-Acting Pumps and Engines A and Z Daw, London, Eng (Brit No 18,027 of 1907.)

ROCK DRILLS Improvements in or relating to Pneumatic and Steam-driven Rock-Drills Edward L. W Bellhouse, Grenoside, and Reuben Jones, Sheffield, Eng. (Brit. No. 27,415 of 1907.)

ROCK-DRILLING MACHINE. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 892,082; June 30, 1908.)

SAFETY-LAMPS—Improvements in Safety-Lamps, Particularly Miners' Lamps. George Meyer, Herne-in-Westphalia, Germany. (Brit. No. 1616 of 1907.)

TUNNEL-DRIVING MACHINE. George A. Fowler, Georgetown, Colo., assignor of one-half to Edward J. Wilcox, Denver, Colo., and one-fourth to Frank V. Goetze, Clear Creek county, Colo. (U. S. No. 891,473; June 23, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

ANNEALING-FURNACE. Hugh L. Thompson, Waterbury, Conn. (U. S. Nos. 890,250, 890,251 and 890,252; June 9, 1908.)

ANNEALING-FURNACE. Hugh L. Thompson, Waterbury, Conn. (U. S. No. 890,314; June 9, 1908.)

CHARGING DEVICE for Furnaces, Receiving Vessels, or the Like. Ludwig Mond, London, England. (U. S. No. 891,713; June 23, 1908.)

CRUCIBLE-FURNACE. Edward H. Schwartz, Chicago, Ill., assignor to Kroeschell Brothers Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 892,012; June 30, 1900.)

ELECTRIC FURNACE Basil Igevsky, Kiew, Russia. (Brit. No 5301 of 1907.)

ELECTRIC FURNACE. Léon Dion, Wilkes-Barre, Penn., assignor to The Americus Electro-Hermetic Company, Wilkes-Barre, Penn. (U. S. No. 888,877; May 26, 1908.)

ELECTROLYSIS Apparatus for Treating Liquids Electrically. Alfred Ord Tate, Toronto, Ont., Can. (Brit. No. 13,891 of 1907.)

EVAPORATION APPARATUS — Improvements in Vaporizers for Mineral-Containing Liquids. Communicated from Maschinenfabrik Aktiengesellschaft G. Sauerbrey, Stassfurt, Germany. (Brit. No. 501 of 1908.)

EXTRACTING APPARATUS. James E. Porter, Syracuse, and Arthur L. Clark, New York, N. Y., assignors to The Just Mining and Extraction Company., a Corporation of New York. (U. S. No. 887,268; May 12, 1908.)

FURNACE-CHARGING MECHANISM. David Baker, Philadelphia, Penn. (U. S. No. 889,571; June 2, 1908.)

FURNACE for Metallurgical and Smelting Purposes. Kristian Birkeland, Lysaker, near Christiania, and Samuel Eyde, Christiania, Norway. (U. S. No. 889,431; June 2, 1908.)

FURNACE—Metallurgical Furnace. William S Dempsey, New York, N Y. (U. S. No. 887,777; May 19, 1908.)

FURNACE-TAPPING SPOUT. Charles C. Johnson, Redding, Cal. (U. S. No. 892,263; June 30, 1908.)

FURNACE-WALL. Kinney C. Hoxie, Duluth, Minn. (U. S. No. 886,370; May 5, 1908.)

KILN—Continuously-Operated Drying and Carbonizing Kiln. Richard Bock, Prague-Smichow, Austria-Hungary. (U. S. No. 891,456; June 23, 1908.)

LIXIVIATING APPARATUS. Charles E. Arnold, Wilmington, Del., assignor to the E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 888,685; May 26, 1908.)

METAL-HEATING FURNACE. Jerome R. George, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a Corporation of Massachusetts. (U. S. No. 886,492; May 5, 1908.)

ORE-REDUCING FURNACE. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 891,549; June 23, 1908.)

ORE-ROASTING FURNACE. William H. Smyth, Berkeley, Cal. (U. S. No. 891,300; June 23, 1908.)

ORE-ROASTING FURNACES — Improvements Relating to Ore-Roasting Furnaces. Eduard W. Kauffmann, Cologne, Germany. (Brit. No. 13,692 of 1907.)

RETORT-FURNACE—Regenerative Retort-Furnace. Oscar H. Eliel, La Salle, Ill. (U. S. No. 885,740; April 28, 1908.)

REVERBERATORY SMELTING-FURNACE. Alva D. Lee, Brookline, Mass. (U. S. No. 888,624; May 26, 1908.)

ROASTING AND SMELTING FURNACE. Josephus J. Brown, Jr., Troy, Ill. (U. S. No. 888,582; May 26, 1908.)

ROASTING-FURNACE — Rotary Furnace Applicable for Use in Roasting Ores or the Like. Woldemar Hommel, Lee, England. (U. S. No. 888,502; May 26, 1908.)

SINTERING APPARATUS. Eugene B. Clark, Chicago, Ill., and Charles H. Fettel, Hubbard, Ohio, assignors to American Sintering Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 891,327; June 23, 1907.)

SMELTING-FURNACE. William J. Holzapfel, Scottdale, Penn. (U. S. No. 891,256; June 23, 1908.)

ANALYTICAL CHEMISTRY

LABORATORY APPARATUS—A New or Improved Support for Laboratory Crucibles, Basins and the Like George T. Holloway, London. (Brit. No. 12,787 of 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

R. A. Stewart, of Tucson, Ariz., is in Mexico.

Chas. F. Weiss, of Tucson, Ariz., is visiting a number of mining camps in Mexico.

A. Grothe, of Grothe & Carter, Mexico, City, has returned from a business trip to Chicago.

Chester A. Fulton, of Guanajuato, Mexico, has returned from a business trip to New York.

H. R. Conklin, general manager of the Lluvia de Oro Company, Chihuahua, is in Joplin, Missouri.

F. F. Carter has been appointed manager of Gold Hill & Iowa mines at Quartzburg, Idaho.

Edmundo Girault, of Pachuca, Mexico, is building a cyanide plant at the Natividad mine in Oaxaca.

George M. White and Clive B. Newcomb have opened engineering offices in the Bancario Building in Mexico City.

C. W. Van Law, of Guanajuato, Mexico, is in Pachuca, studying the vacuum filters and air agitation tanks of the camp.

E. L. Dufourcq has undergone an operation for appendicitis at the American hospital in Mexico City, and is reported to be convalescing.

J. H. Granbery has returned from Georgia where he has been studying railroad conditions with a view to the extension of one of the existing roads.

J. M. Callow started July 9 for Alaska and the Yukon Territory on professional business, expecting to return to Salt Lake City, Utah, the first week in August.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, is at present in Mexico, making an examination of mining properties for Eastern capitalists.

J. Volney Lewis, of Washington & Lewis, New York, has taken up professional work in northern New Jersey that will require about two months for completion.

President E. P. Earle and managing-director Watson, of the Nipissing Mines Company, were at Cobalt recently inspecting the concentrator lately installed on the property.

G. C. Kaufman, general manager of the mining department of the American Smelting and Refining Company, has left New York on a tour of inspection of the company's mines.

Dr. W. C. Heraeus has been awarded the John Scott legacy premium and medal of the Franklin Institute of Philadelphia for his improvements on the Heraeus-Le Chatelier pyrometer.

L. C. Monahan, who has been superintendent of the Mammoth Copper Company, California, has resigned and has been succeeded by Peter Henderson, formerly assistant manager.

Austin H. Brown, for several years general manager of the Trinity Copper Company has resigned and the position is now filled by R. N. Bishop, with headquarters at Coram, California.

George F. Waddell, formerly assistant superintendent of the Utah Copper Company, has been appointed superintendent of the Steptoe Valley Smelting and Mining Company's mill at McGill, Nev.

A. E. Drucker, metallurgist with the Oriental Consolidated Mining Company, of Korea is visiting Australia, New Zealand, South Africa, India, Mexico and the United States to study the treatment of gold and silver in those countries.

J. B. Tyrrell, of Toronto, has offered a cash prize of $100 for the best collection of minerals obtained in the province of Ontario during 1908 by anyone not a collector in a public institution or a dealer in minerals. The collection must not contain less than 30 specimens, properly labeled.

Lloyd B. Smith, instructor in the Pennsylvania State College School of Mines, has accepted a position with Spurr & Cox, Inc. A complete topographic and geological survey of the properties of the Helvetia Copper Company, near Tuscon, Arizona, is being made by this firm. The party consists of J. E. Spurr, J. H. Farrell, W. D. Blackburn, and Lloyd B. Smith.

Obituary

Thomas Beddow, long an operator in the anthracite region and a member of the firm of Beddow & McCreary, of Pottsville, Penn., was killed July 7 by the explosion of a boiler at his colliery at Pottsville.

Societies and Technical Schools

Montana State School of Mines—A new metallurgical laboratory, with many improvements, is being added to this school at Butte.

[illegible] The sum of $500 [illegible] society, and deposited in trust, as a research fund [illegible] under the following conditions: The Pacific Coast Borax Company desires to awaken an interest in research work and experiments which may lead to some improvement in the commercial method of manufacturing ferro-boron, by a direct process from colemanite. It is essential that the process should be sufficiently economical and suitable to be applied on a large scale, so that the finished product may be available for commercial purposes. Commercial ferro-boron, as [illegible] of carbon, and sulphur and phosphorus are practically absent. The prize has [illegible] problem, under reasonable conditions, to be decided upon by the board of directors.

Canadian Mining Institute—The program for stages 1 and 2 of the summer excursion was given in the JOURNAL July 18. Following is the program for stage 3.

For Stage 3, the Alberta and British Columbia excursion, the program is subject to minor alterations at the discretion of the local committees at the different localities. It is, briefly, as follows: Leave Sudbury Sept. 8, pass Winnipeg Sept. 10. Arrive Medicine Hat Sept. 11 and visit natural gas wells. Leave by special train for Lethbridge, where the afternoon will be spent at the colliery of the Alberta Railway and Irrigation Company. Sept. 12 arrive in Frank, where a short stop will be made to enable the party to see the landslide and coal mine. Arrive before noon at Coleman, where the remainder of the day will be spent in inspecting the mines and plant of the International Coal and Coke Company. Special side excursions to Lille, Hillcrest and Bellevue collieries may be arranged. Sept. 13 leave Coleman for Hosmer. A short stay will be made here to enable the party to inspect the extensive and thoroughly modern colliery established at this point by the Canadian Pacific railway. After arriving at Fernie early in the afternoon, the train will immediately leave for a visit to the mines at Coal Creek. Leave Fernie at midnight for Moyie.

On Sept. 14 the train will arrive at Moyie at 6 a.m., and the morning will be spent at the St. Eugenie mill and mine, this being the largest silver-lead mine in Canada. The train will leave at midday to connect with the steamer leaving Kootenay Landing, for Nelson. Sept. 15 the party will inspect the smelter and refinery plant of the Consolidated Mining and Smelting Company, of Canada. The remainder of the day will be spent at Rossland and visits will be made to the Le Roi, Le Roi No. 2, Centre Star and War Eagle mines. Sept. 16 arrangements will be made for visiting the copper-smelting works of the B. C. Copper Company, the Mother Lode mine and the smelter at Boundary Falls, owned by the Dominion Copper Company. Sept. 17, special train will leave Greenwood early in the morning for Phœnix, where several hours will be spent in visiting the important mines including those of the Granby company, the Brooklyn mine owned by the Dominion Copper Company, and the Snow Shoe operated under lease by the Consolidated Mining and Smelting Company, of Canada. In the afternoon the important smelting works [illegible] will be visited.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Butte, Salt Lake City, Denver and Indianapolis

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 18—On the day on which the sale was to have taken place Peter M. Rasmussen, of Berkeley, Cal., secured an injunction restraining the Redding Gold and Copper Company, a corporation organized under the laws of South Dakota, but operating in this State, from selling $26,000 worth of stock owned by him. It was shown to the Court that stock issued Rasmussen was non-assessable, a provision that can be made under the South Dakota laws, but which is not possible under the laws of California. Despite this, an assessment of $405 had been levied against the stock and because Rasmussen refused to pay it, the mining company advertised his stock for sale. The court held that the assessment was invalid because Rasmussen's stock was non-assessable under the laws of South Dakota. This decision was doubtless just under the circumstances, but it is a well known fact that some hundreds of good mining properties in this State are now idle because assessments were not possible, the incorporation having been made in States where provision is made for non-assessable stock. Under the California laws, the stock may be assessed to pay debts or to continue work. If the money is not paid the stock is sold to the highest bidder or forfeited to the company issuing it.

After a long delay the application of the Quincy Mining and Water Company for patents to certain lands in Plumas county, near Spanish Ranch, has been denied by the Land Office, on the recommendation of the Forestry Department, which had the properties examined by geologists. This is land owned by W. P. Hammon and others, who had invested hundreds of thousands of dollars in that section of Plumas county. It was their intention to organize a company with sufficient capital to build a dozen or more large dredges and work the ground for the gold contained in the gravel. It means, however, that the government experts have decided that the land is more valuable for its timber than for its gold. The Quincy Mining and Water Company has now employed attorneys, mining experts and geologists, it is reported, and will carry the matter through the General Land Office to the Secretary of the Interior, and to the courts, if necessary. It is claimed that the company has complied with all the requirements of the mining laws of the United States and will contest the stand taken by the Government. The company contends that it is engaged in the legitimate enterprise of gold dredging, but that in order to obtain the necessary capital it had to have absolute patented title to the land. Failing in obtaining this title it could not carry out its plans. A large amount of money is tied up pending the ultimate decision.

The Lecompton mine in Willow Valley district (Nevada City) is to be started up again; the water is being pumped out preparatory to retimbering and developing. The mine was formerly a large producer, but has been idle some time. San Francisco, Nevada and Eastern men have now taken hold of the mine and also acquired the Treadwell and Independence mines adjoining. The necessary machinery is nearly all on the ground.

The mill of the Fairview Mining Company, Papoose, Trinity county, which has been closed for two years, has had 10 of its 40 stamps started up. As the stopes are opened up more stamps will be set dropping. The Fairview is one of the important quartz mines of Trinity county.

J. W. Shanahan is about to install a gold dredger on Weaver creek, near Weaverville, Trinity county, and some of the machinery has already been shipped from San Francisco. The machinery of the dredge at Hornbrook, Siskiyou county, weighing about 300 tons, is to be hauled by team to Hamburg on the Klamath river, in the same county, where it will be installed in a new boat.

Wallace, Idaho

July 15—Mining in the Cœur d'Alene district continues on its uninterrupted course of quiet prosperity. Almost every week new strikes are reported from different points, and in spite of the depression of the metal markets the advances made this year, especially among the smaller prospects are without parallel in previous years. As a matter of fact the hard times, such as they were, have proved a great boon to the district, the benefit of which is only now beginning to be realized. Throughout the winter most of the big mines were closed and several thousand men were thrown out of employment. Many of these were unwilling to leave the district for, as a general rule, conditions throughout the country were a good deal harder than those prevailing in the Cœur d'Alene. The result was that such of the miners as had interests in smaller prospects put in the winter at work upon them, while others were only too glad to accept contracts on almost any terms involving a small amount of cash and stock on properties where the question of finance had been up to that time of paramount importance.

In addition to this the construction work on the Idaho Northern Railroad, into the north side of the Cœur d'Alene district, is now rapidly nearing completion. As soon as this line has been completed the annual output of the district will be greatly increased. Already there are a number of mines only awaiting railroad facilities to erect mills and start shipments. It is general belief that in the course of a very few years the north side district will far surpass all the rest of the Cœur d'Alene in its output of silver-lead ore. Want of shipping facilities has handicapped the district all along and now that this is at last assured an added impetus has been given to the industry.

Salt Lake City

July 17—The board of directors of the Consolidated Mercur Gold Mines Company, chosen at the late annual shareholders' meeting, has organized with John Dern, president; Hubbard W. Reed, vice-president; G. H. Dern, manager, who, with E. H. Airia, J. E. Frick, Henry W. Bingham and A. W. Chesterton, are directors. While no one connected with the Consolidated Mercur company has given any intimation of possible dividends in the near future, it is believed, nevertheless, that the company will be in condition to return to them in the autumn. Last year was an unsatisfactory one owing to a close-down necessary to complete repairs and the installation of a slimes plant, and it is the policy of the management to get a good treasury surplus before sharing profits with shareholders. The company is now producing from $70,000 to $75,000 in gold bullion monthly.

The resumption of smelting operations by the United States Smelting, Refining and Mining Company, is highly pleasing to ore producers, particularly those who have contracts with the smelting company, and have been without a market for the past seven months, the duration of the inactivity of the plant. The United States company is receiving 100 tons of ore per day from the Richmond-Eureka, one of its own system of mines which is located at Eureka, Nevada. Its Bingham mines are to be put back on a producing basis at once. Only one furnace is in operation at the smeltery at the [illegible] two more will go in next week, while the treatment of sulphide ores will begin within three weeks. The smeltery is equipped with six lead furnaces, each capable of treating 200 tons per day.

The Godiva, one of the oldest mines in the Tintic district, and which has a record of production approximating $700,000, is to be reopened. The company was recently reorganized, and plans are being made to sink the shaft from 900 to the 1300-ft. depth.

The Tintic Smelting Company's new smeltery is scheduled to go into commission on July 24, for which event due preparations are being made. Only the lead department will be ready, however, as the copper furnaces will not be completed before autumn.

Those in charge of the mill of the Boston Consolidated Mining Company at Garfield express a great deal of satisfaction about the behavior of the plant. A highly gratifying extraction is being made and the concentrate carries from 20 to 22 per cent. copper. It is very evident that the company made a bad contract with the American Smelting and Refining Company, for a loophole was left for the latter to impose a penalty for the iron which the concentrate contains in generous quantity. President Newhouse and General Manager Hanchett went East for a conference with the smelter officials with the view of getting this changed, and in the meantime shipments of concentrate are being withheld. It has been ascertained that the bins at the mill contain about $200,000 worth of this product.

The ore and bullion settlements reported by Salt Lake banks last week amounted to $432,000.

The May Day Mining Company has posted a dividend for July of 1½c. per share, or $12,000.

Butte

July 16—The hearing of complaints concerning rates on ore shipments, which began before the State Railway Commission in Helena yesterday, is being attended by a number of Butte mining men. The commission, created by act of the 1907 State legislature, is vested with full power to regulate and control freight and passenger rates within the State and is organized along the same lines as the Federal Inter-State Commerce Commission. This is the first hearing held by the commission for the consideration of rates on ore shipments. The Montana Mining Association has demanded a reduction of from 25 to 40 per cent. on ore rates between various points within the State.

John D. Ryan, managing director of the Amalgamated properties, returned to Butte a few days ago after an absence of three months. Mr. Ryan states that the Boston & Montana smelter at Great Falls will not be ready for the treatment [illegible] Boston & Montana Company is operating the Leonard, West Colusa and East Colusa mines at somewhat under their full capacity. It is reported that the East Colusa will be closed down a short time for repairs. At the Mountain View mine no ore is being hoisted and only a small amount of development work is being carried on, awaiting the resumption of operations at the Boston & Montana smelter. The Butte & Boston company is operating the Silver Bow, Berkeley, East Greyrock and West Greyrock mines to their normal capacity. In the Speculator shaft of the North Butte company work has been commenced cutting stations on the 2000- and 2200-ft. levels.

Denver

July 17—In the Strong mine, in the Cripple Creek district, a wonderful rich vein of ore has been opened in the bottom, or 1000-ft. level, which still further emphasizes the fact that there is high-grade gold ore to be found at great depths in that camp, and (as in this case) in the granite which surrounds the breccia area.

The competition between the custom mills treating Cripple Creek ores has recently shown signs of abatement, in the announcement by the largest mill using the cyanide process that it would take no more ore from the open market, and thereafter would simply attend to its contracted tonnage. Now the exponents of the chlorination process announce an advance in treatment charges of 25 to 50c. per ton, effective July 20.

The causes given for this increase are three-fold: First, the shipment of ores from the district of too low grade to pay the treatment charges, thus entailing a loss on the mill; second, the chlorination companies claim to pay for all ores received within 24 hours after sampling; and third, the benefit of the open rates heretofore in force by the chlorination interests were extended to their shippers who had contracted their ores at higher rates, thus entailing a reduction in revenue to the chlorination mills. The old and new rates are as follows:

Ore Value	Old Rate	New Rate
Up to $5 per ton	$3.50	[illegible]
$5 to $10	4.50	[illegible]
½ to ¾ oz.	5.00	5.25
¾ to 1 oz.	5.50	[illegible]
1 to 1¼	6.00	[illegible]
1¼ to 1½ oz.	6.50	7.00
1½ to 2	7.00	[illegible]
2 to 3	8.00	8.50
3 to 5 oz.	8.50	[illegible]

Bender & Co., lessees on Stratton's Independence, have opened into good ore in a pillar of ground in the caved area on the third level. They reached this rich ore by sinking from the second level. The strike is an important one. Lessees working on the surface of the same property are taking out rich ore from the surface near the junction of the Independence and Bobtail veins.

During the present month the Portland [illegible] quarterly dividend of $120,000, the Vindicator [illegible]

Indianapolis

[illegible] State mine inspector, has returned from a tour of the Linton, Clinton and Jasonville mines and reports that he has instituted 30 prosecutions against miners and operators for violating the law. Charges were filed against eight coal companies, some of them answering to as many as ten charges. There were several prosecutions for failure to leave clear the 2-ft. space along all entries in mines.

There were also a number of prosecutions of coal companies for permitting more than 50 persons to work in one air current, and also for driving rooms more than 45 ft. from break-throughs. Six miners were arrested and fined for drilling beyond the cutting or loose end. In every instance pleas of guilty were entered, and the defendants promptly paid fines.

It is reported that the bottom has suddenly dropped out of the activity in the Linton coalfield and that indications point to a continuance of dull times in the mines for several weeks. After two weeks of full time the Vandalia mine No. 9 closed, leaving but four of the nine active mines working, while the Shirley Hill Company announces that it will close the entries, 42 in number, at the Little Giant mine. The Summit mine closed the middle of the week, and will continue closed until the new tipple is finished. Of the eight mines in condition to work, none are working over half time, and as a result 2000 men, heads of families, are idle. There promises, however, to be another spurt of activity in a few weeks, and both operators and miners take an optimistic view of the situation.

Suit has been brought in the Sullivan County Circuit Court to test one provision of the mine law enacted by the last legislature. There are ten veins of Indiana coal, according to geologists, and when the legislature, on March 9, 1907, passed a law [illegible] passageway of 2 ft. between mine track rails and the side walls of the mines, the legislature exempted mines operating in the third and fourth veins. The exemption makes the law practically useless, since nearly all the mines in the Sullivan district operate on one or the other of these veins. The law is alleged to be a sort of sop to miners, as it works against them in a majority of cases, while pretending to favor them. The circuit court held the law constitutional and the State mine inspector took an appeal to the supreme court, hoping for a reversal on the ground that such exemption cannot stand and that law must treat all mines alike relative to [illegible] working in mines.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

SOUTHEAST ALASKA

Alaska Mines Securities Company—This company is starting up its mines at Hadley, which have been shut down since last July, owing to the unsettled condition of the copper market. The company has just acquired the Mamie mines adjoining, formerly owned by the Brown Alaska Company, together with the tramways and general equipment. Ore of a high grade has been discovered in the Mamie; the mine is 400 ft. deep.

Arizona

SANTA CRUZ COUNTY

The old mines of the Patagonia mountains were worked mostly by leasers, whose only interest in the properties was the amount of high-grade ore they could take out with the least development work. Most of the work done was at a depth of less than 150 ft., and consisted of following and gouging the richer streaks of ore that run through the veins. Small drifts, narrow stopes and shapeless holes for which a miner would have trouble in finding a name, twist and turn in all directions through the workings. As depth was acquired and the concentrated values decreased with the broadening of the veins, the leasers abandoned the properties, and they have laid idle for years past. To be profitably worked facilities for treating the ore must be at the mines, as the ore in the larger bodies will not pay for hauling to the railroad and shipping to smelters.

Four Metals—The Red Hill tunnel at this mine, in the Mowry district, when in about 440 ft., cut a ledge that was not expected. Fourteen feet of concentrating sulphide copper ore was cut and so far the tunnel is still in ledge matter, about 14 ft. further, that is streaked with ore. The management estimates that the tunnel must yet be driven about 150 feet to cut the ledge that outcrops on the hill.

Red Cloud—The hoist has been put in place at this mine, in the Harshaw district, owned by Dan Hampton and recently bonded to C. H. Ferry, a New York mining man. Sinking will be commenced soon. The Red Cloud is a copper prospect.

YAVAPAI COUNTY

Coronado Mining Company—This company, near Congress, will soon be producing ore and will have its mill in operation.

Del Pasco—This mine, near Crown King, has been bonded by Eastern parties, who will develop it at once. In the past the Del Pasco has produced a large amount of high-grade ore but has been idle for a number of years.

Monte Cristo—This mine, on Groom creek seven miles south of Prescott, is being operated by Colorado parties under a bond and lease. The old workings are being cleaned and the mine put in shape to produce ore. It is equipped with a 10-stamp mill and concentrators. The shaft is 300 ft. deep and is equipped with a steam hoist.

Octave Mine—A new discovery has been made at this mine, near Congress Junction. By crosscutting in the footwall, an entirely unknown vein has been cut on the eighth level; the new ledge is of the same general character as the other known ledges.

Poland Consolidated—This company resumed operations on July 6, after a shut down of three weeks for the purpose of making needed repairs. The production will be increased.

Silver Cord—Two cars of high-grade silver ore was shipped from this mine recently by lessees. The mine is near Turkey and near the railway. Considerable ore is now exposed and production will be kept up. The mine is opened by both tunnels and shafts.

Arkansas

SCOTT COUNTY

John Madill, of Ebensburg, Penn., has purchased 2000 acres of coal lands about 10 miles from Waldron, on the line of the Kansas City Southern railway, partially developed. Plans have been made for the construction of a number of coke ovens.

California

AMADOR COUNTY

South Eureka—At this property, Sutter Creek, W. H. Finchley, superintendent, drifting is in progress on the ore recently struck on the 2600 level, where the vein is 22 ft. wide. The shaft is to be sunk to the 2700 level. There are 65 men on the payroll, and the 20-stamp mill is crushing 95 tons in 24 hours; 20 stamps are to be added to the mill.

CALAVERAS COUNTY

Black Wonder—This mine, nine miles from West Point, after being closed down for a year, has been reopened and a tunnel is being run.

Marlita Mining Company—This company began work a month ago on its property on the northeast slope of Stockton hill, near Mokelumne hill; a bedrock tunnel has been started to reach the old channel. R. P. Williamson is superintendent.

Golden Era Mining Company—This company has bonded the Blue Bell mine near Glencoe from Miss A. J. Palmer, and work is being done on two tunnels and a shaft. A 40-stamp mill is to be erected.

EL DORADO COUNTY

Woodside Eureka Mining Company—After several years' idleness, work has been resumed at this mine, Georgetown, under the superintendency of W. E. Everson.

Big Cañon—This mine, shut down years ago, and having a very large body of low-grade ore, is being pumped out preparatory to reworking.

INYO COUNTY

Cliff—Arambula and Carrasco are taking very high-grade ore out of this mine at Beveridge.

KERN COUNTY

LaGross—The Deacon Brothers, who have this mine at Johannesburg under bond, have purchased gas engines, compressor, drills, etc., and are to sink a new 1000-ft. shaft

LOS ANGELES COUNTY

Red Rover & Topeka Consolidated Mining Company—Edward Brough and associates have taken an option on the properties at Acton, and sinking is to be commenced.

San Gabriel Cañon—Numbers of prospectors and miners are now in this section, and some old mines have been reopened of late.

MARIPOSA COUNTY

Stockton Creek—This property has been leased by the Mariposa Commercial and Mining Company to Rowland Brothers, and a mill is contemplated.

MODOC COUNTY

Hoag District—Bassler & Schauer have purchased the Jamison & Laughlin groups in this district. Grigsby & Jamison are erecting a five-stamp custom mill with cyanide plant.

NEVADA COUNTY

Ancho Mining Company—At this property, Graniteville, a wide vein carrying gold has been struck in the lowest tunnel. Henry Overman is manager.

PLUMAS COUNTY

Crescent Hill Mines Company—W. J. Oddie has made final payment on the Crescent Hill group near Quincy, and will form a company to work them under the above name. There are three full locations.

Bullfrog Channel—Roddle & Brand have discovered exceedingly rich gravel in Bullfrog ravine and are taking out many nuggets.

Megown—L. J. Stratton and W. H. Blalock have leased this property near Mountain House and are sinking a shaft on the ledge.

SAN DIEGO COUNTY

Buckhorn Mining Company—In this property, Duluth district, F. R. McPherson, superintendent, free-milling gold ore has been reached in the tunnel.

Gem Mines—C. J. Moore and R. M. Wilke, of Palo Alto, have bought from J. M. Mack and Jessop & Sons, of Los Angeles, the Victor, Rincon and Mack & Bristol claims at Mesa Grande. The Victor is well known for its production of kunzite and tourmaline. More extensive work will be carried on than heretofore.

SHASTA COUNTY

Dredges—The dredge at Horsetown has been started up again after being altered to the single lift type, and the ladder lengthened. The Dubois suction dredge is steadily running at the mouth of Clear creek. The United States Dredging Company has its suction dredge running on the Sacramento river opposite Redding.

SHASTA COUNTY

Trinity Copper Company—The late shipment of approximately 700 tons of Trinity copper ore, from the bins at Ceram, was sold to the Bully Hill smelter by the Balaklala Copper Company, which holds the contract for all of Trinity ores. The ore was sold to the Bully Hill company, as a fluxing mixture for certain rebellious ores and to favor that company, Trinity ore being low in zinc and high in iron percentages. It was not for a test run of Trinity ore, as some papers have stated. The ore was mined in October, 1907. The Balaklala smelter is running.

SIERRA COUNTY

Brush Creek—This old mine near the Mountain House has been bonded to J. W. Morrell and J. W. Rea. The mine at one time, years ago, paid well, but water drove the miners out. The old shaft will be reopened and the mine pumped out.

Parker Cañon Mining Company—This company, J. M. Shunn, manager, has bonded the extensive Mountaineer mine property, north of Sierra City, and commenced development work.

[illegible]

[illegible] the ditches leading to this mine near Cal[illegible] running order.

[illegible]

[illegible] Brown Bear mill. At this latter mine, [illegible] but the company itself is also developing.

[illegible]

[illegible] and building a flume preparatory to starting up this mine, 12 miles from Columbia. J. D. Biggs is superintendent.

Greenstone—At this copper mine near [illegible] have been set at work.

[illegible]—The new slime plant at this mine, Chinese Camp, erected by P. H. Craven, has been started up.

[illegible] company has bonded from J. E. Conde the Dreisam mines in the East belt. The Dreisam mines have lately been producing largely.

Colorado

LAKE COUNTY—LEADVILLE

[illegible] started on the mine, a few months ago, the production has steadily increased in silver, until now it is on a silver basis. Steady shipments will be continued and the scope of operations enlarged.

[illegible]—A [illegible] mineralized area under Sugar Loaf mountain becomes more apparent and ore is expected to be encountered any day. Small streaks are encountered frequently.

Penrose—About 25 tons of iron ore are shipped daily. The ore carries some silver.

Tiger—Samples taken recently from the property [illegible] gold. This ore was found only in spots and surrounded by waste. The Tiger is a part of the Sunday property.

South Evans—Several properties in the district are making regular shipments. Notable among these is the Louise property.

Alicante—Much interest centers around Wortman, in this district. Most of the product carries enough gold to make the mining pay. The work has thus far been near the surface; some well defined veins have been encountered. Improved machinery will probably be installed on several of the properties.

Idaho

[illegible]

[illegible] Jan. 1 from this property, on the north [illegible] been developed in the upper workings and [illegible] increase the capacity to 200 tons during the fall.

[illegible] 60-ft. lead has been opened up in this property (on Placer creek) at a depth of about 400 ft. The entire ledge is well mineralized and the men are engaged in drifting. A flume is being constructed at present and it is the intention of the company to install a compressor a little later on.

[illegible] sued by Manager Greenough to the effect that no dividend will be paid this month. The mine has been shipping ore steadily at the rate of from 400 to 500 tons a day and the proceeds of this are said to have [illegible] certain debts of the company.

Imperial Mining Company—A crosscut adit 2000 ft. in length will be started from Sawmill gulch and is designed to give a depth of about 1100 ft. on the vein. Some good carbonate ore has already been opened up in the property. It is estimated that the new tunnel will cost in the neighborhood of $30,000.

[illegible] Wardner, is treating ore in its new $25,000 mill at the rate of about 144 tons a day, or 55 tons more than the guaranteed output of the mill. It is the intention of the company to ship the concen[illegible] the railroad to the property is open.

[illegible] water, which has driven out the miners, has been encountered in the crosscut being run from the main adit to tap a parallel lead. The crosscut was in 240 ft. when work was suspended, and it was thought the footwall of the large copper vein had been encountered. The flow of water is regarded favorably.

[illegible] for this property, a charge having been [illegible] has been shut down. There are many stockholders in the Cœur d'Alene who welcome the receivership of P. F. Smith [illegible] at the property.

Indiana

GREENE COUNTY

The coke tests which have been in progress at the Black creek mines for the [illegible] able results. The first report showed that there was a 25-per cent. differential between the Linton (Ind.) and Connellsville coke. Since that time experts have been working to reduce the differential and it has been decreased so much in fact that the promoters are sanguine that within a short time they will be making an excellent grade of coke.

Application has been made in the circuit court of this county for a receiver for the Southern Railroad Company, the principal coal-carrying road of this territory. It is alleged that this is the first time in the history of the State that application for receiver has been made, alleging insolvency, for the purpose of marshalling the assets and income of a company to pay current taxes.

Michigan

Copper

Atlantic—Preparations to resume shaft sinking at section 16 are about completed. This shaft has been bottomed at the 16th level for some time and all work has been confined to opening the ground from the upper levels. It is now planned to sink indefinitely in the hopes of disclosing the Baltic lode in a more settled condition. The formation throughout the entire depth of the shaft has been very fragmentary, with the vein matter showing only intermittently. The most substantial formation encountered has been in the south drift from the 12th level, which shows the lode in a well organized state; this drift is within 150 ft. of the boundary line. All the levels are being opened on the same horizontal plane as the Baltic mine, and will be connected with the levels from the Baltic shaft; this arrangement will benefit the Atlantic materially, as it will afford ample ventilation and a second means of getting from underground.

Ahmeek—Both shafts are being equipped with a telephone system. The telephones will be placed four levels apart and both shafts, together with the several surface buildings, will be connected by means of an intercommunicating switchboard.

Calumet & Hecla—Sinking is going on in all six of the Osceola amygdaloid lode shafts, and from points on the conglomerate lode (which is 750 ft. to the west), crosscuts have been driven to cut the amygdaloid at depth; from the point of intersection raising, in line with the shaft, has been started. No. 13 shaft, which adjoins the Osceola on the north, is equipped with a new duplex hoisting engine and two 7½-ton skips, the shaft house is equipped with three crushers, capable of handling 2000 tons daily, which is the ultimate capacity of each of these shafts. No. 16 is similarly equipped. Nos. 14, 15 and 17 have temporary hoisting plants, but are being opened on the same scale and when necessary, new equipment will be provided. At No. 18 shaft, the newest of the openings and just south of the Centennial's southern boundary, sinking and drifting are being carried on; some copper is appearing in the formation. At No. 5 Calumet shaft of the main mine, the electrical pumping installation is progressing satisfactorily. This installation, consisting of four multi-stage centrifugal pumps of 1000 gal. per min. capacity will pump the water from the northern portions of the mine, and will be ready for service early in the fall; all water-way connections between the shafts have been completed. The new boiler house at the mills has gone into regular commission. The old plant has been closed down, and will soon be dismantled.

Dacotah Heights—Diamond drill explorations are being carried on about one-half mile west of Houghton, on the Dacotah tract and a good formation has been disclosed by the drill core. A gang of workmen, engaged in digging a sewer within the village limits of Houghton, opened an amygdaloid formation, well charged with copper.

Lake—The shaft is down more than 250 ft. on its way to the second level, which will probably be cut at a depth of 300 ft. Drifting to the south from the first level continues and the formation is practically unchanged.

Ojibway—Work on the concrete collars of both shafts is nearing completion and when completed work on the permanent skipway will be started; concrete will be used throughout for stringers and ties. No. 1 shaft is sinking at a depth of about 250 ft. and No. 2 is about ready to resume sinking below the first level, a distance of 350 ft. from surface. Drifting to the south at this level continues and the drift is breasted in a uniform formation, well charged with copper.

Osceola—At No. 6 shaft of the Osceola mine a new 6-ton skip has gone into commission; the adoption of this large skip necessitated the installing of a larger hoisting drum and a general strengthening of the surface equipment. The shaft was closed down one week to make these changes. No. 5 shaft is using a 5-ton skip, due to the size of shaft. These two shafts are in fine condition and record shipments are being made daily to the mills.

Missouri

Zinc-lead District

All Jack Mining Company—This company has been incorporated by O. E. Marshall, H. H. McNeal and F. M. Sharp, of Joplin. It will operate a lease south of the Conqueror mine at Chitwood. A shaft on the lease is already in ore and a mill has been completed.

Chapman & Lennan—This company has been incorporated by G. Y. Chapman, Temple Chapman, and T. F. Lennan, all of Webb City, with $100,000 capital.

Herald—This company has closed down its mill near Carthage, while its inclined shaft is sunk about 100 ft. further to the bottom of the orebody. The shaft at present is down 374 ft. on a 45-deg. incline, and drifting is done on top of the orebody.

I Know Lease—There are now four producing mines on this lease on the Taylor land, near Joplin. The lease is owned by C. M. Sheldon.

Jenkins & Co.—This company has taken a 15-acre lease on the Ground Floor tract north of Webb City, and will sink a shaft to find the orebody developed in the old Chicago mine.

McCullagh & Murdock—This company has succeeded in draining the upper levels of its mine at Cave Springs.

Mattes Brothers—This company is sinking a second shaft to the sheet ore on its Jackson tract, southwest of Joplin.

Mikado—This company, which is working sheet ground west of Joplin has built a long tramway from the shaft to its mill, and has increased the capacity of the mill from 150 to 250 tons daily.

Ontario Lease—Ore has been struck at 204 ft. depth on this lease south of Webb City.

Norton Land—On this land, near Joplin, the Helen Mining Company has made a good strike at 135 ft. It is between the Nortonia and the Lucky Jim leases, and is managed by A. J. Baker, of Joplin.

Symmes—This 40-acre lease on the Riseling land, west of Joplin, is being rapidly developed. A 250-ton mill is being built and the ground has been prospected by 25 drill holes. Sheet ore is found at 170 ft., and the mill shaft shows an orebody 18 ft. thick.

Tussing—Hardy & Co. have reopened this old mine near Belleville, and are now producing ore.

Waddell—This company has just completed its 100-ton mill, northwest of Carthage.

United Zinc Company—James Galbreath and associates have made a good jack strike at 60 ft. on this land at Aurora.

Montana

Jefferson County

Elkhorn Electro-Metal Company—This company was recently incorporated for the purpose of erecting and operating an electrolytic plant at the Elkhorn mine at Elkhorn. The proposed plant, with a capacity of 100 tons daily, will use the Baker-Burwell process for the treatment of tailings. As there are now about 125,000 tons of tailings at the mine, and as the present concentrator on the property is operating to the extent of two-thirds its capacity, it is estimated that there will be sufficient tailings to keep the new plant operating for several years. A test plant was erected at the mine some months ago and the runs made indicate that a profit of $2.50 per ton will be realized. The management states that the new plant will be completed and ready for work within 60 days. The operations of the plant will be watched with much interest inasmuch as the process is an entirely new one in this country.

Nevada

Esmeralda County—Goldfield

Ore Production—Shipments for the week ended July 9 were 2760 tons, as follows: Western Ore Purchasing Company from Rogers Syndicate, 548 tons; Engineers' lease, 345; Eisen, 24; Van Riper, 87; Mohawk Combination, 22; total, 1026 tons. Nevada Goldfield Reduction Company, from Victor, 51 tons; Sandstorm, 54; Little Florence, 70; Jumbo, 55; Commonwealth, 65; Florence-Mohawk, 15; Curtis-Mohawk, 105; Combination Fraction, 40; Lime Point, 20; Hayes-Curtis, 40; Black Butte, 6; Mohawk, 50; Bullfrog, 2; American mill tailings, 25; total, 598 tons. The Combination mill worked 560 tons.

Griffiths-Moore Stoneham Lease—This lease on blocks 2 and 3 of the Combination No. 2 claim has encountered a vein on the 200-ft. level, which across the entire breast assays $12.80. The conditions are such that the management confidently expects to get shipping ore with a little more development work.

Mitchell Fairfield Mining and Leasing Company—Contractors on this lease on the Combination No. 3 ground have just completed 151 ft. of a double compartment shaft, timbered with 8x8 timbers in 20 days, which is about the record for Goldfield.

Great Bend—The new vertical shaft has attained a depth of 90 ft., and is going down at the rate of 5½ ft. per day.

White Rock—Sinking has been resumed in the No. 7 shaft and the No. 5 shaft is being pumped out preparatory to sinking.

Esmeralda County—Red Mountain

This district, which is on the eastern edge of the Goldfield district about eight miles from town, is showing no little activity and encouragement. On the Butte Boys property a shaft has been sunk to a depth of 331 ft. and considerable crosscutting has been done exposing large quantities of milling ore and some stringers which assay high.

The Blackbird company has had a diamond drill prospecting outfit at work for some time and at one point has encountered at a depth of 300 ft. a quartz ledge carrying rich ore. A hoisting plant will be installed and a deep shaft will be sunk.

Humboldt County—Packard

Packard Mining and Milling Company—This company has purchased the Winope group of claims from Geo. D. Whipple, of Goldfield, and is excavating on the millsite preparatory to installing a mill and hoist.

[illegible]

The Truckee River General Electric Company has brought its transmission lines into this district, and all the operating mines are now equipped with electric power. There are five copper claims [illegible]

Nye County—Tonopah

Ore Shipments—Ore shipments for the week ended July 9 were all to the mills and were light on account of the holiday. The shipments were from the Tonopah Company, 2950 tons; Belmont, 450; Montana-Tonopah, 1000; North Star, 80; Midway, 100; [illegible] total 4775 tons.

[illegible]

[illegible] has started up and is now crushing ore. The mill has 25 stamps. The mill building is of steel.

Shoshone—It is reported that the Shoshone mill is to be enlarged in order to treat the ore from Schwab's Tonopah Extension mine at Tonopah.

Campbell Mill—The Campbell-Smith custom mill at Beatty has the foundations completed and the building about all framed. The machinery will consist of 10 stamps, amalgamation, concentration, and cyanide equipment.

Nye County—Manhattan

Black Jack—Work has been started on the Bittroff lease on the 220-ft. level.

Lemon Mill—The machinery is being overhauled in preparation for starting up the 10 stamps and cyanide plant.

Manhattan Consolidated—The shaft has been unwatered and miners have been stoping to fill the contract made to supply 1500 tons of ore to the Peterson mill.

Nye County—Wonder

Keane Wonder—The second clean-up for the month has been made by the Keane Wonder mill, the brick being worth $6500, making the month's production $15,500.

Nye County—[illegible] Mountain

Solid Gold Lease—This lease on the Daisy has been successfully financed. A mill has been ordered and ground for it has been broken. The mill will have six Merrall quadruple discharge stamps with a guaranteed capacity of 50 tons per day.

[illegible]—The mill of this company is treating 25 to 30 tons of ore per day so successfully that it is expected that at the approaching meeting of the directors in Denver the necessary steps will be taken for doubling the capacity.

[illegible] The old mill of this company will be taken down and moved to the mine and its capacity doubled. It will treat the [illegible] dump.

Oregon

[illegible]

[illegible] district, three adits are being run, and [illegible] Work is being continued. George M. Diehm is in charge of the work.

[illegible] made to reopen this mine, near Sumpter. James Manahan, of St. Paul, Minn., is the principal owner.

[illegible] of ore has been taken out of this mine, near Prairie City, and a mill test of the ore is to be made. Reese & Williams are lessees.

[illegible]

[illegible] this mine in the Bohemia district, and ore shipments will begin soon. F. J. Hard is manager.

West Coast—On this company's claims No. 2 adit is now in 400 ft., and work is being pushed under direction of L. D. Ryan, manager. At the recent annual meeting in Portland the following directors were chosen: C. H. Thompson, Portland, Oregon; Charles S. Collins, Nashua, N. H.; Jesse Hatfield, North Adams, Mass.; John W. Wheeler, Orange, Mass.; James E. Pratt, Southington, Conn.; Herbert E. Smith, New Haven, Conn.; C. B. Osgood, New York.

Pennsylvania

[illegible]

[illegible] plosion occurred July 15 in No. 1 shaft of this company's Williamstown colliery, by which 7 men were killed and 10 badly injured. [illegible] a miner lifting the gauze of his safety lamp just after the explosion of a shot which brought down a large quantity of coal, and also liberated much gas. The timbering and shaft were damaged, and part of the works set on fire. The colliery is near the lower, or southwestern end of the anthracite field. It has always been considered a fiery mine. The district inspectors have begun an inquiry into the cause.

[illegible]

George D. Howell, of Uniontown, Penn., recently completed the purchase of 200 acres of coal land, known as the English property, in Jefferson township, Fayette county, 3 miles from Brownsville [illegible] eau, Pittsburg, at $1500 an acre, the highest price ever paid for coal in that vicinity. The property contains the largest body of coking coal in the Redstone district. It [illegible]

Pennsylvania railroad and near the Pittsburg & Lake Erie road, beyond the Alice and Albany mines. An 8-ft. vein lies about 100 ft. below the surface. It is understood that the property will be turned over to the Monongahela River Consolidated Coal and Coke Company.

Pennwood Coal Company—This company has increased its capital stock to $1,000,000 and has authorized an issue of $1,000,000 bonds. The company recently bought a tract of 3900 acres of coal land in Somerset county, making its total holdings 5176 acres. The land is on the Pittsburg division of the Baltimore & Ohio, and the company has mines opened at Rockwood and Garrett. Hugh L. Kirby, Harpers Ferry, W. Va., is president of the company.

South Dakota

LAWRENCE COUNTY

Oro Fino—The Golden Reward announces that this property will resume at once. It is one of the high-grade smelting properties of the early days. Ore will now be shipped to the Denver smelter.

Puritan—The dissenting factions have reached an agreement to sell stock, give the bondholders stock for their bonds and operate the property in Strawberry gulch. There is $100,000 in bonds outstanding.

Victoria—Work has been resumed under John Simm, and if the development is as anticipated, the 200-ton cyanide mill will be soon in commission.

PENNINGTON COUNTY

Lucky Strike—The annual meeting of this company resulted in the election of the following officers: President, Henry Sorge, Reedsburg, Wis.; vice-president, E. M. Cassady, Whiting, Ia.; secretary, Lee Swift, Tracey, Mont.; treasurer, H. F. Seiter; superintendent, Frank Allen; manager, C. A. Allen all three of Deadwood. It was decided to sink the shaft 200 ft. further.

Utah

JUAB COUNTY

Taylor & Brunton Sampling Company—This company has decided to erect a 600-ton plant in the Tintic district.

MILLARD COUNTY

Ibex—This property, owned by a syndicate of Salt Lake and Los Angeles men, has recently been equipped with a large new hoisting plant. The shaft, now 300 ft. deep, is to be sunk to 1000 ft. depth. The company owns about 1000 acres of land.

SALT LAKE COUNTY

Yampa—A three-compartment shaft is being sunk at this mine in Bingham which is to be continued to at least the 2000-ft. level below the tunnel, which means 3200 ft. below the surface. The Yampa sulphide orebodies are among the largest in Bingham. The gold in the ore is sufficient to a little more than pay mining costs. The smeltery is treating 800 tons of ore per day. The new converter plant will be ready for commission August 1.

Flagstaff—This company, operating at Alta, is conducting a vigorous development campaign. Energy is being devoted mainly to driving on the Allegan fissure toward the Flagstaff where the former owners of the property found their principal resources on the upper levels in the early days of the camp.

SUMMIT COUNTY

Daly West—This company is producing again and has more than 100 men back on the pay-roll. The mine is to be developed at depth from a drift from the Ontario drain tunnel adit.

Virginia

Oriskany Ore and Iron Corporation—This company, which was chartered recently, is composed exclusively of Virginia interests, which have leased for three years the properties of the Alleghany Ore and Iron Company. The blast furnaces covered by this lease are at Iron Gate, Buena Vista and Shenandoah. The company's ores come from its Oriskany steam-shovel mines and its Reidton and Dixie mines at Vesuvius. R. L. Parrish, Covington, Va., is president; W. W. Taylor, vice-president and general manager; B. T. McPeak, Covington, Va., secretary. The operating force is the outgrowth of the Alleghany Ore and Iron Company, W. W. Taylor having been general superintendent of that company since its incorporation. John W. Stull, who has been in charge of the Oriskany mines, is still superintendent, and O. M. Stull, formerly superintendent of the Buena Vista Furnace, is now superintendent of the Iron Gate stack, which has started up after having been banked for two months.

Washington

FERRY COUNTY

Republic—The first carload of ore from this old mine has been shipped. The mine has been under development for several months by Richard Mulroy, who leased it from Ferry county, which came into possession of the mine for delinquent taxes amounting to about $40,000, several years ago. Formerly it was the largest mine in the district, and was the scene of much activity when an enormous reduction plant was installed. Mr. Mulroy is working a small, rich pocket in the mine. The ore is gold in silica.

West Virginia

RALEIGH COUNTY

New River Coal and Coke Company—This new company will develop 3000 acres of New River coal land on the line of the Virginian railway. The Chesapeake & Ohio Railway will also have a branch line on the property. Officers of the New River company are: W. P. Tams, Jr., Macdonald, W. Va., president; James O. Watts, Lynchburg, Va., secretary-treasurer.

WEBSTER COUNTY

Hamzite Coal and Coke Company—This company has been organized with headquarters at Martinsburg, W. Va., with the following officers: President, Alexander Parks; secretary, P. R. Harrison; treasurer, S. N. Myers. The company is said to own 3000 acres of coal land on the Baltimore & Ohio Railroad. It is stated that mining operations will begin Sept. 1, with an output of about 100 tons of coal per day.

Wisconsin

ZINC-LEAD DISTRICT

United States Zinc Corporation—Recent improvements made at this company's mills and mines include, besides the mill, a deep well and reservoir and a tramway 1200 ft. long from the mill to the Chicago & Northwestern road.

The concentrating plant consists of crusher, rolls, jigs, revolving screens, centrifugal pump, and is capable of treating 20 tons of mine dirt an hour. The power plant comprises one 250-h.p. boiler, and two 125-h.p. boilers. The drilling is done by Ingersoll-Sergeant compressor. There is a 100-h.p. mill engine, complete electric-light plant and a pumping plant consisting of one 10x6x10-in. Gardner duplex pump and two Camerons, any one of which is capable, under normal conditions, of handling the entire flow of water.

The company informs us that this mine has been producing an average of about 40 tons per day of raw concentrates, working 40 men single shift, or nine hours per day. For the week ended June 20 the production was 237 tons, which beats the record for the Wisconsin field. All ore taken from the mine is handled automatically until it is loaded in the cars on the tracks of the Chicago & Northwestern Railroad. No teams are used on the premises. After the new roasting and separating plant is completed, it is the intention to work double shift, which will mean a greatly increased output.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending July 11 were as follows: Cobalt Lake, 95,228 lb.; Kerr Lake, 60,674; La Rose, 83,100; Nipissing, 127,007; Nancy Helen, 187,007; O'Brien, 191,307; Peterson Lake, 41,237; Silver Queen, 180,000; total, 965,560 pounds.

Cobalt-Lake—A statement covering the first six months of the year has been issued, showing that 1222 ft. of drifting, 160 ft. of sinking and 30 ft. of raising have been done, making a total of 1412 ft. No more sinking will be done at present, efforts being directed to drifting [illegible] points under the lake.

Chambers-Fernald—Development is being systematically carried on by W. H. Jeffrey. Shaft No. 2, sunk on the O'Brien vein, which runs across the property into the LaRose, is down more than 90 ft. Drifts wil be run along the vein and a crosscut made to the north. Shaft No. 1 is being put down on vein No. 4 between the La Rose and Nipissing and crosscuts will be run when the 100-ft. level is reached. Shaft No. 3 is being sunk on vein No. 7 close to the La Rose.

Little Nipissing—Nothing of value has been encountered on the property owned by this company, but the drifting is being continued. On the Peterson Lake vein, leased by the Little Nipissing, the shaft is down 100 ft. At about 80 ft. the vein left the shaft and crosscutting has been started to reach it.

Nipissing—Another rich find is reported consisting of a calcite and silver vein with an average width of 10 in. and carrying several thousand ounces of silver to the ton. It was struck at 80 ft. on territory opened up this summer lying north of Cobalt. Two or three miles of trending have been done on this location which led to the discovery of several veins.

Silver Leaf—Over $20,000 was realized from the last two carloads of ore shipped from this mine. The new shaft is down 170 ft., at which point the vein, encountered at 125 ft., shows a width of about 4 in. and carries 500 oz. to the ton. A station has been cut at the 125-ft. level from which point drifting will be started on the main vein.

Ontario—Montreal River District

Cragg Location—A vein 3 in. wide and heavily shot with native silver has been found on this property in Smythe township, and has been stripped for more than 200 ft. Test pits are being sunk.

Ontario—Silver Center District

Grover & Smith—A large slab of native silver and a rich nugget weighing more than 200 lb. have been taken from this property in Lorraine township.

Ontario—Dryden District

Hutchison Location—A shaft has been put down 10 ft. on this property at Lake Flambeau and good ore is in sight. Camp buildings will be erected and development will be pushed.

Warner Location—This property has been purchased by John Morton, of Port Arthur, Ont., on behalf of a syndicate which will begin operations immediately.

Mexico

Chihuahua

[illegible] is shipping from its Santa Eulalia mines about 150 tons of lead ore daily. General manager Donald B. Gillies lately returned from an extended trip to Tonopah and other points in the States.

Otates—Captain Richard Harper and associates, of Los Angeles, Cal., recently spent several days in Chihuahua, en route to Otates where they have started work at a number of old mines.

Socorro—A 100-ton cyanide plant is being installed at this property in the Ocampo district. Col. J. H. Pender is the manager in charge.

Republica—The May output of this company consisted of about 20,000 oz. of bullion and 45 tons of high-grade concentrates, and the monthly product henceforth is estimated at $60,000. With the proposed enlargement of the concentrating and cyanide plants this figure will probably be doubled within six months. J. W. Malcolmson, the company's general manager, accompanied by several El Paso stockholders, returned from an inspection trip to the property last week.

Mexican Smelting and Refining Company—It is likely that the blowing-in of the new plant near Chihuahua may be deferred, on account of the scarcity of water in the Chuviscar river, from which stream the plant's supply is secured. In the meantime, a stock of ore is being accumulated, a tonnage coming from several tributary camps in this State. The two roasters were put in commission last week, and it is stated that additional roasting facilities may be necessary for the increasing supply of sulphides.

Pinos Altos—W. P. Dunham, of Los Angeles, has begun work at several mines belonging to the Pinos Altos Mines Company in the Ocampo section. E. H. Barton is to direct operations.

Bullion Shipments—The Banco Minero, of Chihuahua reports the following bullion shipments for the week ending June 27: Dolores Mines Company, 70 bars of a value of 151,000 pesos, and Lluvia de Oro, 6 bars of a value of 13,000 pesos.

Santo Domingo Placers—It is reported that J. R. Roslyn and associates are to install several dredges at these locations along the Boquilla river, in the vicinity of Falomir station on the Orient road east of Chihuahua.

[illegible]—A recent [illegible] from this property, situated in the Rayon district, brought $17,000 and other high-grade lots are being prepared. The chief metal contents are gold and silver. J. H. & Chas. Qualey are the operators.

La Reina—A recent shipment from this mine, belonging to the Compañia Metalurgica de [illegible], a carload of high-grade silver ore, netted about 9000 pesos. Preparations [illegible] amalgamation plant.

[illegible] Nuevas district is being unwatered, preparatory to the resumption of ore extraction. Juan R. Carey is the new superintendent. [illegible] pard are the leasing operators.

[illegible] at its mines in the northern part of the State. The properties are developed to a depth of 400 ft. and have produced considerable high-grade gold ore.

[illegible] the camp for the week ending July 4 [illegible] were shipped to outside smelters and the balance treated at local milling plants. The June output was 34,525 tons.

[illegible]

[illegible] the last week of June, the office of the Dwight Furness Company shipped concentrates and ore to the amount of $53,000, which, together with the shipments of others, amounted to over $67,500. The bullion shipments reached the high mark of $153,000, which is the highest since silver took a drop. [illegible] concentrates shipped through the Dwight Furness Company amounting to over $100,000, an increase of $47,000 over the previous week. The bullion shipments amounted to $156,000, a slight increase, and was divided between Mexico City and Aguascalientes.

Sonora

[illegible] ing plant at Cananea resumed operations on the morning of July 11. The new feeding arrangements and the various other improvements, were brought into use without a hitch.

Europe

[illegible]

The magnesite deposits of Euboea are being actively worked, and several new deposits have lately been opened. The exports, which were 22,747 metric tons in 1905, increased to 32,134 tons in 1906, and 36,520 tons in 1907. The contracts of the Anglo-Greek Magnesite Company call for [illegible]

Asia

A British consular report states that the production of the three mines worked in the Keelung district of North Formosa in 1907 was as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 22—The coal trade in the West shows no change, having been almost stationary during the week. The slow improvement reported recently seems to make little progress; but there has been no recession. There has been, perhaps, too much disposition to ship coal to consuming centers, the result being sales at low prices to avoid demurrage charges.

In the East the bituminous trade continues dull, with little prospect of a revival before fall. Anthracite trade is also quiet and without change. The Seaboard trade has been very light. The upper Lake ports are receiving some shipments, but there is still a large accumulation of coal at lower Lake ports awaiting the arrival of normal iron-ore shipments.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 11, in short tons:

	1907.	1908.	Changes.
Anthracite......	2,995,280	2,799,960	D. 195,320
Bituminous.....	20,066,018	16,876,940	D. 3,189,078
Coke............	7,483,150	3,540,028	D. 3,943,122
Total..........	30,544,448	23,216,928	D. 7,327,520

The total decrease this year to date was 24 per cent.

New York

ANTHRACITE

July 22—There is no change in the hard-coal market except that No. 1 buckwheat is shorter and the demand and supply are now about equal. Prepared sizes and the other small steam coal are in abundant supply. Independent dealers continue to cut circular prices for all sizes. Prices quoted by the principal producers are as follows: Broken, $4.55 egg, stove and chestnut, $4.80; pea $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

There is no change in the general situation except that in certain quarters there is a little better demand. This refers more especially to points around Cape Cod. In New York harbor the demand has not improved and good grades of steam coal are offered at $2.40@2.50 per ton with few takers.

Transportation from mines to tide is good. In the Coastwise vessel trade there is practically no demand and boats are unsuccessfully seeking business. Freight rates are at the lowest point in years and large vessels can get no more than 50c. per ton from Philadelphia to points around the Cape; small craft can get 60 @70c. to these points but there is not enough business to supply the number of vessels seeking charters.

Birmingham

July 20—The coal production in Alabama has been materially decreased by the union miners' strike. Although the mines are being kept in operation by the furnace operators and by a few commercial coal companies, at the majority of the places there has been a serious falling off in the output. A number of disturbances occurred and it became necessary to call on the governor for the troops to protect property and the lives of the men who wanted to continue at work. The coke production, as a consequence of the reduction in coal output, shows some decrease.

There is but little demand for coal, and there have been no changes in coal prices recently. The operators reiterate their intention of operating their mines on the open-shop plan, but six of the smaller commercial companies have signed the union wage scale and have mines in full operation.

Chicago

July 21—The coal market continues weak generally, except in the harvesting trade which is improving steadily. Good grades of coal are in demand for this trade, and are as high this year as ever. Eastern coals get some benefit from this increase, as does also Western lump.

Hocking Valley, heretofore off as much as 25c. from circular prices, is now close to circular ($3.15). Smokeless, selling at a similar discount, is stronger, run-of-mine bringing $3@3.30. Youghiogheny is moving chiefly on contracts at $3.15 for ¾-inch.

Illinois and Indiana coals are stronger in lump; screenings continue strong and lump is weak locally. Lump brings $1.75 @2.25, run-of-mine $1.60@1.75 and screenings $1.45@1.65. Brazil block is stationary at $2.25@2.35.

Anthracite is very quiet.

Pittsburg

July 21—The operation of the railroad coal mines in the Pittsburg district shows a decline. At the opening of the week not more than 75 per cent. of the mines were in operation and they are not running full time. A large coal producer declared today that not more than 50 per cent. of the normal output is being produced. Nearly all the tonnage mined is going to the Lake ports for the Northwestern markets. Ohio and West Virginia interests have captured more of this trade than usual. Prices remain at $1.15 per ton on contract for mine-run coal at the mines. The river coal mines are still operating to nearly their capacity, but production is being decreased owing to the large stocks that have accumulated. There are no immediate prospects of a raise in the rivers, but when they are again navigable shipments will be unusually large.

Connellsville Coke—There is but little change in the coke situation. The H. C. Frick Coke Company is increasing its capacity each week as the Steel corporation is putting more furnaces in blast. Independent interests, however, are operating their plants about the same. No change in prices is noted, furnace coke still being quoted at $1.65@1.75 and foundry at $2.10@2.25 at ovens. For prompt shipment these prices may be shaded a trifle. The *Courier* in its summary for the week gives the production in both of the Connellsville fields at 174,729 tons. The shipments were 6084 cars as follows: To Pittsburg, 2283; to points west of Connellsville, 3270; to points east of Connellsville, 531 cars.

Sault Ste. Marie Canal

The movement through the Sault canals in June continued light. The total freight reported for the season to July 1 was, in net tons:

	1907.	1908.	Changes.
East-bound.......	13,649,105	3,937,509	D. 9,711,596
West-bound.......	4,139,214	2,064,816	D. 2,074,398
Total............	17,788,319	6,002,325	D. 11,785,994

The total decrease was 66.2 per cent. The number of vessel passages this year was 3295, showing an average cargo of 1822 tons. This is a small figure, and it is evident that few of the larger vessels have been in commission yet. The mineral freights included in the total were as follows, in short tons except salt, which is in barrels:

	1907.	1908.	Changes.
Coal................	3,741,512	1,761,875	D. 1,979,637
Iron ore........	11,840,412	2,733,430	D. 9,106,982
Pig and manuf. iron	102,618	86,966	D. 15,652
Copper............	22,100	27,484	I. 5,384
Salt, in bbl........	157,085	199,915	I. 42,830

Iron ore was 45.5 and coal 29.4 per cent. of the total freight in 1908; against 66.5 and 21.1 per cent., respectively, last year.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, six months ended June 30, long tons; with coal furnished to steamships in foreign trade:

The larger exports of coal this year

	1907.	1908.	Changes.	
Coal	29,675,774	30,024,552	I	348,778
Coke	416,737	494,900	I	78,163
Briquets	709,702	756,557	I	46,855
Total exports	30,802,213	31,276,009	I.	473,796
Steamer coal	9,102,823	9,440,660	I	337,837
Total	39,905,036	40,716,669	I	811,633

The larger exports of coal this year were 5,318,643 tons to France, 4,609,271 to Germany, 4,179,629 to Italy and 1,745,113 tons to Sweden.

Belgian Coal Trade—Imports and exports of fuel in Belgium, five months ended May 31, metric tons:

Imports	1907	1908	Changes.	
Coal	2,174,546	2,153,984	D	20,562
Coke	152,853	139,519	D.	13,334
Briquets	66,508	82,776	I	16,268
Exports:				
Coal	1,799,059	1,838,147	I.	39,088
Coke	340,972	345,762	I	4,790
Briquets	176,429	176,982	I	553

Imports are chiefly from Germany; exports are largely to France and Holland. Changes were small.

German Coal Production—Coal production of Germany, five months ended May 31, metric tons:

	1907.	1908.	Changes.	
Coal	58,113,174	61,516,204	I.	3,403,030
Brown coal	24,691,647	27,003,501	I	2,311,854
Total mined	82,804,821	88,519,705	I.	5,714,884
Coke made	8,824,207	8,938,212	I.	114,005
Briquets made	6,385,634	7,355,237	I	969,603

Of the briquets made this year 5,699,578 tons were from brown coal, or lignite.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of July 4: Best Welsh steam, $3.90; seconds, $3.66; thirds, $3.54; dry coals, $3.84; best Monmouthshire, $3.36; seconds, $3.30; best small steam, $2.28; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 22—Some sales of pig iron are reported, but chiefly in small quantities. There are still reports of offers at lower prices, but it is not easy to verify them. Southern iron is reported sold at 25 to 50c. below the price recently quoted of $12 Birmingham, for No. 2 foundry. There have been some sales of basic iron, chiefly to seaboard and eastern points.

Finished material is generally quiet. The only activity reported is in structural steel, and that is chiefly in inquiries and negotiations. Bridge work is scarce, but there are a number of building projects which will probably materialize, if the price question can be settled.

As a result of the signing of the Amalgamated association bar-iron scale by the Republic Iron and Steel Company all the mills in the Sharon, Penn., district have resumed operation affording employment to about 5000 men.

Iron Ore Movement—Exports and imports of iron ore in the United States for the five months ended May 31 are reported as follows, in long tons:

	1907	1908	Changes.	
Exports	11,940	36,181	I	24,241
Imports	[illegible]	[illegible]	D	[illegible]

Imports of manganese ore for the five months were 74,646 tons in 1907, and 91,401 in 1908; an increase of 16,755 tons.

Baltimore

July 20—Exports for the week included 878 short tons of copper in ingots, cakes and plates to Hamburg and 25 tons to London. There was also exported 216 lb. of selenium to London. The imports included 765 tons of ferromanganese from Liverpool.

Birmingham

July 20—Manufacturers are holding pig iron at $12@12.50 per ton, No. 2 foundry. It was reported recently that some iron was being sold in this district under $12 per ton, but the report was not substantiated. One or two good-sized sales were made recently, but the principal business is in small lots and for immediate delivery. The orders booked during June are being delivered easily. The production in this district has been improved a little by the blowing in of another furnace at Woodward by the Woodward Iron Company. An accident caused one of the furnaces of the Sloss-Sheffield Steel and Iron Company to close down for several days last week. There is some apprehension that the coal miners' strike may affect the iron production. Arrangements have been made for a supply of coal and coke, if necessary, to be shipped in from West Virginia.

The production at the steel plant is holding up well, although there is need for a greater production of certain shapes. The rolling mills of the Tennessee company at Bessemer were closed down for a couple of days because of a short supply of steel. Steel rails are still being shipped out as rapidly as they are produced. More labor is being put to work in this plant. There is no change in conditions at the cast-iron and soil-pipe works in this district, all being active. Foundries and machine shops are still without any appreciable amount of business, but there is hope of an early improvement in the trade.

Chicago

July 21—Business generally has not recovered from the great depression of last autumn. Buying of pig iron is in small lots, and contract requirements are, in general, ignored and carload lots, up to [illegible] sale.

Prices for both Southern and Northern are weaker. No. 2 Southern sells at $11.50 Birmingham ($15.85, Chicago) and No. 2 Northern at $16.75@17.25. Lake Superior charcoal is quiet at $20@20.50.

For iron and steel products the market is chronically dull. Railroad materials and structural materials show a little life and bars are comparatively strong.

Coke is dull and inquiries for good-sized contracts have nearly disappeared. The best Connellsville coke sells for $4.90 and West Virginia cokes fetch $4.15

Pittsburg

July 21—A decided improvement is noted this week in the iron and steel industry, due partly to the three-weeks' idleness of a number of plants which are now at work on accumulated orders. The general opinion, however, is that there will be no falling off and that the improvement will continue until normal conditions are restored, probably about the begining of the fourth quarter. The steel plant and the Brown-Bonnell works at Youngstown started up full yesterday; the Valley works, also at Youngstown, and the other plants in the West are scheduled to begin work during the week. The Youngstown Sheet and Tube Company also put its plants on full schedule yesterday. The Carnegie Steel Company has added to its capacity and so has the National Tube Company. Production has been increased at most of the active mills in the Pittsburg district. Last week the American Sheet and Tin Plate Company was forced to close 55 of its tinplate mills because the hot mills had got ahead of the finishing mills. This does not mean a decline in production as the hot mills had been breaking records. This week all of the idle mills except eight at the National works were put in operation again and the company is operating about 90 per cent. of its capacity. It is running 86, or 47 per cent. of its sheet mills. The independent sheet and tin-plate mills are in satisfactory operation and the outlook is encouraging.

Pig Iron—In addition to a good healthy inquiry for pig iron two important transactions have been closed. One is for 10,000 tons of chill-cast bessemer for deliveries extending through August, September and October. It was bought by a Pittsburg [illegible] Valley furnace. The price was $16.00 delivered. The other sale was 8000 tons of basic iron for August delivery, the purchaser being the Pittsburg Steel Company which will start four of its eight new open-hearth furnaces next month at its wire plant at Monessen, near Pittsburg. The United Steel Company, Canton, O., was in the market for 2500 tons of basic iron for [illegible] it has withdrawn and it is understood the [illegible] Several sales of small lots of different grades are recorded and some good sales are in sight. Prices remain about as follows: Standard bessemer, $15.75@16; basic, malleable bessemer and No. 2 foundry, $15@15.25; gray forge, $14 all at Valley furnaces.

Steel—Conditions remain unchanged. Besemer and open-hearth billets are quoted at $25 and sheet bars at $27.50, Pittsburg. Steel bars are firm at 1.40c. and plates at 1.60c. Pittsburg.

Sheets—The steel market is a little stronger, but no large orders are being booked. Prices are the same, black sheets being quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferromanganese—Prices continue strong at $46@47 for prompt delivery.

Foreign Iron Trade

British Iron-ore Imports—Imports of iron ore in Great Britain for the half-year ended June 30 were 3,899,893 long tons in 1907, and 2,926,012 in 1908; a decrease of 973,881 tons. Of the imports this year 2,171,937 tons were from Spain.

German Iron Production—The German Iron and Steel Union reports pig iron production in May at 1,010,917 metric tons, being 31,051 tons more than in April. For the five months ended May 31 the total pig-iron produced in Germany was, in metric tons:

	1907.	1908.	Changes	
Foundry iron	905 274	955,328	I.	50,054
Forge iron	334 559	292,706	D.	41,853
Steel pig	421,198	426,329	I.	5,131
Bessemer pig	200,838	181,746	D.	19,092
Thomas pig	3,449,748	3,237,187	D.	212,561
Total	5,311,617	5,093,296	D.	218,321

The only gains were in foundry iron and in steel pig, which includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The largest decrease was in Thomas, or basic, pig. The total loss was 4.1 per cent.

German Foreign Trade—Imports and exports of iron and steel, and of machinery, in Germany, five months ended May 31, metric tons:

Imports:	1907.	1908.	Changes.	
Iron and steel	305,163	236,330	D.	68,833
Machinery	38,759	36,417	D.	2,342
Total	343,922	272,747	D.	71,175
Exports				
Iron and steel	1,380,294	1,471,444	I.	91,150
Machinery	123,858	142,068	I.	18,210
Total	1,504,152	1,613,512	I.	109,360

The Steel Syndicate has been pushing the export trade actively this year, to compensate for declining home trade.

Belgian Iron Production—Pig iron production in Belgium in May was 111,590 tons, a decrease of 11,390 tons from 1907. For the five months ended May 31 the total was: Foundry iron, 35,300; forge, 67,850; bessemer and basic pig, 367,630; total, 470,780 metric tons. This is a decrease of 121,500 tons from the corresponding period last year.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 22.

At all U. S. Ports in June and year.

Metal.	Exports.	Imports.	Excess.	
Gold:				
June 1908..	$ 8,626,718	$ 3,409,885	Exp.	$ 5,216,833
" 1907..	23,872,140	2,165,342	"	21,706,798
Year 1908..	53,507,975	26,368,198	"	27,139,777
" 1907..	36,300,732	21,468,647	"	14,832,085
Silver:				
June 1908..	4,437,360	3,366,182	Exp.	1,071,178
" 1907..	5,360,599	3,476,546	"	1,884,053
Year 1908..	25,514,545	21,054,332	"	4,460,213
" 1907..	29,219,209	22,395,611	"	6,823,598

Exports of gold from New York, week ending July 18: Gold, $1,049,631 mostly to London; silver, $758,294 to London. Imports: Gold, $57,000 from South America; silver, $58,812 from South America, Hamburg, West Indies and Mexico.

Specie holdings of the leading banks of the world July 18, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$310,163,600
England	$189,119,970	....	189,119,750
France	634,022,525	$182,165,025	816,187,550
Germany	200,355,000	81,395,000	281,750,000
Spain	78,270,000	134 115,000	212,385,000
Netherlands	38,516 500	20,841,000	59,357,500
Belgium	20,413,335	10,216,665	30,630,000
Italy	180,765 000	21,375,000	202,140,000
Russia	561,110,000	38,885,000	599,995,000
Aust.-Hungary	234 225,000	66,745,000	300,970,000
Sweden	19,415,000	....	19,415,000
Norway	8,160,000	....	8,160,000
Switzerland	18,675,000	....	18,675,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Foreign commerce of the United States half-year ended June 30, reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports	$ 940,450,372	$ 877,823,264
Imports	751,279,183	522,451,357
Excess, exports	$ 189,171,189	$ 355,371,907
Add excess of exports, silver		4,460,213
Add excess of exports, gold		27,139,777
Total export balance		$ 386,971,897

The gold and silver movement in detail will be found in the table at the head of this column.

Silver Market

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
16	4.8700	53¼	24 9/16	20	4.8700	53	24½
17	4.8700	53	24 9/16	21	4.8700	52¾	24 7/16
18	4.8700	53⅛	24 9/16	22	4.8690	52⅞	24 7/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 9:

	1907.	1908.	Changes.	
India	£6,566,074	£4,200,158	D.	£2,365,916
China	......	516,400	I.	516,400
Straits	544,012	90,510	D.	453,502
Total	£7 110 086	£4 807,068	D.	£2,303,018

The silver market has had a sagging tendency the last week. The Indian bazars have been the principal buyers and their demand being satisfied each day, has resulted in a lower level for quotations.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
16	12¾ @13	12½ @12¾	57¼	29½	4.40 @4.45	4.40 @4.45	4.25 @4.30
17	12¾ @13	12½ @12¾	57½	29½	4.40 @4.45	4.40 @4.45	4.25 @4.30
18	12¾ @13	12½ @12¾	....	29½	4.40 @4.45	4.40 @4.45	4.25 @4.30
20	12¾ @13	12⅝ @12¾	58⅛	29¼	4.40 @4.45	4.42½ @4.47½	4.27½ @4.32½
21	12¾ @13	12⅝ @12¾	57⅞	29¼	4.40 @4.45	4.42½ @4.47½	4.27½ @4.32½
22	12¾ @13	12⅝ @12¾	58⅛	29¾	4.40 @4.45	4.42½ @4.47½	4.27½ @4.32½

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The improvement in business which we reported last week has gone further, substantial transactions having been effected from July 16 to 22, both for domestic and foreign account, and both in electrolytic and Lake copper. The bulk of this business has been for early delivery. Up to the 18th the demand for electrolytic was freely met at about 12⅝c., but since Monday there has been a stiffer attitude.

The most encouraging factor in the situation is the sustained improvement in the demand for home trade. The large sales for near-by shipment confirm the belief that there are no stocks in the hands of manufacturers. The heavy sales for export indicate that foreign buyers are much less concerned about stocks in public warehouses in Europe than are some interests on this side.

The market closes firm at 12¾@13c. for Lake copper, and 12⅝@12¾c. for electrolytic in ingots, cakes and wire bars. The average of the week for casting is 12⅜@12½c.

A vigorous rise in the London standard market was started during the week, and the closing cables report the market at the highest price reached in this movement, i.e., £58⅜ for spot, and £59 for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 2000 tons.

Refined and manufactured sorts we quote: English tough, £60½@61½; best selected, £60½@61½; strong sheets, £72½@73½

Manufactured Copper—Sheets, cold rolled, 17[illegible]c.; hot rolled, 16[illegible]c. Wire, [illegible]c. base.

Tin—The London market was very firm the larger part of the week and closes at £134[illegible] for spot and £135[illegible] for three months.

The quick recovery in the London market from a decline at the beginning of this week had a favorable influence on domestic business, which, however, was mostly confined to dealers. Consumers are still fighting shy and buy only their immediate wants. Spot metal is well concentrated and a premium exacted for it. At the close business is being done at about 29¾c.

Lead—The market is quiet and unchanged at 4.40@4.45c., New York.

After the recent rapid advance, it was not unnatural that there should be a reaction in the London market, but at the close there has been a recovery from the low point, the cables quoting Spanish lead at £12·18s. 9d., and English lead at £13 1s. 3d.

Spelter—A little more business is doing owing to an increase in the demand from galvanizers, and the market closes somewhat higher at 4.27½@4.32½c. St. Louis, 4.42½@4.47½c. New York.

The London market has held the advance throughout the week and closes firm at £19 [illegible] for good ordinaries and £19 [illegible] for specials.

Other Metals

Antimony—The market is without interest. Quotations are 8[illegible]c. for Cookson's, 8[illegible]c. for Hallett's and 8@8[illegible]c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Platinum—Prices were reduced $1 per oz., at which level some sales were made. Quotations now are $22.50 per oz. for hard platinum, $20 for ordinary and $1[illegible] for scrap.

Missouri Ore Market

Joplin, Mo., July 18—The highest price paid for zinc ore was $38 per ton; the assay base price was $35 per ton for 60 per cent. zinc, the base ranging down to $34 per ton for medium grades and as low as $30 for sludge. The average price, all grades, was $32.08 per ton. The high price for lead ore was $60 this week, with week-end offerings of $58@59 and sales [illegible] $57 for [illegible]. The average price, all grades, was $58.88, owing to a large amount of the ore shipped being settled for on the price of the previous week.

The weaker market has a depressing effect on the output and may tend to discourage operators from resuming production.

Following are the shipments of zinc and lead from the district for the week ending July 18:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	$60,502
Joplin	[illegible]	[illegible]	40,969
Duenweg	[illegible]	[illegible]	14,698
Oronogo	[illegible]	[illegible]	[illegible]
Galena	[illegible]	80,340	11,762
Alba-Neck	[illegible]		9,224
Prosperity	[illegible]	69,050	6,621
Miami	[illegible]		5,768
Granby	[illegible]	30,000	5,400
Carthage	[illegible]		5,204
Spurgeon	[illegible]	[illegible]	4,761
Aurora	[illegible]		4,488
Badger	[illegible]		4,429
Quapaw-Baxter	[illegible]	[illegible]	[illegible]
Zincite	148,850		2,381
Carl Junction	[illegible]	1,790	[illegible]
Sarcoxie	70,970		1,135
Totals	[illegible]	[illegible]	[illegible]
29 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week, [illegible]; 29 weeks, [illegible]

Lead value, the week, [illegible]; 29 weeks, [illegible]

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	[illegible]	[illegible]
February	47.11	34.92	February	84.58	49.72
March	[illegible]	[illegible]	March	82.75	49.90
April	[illegible]	[illegible]	April	79.76	52.47
May	[illegible]	[illegible]	May	79.56	56.05
June	[illegible]	[illegible]	June	73.66	60.48
July	[illegible]	......	July	[illegible]	......
August	43.22	......	August	59.54	......
September	40.11	......	September	[illegible]	......
October	[illegible]	......	October	51.40	......
November	35.19	......	November	[illegible]	......
December	[illegible]	......	December	[illegible]	......
Year	43.68	......	Year	68.90	......

Wisconsin Ore Market

Platteville, Wis., July 18—The base price for 60 per cent. zinc ore this week was $33@36 per ton. The price paid for lead ore declined further, the best grades selling at $58@60 per ton. High-grade zinc ore is still scarce, causing the base price to go higher but no premium was paid. All but three roasters have been idle since [illegible] and the product of [illegible] is offered for sale. The [illegible] and Acme plants, however, will be put in operation at once by the [illegible] Company at Platteville. The carbonate producers at Highland have resumed and are shipping to the Mineral Point Zinc Company.

Shipments [illegible] ended July 18:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
Highland	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]		57,000	
[illegible]		[illegible]	
[illegible]		88,180	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Chemicals

[illegible] The market in general continues dull and little business is being done. The average sales [illegible] months of 1907.

Arsenic—White arsenic has advanced slightly, due to a better feeling abroad; [illegible] offered at less than 3½c. per lb.

Copper Sulphate—[illegible] and independent dealers are offering moderate quantities at $4.50 per 100 lb. Standard goods are held firmly at $4.65 for carloads and $4.00 for smaller quantities.

Nitrate of Soda—[illegible] less. Quotations are unchanged at 2.30@2.32½c. for spot 95 per cent. and 2.25@2.35c. for other positions of 1908.

[illegible] Italy, report a reduction of 30,000 tons in the stocks at the end of June compared with June, 1907. Exports of sulphur from Sicily during May amounted to 30,485 tons against 23,260 tons in May, 1907. [illegible] the end of May, 1908, against 174,327 tons in a similar period of 1907. The visible stock in Sicily at the end of May was 527,708 tons in 1908; 503,550 in 1907; and 430,213 tons in 1906.

Phosphates—[illegible] report shipments of Florida phosphates through the port of Savannah in June as follows: To Great Britain, 7257 tons; Germany, 6957; Belgium, 3300; total, 17,514 long tons.

Mining Stocks

[illegible] Copper dividend, usually awaited with interest, caused no excitement when announced this week. It is 50c., or ½ per cent., the same as last quarter. Boston & Montana paid $3, also the same as last quarter. On the New York Exchange Amalgamated closed strong at 71⅝; [illegible] States Steel, common, 45⅛; preferred, [illegible].

[illegible] were fractionally higher at the close.

Boston

July 21—After a slight reaction last week the market quieted down, but business recovered its activity and strength followed by moderate price recessions today.

Amalgamated reached $71.50 during the week, closing tonight at $71 or $1.25 above a week ago. Butte Coalition on active trading rose $1.12½ to $26.12½, with slight reaction. Copper Range has fluctuated between $74@75; Mohawk rose to $62, subsequently falling back to $60, and recovering to $61.50; North Butte rose from $72.75 to $75; on active trading. Old Dominion spurted $1.50 to $37.50; Osceola, $3 to $103; Parrott, $1.75 to $26.37½; Trinity, $1.75 to $15; United States Smelting, $2 to $38.25; and Utah Consolidated is firm around $44. Utah Copper is up $2.12½ to $36.62½.

Some of the low-priced issues have also been dealt in. Adventure advanced $1.37½ to $5.50; Arcadian, 75c. to $4.25; Boston Consolidated, 75c. to $12.75; Boston & Corliss, $1.25 to $17.25; Isle Royale, 75c. to $21.50, and Mass, 50c. to $6.20. On the curb First National has been the feature, selling at $2.25 to $6.25, with a fractional setback. The Boston Stock Exchange has furnished a sensation by voting to divorce itself from the curb by not allowing either wires nor any member or firm to be directly represented on the curb. In other words stock-exchange houses cannot be represented on the curb, but must do business direct with curb brokers.

STOCK QUOTATIONS

NEW YORK July 21

Name of Comp.	Clg.
Alaska Mine	1/16
Amalgamated	71
Anaconda	44 1/8
Balaklala	3 1/2
British Col. Cop.	5
Butte & London	....
Butte Coalition	26
Colonial Silver	1/8
Cum. Ely Mining	8
Davis Daly	2
Dominion Cop.	2 1/16
Douglas Copper	4 1/2
El Rayo	2 1/16
Florence	3 1/4
Foster Cobalt	42
Furnace Creek	.14 1/2
Giroux	3 1/2
Gold Hill	1/2
Goldfield Con.	5 7/8
Granby	‡101
Greene Gold	1/2
Greene G. & S.	1 1/8
Greenw'r & D.Val.	.75
Guanajuato	1 3/4
Guggen. Exp.	150
Hanapah	‡.20
McKinley Dar.	73
Micmac	2
Mines Co of Am.	1 1/16
Mitchell Mining	1/2
Mont. Sho C.	.80
Nev. Utah M. & S	3
Newhouse M. & S	5 1/4
Nipissing Mines.	7 1/4
Old Hundred	1/2
Silver Queen	1.09
Stewart	3/4
Tennessee Cop'r.	35
Tri-Bullion	1 1/16
Union Copper	3/4
Utah Apex	4
Utah Copper	36 1/2
Yukon Gold	3 3/4

*Ex. Div. †Ex. Rights.

BOSTON July 21

Name of Comp.	Clg.
Adventure	5 1/2
Allouez	31
Am. Zinc	28
Arcadian	3 3/4
Arizona Com	19 1/2
Atlantic	14 1/2
Bingham	.75
Boston Con	12 3/4
Calumet & Ariz.	115
Calumet & Hecla.	670
Centennial	25 3/4
Con. Mercur	.44
Copper Range	74 1/2
Daly-West	11
Franklin	9 1/2
Greene-Can.	10 7/8
Isle Royal	21
La Salle	14 1/4
Mass	6 1/8
Michigan	9 3/4
Mohawk	61 1/2
Nevada	12 7/8
North Butte	74 1/2
Old Colony	.40
Old Dominion	37
Osceola	103
Parrot	25 1/2
Quincy	88 3/4
Rhode Island	3 7/8
Santa Fe	1 7/8
Shannon	14 3/4
Superior	16 1/2
Tamarack	66
Trinity	14 1/2
United Cop., com.	6 3/4
U. S. Oil	24
U. S. Smg. & Ref.	38
U.S.Sm. & Re.,pd.	46
Utah Con.	43 1/4
Victoria	5
Winona	6 1/2
Wolverine	132
Wyandotte	1 1/4

‡Last quotation

N. Y. INDUSTRIAL

Am. Agri Chem.	25 1/4
Am. Smelt. & Ref.	84
Am. Sm. & Ref., pt.	107 1/4
Bethlehem Steel	19 1/4
Colo. Fuel & Iron.	32 3/4
Federal M. & S., pt.	‡83 1/2
Inter. Salt	18 1/2
National Lead	71 1/2
National Lead, pf.	103
Pittsburg Coal	12
Republic I. & S.	21
Republic I. & S., pf.	74
Sloss-Sheffield	60
Standard Oil	640
U. S. Red. & Ref.	12
U. S. Steel	45
U. S. Steel, pf	108 1/2
Va. Car. Chem.	25

BOSTON CURB

Ahmeek	‡72 1/2
Black Mt.	3
East Butte	6
Hancock Con.	‡5 3/4
Keweenaw	6 7/8
Majestic	.77
Raven	.95
Shawmut	.38
Superior & Pitts.	12
Troy Man.	.55

ST. LOUIS July 11

N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.00	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	4.00	3.00
Con. Coal	19.00	16.00
Doe Run	120.00	110.00
Gra. Bimet.	.22	.20
St. Joe	14.00	12.00

LONDON July 22

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 0 9
Camp Bird	0 12 9
Esperanza	1 11 3
Tomboy*	1 1 3
El Oro*	1 4 3
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS July 22.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.19
Belcher	.27	St. Ives	.32
Best & Belcher	.59	Triangle	.04
Caledonia	.11	BULLFROG STOCKS	
Chollar	.15	Bullfrog Mining	.03
Comstock	‡.26	Bullfrog Nat. B.	.04
Con. Cal. & Va.	..	Gibraltar	.05
Crown Point	.23	Gold Bar	.04
Exchequer	.29	Homestake King	.42
Gould & Curry	.19	Montgomery Mt.	.06
Hale & Norcross	.29	Mont. Shoshone C.	.80
Mexican	‡.45	Original Bullfrog	.02
Ophir	2.45	Tramp Cons	.17
Overman	‡.07	MANHAT'N STOCKS	
Potosi	.12	Manhattan Cons.	.08
Savage	.29	Manhat'n Dexter	.04
Sierra Nevada	.36	Jumping Jack	.02
Union	.41	Stray Dog	.02
Utah	.04	MISCELLANEOUS	
Yellow Jacket	.38	Golden Boulder	.08
TONOPAH STOCKS		Bonnie Clare	.09
Belmont	.93	Lee Gold Grotto	...
Extension	.82	Nevada Hills	1.75
Golden Anchor	.02	Nevada Smelting	.75
Jim Butler	.30	Pittsburgh S. Pk.	1.08
MacNamara	.70	Round Mt. Sphinx	.22
Midway	.39		
Montana	1.37		
North Star	.10		
Tono'h Mine of N.	7.75		
West End Con.	.68		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.22		
Booth	.19		
Columbia Mt	.18		
Comb. Frac	1.04		
Cracker Jack	.05		
Dia'dfield B. B. C.	.19		
Goldfield Belmont	.14		
Goldfield Daisy	.75		
Great Bend	.27		
Jumbo Extension	.48		
Katherine	...		
Kendall	.15		
Lone Star	.08		
May Queen	.06		
Oro	.09		
Red Hill	.24		
Roanoke	...		
Sandstorm	.35		

COLO. SPRINGS July 18

Name of Comp.	Clg.
Acacia	6
Black Bell	....
C. C. Con	3
Dante	6 1/2
Doctor Jack Pot	6
Elkton	58
El Paso	33
Findlay	....
Gold Dollar	6
Gold Sovereign	‡3
Isabella	28
Index	....
Jennie Sample	2 5/8
Jerry Johnson	4
Mary McKinney	‡25
Pharmacist	3
Portland	1.00
Un. Gold Mines	3 1/4
Vindicator	81
Work	‡8 5/8

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	July 17	Aug. 6	$0.02
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Chollar, Nev	July 8	July 30	0.10
Exchequer, Nev	Aug 11	Sept. 1	0.05
Helvetia, Ariz	... ...	July 20	0.50
Ingot, Utah	July 17	Aug. 5	0.01
Iowa Copper, Utah	July 13	July 30	0.05
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Lucky Calumet, Ida	July 3	Aug. 13	0.01
Maxfield, Utah	July 18	Aug. 17	0.02
Mexican, Nev	July 17	Aug. 17	0.10
Missoula Copper, Ida	July 25	Aug. 25	0.01
Oro Cobre, Cal	July 16	Aug. 3	0.02
Sierra Nevada	July 14	Aug. 4	0.10
Signet	Aug 8	Oct. 6	0.01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Wabash, Utah	July 10	Aug. 1	0.10
Wheeler, Utah	July 16	Aug. 6	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	......	31.366	......
August	68.745	......	31.637	......
September	67.792	......	31.313	......
October	62.435	......	28.863	......
November	58.677	......	27.154	......
December	54.565	.....	25.362	.....
Year	65.327	......	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	......	21.923	......	95.016	......
August	18.356	......	19.255	......	79.679	......
September	15.565	......	16.047	......	68.375	......
October	13.169	......	13.551	......	60.717	......
November	13.391	......	13.870	......	61.226	......
December	13.163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	......
February	42.102	28.978	August	37.667	......
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	......	20.350	......
August	5.250	......	19.063	..
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	....
Year	5.325	......	19.034	....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	......	5.922	......	23.850	......
August	5.701	......	5.551	......	21.969	......
September	5.236	......	5.086	......	21.050	......
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, AUGUST 1, 1908. NO. 5

The Silver-Lead Mines of Santa Barbara, Mexico

Milling in This District Has Been Highly Developed Owing to Early Recognition of the Importance of the Mixed Sulphide Ores

BY CLAUDE T. RICE

MONTEZUMA LEAD COMPANY, SANTA BARBARA

The town of Santa Barbara is situated amid rolling hills about 12 miles southwesterly from Parral, and is reached by the branch of the Mexican Central leaving the main line at Jimenez. The town is situated in a narrow gulch, along a stream (almost dry in the hot season) to the west of the ridge, along the western slope of which is the Mina del Agua vein, where ore was first found by the Spaniards in 1547, only 26 years after the conquest.

History of the District

As at Leadville, Colo., and in the Cœur d'Alene district of Idaho, it was gold (in this case gold ore in place) that first attracted attention, for in the year above mentioned a party of Spanish adventurers on an exploring expedition in northern Mexico found rich ore along the outcrop of the Mina del Agua vein. This was the first ore found by the Spaniards in northern Mexico, and as the ore found was very rich (some writers say that some of this ore produced 12 oz. gold per *carga* of 300 lb.), the district soon began to flourish.

By 1580 Santa Barbara had a population of 7000 inhabitants and was the principal city in northern Mexico; at that time the viceroy of Nueva Viscaya, who reported direct to the King of Spain and who ruled over Chihuahua, Texas, New Mexico, Arizona and California, and also part of Sonora and Coahuila, had his residence and seat of government there.

The veins in the district outcrop boldly, and it was no wonder that the district prospered, for little prospecting was necessary to find the veins. Therefore Santa Barbara flourished for many years and many arrastras were treating the gold ore [illegible] different veins, until in time this ore was exhausted, and the miners had to work on the oxidized silver-lead ore which then formed the bulk of the ore in the upper part of the veins. The Mexicans erected adobe furnaces and began to smelt the ore after roughly concentrating it on *planillas*, but the results of this work in 1645 were not especially enticing, for in that year, when Diego Rodrigo discovered ore in the Veta Colorada vein at Minas Nuevas, near Parral, the Santa Barbara mines were almost deserted and nothing noteworthy appears to have happened until English-speaking people obtained control of the district.

In the meanwhile *gambucinos* had continued to work the upper parts of the veins so that in some places a depth of 150 ft. had been attained. The rich ore was first gouged out, as is characteristic of leasers in Mexico, as in the United States; after "gophering" out the ore, the *gambucinos* had robbed the pillars. Consequently when English-speaking mining men began to work the mines (in the late seventies) they found the upper parts of the veins badly wrecked.

The Tecolotes was the first vein worked by the new-comers, and later an English company obtained control of the Mina del Agua mine. Still, in 1883, when the old Tecolotes company erected a small water-jacket blast furnace to smelt the ore from the Tecolotes vein, the Mexicans were treating considerable ore in their adobe furnaces and were concentrating much ore on *planillas* alongside the creek. The product from the Tecolotes furnace is said to have been shipped at first to Denver, but after 1886, when the smelter at El Paso was completed, it was shipped to that place.

MINA DEL AGUA, SANTA BARBARA

In the last 10 years the Santa Barbara camp has developed rapidly, for mining men recognized that it was not a shipping camp; consequently they began early to solve the problem of milling the sulphide ores.

Geology of the District

The Santa Barbara district is sometimes considered to be part of the Parral camp, but as the country rock is shale and the ore an argentiferous galena carrying some zinc, copper and iron sulphides, instead of a silicious silver ore in an andesite or rhyolitic country rock as at Parral, the district, especially as it is producing more ore than Parral, should be considered separate from Parral.

The country rock at Santa Barbara is shale, locally called "slate," in which no interbedded limestone is found. In places the shale has been much folded, but generally it lies quite flat with a dip to the west. Cutting through the shale are several large rhyolite dikes having generally a northerly and southerly strike, but the large dike on the crest of the ridge between the Tecolotes and the Cabrestante mine is a notable exception. The veins are roughly parallel to these dikes and generally dip from 50 to 60 deg. to the west, although sometimes they are nearly vertical, especially near the surface; a few of the veins dip to the east, notably the Clarinas vein.

The Mina del Agua is probably the strongest of these veins, since it can be traced for a distance of 2½ miles or more, dying out in the plain to the north and becoming lost in the mountains to the south. It has a very strong, but not continuous, outcrop as have most of the other veins in the camp, and it is no surprise that it was one of the first veins to be discovered. To the east of the Mina del Agua is the Tecolotes vein; this is almost as strong as the Mina del Agua vein, provided that one considers the Central vein and other veins of the Montezuma Lead Company to be the northern extension of this vein series beyond the large dike already mentioned. Farther west are several veins which pass through the Caballo and Clarinas properties, while still farther west are the veins which pass through the property of the Grenadeña company and those that pass through the San Francisco Del Oro property.

Character of the Ores

As has been said, the surface ore carried quite a little gold, but this was almost all worked out centuries ago. In the pillars of the upper stopes there is little indication of this rich ore, so that some in the district are inclined to question the stories of the immensely rich ore found in the first years of the camp's existence. Still some stringers of this rich ore were found by the first foreigners to work mines in the district.

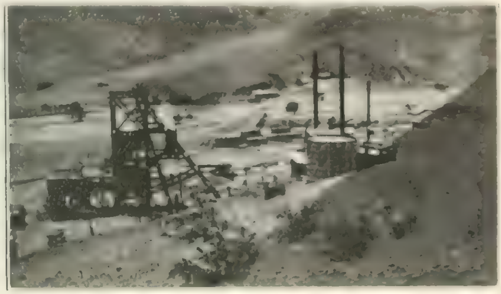
The surface ores of the district are oxidized silver-lead ores which carry little zinc and some gold. The zone of this oxidation is variable so that often on the same level there are both oxidized and sulphide ores. Most of the oxidized ore was mined before English speaking persons entered the district, but a considerable amount of oxidized ore is still produced in the camp. This ore is hand-sorted and the "fines," provided it carries little copper, is hand-jigged before being shipped to the smelter.

The carbonate ore shipped from the camp carries from 300 to 500 grams silver and 3 to 5 grams gold per metric ton, and from 10 to 12 per cent. lead, 3 to 4 per cent. zinc, 10 to 12 per cent. iron, and 40 per cent. silica. The sulphide ores vary greatly in their zinc content. The San Diego veins are especially rich in this element, sometimes carrying as high as 26 per cent. zinc. The Tecolotes vein and especially the veins in the San Francisco del Oro property also carry quite a little zinc. In fact all the veins contain some zinc, which apparently increases as depth is obtained. There is copper in some of the veins, especially in those low in zinc, in which case the copper appears to increase in depth. The gold content has a strong tendency to increase as the copper content rises, for the gold occurs mainly in the pyrite and the chalcopyrite. The sulphide ores of the camp carry about 250 grams silver and 2 to 8 grams gold per metric ton, 5 to 10 per cent. lead, 10 to 20 per cent. zinc, 6 to 7 per cent. iron, [illegible] to 3 per cent. copper, and 30 to 40 per cent. silica.

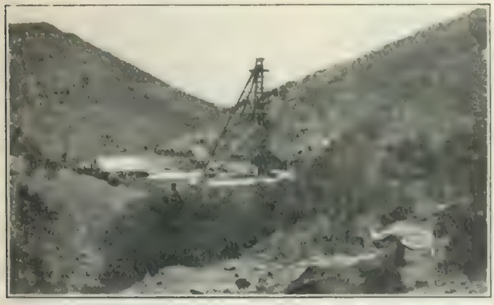
As has been said, the veins have bold outcrops which cut across the shales, but the walls, although rough and jagged, are strong. The veins, while they are strong and persistent, have a tendency to split and send off branch veins; frequently large ore shoots occur in the veins at such points. The width varies greatly; the stopes are often 30 ft. wide and in places even 100 ft., but the average width is 10 to 15 ft. The ore [illegible] and in some veins in large pockets which seem to have no connection with one another; such is especially the case in the veins of the San Diego mine.

The ore is mined both by overhand and underhand stoping and, as the walls are strong, very little timbering is required. The cost of mining is low; in the San Diego mine, where the veins are narrow, the ore is mined on contract at 2 pesos per 16 cu.ft. car, delivered at the shaft station. At the Tecolotes property it is said that the ore is delivered to the mill at about 3 pesos per ton, the drilling and breaking costing 1.75 pesos. The ore is mined by overhand stoping and air-hammer drills are used.

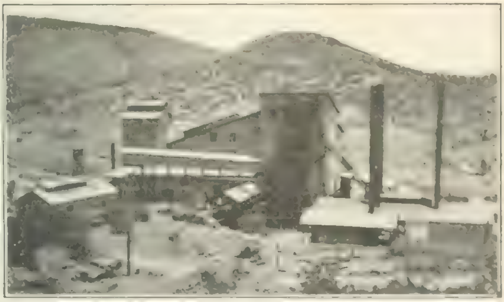
OUTCROP OF CLARISTANTE VEIN, SANTA [illegible]



[illegible]



TECOLOTES MINE, SANTA BARBARA



[illegible] MILL [illegible]

•

Milling the Ore

The 60-ton mill erected by the old Tecolotes company was the first mill built at Santa Barbara. Later the mill of the Montezuma Lead Company was erected but this, after being run for a few years, was shut down about three years ago. Later the new Tecolotes 600-ton mill, which is run by power generated in gas engines, was built and after much overhauling has finally been running successfully for a little over a year. Other but smaller mills, the Grenadeña, Hinds Consolidated, Alfareña and San Diego, have been built in the district.

The Tecolotes mill is the largest in the district [illegible] mill. The general milling practice at the San Diego mill, belonging to the Compañia Metalurgica de Torreon, is in some ways the most advanced in the district, the mill being provided with driers and magnetic separators for the extraction of zinc from the ore. The following paragraphs on milling are descriptive of the practice at this mill, which was running until the slump in metal prices, but is now shut down.

[illegible]

After crushing in a Blake breaker the ore is [illegible] belt, where the smelting ore and pieces of shale and barren quartz are picked out. The ore is then sent to another Blake breaker, which crushes it to ½-in. size; it is then crushed in roughing and finishing rolls to 8 mm. size, the undersize being screened [illegible] to avoid unnecessary sliming. The treatment of both the lead and the zinc ore is the same up [illegible] in- stead of being concentrated coarse as is the lead ore, the zinc ore is passed over a 1½-mm. screen, and after the oversize has been [illegible]

TECOLOTES MILL, SANTA BARBARA

REMEDIOS, HINDS CONSOLIDATED, SANTA BARBARA pass this screen all the zinc ore is elevated to a bin. This bin feeds the Robins belt conveyer, which takes the ore to the magnetic separation plant as fast as it can be treated on the separators.

The lead ore is elevated to trommels which separate 6 mm. 2½ mm. and 1½ mm. sizes, while the undersize from the 1½ mm. goes to a hydraulic classifier which feeds the different sizes to Wilfley and Card tables and Frue vanners. The 6 mm. size from the trommels goes to three 4-compartment Hartz jigs, while the other two sizes are distributed to three other 4-compartment Hartz jigs, two treating whichever of the smaller sizes is the greatest in amount.

The tailing from the coarse jigs, which assays 1 per cent. lead and 6 to 7 per cent. zinc, is thrown away after being dewatered; the tailings from the other jigs are all reground in rolls to about 1 mm. size and, after being dewatered in a settler, are sent to a different classifier which feeds to a separate set of tables and vanners. The tailings from the different tables are dewatered in settlers and Callow cones and this water, together with the water from the tailing made by the coarse jigs, is pumped back to the top of the mill.

The tables and jigs made a lead concentrate, a zinc and iron middling, and a zinc concentrate, the ratio of concentration being 9 to 1. The zinc and iron middling is retreated on the magnetic separators.

Magnetic Separation of the Zinc Ores

The zinc ore is treated by magnetic separators before being concentrated on the jigs, tables and vanners. This zinc ore assays 23 to 30 per cent. zinc, 4 per cent. lead and 8 to 9 per cent. iron. The iron is in the form of pyrite, and is therefore non-magnetic; the zinc sulphide fortunately contains sufficient iron to render it magnetic, while the gangue is non-magnetic, being quartz and pieces of silicified shale included in the vein or broken from the wall.

In the magnetic separating department the ore from the zinc bins, or the middling from the tables, is fed to a Bartlett-Snow cylindrical drier where it is dried, but not roasted, for roasting would render the pyrite magnetic. The dried product is then fed directly to two units of four International magnetic separators. The four separators composing a unit are placed vertically one above another so that the belt from the pulley of one separator drives the separator below and the tailing from one separator feeds to the separator immediately below.

The ore is delivered to the International magnetic separator by a roll feed, and falls evenly upon the top of a horizontal toothed roll situated between the horizontal pole-pieces of an electromagnet. The roll is made of soft iron and is regulated at 80 r.p.m. As the roll revolves, the ore and the teeth enter the magnetic field of the nearer pole; thus the magnetic material sticks to the rotating roll even when the lower quadrant has been entered. The non-magnetic material then drops off and passes to the separator below for further concentration. The magnetic material is held on the rotating roll until the neutral point between the two poles is reached; here, the magnetism being nil, the zinc drops into a hopper which leads to a spout, in this case feeding to a bucket elevator.

The International separator has the advantage of having a large capacity, but unfortunately it cannot be adjusted to do as close work as the Rowand type of Wetherill separator.

The tailing from the separators is elevated by bucket elevators to the wet concentration system where it is concentrated to remove the lead and pyrite, for the pyrite assays about [illegible] Unfortunately all the zinc is not removed by the separators; therefore a zinc middling is made in the wet concentration, and this is again treated on the magnetic separators.

[illegible]

The magnetic separators at the San Diego mill are run on a 7 to 8 ampere current of 110 volts. The efficiency of the concentration varies with the percentage of zinc in the ore. With an ore assaying 30 per [illegible] as 75 to 85 per cent. of the zinc can be obtained but, where the ore is low in zinc, the extraction falls to 60 and even 50 per cent. When making an [illegible] per cent., 28 per cent. of the total zinc in the ore would be taken off by the first separator, 14 per cent. by the second, 6 to [illegible] cent. by the fourth separator. The con- [illegible] cept when treating ore carrying less than 22 per cent. zinc; then it is impossible to get the concentrate to assay as high as 40 per cent. zinc.

[illegible]

In the Santa Barbara district, the Tecolotes property is running at full capacity; the Compañia Metalurgica de Torreon is shipping some ore to the smelter from the San Diego No. 8 vein; the Montezuma Lead Company is shipping some good oxidized silver-lead ore from its Central and Cabrestante mines; the operators of the Monterey smelter No. 2 are shipping some ore from their Caballo property; the Granadeña Mining Company is doing some development and preparing to install a tramway; while the Hinds Consolidated company is treating a considerable tonnage in a mill equipped as yet only with [illegible]

The El Rayo in the Los Azules district, but sometimes considered in the Santa Barbara district, is treating 110 tons of gold ore per day, while the San Francisco del Oro Company, which is sometimes considered to be in the Parral district, is shipping galena-blende-pyrite-iron ore carrying silver. Recently, at a point about eight miles south of the town of Santa Barbara, rich silicious silver ore was found at surface and from the first shipment of about 17 tons, $6000 above smelting charges was received. This indicates the possibilities even in a district where mining has been going on for over 350 years. Although this strike is only a few weeks old, trenching is said to indicate a fair prospect of permanence to the ore shoot. Locally this strike is attracting attention, but unfortunately litigation is threatened regarding some of the later locations.

Conclusion

A peculiarity of this lead-silver district is the absence of limestone in the sedimentary series, and the presence of calcium fluoride in some of the ore. The probable character of the ore that will be found at depth is enigmatic, for only in a few properties has even a comparatively shallow depth below water level been attained. In some of the veins the copper content appears to increase near water level, but in others, where zinc is present in quantity, this tendency is not shown. Nevertheless, as in all the veins the zinc content increases with depth, it seems certain that below water level the ore will become a mixed sulphide of galena, sphalerite and pyrite, carrying some chalcopyrite. However, owing to the rapidity with which the magnetic treatment of mixed sulphides is advancing, this probable change to mixed sulphides of higher zinc content should not present a serious problem.

Short Talks on Mining Law—VI

By A. H. Ricketts*

In the United States a valid lode location is made by appropriating certain surface land which includes the apex of at least one vein or lode. By the terms of the statute such appropriation gives the exclusive right of possession and enjoyment of all the surface included within the limits of the location (not included in prior appropriated territory), and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines. The parallel end lines of the location as laid upon the ground are the end lines of all veins, lodes or ledges within the claim, irrespective of their strike. The location need not be laid along the strike of the vein or lode, nor need its end lines be parallel, nor its side lines be equidistant, nor the surface boundaries be wholly or at all upon unappropriated territory. But no individual location must exceed 1500 ft. in length, nor 300 ft. on each side of the center of the vein or lode at the surface, but should it do so, it is void only as to the excess, unless fraud plainly appears.

If the claim is laid so that its greatest length crosses the vein or lode on its strike, its shortest lines become its end lines and its longest lines its side lines, so far as the extra-lateral rights are concerned. If the end lines of a claim are not parallel with each other, they may be made so and the extralateral right obtained. The straightening of the lines is usually done by an amended location or by the deputy mineral surveyor when making the survey for patent.

It is not necessary that the end lines of one claim shall be parallel with the end lines of any other claim. Irregularly shaped pieces of ground left by their divergence or otherwise may be located so as to secure the extralateral right by placing the boundary marks upon the adjoining claims, although they may be patented to others, if no objection is made to such a course at the time. Subsequent objection would be of no avail.

Placer Claims

Placers are defined by the act as "all forms of deposit excepting quartz or other rock in place," but if any particular deposit, whether "in place" or not, is by the act made subject to location as a lode or as a placer claim, it must be located as such, or the location is void. For instance, marble deposits may lie in lode formation, but must be taken up as a placer claim, and iron, not being placed in either category by the statute, must be located as a lode or placer claim as the character of the particular deposit may warrant. It is essential that a placer location shall include land which is chiefly valuable for some mineral deposit therein. This, under the decisions, runs from diamonds to guano.

Appropriate discovery is necessary to each single location, whether it consists of 10 or 20 acres by an individual or 160 acres by an association; but mineral discovery on a particular part of the location of 160 acres does not conclusively establish the mineral character of the entire claim. Any person, or association of persons, not more than eight, may make as many single locations, whether contiguous or otherwise, as may be deemed expedient, provided that no one location exceeds the maximum limit, that is, 20 acres for one person, or 160 acres for an association of not less than eight individuals. A corporation is deemed to be a single person.

If upon surveyed lands, the location should be made in conformity to the rectangular subdivision of the public surveys as near as may be reasonably practicable. A departure from a "square location" renders the validity of the location open to question, and thereupon the reasons relied upon for the irregularity in shape of the claim, must be explicitly shown. A placer location, whether upon surveyed or unsurveyed lands, is not necessarily void because of irregularity in surface form, and placer locations made in the form of a parallelogram (lode location), have been upheld by the courts. Whether the exterior boundaries of a location made in conformity to the public surveys shall be marked by the locator as an essential act of location, is determined by the local law or local rule, or perhaps the decisions of the courts prevailing in the place where the particular claim may be situated.

No extralateral right attaches to a placer claim held only as such. Any vein or lode known to exist therein may be located by another person, or it may be included in the patent for the placer claim, if included in the application for patent. If open to location and not included in the application such omission is construed as a declaration that the applicant has no right of possession of such vein or lode. The existence of outcroppings or the mere sinking of shafts, etc., may make it a "known vein."

The true rule seems to be that a vein or lode is known to exist when it is already ascertained to be of such extent from actual discovery within the claim, as to render the land more valuable on that account and justify its exploitation. It has been held that if a vein or lode is known to the applicant for a placer patent, or known to the community generally, or else disclosed by workings and obvious to anyone making reasonable and fair inspection of the premises, for the purpose of obtaining title from the Government, it is a known vein or lode. But speculation, belief, or presumption as to the existence of the vein or lode within the claim, is sufficient to charge the placer claimant with notice of its existence.

No person may prospect for any vein or lode within the confines of a placer claim without the consent of the placer claimant, but a known vein or lode may be lawfully located by another even after the issuance of the placer patent, if known to exist at the time of the application for patent and not expressly included therein.

It follows that a placer claimant has only a qualified possession of the surface and no extralateral right to any blind vein or lode discovered within such claim.

Mill and Tunnel Sites

A mill-site location can be made only on non-mineral land not contiguous to a vein or lode not otherwise appropriated. For instance, while a mining location may be validly made upon ground within the unpatented limits of a congressional grant of land to a railroad or a State, still no mill-site location can be made thereon, under the law. The mill-site location must not exceed five acres in area, nor be made by one other than the proprietor of a vein or lode, or the owner of a quartz mill or reduction works, who may not own a mine in connection therewith.

The mining act does not prescribe what acts are necessary to evidence the fact of location, nor does it provide for any annual expenditure thereon. It is sufficient that the boundaries of the claim be marked and record made if such be required by local law or local rule, and that there be a reasonable use and occupation of the mill site for mining or milling purposes. Generally, the mill site may be included in an application for patent for a vein or lode claim, or may be patented separately and paid for at the rate of $5 an acre or fractional part of an acre.

A tunnel may be run either for the development of a vein or lode or for the discovery of such. In the first instance it seems to be contemplated by the law that it is run for such purpose by the person or company owning such vein or lode, and it is provided by the mining act that work done therein shall be considered as work expended on such vein or lode. But a tunnel site may be acquired for either purpose. In the second instance, a tunnel-site location may be made for the discovery of veins or lodes subject to the rights of surface claimants. The mining act does not provide how such a claim shall be located, but limits the right of possession to all veins or lodes within 3000 ft. of the face of such tunnel, that is, the point at which it first enters cover. A location exceeding that length is void only as to the excess.

The tunnel owner is entitled to all veins or lodes within that distance on the line thereof, not previously known to exist, or which have not previously passed into private ownership, to the same extent as if discovered upon the surface. He may locate the same on either side of the tunnel or as may be convenient, subject to the rights of others, without further discovery and his rights relate back to the time of the location of the tunnel site. No immediate development of a vein discovered in the tunnel is necessary, but failure to prosecute the work upon the tunnel itself for six months with reasonable diligence is considered as an abandonment of the right to all blind veins on the line of such tunnel.

---

*Member of the San Francisco bar, San Francisco, Cal

It has been held that locations made by others subsequent to the tunnel location, if they are within 300 ft. of the vein or lode and within 1500 ft. as located along the vein or lode discovered, are at the risk of such locators. The tunnel owner, as such, can acquire no right to a blind or other vein or lode within the boundaries of a preexisting adverse valid lode location, nor has he the inherent right to pass through such territory in prospecting for such or any veins or lodes.

The Holman Air-cushion Stamp

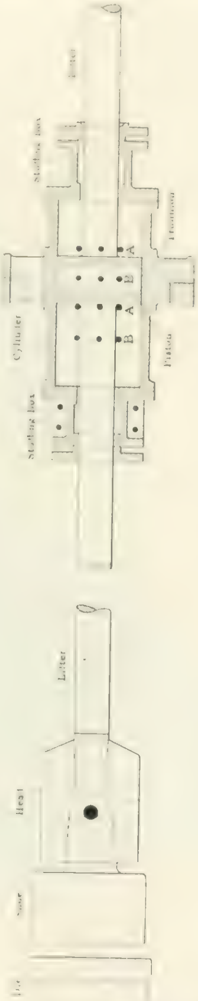
By Edward Walker

In an article dealing with Cornish methods of ore dressing which appeared in the Journal of April 13, 1907, I gave some particulars of the so-called pneumatic stamp. This stamp has not received the attention it deserves because the former makers were not in a position to push it and the name given to it is so misleading that even the highest authorities on ore dressing obtained a wrong idea of its principle. The stamp is not operated by compressed air, as might be supposed. It is steam-driven, with an air cushion interposed in the stem. With due deference to the makers, Holman Brothers, of Camborne, Cornwall, I intend to rechristen it the "Air-cushion stamp," hoping that metallurgical engineers will be attracted to it under its new name.

Details of Construction

I take this opportunity of giving some further details of its construction and its capacity. The accompanying illustration shows a section of the working parts. The cylinder is raised and lowered by connecting-rods which connect the trunnions with the source of power. The lifter or stem passes through this cylinder, and the piston fixed to it traps the air at the top and bottom of the cylinder, thus forming a pneumatic cushion. The air enters the cylinder through holes in its side. In order to allow for the wear of the shoe and die it is desirable that there should be more than one row of holes at top and bottom. There are, therefore, four rows provided. Only two rows are used at a time, either the first and third, marked *A*, or the second and fourth, marked *B*. When new shoes and dies are used, the holes *A* are [illegible] these are closed up, and the holes *B* are used instead. In order to facilitate opening and closing the holes, they are tapped and suitable set-screws are provided to close them.

A machine which performs so much work has to be looked after carefully and a good mechanic is required; but the machine is far simpler than other [illegible] tention to a few points is all that is required. [illegible] per minute. It should not be more than 140 nor less than 120 blows per minute. It is necessary to adjust the piston rings and the stuffing boxes very accurately [illegible] careful attention, so that the cylinder [illegible] ricate the cylinder, so that oily matter [illegible]



[illegible]

Every three months the lifter or stem should be removed and annealed. To do this all that is required is to heat it to a red heat and bury it in ashes until it is cold. A spare stem and cylinder should be kept in stock and used alternately. When the stem requires annealing, the cylinder may also be removed and thoroughly cleaned.

These air-cushion stamps are used in a number of Cornish mines and their application is extending. At East Pool mine, two heads have been in use for six months, and the results are so satisfactory that six more are to be erected. In an article in the issue of May 18, 1907, I mentioned that at this mine the old plant was being gradually replaced by more modern machinery, paid for out of the profits and not by the issue of further additional capital. In this way, the old Cornish stamps are being replaced, as they wear out, by air-cushion stamps.

[illegible]

The two stamps that have been working for six months crushed 21 tons each, in 24 hours, reducing the ore to pass a 25-mesh screen. The Cornish stamps treat about 19 cwt. per head in the same time. The ore is very hard and heavy in mineral, and for both these reasons takes an exceptionally long time to crush in the stamps. Judging by what is done at other mines in the vicinity, a California stamp with a 950-lb. head would crush from 28 to 30 cwt. in 24 hours. The ore is fed in fairly large-sized lumps, much of it being in pieces three inches across.

The cost of crushing by the air-cushion stamp at East Pool is 11d. per ton, compared with 14d. per ton by the Cornish stamp; labor, renewals and all other costs are included.

According to the London *Mining* [illegible] petroleum in Java in 1907 was 1,655,331 cases compared with 1,934,683 cases in 1906. The industry is carried on by the [illegible] Balik Pappan and is under Dutch management with headquarters at the Hague. The oil refinery has a capacity of about 450,000 tons of crude oil per annum.

Cast-iron carwheels are placed in cylindrical brick-lined annealing pits immediately after removal from the molds. At the beginning of annealing the wheels are a cherry red, and it usually takes four days for them to cool sufficiently to be handled.

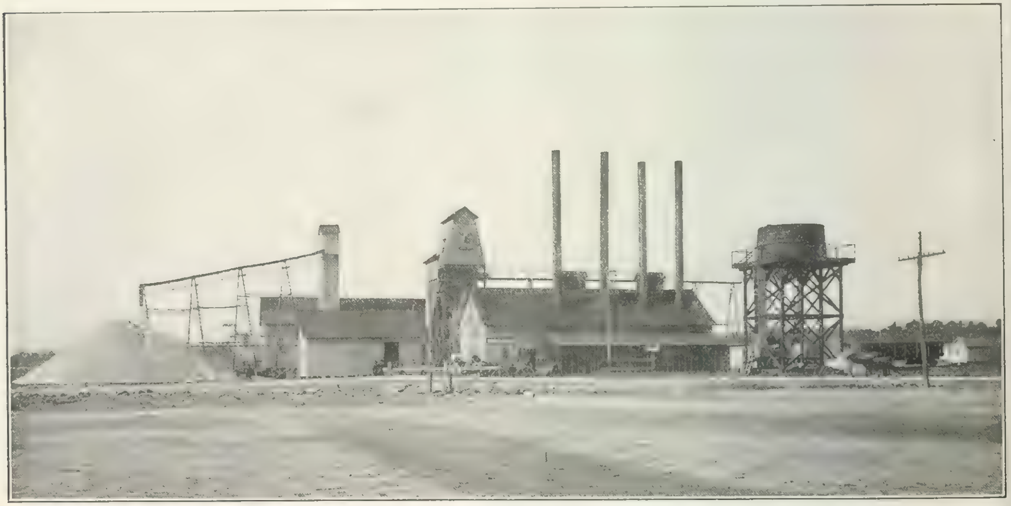
Pumping Problems of the Joplin District

Abundant Rainfall, Broken Ground, Numerous Streams Subject to Flood Increase the Difficulties of Keeping the Workings Free from Water

BY DOSS BRITTAIN[*]

The Joplin district includes the territory lying between Alba and Neck City on the north and Granby, Mo., on the south, a distance of 35 miles, and from Aurora, Mo., on the east to Baxter Springs, Kan., and Quapaw, Okla., on the west, a distance of 75 miles. This irregular area includes portions of Missouri, Kansas, and Oklahoma, and is remarkable for its deposits of lead and zinc ore, the mining of which is one of the principal industries of this region.

The rainfall is abundant, being about 45 in. per year. The surface drainage is to the southwest. The water flows through numerous small streams, the principal one of which is Spring river, which rises about 30 miles east of the eastern boundary of Jasper county in which Joplin is situated, flows northwest to the northern section of this county; thence after its confluence with Center creek, Turkey creek, and Shoal creek, next in importance to Spring river, it turns southwest into Kansas, where at Lowell, 12 miles west of Joplin this stream operates the power plant of the Spring River Power Company, which supplies the district with electric power.



SURFACE PLANT, OZARK LEAD COMPANY, CENTER CREEK VALLEY, MISSOURI

Since the district lies in the foothills of the Ozark mountains, the slopes are decided, no opportunity being given for the formation of marshes and swamps. On the other hand, natural water-power is available with but little assistance from artificial structures, as at Grand Falls on Shoal creek, where power is generated to supply the lights of the various cities of the district. On account of the excellent surface drainage, in spite of the heavy rainfall, there are with the exception of two or three stream valleys, no heavy water problems to be solved. The exceptions, however, required much skill, time and heavy expenditures.

Water in the Mines of the District

Throughout the district there is no general water level. Each camp has its own water level which varies with the mining operations in the contiguous territory. At Galena, Kan., the water level in most of the mines is from 60 to 70 ft. from the surface where no pumps are used. In 1891 the water level under similar conditions was at 40 ft. The extreme variability of water levels even in contiguous mines is illustrated in two mines one mile south of Galena, not more than 800 ft. apart; in one the shaft is 200 ft. deep and free from water, while the other shaft, only 150 ft. deep, is flooded.

Similar examples in various parts of the district lead to the belief that underground streams are numerous, which theory accounts in large measure for the difficulty experienced in draining certain mines and the ease attending the drainage of others. One of the most notable examples showing the presence of underground streams is encountered at Granby. Here Mint spring flows vigorously while no pumping is being done in the mines below it, but when the pumps are started the flow ceases at once. Frequent caves, or sink-holes, as at Porto Rico and Prosperity, where in places the ground has dropped 40 to 50 ft. exposing the bed of an underground stream, also point to the correctness of the theory that these streams below the surface vitally affect the drainage and pumping conditions of the district.

The presence of uneroded lime bars, comparatively difficult for water to penetrate, has also much to do with the difficulty of draining some mines; there are many instances of difficult water problems near mines free from water. In such cases, whether the water saturates the open and broken ground, or whether it exists in the form of an underground stream, the lime bars sometimes extending almost to the surface of the ground will have a like effect, turning the water from some mines into others.

A notable example of this condition is

---

[*] Joplin, Mo.

found on the Mastin land, southwest of Galena. On this land most of the mining was carried on at a depth of 85 to 120 ft. On a portion of the land some distance from any other mine a shaft was sunk to a depth of 165 ft. and used as a pump shaft. Pumping from this shaft drew away all the water from the surrounding mines except such as was desirable for ore washing. Soon after the efficiency of this method of drainage had been demonstrated, the property on which the 165-ft. shaft was sunk changed hands, and near-by a deep shaft was sunk on the same ground to be used as a pump shaft. It was soon found that this shaft was not nearly so efficient from which to pump as the first. The difference in efficiency is explained by the theory that the first shaft was sunk in open ground which permitted the water from the surrounding mines to flow through it with little resistance. The second was on a lime bar which effectually diverted the water from the shaft and rendered it worthless for its purpose. With the first shaft the water was kept at 150 ft., while the second affected the water level in the surrounding mines very little.

Condition of the Ground

Another local condition which has a marked effect on the water of mines is the tightness of the roof and its corresponding capacity for shedding surface water. A remarkable instance of the influence of local floods on mine waters occurred in 1883, when a series of unusually heavy rains completely swamped the mines at Webb City and Carterville, many of the mines at Joplin and half of those at Galena. A portion of the water ran into the mines through shafts and drill holes, but by far the greater part of it percolated through the loosely broken open ground forming the roofs of the mines; long after the mines had been unwatered sufficiently for operations to begin, the supply of mine water continued unusually great, and seriously interfered with mining operations. The unusually wet season of 1907 also placed many mines out of commission, but the effect was not so general as in 1883.

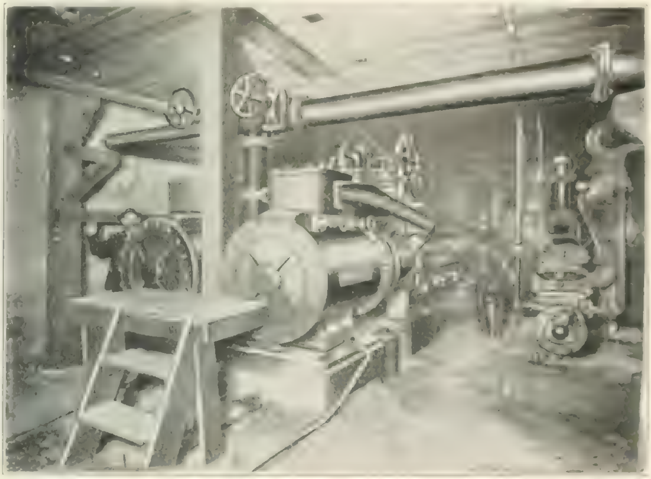
These facts tend to prove much as to the source of mine water concerning which there seems to be much difference of opinion, not so much as to the variety of sources, but as to their relative importance. Some geologists in connection with their theories of ore deposition claim that the underground waters of the Joplin area are largely due to the influence of a catchment area in the high uplands in the vicinity of Cedar Gap, 40 miles east of Springfield. They even go so far as to attribute to this source the waters of Cave springs and other springs farther south. It is also contended by them that local rains are without an appreciable influence.

The Mastin Land Investigation

Some years ago an attempt was made to investigate the sources of the mine waters of Galena, Kan. For this purpose two well known tracts were studied, the Mastin land, southwest of Galena, and the South Side tract, just east. The Mastin land is situated in a valley with low hills on nearly every side. From the north end the water drains northwest into Short creek; from the south end, southward into Shoal creek. Surface water from possibly 240 acres drained into the Mastin tract. Upon the land are many shafts, drill holes, and tailing piles, while in two places the surface is broken by caves of the mine workings into which at every hard rain the water flows unchecked. Some of the water from the pumps and surface ponds likewise finds entrance. The soil is loose and porous and to an unusual extent permits the seepage of surface waters. At the time of the investigation there were six large mining companies operating 8- to 12-in. pumps. Approximate computations based on the size of the pumps and the time operated indicated that the amount of water pumped per year was equal to a rainfall of 45 in. on an area a fraction less than 250 acres. Investigation also showed that of the water brought to the surface by the pumps, 60 per cent. was carried off the tract by the streams, and that the other 40 per cent. in one way or another worked back to the mines, or evaporated. In returning to the mines various factors contributed. A part of the water ran directly back into the mines; much went back through old abandoned shafts and drill holes; the caved areas were also responsible for the return of a large portion of the water, and much also returned by ordinary methods of percolation through the porous soil. Especially was this noticeable under large tailing piles which cover a large portion of the tract investigated, and not only retain the water which comes from the mills with the tailings, but also catch and hold large quantities from rainfall and from the pumps.

It was not believed, however, that 60 per cent. of the rainfall could be obtained from the ground by pumping nor that 40 per cent. was sufficient to account for the surface run-off and evaporation. There is, therefore, 10 to 15 per cent to be accounted for which came from outside the 240 acres. This is supposed to be probably due to the catchment area near Cedar Gap, and to the territory contiguous to the Mastin land.

During this study special investigations were made regarding the effect of tailing piles upon the flow of mine water. These showed that under large tailing piles leaks occurred, while roofs some distance removed, bearing no tailing piles, but of the same formation as the others, were dry, showing not only the effect of the tailing piles, but also corroborating the theory of the return of mine water to the mines.

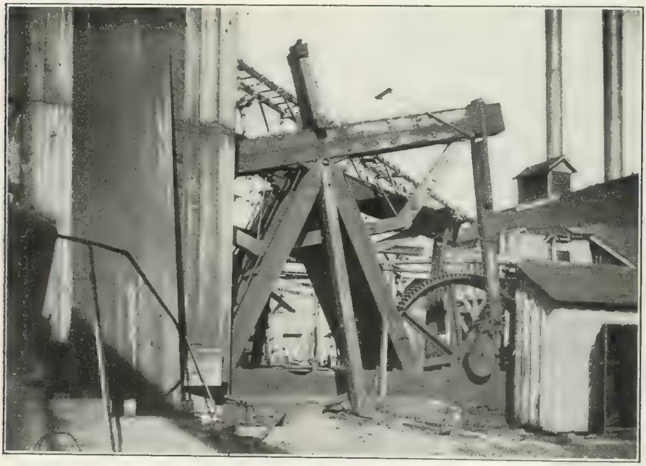


[illegible]

[illegible]

While investigations were being prosecuted on the Mastin land similar studies were in progress on the South Side tract east of Galena. Here the surface is void of vegetation and probably three-fourths of it covered with large piles of tailings and waste dumps from the mines, so that the surface drainage of the rainfall is greatly checked.

Just south of the South Side land the Cornwall Mining Company operated mines. Still further south a lime bar was encountered running to the north- [illegible] bar with the surrounding ground the rock was broken and capable of absorbing an unusual amount of surface water. A portion of the South Side land is open and part very compact, and the amount of water pumped from it was estimated to be equal to that supplied on 100 acres of ground with a 45-in. rainfall. As with the Mastin land about 60 per cent. of the rainfall was found to be returned to the surface through pumps. A small hollow on the southeast is especially favorable for a large amount of outside water to flow upon the South Side land. On the southeast corner of the land the mines have been especially carefully worked; for during the rainy season the water is so strong that mining is almost impossible, while during dry seasons it is almost free from water, hardly enough being obtainable for milling purposes.



WALKING-BEAM PUMP. FIRST PUMP USED IN UNWATERING THE MINES

During this series of investigations inquiry developed the fact that some mines were especially sensitive to the influence of floods, while others were almost totally unaffected. At the Oronogo mine at this time the pumps had to be run for a week after a heavy rain. At the Columbia mine the effect of a rain is noticeable within 12 hours, while at the property of the Warren Bros., it was noticeable within three or four hours. On the South Side land at the Big Four mine it was reported that the mine was scarcely affected by rains, however severe. Other reports as various were obtainable in different parts of the district showing that the influence of rains on underground water supply is generally very great and that it is modified to a large extent by local surroundings.

Observation also tends to show that the underground waters migrate to the west down the slope of the Ozark area. It is equally probable that a part of this migratory water comes from the catchment areas of Cedar Gap.

The artesian effect of underground waters in the Joplin district is not very pronounced, a condition impossible without some relief in the pressure somewhere south of Cedar Gap. Deep wells at Joplin, Empire City, and Columbus, show no pressure sufficient to bring the water to the surface, although penetrating the Silurian sandstones. At Fort Scott there is a strong artesian well, but in most other places where deep wells have been sunk in this upland area there is no flow.

Methods of Unwatering

As a relief against the incursions of surface waters, especially down shafts, drill holes, and caves in the surface, various devices are employed in the district. At some of the mines the water pumped from the shafts is hauled away in tanks; at others, flumes are employed, but in most cases the compactness of the cap rocks is depended upon to shed the water from the pumps. Where the mines are situated in the valleys or near the bed of a stream, embankments either of earth or concrete are built along the dangerous ground or about the mouths of the ground openings. At Lehigh an embankment several hundred feet long skirts the south boundary of the Moeler-Smith Lead and Zinc Company's property and has assisted in conquering one of the worst water problems in the district. In the Center creek area north of Webb City a similar device has been used as well as embankments of earth around all openings into the ground. In the Peacock and Badger camps concrete walls have been built around the shafts and drill holes but have proved only partially successful.

The method of unwatering a mine in the Joplin district differs little from the usual practice. The pump is usually located in a seat cut near the bottom of the shaft; it is more easily assembled there or removed and cared for. The lift is also shortened by placing the pump near the shaft. In sinking or in first draining a flooded mine the pumps are lowered on cables into the shaft as the water goes down.

The old Cornish lift pump and the Neosho crosshead pump are stationed on the surface of the ground. These old types of pump have done much service in the district and many are still in use. Of the steam pumps employed the prevailing type is the duplex, piston-packed plunger pump varying in sizes from 6x4x6 in. to 16x10x12 in. Some compound steam cylinder pumps are in use, and for sinking some Cameron pumps are employed. The walking-beam pump is the regulation sinking pump, however, down to 150 to 175 ft. A number of steam heads and Neosho crossheads are also used for the same purpose.

Campaign of the Ozark Lead Company

The most serious water problem ever encountered in the Joplin district was that of the mines of the Ozark Lead Company in Center Creek valley, north of Webb City. The valley of Center creek extends from Sarcoxie, Mo., westward a distance of 50 miles to its confluence with Spring river, and varies in width from ¼ to 1¼ miles. A portion of this valley, notably that immediately north of Webb City, had long been prospected with the drill, and was known to contain large deposits of ore including both zinc and lead. Some mining was carried on in spite of the fact that during wet seasons the mines were completely flooded and abandoned. During floods or moderately heavy rains the drifts and machinery were often submerged.

Even under these adverse conditions hundreds of drill holes were put down, many of them in excellent deposits of ore, and from 50 to 60 shafts were sunk by the numerous fee owners and lessees. In many instances large bodies of high-grade ore were encountered. Strikes of unusual richness rewarded the labors of others. Mills were erected at some of the more promising prospects and the area developed one or two of the most famous mines of the district. The old Silver Dick mine was one of the most notable, and for years was one of the famous producers in the Southwest.

This old mine, together with many others almost as rich served to show the possibilities of this section if the water could only be controlled. Hitherto the history of the desultory attempts to drain mines in this valley had resulted in failure. Thousands of dollars had been spent without the slightest benefit in return. Many of the operators had been plunged into bankruptcy. In the face of such a history the Ozark Lead Company undertook, singlehanded, the gigantic task of draining the whole valley. A lease of 120 acres known to be richly underlaid with lead and zinc, furnished the incentive.

The magnitude of the task, while in no wise overlooked, may have been greatly underestimated. The conditions existing at the time the task was begun were known to be thoroughly unfavorable. The water level during ordinary weather was within 15 ft. of the surface. Every drill-hole, shaft, and cave-in in the valley stood open ready to drink in the floods which Center creek periodically brought down the valley. On Nov. 17, 1904, however, the first pumps were set to work. They were huge 16-in. walking-beam affairs with working barrels 90 ft. below the surface. They were driven at the rate of 12 strokes per minute. They were never idle, and worked alone for months until nearly all the surface water was out and the water level had been lowered from 15 to 45 feet.

Then three 6-in. Cameron pumps were installed, each with a capacity of 450 gal. per minute. With this addition the water was lowered until at a depth of 87 ft. the increased inflow with the increased depth made necessary additional pumping machinery. Then two Emerson pumps, one with a capacity of 1000 gal. per min. and another with a capacity of 700 gal. per min. were installed. With this additional power the water was lowered to the lower drifts at a depth of 153 ft., after constant pumping for 11 months from the time the first walking beams were started.

SECOND CAMPAIGN

Miners went to work in some of the richest ore ever seen in the district, but were called to the surface in a few hours. The day following the drainage of the mine, there came a flood which completely inundated Center Creek valley and, checked by the dam of the Spring River Power Company, at Lowell, Kan., pushed the flood out of the banks and filled every drift, shaft and drill-hole to the surface. Water stood for hours within 3 in. of the fire grates under the boilers. A large cave-in covering acres of ground at the old Englewood mine had allowed the flood to enter and the Ozark Lead Company faced the same obstacle it had taken 11 months to conquer.

During the flood the walking-beam pumps were down, and it was found that the steam pumps on cables were covered with 50 ft. of water but still working. The walking beams were again set to work. More weary weeks were spent in pumping, and the ground drained a second time; but only in time to allow the repacking and repairing of the steam pumps, when a second flood came nearly as high as the first, and the water rose covering the pumps to a depth of 75 ft. in spite of the precaution of building dikes around every opening into the ground that could be found in the Center Creek valley. The south bank of the creek had also been diked, but apparently without result.

[illegible]

[illegible] and all the steam pumps having an aggregate capacity per minute of 6000 gal. [illegible] with this equipment to drain the ground the third time. During this work the pumps were run continuously 24 hours per day and were not pulled for repairs except for repacking, and then not until they had uncovered themselves.

Within three months from the completion of the work the chamber was cut for the largest pump ever installed in the Joplin district. It is a Jeansville compound-condensing, wood-lined station pump with a capacity of 4500 gal. per min. when running at ordinary speed, but with increased stroke it has a capacity of 5000 gal. per min.; it weighs 81,000 lb., has a length over all of 36 ft., hight, 11 ft., width 11½ ft., and requires a room 50 ft. long, 20 ft. wide, and 18 ft. high, to permit the assembling of its parts underground. It has a 14-in. suction and a 14-in. discharge, and cost $12,000. So well are the pipes protected that under 150 ft. of water the pump works almost as well as if uncovered.

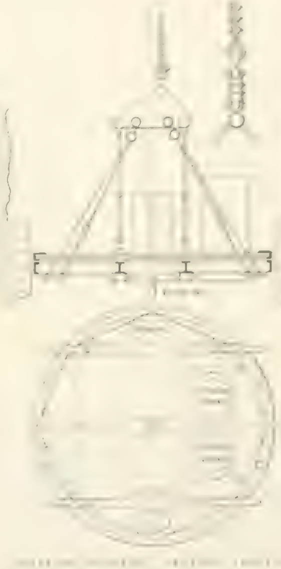
An Improved Swinging Staging

A German contrivance for hanging a staging in a shaft during sinking and lining operations, is described in *Der Bergbau*, April 16, 1908. As shown in the accompanying drawings, it is designed for the usual European circular shaft, the walls of which are carefully lined with brick or masonry, but certain features of it commend themselves to American practice, and its design can easily be changed to suit the rectangular shaft.

Most swinging stagings are hung from a rope in the middle of the shaft, which makes it impossible to hang a plumb line there. According to this design, the plumb line can be hung freely down the center of the shaft, from the surface to the bottom, and all measurements, both for guiding and shaft-sinking and plumbing the walls, can be taken from it.

Between the suspension rope and the six chains from which the platform is hung, is a yoke formed of two iron plates in the form of scalene triangles, bolted together, but with an intervening space. The main rope is attached to one angle, and the suspending chains occupy the other two angles, and the side between them. This throws the rope out of center. A hole is cut at the center of the platform for the plumb line to pass through, and other holes are cut, in the positions indicated, to permit the passage of the two [illegible] or otherwise, to avoid accidents to the [illegible] to balance the tilting which would result from the unsymmetrical hanging of the platform; if necessary, additional weights can be put on the high side.

The platform is built of channels and I-beams, covered with planks. To hold the platform steady, four iron bars are provided, which can be shoved outward into holes in the finished wall. The space between the platform and the wall is closed by hinged doors in the form of segments of the circle. The apparatus is built by the Grossman firm, in Dortmund, and has given satisfaction in a number of recent shaft-sinking operations.



Consul Alfred A. Winslow, of Valparaiso, reports that during the year ending March 31, 1908, the exportation of Chilean nitrate amounted to [illegible] the previous year. During the same time the production of nitrate amounted [illegible] tons over the previous year. The world's consumption of nitrate during the [illegible] 1,817,402 for 1906-7. This is an encouraging showing for the nitrate industry of Chile. The first three months of 1908 [illegible] nitrate.

A "chicken ladder" usually consists of a round timber, 6 to 8 in. diameter, into [illegible]

Steam Churn Drill in Hot and Cold Climates

Transportation Difficulties and High Cost of Fuel, Labor and Supplies Render Operations Expensive at Best. Hand Drills Often Preferable

BY JOHN POWER HUTCHINS*

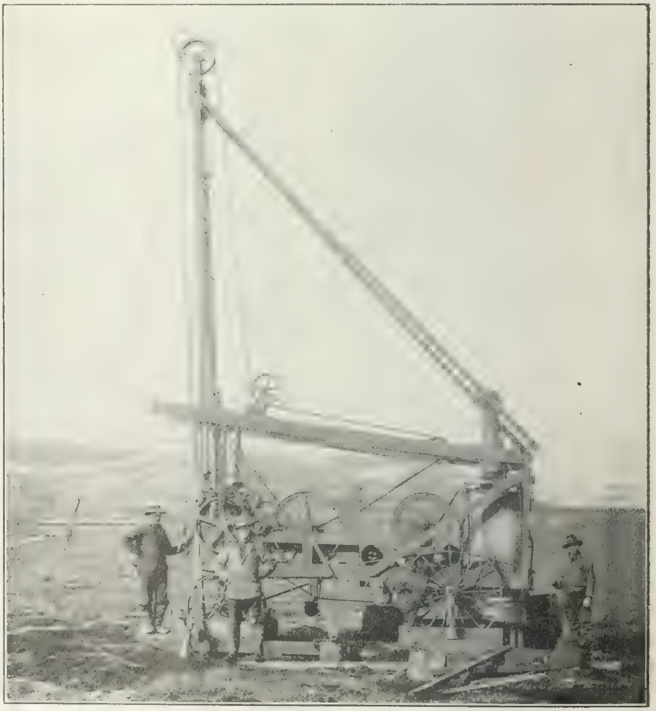
The difficulties of operating a steam churn drill in the tropics at low altitudes are generally those of moving over surfaces covered with a dense growth of bush and large trees, ground which may be marshy and intersected by frequent water courses. The expense of moving and of bridging the streams is great; in addition there is the cost of transportation to the area under examination, which is often high, and the outlay for renewals and repairs in inaccessible regions. Slow progress is all that can be expected under such circumstances.

Actual drilling also has its troubles. Chief among these are those resulting from the necessity of burning poor, wet wood; accumulations of scale in the boiler, resulting from the vegetable acids contained in the water; and the lost time due to accidents and repairs in a district far from machine shops. A feature peculiar to dredging ground in the tropics is the occurrence of buried timber, which may be several feet in diameter and in such a good state of preservation that the drive pipe cannot be driven through it, even though the drill bit may penetrate it. Some of the hard buried timbers are cut through with a drill bit only with great difficulty.

Deep and very stiff clays occurring as overburdens make driving and pulling difficult. A large proportion of clay in the gravel causes an excessive amount of slime and conditions in the material pumped from the drill holes which call for careful manipulation to prevent losses in panning and rocking. The bedrock may be much decomposed, sticky and clayey. This saprolitic condition, which continues for a depth of several hundred feet in some places, is due to the rapid decomposition that occurs as a result of the percolation by waters containing dissolved humic and other vegetable acids and organic matter. To this same cause also is due the general occurrence of clays as overburdens and interbedded in the gravel in regions having country rocks like granite which, in becoming saprolitic, is like a sticky clay.

In moving in the tropics the drill must rely upon its own traction more than in temperate regions where draft animals are easily procurable. In tropical countries draft animals are not only hard to get, but they do not thrive in hot climates. It is also often a difficult matter to get fodder in the jungle areas where no edible grasses or no grasses at all grow. The scarcity of fodder is very surprising to those unfamiliar with the many peculiarities of the tropics.

The tropical laborer is not satisfactory as a member of the drill crew. Thus to insure against difficulty in this respect a full crew should be imported. It is good practice to have at least one extra man who is able in case of sickness of either the drill man, the fireman or the panner to act as substitute. It is not unlikely in examination continuing more than three months that the extra man will be constantly needed to keep the drill in steady operation. On short examinations, say, of three months or less, an extra man may not be needed, for generally it takes about this time for malaria to overcome the robust constitutions commonly found among drill crews.



DRILLING ON SEWARD PENINSULA

Strange as it may seem, it is difficult to get good fuel in the tropics, and also to keep up steam. The boiler water available has remarkable scale-producing qualities which is a frequent cause of delay.

EQUIPMENT FOR HOT COUNTRIES

The equipment for a drill to be used in tropical regions should include plenty of extra parts, especially those more likely to be broken in operation. Parts of the traction device will be needed because there are no draft animals to help over difficult ground. The drilling cable and the sand-pump line rot rapidy in the hot humid atmosphere.

A canvas fly to protect the drill from the heavy rains is absolutely necessary if investigation is to be conducted continnously in the wet season. Even if an investigation is made during the dry season, it is good practice to have a canvas fly to be used if, as if often the case, abnormal seasons occur and rain falls unexpectedly. Abnormal seasons are of frequent occurrence. Investigations of tropical dredging ground with steam churn drills should, if possible, be conducted during the dry seasons. There are large areas of gravel which are several feet under water in the wet seasons. These cannot be crossed with a drill at such times and are difficult of access even in the dryest periods.

---

*Mining engineer, 52 Broadway, New York.

It is better to use a hand drill in investigating alluvium at low altitudes in the tropics. It is preferable from every point of view; cheaper and more rapid work can be done by hand than with a steam drill.

TYPICAL PLACER GROUND IN TROPICS

In the Arctic Regions

As in prospecting in the tropics so in cold countries the difficulties of transportation are generally great. Moving over surfaces that may be very marshy or wet as a result of the superficial thawing of the muck surface beneath the moss or tundra covering, is always troublesome in the short summers. This condition continues through the open season, because the ground is constantly thawing and the water is brought to the surface by capillary action. It is often possible to haul only about 500 lb. per animal on areas of this kind. Accidents and repairs are expensive, particularly since machine shops are rarely available

In discussing the difficulties of transportation in Alaska, Alfred H. Brooks, geologist in charge of the Alaska Division of the U. S. Geological Survey, in a paper read before the Association of American Geographers, referred to transportation charges of 5c. to $1 per lb. and said: "Translated into terms more familiar to the average man, this means that the mine operator may have to pay a rate on all his heavy machinery equivalent to the charges for express between New York and San Francisco. In fact, I have known mining enterprises to be carried on in localities to which the transportation charges were greater than letter rate postage."

BOATS USED IN TRANSPORT IN TROPICS

The actual drill operation is difficult if drive pipe is used, where partly or solidly frozen ground is encountered. Solidly frozen ground is hard and is very like concrete. It corresponds to very hard gravel in that it cannot be worked with a pick; a prospecting shaft sunk in it would require no timbering. It must be treated like the very hard gravel of the temperate zone. Drive pipe may be driven in it about one foot in about 10 min. depending upon the presence of frozen muck which is extremely difficult to penetrate. If boulders are encountered drilling below the pipe must be done before the pipe can be driven. There is less danger of drilling below the pipe in frozen than in any other uncemented ground.

Pulling pipe is very difficult for it seems to freeze solidly, and there also seems to be a greater amount of skin friction due to some rearrangement of the material inclosing the pipe, probably from thawing and subsequently freezing. A probable reason is that when the pipe is driven through the material the ground is broken by the drill and thawed by the drilling water, but on subsequent freezing the material expands gripping the pipe firmly. This is, however, mere supposition; not enough drilling has been done in arctic countries to get a large fund of information on this subject, but considerable pipe has been lost by reason of inability to pull it from the hole, apparently from this cause.

Peculiarities of Arctic Placer Deposits

The alluvial deposits occurring in the North are often much spotted, and paystreaks are narrow and shallow. Therefore the location and number of drill holes may have a most important bearing on the results of prospecting. As a general rule it may be said that the occurrence of much solidly and perennially frozen ground in a placer believed to be suitable for exploitation by the dredging method is fatal to profit. Some of the frozen ground may be thawed by driving steam points into it at a cost of about 40c. per cu. yd.; but there are frozen areas which contain many large boulders, and these cannot be thawed for this cost. Generally it would be necessary in such cases to drill through the boulders before the steam point could be driven and the additional expense would generally be prohibitive.

Frozen muck is often encountered as overburden on ground or as filling in ground that has been worked by open cutting, the muck being washed in after the cut had been worked out. Muck is a mixture of semi-decomposed vegetable matter, soil, sand, and fine pebbles in varying proportions with a proportion of water often 75 per cent. of the total. Pure muck contains no sand or pebbles and is like peat. Muck increases the difficulty of drill operations, in nearly all its phases, for it is difficult to drive, drill, and pull through it. When first encountered in the drilling operation, it is so hard that it can hardly be worked with a pick. After the hole is finished it may be thawed around the pipe and difficulties such as those encountered in pulling pipe from dry sand in temperate zones are to be overcome. As in drilling hard gravel elsewhere, much sliming occurs in prospecting frozen ground, also flouring of the gold. This must be borne in mind in estimating results.

TROPICAL LABORERS

Drill prospecting can be conducted throughout the winter even with temperatures of 65 deg. F. below zero by modifying and enlarging the canvas fly used in California in rainy weather, and making it cover the whole machine and the men operating it. A tent of these dimensions would cause difficulty in windy climates, but it is most exceptional to have heavy wind or any wind at all during the cold weather of the far North except on the coast.

There are several reasons why drill prospecting could be done advantageously in winter, the principal one being that the surface of marshy areas is then frozen, which facilitates moving over ground impassable without close corduroy in summer. Streams can also be crossed on the ice, and the beds of rivers can be more easily drilled in winter than in summer. It is easier to operate a drill on the ice in winter than from a scow in summer. The condition of the gravel does not change except by superficial freezing; so that ground can be drilled as well in winter as in summer except for the resulting greater proportion of frozen ground encountered.

The daily expense of operating a steam churn drill in Alaska based upon costs as noted in 1907 are as follows:

Drill runner	$11 to $12
Panner	6 to 8
Fireman	6 to 8
Pumpman	6 to 8
Man and team	20 to 25
Repairs, renewals and fuel	10 to 30
	$59 to $91

In one drill investigation Seward peninsula coal cost $120 per ton. Steam churn drills using drive pipe may, under favorable conditions, drill more than 15 ft per day. When operating in frozen ground without drive pipe 50 ft. or more may be drilled.

Equipment for Frigid Environment

Drill equipment for cold climates should, like that for the tropics, include more spare parts than for operating in temperate zones. Extra parts of the traction device should be provided generously, for the drill must rely upon its traction for moving very largely if not entirely, although not so generally as in the tropics. Draft animals are generally hard to get and maintain in both tropic and arctic regions.

In drilling in cold weather a large per cent. of breakage is to be expected because of increased brittleness of the metal. Drilling frozen ground is very hard on all the apparatus particularly on the driving and the pulling mechanism and on the pipe. A pipe-cutting and threading machine is useful where circumstances warrant, as in extensive investigations. An auxiliary apparatus consisting of a steam hose and steam points for thawing are sometimes useful in investigating frozen ground; a boiler having 10 h.p. capacity can run five to eight points if shaft sinking is done.

There is a large field for the hand drill in the far North. Where difficult transport is encountered the hand drill can do the cheaper work. As the dredging horizon widens inaccessible areas are being investigated with steam churn drills, and manufacturers have now sectionalized the machine so that the heaviest part weighs about 250 lb. Drills can thus be carried by mule or on the backs of men, but it is generally only with difficulty that such means of transportation are applied. Other drills than those operated by steam should be applied if possible where transportation is so difficult.

Hand drills are often better adapted for determinations in inaccessible areas than power machines. They can put down large holes using casing and thus get an accurate core. Having great advantages of mobility they may be used in inaccessible regions with greater ease and less expense. The steam-percussion drill weighs about six tons; this is for the power function alone. The power plant of the hand drill consists of men, and they in transporting the rest of the equipment on their backs make moving under the extreme difficulties encountered comparatively easy. It is also often the case that the inaccessible region to be investigated has very cheap native labor sufficiently efficient for operating hand drills. Generally the steam-drill crew must be imported and men unused to tropical climate are likely to suffer from malarial fevers and other complaints peculiar to tropic climates to which the native of the temperate zones is most sensitive.

According to a writer on the copper and brass industries, the old form of coke crucible furnace for brass melting is being replaced in large works by more modern coke furnaces using forced-blast, which can be tilted to pour the metal; this saves wear on the crucibles.

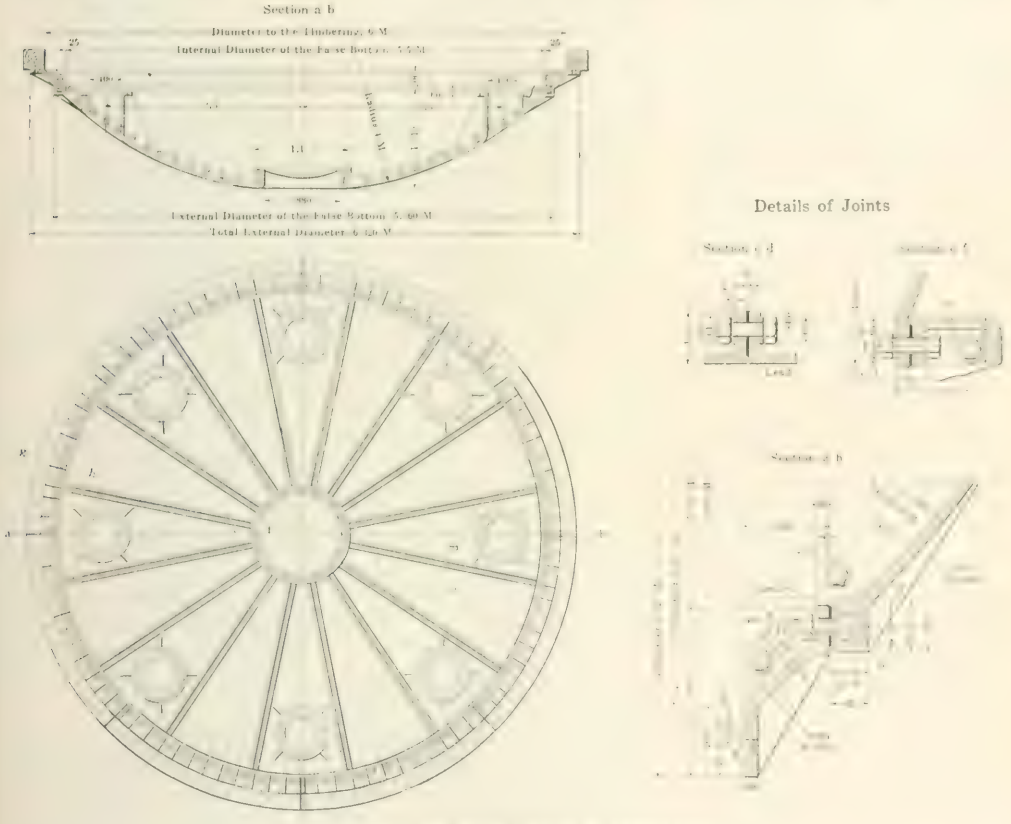
Shaft Sinking by Cementation*

By L. Morin†

While sinking the third of a series of ventilating shafts at the Lievin collieries, a stratum of water-bearing white chalk was met at a depth of 170 m. the flow from which, 240 cu.m. per hour, put a stop to sinking operations and necessitated the employment of the process described below. The chalk did not show any open breaks, but rather a great number of narrow fissures of varying directions and inclinations.

The freezing process was passed by as being too expensive. It was next proposed to create a pressure from within the shaft by pumping water from a number of small shafts surrounding the big one, and emptying their discharge into the latter, at the same time adding cement to the water, but this plan was also discarded as not satisfactory. The process finally adopted was that indicated by Duvivier, director of mines at Lievin. Briefly stated, the procedure included the placing of a false bottom in the shaft, fastening it to the lowermost fixed lining; boring of holes downward; injection of cement beneath the false bottom and into the rocks, by means of the holes; removal of the false bottom; and continuation of the shaft-sinking operations into the now solidified rock. By alternating the boring and the cementing processes, the flow of water was not allowed to exceed the available pumping capacity.

The pump was a vertical, Otto-Schwade, capable of lifting [illegible] per hour from a depth of 100 m., with an effective steam pressure of 6 kg. It was suspended by rope in a compartment adjoining that occupied by the electric hoist, and the pipes were cut into lengths of 3 or 5 m. The steam feed pipe had three sleeve joints, permitting a variation of 6 m. at the pump without changing the pipes.



Section a b
Diameter to the Timbering, 6 M
Internal Diameter of the False Bottom 5.5 M
25
25
880
External Diameter of the False Bottom 5.60 M
Total External Diameter 6.50 M
a
b
Details of Joints
Section c d
Section e f
Lead
Section a b

FALSE BOTTOM FOR SHAFT SINKING BY CEMENTATION

The False Bottom

The false bottom was made of cast [illegible] ranged for a diameter of 5.5 m. if desired. It consisted of an annular crown, 25 cm. wide, which could be attached by screw bolts to the bottom edge of the timbering, and to which the false bottom proper could also be fastened by bolts. The bottom was formed of 16 spherical trapezoids, eight of which had one tubular opening each, of 40 cm. diameter, and located on a circle of 3.60 m. diameter. These openings served for the drilling of the bore-holes, the injection of cement, and for the passage of the pump suction pipe. Each opening was thus at a distance of [illegible] from the wall of the shaft. The circular opening at the center, 1 m. diameter, was also used for the suction pipe. All joints were carefully dressed and [illegible] lead. The grooves on the upper face of the outer ring permitted a tight joint to be made with rope. It was not necessary that the joints be absolutely tight, since the first injection of cement was made with the shaft full of water, and

---

[*] Abstract of an article in *Annales des Mines*, Nov., 1907.

[†] Chief engineer of the Societe Houillere de Lievin, France.

the escaping cement made the joints tight. For fear that the cement would stick to the underside of the steel, several kinds of coatings were experimented upon, but the adhesion was found to be so slight that no coating was used.

First Application

The first placing of the false bottom was done as follows: Six carpenters dressed smooth the underside of the lowest timbers, and then fastened to them the eight sections of the outside ring, placing hemp in the grooves. The first 15 trapezoids were then placed without difficulty, but fitting the last sector and the central cover was a delicate task. The space below the false bottom was filled with waste, except directly under each opening, which helped hold the bottom in position. Six of the tubular openings were closed with their covers, one of them having a connection by which the underneath space could be filled with cement directly. The seventh was ready to be closed instantly, as soon as the pump suction should be withdrawn. Through the eighth a bore-hole was begun at once, the cover to this opening being fitted with the pipes necessary to make an injection of cement into the hole in case the flow of water should exceed the pump capacity. Sections were added to the injection pipe to maintain its length equal to the depth of the hole as it advanced.

By the time the first bore-hole had reached 5.9 m. below the false bottom, or about 3 m. into the rock, the flow of water had increased to 280 cu.m. per hour, or nearly the full capacity of the pump. Boring was stopped, the pump suction withdrawn, the two openings were closed, the injecting tubes were put into position, and the shaft was allowed to fill up to the static level, the water coming up through leaks in the false bottom. The cement grouting was then forced down the injection pipe until traces of cement were seen coming up through the joints in the false bottom. After allowing 25 days for the cement to set, the shaft was pumped out, and the bottom was then found to leak only to the extent of 2 cu.m. per hour, against 280 cu.m. before the cement was put in.

Four more holes were then bored to a depth of 23 in., reaching a stratum of hard sandstone underlying the chalk. The holes had diameters of 7 to 14 cm., and were not cased except for 1 m. at the top. Boring was conducted from the surface, and the cuttings were washed out by a water jet, care being taken not to allow any water-bearing seams to become plugged with refuse. Before cement was injected into any hole, a stream of water was first sent through the injection pipe to wash out any mud from the surrounding fissures. Each hole was filled with cement as soon as bored.

The apparatus for drilling was very simple, consisting only of a frame carrying a pulley and a drum which was driven steadily in one direction. A rope attached to the drill rod and bit passed twice around the drum, and the man holding the free end of the rope alternately tightened and released the coils on the drum. Two drillers and four helpers averaged 0.50 m. per hour.

Injection of Cement

The cement injections were made from the surface, all the pressure required being that due to the standing column of liquid. A pump was also tried, but it was found that whenever the ordinary pressure, of about 2 kg., was not sufficient to overcome a stoppage, the added 5.5 kg. pressure of the pump would do no better. The grouting was mixed in a cement grinding mill from which the crushing rolls had been removed, but the chasers retained. The mixture contained 5 per cent. by weight of cement, and three times per hour a flushing of water was given to clear the pipe. From the false bottom up, the injection pipe was 5 cm. diameter, and from that point down, it was 3 cm., so that the added velocity of the stream in the smaller pipe prevented stoppages below the false bottom. The pipe reached to within 1 to 5 m. of the bottom of the hole. The cement was a special portland, of which only one-quarter was coarser than 70-mesh.

The first hole was injected while the shaft stood full of water, and took 540 bags. The space under the false bottom took 114 bags. All the other holes were filled while the shaft was kept empty. No. 2 took 321 bags; No. 3 took 179 bags; No. 4 produced only a small flow of water, and was not injected; No. 5 took 226 bags. The total time consumed in all the preceding operations, related to the first position of the false bottom, was 64 days.

Deepening the Shaft

After removing one section of the false bottom, which required some digging, the rest of it was dismantled and hoisted in 24 hours. The flow of water was then 4 cu.m. per hour. The upper layers of the cement were found to be gray in color and rather soft; deeper levels were hard and of darker color. The shaft was then sunk for 20 m., by which time the flow of water had increased to 150 cu.m. per hour. The vertical fissures were found to be filled with cement, but there were not enough of the holes to reach them all. The horizontal fissures were not so well filled, and the cement in them soon gave way.

Second Application

After having lined the last section of shaft, 10 test holes were bored in a circle within 70 cm. of the outer wall, to depths of 1.50 to 7.50 m. Only a little water came from them, the sandstone being usually considered the base of the water-bearing horizon, and shaft sinking was resumed. But at a depth of 1 m., and within 30 cm. of a hole from which no water had come, an open fissure was struck close to the wall of the shaft, which gave a flow of 100 cu.m. per hour. The false bottom was immediately placed the second time, now at a depth of 49.25 m. Two holes were then bored to a depth of 20 m., and two injection pipes were fitted, one connecting with the water-bearing fissure, and the other with one of the holes, which yielded no water. As the screw bolts to hold the false bottom to the timbering had been omitted, it was necessary to make the injection with the shaft full of water, and to prevent the accumulation of cement on top of the false bottom, getting there by going around the edge of it, the following procedure was adopted: During the injection, water was poured into the shaft in such volumes that the added water was slightly greater in amount than that indicated by the rise in the level of the water standing in the shaft; this assured that the cement could not rise above the false bottom. This injection required 1071 bags of cement.

Shaft sinking was again resumed, and at a depth of 59 m. a solid and dry stratum was reached, beyond which no inconvenient flow of water was encountered.

Cost of Cementation

The additional cost due to the flow of water consisted of the following items:

Purchase of false bottom	fr. 7,416
Wages, placing and removing false bottom twice	3,466
Cement, 2451 bags of 50 kg	4,580
Wages, boring and injecting	3,683
Various expenses	1,391
Total cementation	fr. 20,536
Price of pump and accessories	fr. 18,637
Wages, placing and operating pump	30,117
Various pumping expenses	11,911
Fuel for pumping	10,000
Wages, time lost by flooding	1,828
Total pumping	fr. 72,493
Total	fr. 93,029

This additional expense of 93,000 fr., distributed over the 84 m. gained during the process, is equivalent to 1100 fr. per m.; it is fair to reduce this figure to 900 fr. since the pump, pipes, etc., were still in good order, and were subsequently used. The cost of the freezing method, as estimated by the Société d'Enterprise de Fonçage de Puits par Congélation, would have been 2300 fr. per m., showing a saving of about 120,000 fr. for the whole operation in favor of the cementation process. The cost of cementation alone amounted to only 500 fr. per m. While consolidation of the water-bearing rock was not perfect, it was sufficient. The delays were numerous and sometimes lengthy, but it is believed that they were no more costly than they would have been by any other method.

Discovery of the Camp Bird Mine*

By Thomas F. Walsh

In the examination and sampling of mines, be industrious, thorough, honest and conservative. Sample, assay, and measure your orebodies with great care. See to it that your samples are not tampered with. Do not give the small but attractive pay streak any greater representation than its size justifies. Rich specimen assays it is best to throw out; otherwise they will swell your average to a figure that will not be reached in actual results. Rich ore in a mine has a magnetic attraction for some; it certainly has for me, and it is difficult to be conservative in sampling my own mine. To enlarge a pay streak of 2 or 3 in. into one of as many feet, and transform expectations into sterling realities, are feats I have often accomplished in my mind. Mining is an industry so full of hope that it tends to make optimists of its devotees. Beware of this intoxication. Keep cool heads and be conservative in your examination work, always bearing in mind that you are apt to be checked up and confronted by practical results. I have always believed in making almost endless assays, and also in testing every kind of rock in a mine, and to this I owe, in part, what success I have had. So I say to you do not be stingy in assaying.

In going over roads or trails, keep your eyes open for rich floats, or rich ore on the dumps of abandoned mines. Whenever you find any you suspect of having value, put a piece of it in your pocket and assay it. In this way you can, in a measure, prospect the mining sections that you pass through. I once found a rich mine, when riding in a buckboard with my wife, by noting and sampling the float that lay on the side of the road. It took me not over 10 minutes to get out and take my sample. This few minutes' work netted me a fair sized fortune. I have known many instances of mining engineers passing by and over rich float from undeveloped mines day after day and month after month, too lazy and too indifferent to notice it, much less to get off their horses and sample it. Nature deposits her precious minerals in a very small area and in unexpected places; so, look for them everywhere.

Prospecting the Roof of a House

Apropos of this, I must tell you another of my experiences. Did you ever hear of a mine being discovered on the roof of a house? No! Well, I once discovered one on the roof of a log cabin. In 1880 I was interested in properties in the Frying Pan district, west of Leadville. I was stopping for a few days at our mine, wishing to take a look over a near-by hill that I had not examined. I started out one morning with my prospecting pick and a gun. About ten o'clock I was near a miner's cabin that had been abandoned, and, thinking it was about time to have a smoke, went over to the cabin and set the gun down with the barrel between the poles of the roof. Without that gun I should not have gone near enough to the cabin to notice what was there.

Looking at the dirt-covered roof, after lighting my cigar, I saw it had particles of quartz all through it and that it was likely vein matter. I tried to find the vein, but could see no trace of it, but found near-by a shaft sunk in decomposed granite, absolutely barren. The hole at the end of the cabin, from which the dirt was taken, was covered with débris, and there was no quartz or other mineral indications to be seen.

Finally, I went inside the cabin. Here I noticed the floor was uneven because of chunks of partly exposed rock. I soon had my little pick at work; I broke off corners of the rock, and found that it was nice-looking quartz. I immediately sized up the situation, which, after development proved to be correct. The men who made the location built the cabin squarely on the apex of the vein, covered its roof with dirt from the vein, and went 50 ft. away to sink their shaft in barren granite.

True to my first find I went back to the roof and took my samples from it, assayed them, and got returns of over 100 oz. silver to the ton. Taking chances on my own judgment, before doing any work on the claim, I found the owners, paid their price, put two men to work, and in two weeks had a fine vein uncovered. This claim netted me in two months more than $75,000. The mine has been a large producer, and is producing to-day.

Use Your Own Eyes and Judgment

This brings me to the discovery of the Camp Bird mine. Along in the '80s. millions of dollars were expended in the development of the silver-lead veins and the erection of mills in the Imogene basin, nine miles from Ouray. Miles of adits and shafts were driven and sunk upon the strong veins that pass through that basin. Immense hoisting and concentrating plants were installed to handle and treat the ores, all of which proved failures. As time went on, the mills and machinery were dismantled and sold. The mines were shut down, and when in 1896 I came upon the scene the section was generally condemned as a failure; the country was abandoned, save by Andy Richardson, who was the first white man to cross the range from Red Mountain, 18 or 20 years before, to prospect Imogene basin.

After examining the locality, I con[illegible]ties in the basin and making a large output, I could make the low-grade mines pay handsomely. Following this up, I commenced buying all the prospects and mines that were offered me, and as no one believed it possible to succeed where so much money had been lost, everyone who owned a claim was anxious to dispose of it to me.

At the particular time I speak of, I had already acquired a large number of claims. I was offered one away up near the summit of the range, and started one day, in company with Mr. Richardson, to examine it. We rode as far as we could, and climbed the rest of the way. The trail ran along the slope and high up the side of a steep mountain. About three-fourths of the way up from where we left the horses we came to a slide of reddish pyritiferous porphyry. It at once attracted my attention as having a very strong indication of gold in or near it.

We went up, examined the prospect and as we came down I took samples from the porphyry slide. I asked Andy if gold were ever found in the basin. He said, "No, Mr. Walsh, there is no gold in Imogene except the little associated with silver and lead."

I said, "Andy, I believe there is gold in Imogene, and I am going to find it."

I had the samples of porphyry assayed, and it ran $2 in gold to the ton. This confirmed my suspicion.

Among the claims I owned at the time there was one situated at about the same altitude about 300 ft. east from where I sampled the porphyry. I never [illegible] a snow slide, that never melted, covered the tunnel to a great depth. I suspected that this vein passed through or near the porphyry dike and that it carried gold.

Sampling and Samples

Some days afterward I was taken ill, and went to Excelsior Springs for treatment. Before leaving I told Andy to drive a tunnel through the snow and have samples [illegible] to get back, I left the Springs against the doctor's advice and returned to Ouray in two weeks, mounted my horse the next morning, and started off for our cabin in the basin.

Andy gave me [illegible] samples, saying, "These were the ones you asked me to get."

Something within me said, "Go and take your own samples. Remember Andy has been in the basin for 18 years and has never found gold."

---

*From an address delivered to the graduating class of the Colorado School of Mines, Golden, Colo., May 22, 1908.

I threw them aside, saying, "Andy, I must see and sample that vein for myself."

He said, "Oh, Mr. Walsh, you're too sick and weak to go up there today."

I said, "No, Andy, I'm going."

He saddled the horses, helped me on mine, and we rode as near the tunnel as possible. With a great effort I reached it. Outside I found a dump of very showy ore having zinc, lead, and some copper pyrites. I went inside and examined the vein. There I found an 18-in. streak of the same kind of ore that was on the dump. Between it and the hanging wall there was about 3 ft. of modest-looking quartz. It had none of the shining mineral in it, and looked so barren that the average miner would consider it no good; but as I examined it closely I saw little specks and thread-like circles of glistening black mineral all through it, which experience told me was gold in a telluride form.

My illness was completely forgotten and I became so alert in sampling the grayish-looking quartz, that Andy grew uneasy, and asked me not to work so hard. Thinking that I did not see the low-grade metalliferous streak, he called my attention to it, saying that was the pay streak.

I said, "Never mind, Andy; I always assay everything in a vein."

However, I took some samples from this lead and zinc streak and got returns from them of $8 per ton, while the samples from the common-looking rock ran as high as $3000.

I came back, looked over the situation and found that the men who did the work, although they were no ordinary prospectors, saved the showy low-grade stuff and threw the modest but rich ore over the dump, from which I afterward shipped it. This mine has already had a net production of many millions, and stands to produce millions more; and it is a strange coincidence that the bonanza part of the mine is immediately beneath the spot where I picked up the piece of porphyry on the trail.

The Great Boulder Perseverance Mine

SPECIAL CORRESPONDENCE

The report of the Great Boulder Perseverance Gold Mining Company, Ltd., of western Australia, for the year ending Dec. 31, 1907, has been issued. The issued capital is £1,399,459, upon which a modest 5-per cent. dividend was paid. The ore treated during the year was 199,958 tons, producing bullion to the value of £344,131.

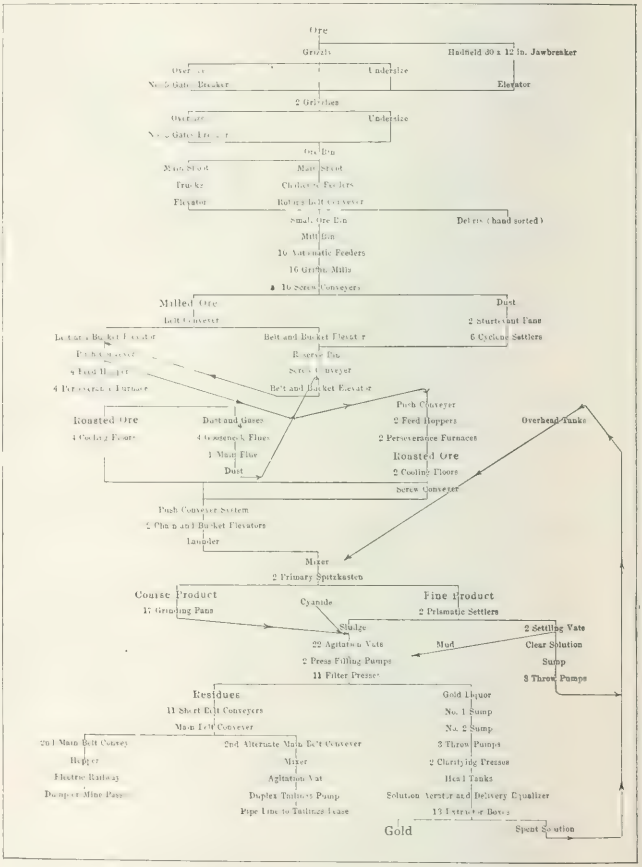
The working costs per ton, or, to be accurate, a portion of the working costs are given as under:

Mining	$1.38134
Treatment	2.64790
Tailings distribution	0.10292
General expenditure	0.22902
Total	$4.36118

A reference to the profit and loss account shows that such important charges as development, depreciation, London expenses, etc., are not included in the above costs. These items, including many small accounts not belonging to capital expenditure, amount to about $1.58 per ton, bringing the actual working costs up to about $5.94. In reporting working costs, there is some excuse for a manager to disregard head office expenses or even depreciation, but to leave out an important and necessary item like development leads to misunderstandings when comparisons are made with the costs of other mines. It is, of course, not suggested that there is any intention to mislead. The report is well drawn up, and in many respects, especially as regards the tables and plans, is a model of what a mining report should be. Anyone reading the report can see without difficulty that the manager's working costs are merely a fanciful expression, and that they only embrace a portion of the cost of winning the gold. Turning to other statistics the report says that the average grade is 7.41 dwt., a figure which he hopes to maintain in the future. The ore reserves on Dec. 31, 1907, amounted to 461,598 tons, excluding 161,597 tons of ore classified as "probable payable ore."

Attached to the report is an ore-treatment chart, giving particulars of the various processes that the ore passes through during the extraction of the gold. The average grade sent to the mill was 8.541 dwt., and the average recovery 8.094 dwt., or nearly 95 per cent.

The treatment sheet is reproduced herewith.



TREATMENT CHART, GREAT BOULDER PERSEVERANCE GOLD MINING COMPANY, LTD.

Mexican *peones* carry a load of 70 to 80 lb. up a "chicken ladder."

Copper for the Foundry *

By F. L. Antisell†

Copper for foundry purposes is required to possess certain properties, determined by the specific use for which it is intended, and that particular grade should be selected which will fill the requirements of the work in hand. To this end, the buyer should carefully consider the following points: (1) Brand; (2) conductivity; (3) analysis; (4) shape; (5) appearance, i.e., color, pitch, etc.

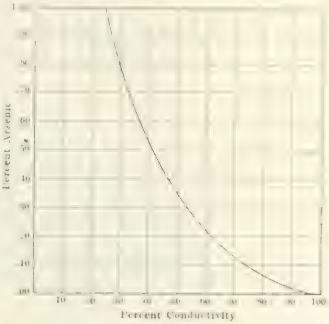
The brand, which I consider as first in importance, conveys the greatest amount of information to the buyer of copper. It insures uniform quality aside from the chemical analysis (as various brands of copper vary somewhat in pitch, or say if you like, gases or oxides), which fact is of great practical advantage to the mixer of copper alloys, as the melting can be conducted largely by a pre-arranged schedule, for a reliable brand of copper can always be depended upon to run uniform; whereas, while the unknown or unbranded ingot may represent the very best grade of copper obtainable, it may be only capable of producing a casting of inferior quality. Again, certain brands stand for a reputation that has required a vast amount of capital to create, and a large plant to produce. It is evident that a non-uniform brand of copper would jeopardize the business of the producing plant. To guard against this possibility, makers of various brands use every precaution to keep their products uniform in quality, it being not unusual to cast over 100,000 lb. of ingots at one charge, 12 ingots being cast simultaneously every 20 or 30 seconds. This large bath of copper is constantly under the inspection of metallurgists, chemists, and physical scientists. It can be said as an almost universal truth that writers on this subject invariably recommend the purchase of branded ingot copper only.

Conductivity

Conductivity may be well considered second in importance only to the brand as it can be said within certain restrictions to be a measure of the ultimate quality of the metal. This test should be carefully conducted with an apparatus of modern design. For the foundryman the best results will be obtained by drawing into wire a specimen of the ingot and testing the hard-drawn wire. The number of dies varies with the grade of copper. The same specimen can then be tested for tensile strength.

If the conductivity of hard-drawn copper wire is 98.75 per cent. (Mathiessen's standard), it will represent a conductivity of about 101 per cent. if properly annealed. Should any impurities appear, the conductivity will be lower according to the specific resistance of the alloy, and quantity of various elements.

The accompanying illustration shows graphically how the occurrence of even the most minute quantity of arsenic will vary the conductivity of copper. Thus, in annealed-copper wire with a conductivity of 100 per cent., we should hardly expect to find more than a trace of arsenic. Curves for the different elements show in an interesting manner the effect of impurities in copper. However, high conductivity in itself does not prove conclusively that between two specimens the higher in conductivity is the more suitable for casting purposes. Within certain limits copper may contain impurities in an oxidized condition, thus reducing the resistance of the specimen as a copper alloy, but at the expense of its tensile strength whereas, on the other hand, the impurity occurring in a metallic state must necessarily reduce the conductivity, and in practically all cases increase the tensile strength. Thus the conductivity test is of more importance when considered in connection with a tensile test, and though various investigators do not agree in general on the point, it appears that as the rate of conductivity increases, the tensile strength decreases. The specimen for this test must necessarily therefore be treated for ultimate tensile strength only.



While copper refiners always give attention to the proper de-oxidizing of the metal there is almost always present a small quantity of copper oxide that does not appear to decrease either its conductivity or tensile strength.

Analysis

In buying copper on analysis it is generally sufficient to specify the total copper contents. Copper running 99.90 per cent. pure is suitable for the highest grade of copper alloy, and no distinction is necessary in specifying its origin as "Lake," "Electrolytic," etc. The percentage of copper contents may decrease steadily for different requirements according to the nature of the impurities. The principal impurities are arsenic, antimony, iron, sulphur, bismuth, selenium and tellurium.

Shape

The shape of ingots varies with the individual tastes of refiners. In fact, it is not unusual for copper refiners producing two or more grades of ingots, to make them up into different shapes, thereby reducing the probability of mixing qualities. It would appear that a standard shape and weight of casting copper would be very desirable, and should receive some attention from the brass founder.

The principal shapes of casting copper in the market are: (1) The old-fashioned three-heeled ingot. (2) The newer form of two-heeled. (3) The ingot bar. (4) The multiple-ingot bar. (5) The slab. These shapes all have advantages peculiar to themselves, but it would seem that the old-fashioned ingot bar is more than holding its own, and is generally preferred by brass founders.

The ingot bar consists of a number of ingots continuously, end to end, generally in groups of three 3-heeled ingots, the ends being joined by a thin gate, forming an extra deep notch to facilitate detaching the individual ingots.

The multiple-ingot bar is formed by several ingot bars cast side by side and connected at several points by gates. These bars must necessarily be cut apart before melting, and when adequate facilities are not at hand to separate them, the final cost is somewhat greater than for the ingot weighing, say, 20 lb., although the latter has probably to stand a charge for cooperage. Furthermore, the ingot bar when cut apart presents sharp corners that have a tendency to abrade and shorten the life of the crucible.

To get economical results from the slab, it is necessary to use a substantial shearing machine, capable of cutting the slab into pieces of proper size to be placed in the crucible, and the cost of this work must be charged against the shape as an offset to the saving in shipping expense.

Appearance

If the author of the saying, "Appearances are deceiving," had in mind copper when making this remark, he could hardly have explained the situation more clearly. If there is one thing impossible, it is to judge the quality of copper by the color of its skin. The terms, "rose red," "brassy," "black," mean nothing in regard to quality; the most beautiful rose-colored ingot may contain 0.5 per cent. of arsenic, while the blackest looking ingot ever made may be 99.99 fine. The various colors are due almost entirely to the temperature of the copper and pickle, when the casting leaves the mold. The pitch on the back of the ingot should be fairly flat with a uniform wrinkled top surface, and without sharp corners.

---

*A paper read before the American Foundrymen's Association, slightly condensed.

†Assistant superintendent, Raritan Copper Works, Perth Amboy, N. J.

Ore Shoots at Butte, Montana[*]

By Reno H. Sales[†]

The subject of "ore shoots" or "bonanzas" or whatever we choose to call the localized occurrences of relatively richer bodies in a vein or ore deposit, is one of the most perplexing and one of the least understood of all problems relating to the geology of metalliferous deposits. Why there should be a selective action exercised by a mineralizing solution traversing a fissure in a uniform country rock, is a matter difficult of explanation. The usual forms and occurrences of these richer portions in ore veins are generally well known. Their importance in mine sampling, mine valuation, etc., is familiar to all who have had occasion to sample and study closely veins of the ordinary type. The subject has not received any especial attention in recent years, and, while there have been a great many new mines opened up, and many facts disclosed, it is doubtful if any substantial advancement has been made in the study of this most important problem.

The presence of well-defined ore shoots in the copper veins of the Butte district was not recognized in the earlier history of the camp; and it appears that they were of doubtful existence as late as the year 1897, when the Butte *Special Folio* was issued by the U. S. Geological Survey. This may be accounted for in a large measure by the fact that most of the earlier mining operations were upon what are known as the older "east-west," or "quartz-pyrite" veins which are of a remarkable width and uniformity in mineralogical character. The more prominent of these have been stoped for hundreds or even thousands of feet continuously along their strike, showing little, if any disposition to develop shoots. There is, of course, a considerable variation in content of the valuable metals in different parts of the veins, but such may not be properly designated as shoots. Later developments, however, have brought new facts to light, and in at least two vein systems which are known to be younger geologically than the Anaconda or east-west system, the occurrence of ore in large irregular bodies, is a characteristic feature. These later veins have been termed fault veins, because they are known to cut and displace the earlier veins, and because of their physical character. They consist mainly of crushed country rock which may be either granite, aplite, or quartz-porphyry, carrying small amounts of quartz and iron pyrites either as finely disseminated material, or in the form of small stringers or scarf-like masses irregularly scattered throughout the crushed country. The fault, or crushed zone, is usually narrow, varying in width from 5 to 20 ft., exhibiting one or more well-defined planes of movement marked by a dark blue or black, tough clay ¼ in. to 6 in. thick. The above description applies to the barren stretches of vein between the ore shoots.

Some of these fault veins have been opened up on strike for more than a mile, and at intervals which are indeterminate excepting by actual development, immense ore shoots have been encountered. These ore shoots, which are quite irregular in form, show great variations in size from mere bunches or pockets, up to great orebodies over 1000 ft. in length and of unknown hight, in some instances 1500 to 2000 ft. vertical hight having been developed with no bottom yet known. The thickness of the ore varies from nothing up to 20 ft., or the entire width of the fault zone. In the latter case, there may be shown a complete replacement of the crushed country rock by ore minerals, leaving but little evidence of the fault character of the original fissure.

The mineralogical content of these shoots is chiefly quartz and iron pyrites with smaller amounts of blende and the copper minerals, chalcocite, enargite, bornite, covellite and chalcopyrite, the last being of rare occurrence. As far as known to me, there is no method of reasoning by means of which the position or extent of these shoots can be foretold. They usually fade out on strike within a distance of 50 ft. or less; although the limiting boundaries are not always well marked. There appears to be no regularity to the pitch of the shoots, i.e., there is no common direction of pitch. There are many examples of what I may term "shoots within a shoot," or localized areas of rich ore within the main orebody as above outlined. There are also enrichments within the larger shoot due to mineralization along cross-faults which are only local and do not extend beyond the boundaries or walls of the main fault. I have observed many examples of this character, indicating continued movement, or readjustment of the orebody, or other material within the fault zone during the period of vein-forming action. Such internal transverse fissures may be filled by richer ore, or there may be an enrichment of the earlier formed ore adjacent to the fractures, or both conditions may be present. Longitudinal fissuring has occurred during the period of mineralization, and has had an important influence upon the nature of the orebody, but these effects are not readily determinable, as the age of such fissuring is not generally evident.

The conditions under which these ore shoots were formed are somewhat obscure, and no attempt will be made at this time to enter into a discussion as to their genesis with reference to their mineral content, that is, whether the ores, either wholly or in part, were deposited from ascending or descending solutions, traversing the fault fissure. A few observations regarding the extent to which the large fault fissures in the Butte district have acted as channels or passageways for underground mineral-bearing solutions, may be of interest. In the first place, it is evident from the thoroughly altered condition of the crushed granite at all points along these faults, that there must have been, at an early period, a reasonably free circulation of waters throughout the entire extent of the fault zone, producing this intense alteration. But, as these fault zones are explored by mine workings, long distances along the strike are found to be absolutely dry and barren of ore, while the ore shoots themselves are usually wet. These facts indicate, to my mind, that the present positions of the shoots represent the channels or zones through which the ore-bearing solutions traveled. The concentration of all the solutions traversing the fault into these channels I believe, to have been brought about through the development, by continuous earth movements within the fault planes of impervious barriers composed of altered, clayey, crushed granite and attrition clay or gouge. The presence of this impervious material directed the circulating waters along lines of least resistance. In other words, solutions which at first traversed the entire extent of the fault fissure, were corralled, so to speak, and confined to more definite zones, while the walled-off or excluded portions gradually became dry.

The situation of the ore shoots was, therefore, determined in part at least by the physical nature of the country rock composing the fault zone. The size and richness of the orebodies may have been influenced to some degree by the cutting off, or I might say damming back, of the mineral solutions, through the later development of impervious material along or within the fault zone.

I have seen many examples of this phenomenon in various parts of the Butte district where the clay and crushed granite of a fault acted exactly as a dam holding back enormous quantities of water. On the 1000-ft. level of the Six O'clock shaft a crosscut was driven for several hundred feet, directly under the foot-wall of a large fault zone, in an absolutely dry, unaltered granite. After passing through the thick clay and crushed granite foot-wall, a perfect reservoir of water was encountered, the whole mass of fractured rocks for a hundred feet or more being thoroughly saturated. A condition exactly similar was noted on the 1000-ft. level of the Butte & London mine. Alternate wet and dry areas along faults in Butte are characteristic. The wet zones often encountered when drifts intersect faults are usually due to the presence of shattered granite or vein near the fault, and not necessarily from the water traversing the fault fissure itself. Fractured or sheared granite but slightly altered or shattered quartz veins appear to offer the most ready passage for underground waters.

---

[*] From *Economic Geology*, 1908, III. IV, 326-331.

[†] Geologist for Amalgamated Copper Company, Butte, Mont.

That the immense quartz-pyrite veins of the old east-west system of copper veins in Butte were formed along shear zones having but slight displacement, I have no doubt. Repeated observations show that these earlier fissures are later than and intersect the quartz-porphyry dikes, but the displacement is very slight, even along the largest veins. The wonderful continuity and uniformity in size and character of these veins are due to the very significant fact that they were not formed along fissures of extensive movement, such as I have described above, but were fracture zones along which there was insufficient movement to develop the impervious fault material so characteristic of the larger faults. A free general circulation was thus permitted throughout the entire extent of the fracture zones, finally producing the extensive quartz-pyrite veins, of which the Anaconda and Syndicate lodes are the best examples Later cross-faulting has cut and displaced the fault veins above described, also the veins of the Anaconda or east-west system, resulting in many instances, in an enrichment of the fractured veins adjacent to the intersecting fissures.

The above is offered merely as a possible explanation, to account for the position of the ore shoots in the fault veins of the Butte district. The circulation of underground water through fault fissures of the character above described does not appear to have been in this district as free and extensive as is generally supposed. During the period of faulting, there was more or less fracturing of the older veins, together with strike faulting along them. The passages for the circulation of mineralizing solutions thus afforded in and along these older veins, were far more important and contain more ore than the main fault fissures themselves.

It is absolutely essential that a breathing apparatus to be safe and effective under all conditions of serious work should possess the following characteristics: (1) simplicity; (2) lightness; (3) strength; (4) comfort in wearing; (5) compactness so that it can be worn easily in low roadways; relief valve for the escape of excess oxygen in the breathing bag; absence of complicated parts, (6) adequate supply of air for two hours work; (7) emergency valve for use in case the automatic valve fails to act; (8) large soda surface for the absorption of carbonic acid gas; (9) pressure gage filled in such a position that the wearer can see for himself what quality of oxygen the cylinders contain; (10) the apparatus should be so designed that the wearer can put it on himself in the minimum amount of time.

A Novel Washing and Leaching Apparatus

By Alfred Gradenwitz*

Washing and leaching processes are used extensively in various industries to separate coarse and fine, or heavy and light, materials, respectively, the components of the mixture being obtained in as pure a condition as possible, so as to allow each of them to be worked, or otherwise utilized, separately.

The accompanying sketch shows a novel stirring device which is capable of keeping in constant motion considerable quantities of ore or other material, with a minimum of power consumption; it is especially adapted to the separation of gold from auriferous sand in cyaniding. The apparatus was invented by Reinhold Freygang, of Hamburg, to meet the requirements of a Chilean gold-mining company whose relatively rich ores (20 to 30 grams of gold per ton) were mixed with about 30 per cent. of ferrous clay.

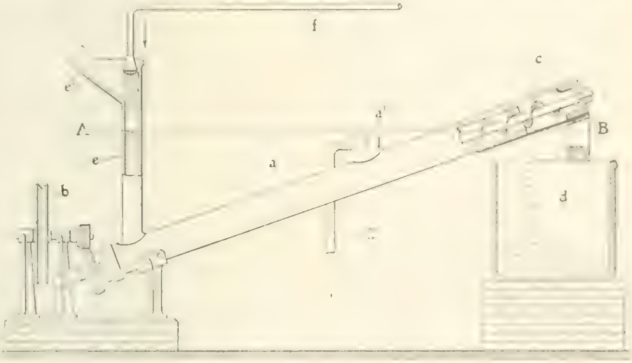
The apparatus consists essentially of a bent pipe *a*, tightened at the bottom with a stuffing-box and inclosing the spiral conveyer *c*. The conveyer is driven from *b*. On the top of the vertical pipe *e* is fitted the charging hopper *e*¹, in which the water-supply pipe *f* terminates. To the pipe *a* is also fitted the outlet *a*¹, to which is connected the bent pipe *g*.

The working of the apparatus is as follows: After starting the conveyer and filling the apparatus with water, afterward supplying sufficient water to maintain the water level at AB, the material to be separated is poured into the hopper *e*¹. The charged material falls to the bottom of tube *e*, becoming thoroughly wet by the time it reaches the conveyer. The slime or pulp formed in the water is carried upward by the conveyer, the heavier material receiving a constant churning.

The water supplied through *f*, owing to the special arrangement of the outlet *a*¹, will leave the apparatus through the pipe *g*, carrying with it the suspended matter. The coarser or heavier particles, on the other hand, are carried by the conveyer to the discharge at the upper end of the pipe *a* and dumped into the tank *d*.

In cases where a single apparatus fails to make a clean separation, the fine material issuing from *g*, or the coarse material issuing from *c*, may be dumped into the hopper of another apparatus; by adjusting the speed of revolution of the latter, a more perfect separation may be obtained. Generally speaking, the degree of purity of the washed material is controlled either by altering the speed of the conveyer or by regulating the water circulation.

If the material issuing from *g* is supplied to the hopper of another apparatus, the two apparatus are said to be arranged in parallel; if the material issuing from *c* is charged into a second apparatus, these are said to be arranged in series.



FREYGANG'S WASHING AND LEACHING APPARATUS

One of the chief advantages claimed for the apparatus is the saving of water. As all of the light particles are kept in suspension by the constant churning of the conveyer, only that amount of water necessary to take up the light material of the continuous charge will be required. The water consumption can thus be reduced to a minimum, depending on the amount of fine material in the charge and on the number of turns of the conveyer.

The experiments necessary to evolve this device were carried out in private with an apparatus of about 2 tons daily capacity, driven by a 1/40-h.p. hot-air motor. One of these devices was recently constructed for an output of about 20 tons per day; it is operated by a 1½-h.p. motor and serves to wash ferrous [illegible] ore) out of an auriferous copper ore in a single operation.

---

*Regensburgerstrasse 3, Berlin, Germany

Iron Ore in the Dominican Republic

E. M. De. Garston, British vice-consul at Santo Domingo, reports that iron is found in immense quantities in several sections of the Dominican Republic. Near Puerta Plata, on the slope of the Isabel de Torres mountain, there is a large deposit of manganese, which from its volcanic formation seems to indicate that a similar deposit may exist on the southern slope of the same mountain of the Cordillera Setentrional. A deposit of magnetic iron ore, about nine miles in extent, is found on the borders of the Maimon river, municipality of Cotuy, province of La Vega. In order to develop this deposit it would be necessary to canalize the Maimon river as far down as its confluence with the river Yuma, so as to render it capable of floating small boats or barges for the transport of the ore. Iron is also found in Monte Pueblo, Arbol Gordo, Sabana de Santa Rosa, and South of Yamasa, in the province of Santo Domingo; these are limonite deposits. In Sierra Prieta, close to the Ozama river, which is navigable for small craft, there are masses of magnetic iron, samples of which are said to have yielded from 60 to 70 per cent. of metal.

There is an immense deposit of iron pyrites extending from Los Llanos across Hato Mayor to Sabana la Mar. A peculiarity of this region is that near the Almirante river the process of carbonization of vegetable matter has been so rapid that the generality of trees which fell centuries ago near the river are now more or less perfect blocks of lignite. Near Seybo, on the Campiña lake, there are stones so saturated with iron that the existence of an iron deposit in the vicinity is highly probable. Great difficulties would be met with at present, however, in producing pig iron profitably, owing to the great scarcity of labor and the absolute want of means of communication.

Efficiency of Hydraulic Air Compression

In *Glückauf,* March 14, 1908, P. Bernstein discusses the operation of a hydraulic air compressor recently installed in one of the mines at Clausthal. It replaced a piston compressor driven by belt from a Pelton wheel, and, as will be shown, afforded a marked economy in running expense.

The arrangement of the apparatus is shown in the accompanying illustration. A flow of water in the tunnel, *t,* is led through the cast-iron pipe, *a,* of 218 mm. diameter, to the air suction pipe, *b.* With the entrained air, the water then flows through the cast-iron pipe, *c,* 218 mm. diameter and 150 m. long, which is led, somewhat crookedly, down an inclined shaft. The water discharges into the bottom of the receiver *d,* 1.1 m. diameter and 4.5 m. high, which rests upon an I-beam support in the shaft at a depth of 52 m. below the level of the overflow tunnel at *u.* The receiver is provided with a pressure gage, and a pipe, *g,* which passes up parallel to the discharge pipe and enters it at the discharge level.

The compressed air escapes through the valve, *e,* passing then into the reservoir, *i,* and thence, through the 80-mm. pipe, *h,* to the working places of the mine. The overflow water passes up through the pipe, *f,* 218 mm. diameter and 50 m. long, to the level *u.* The construction of the component parts of the apparatus is shown in the drawing. By the peculiar construction of the air inlet, which creates no compression of the water, and by the avoidance of sharp corners, the loss of head through resistance is reduced to a minimum.

The average flow of water through the system was found to be 3 cu.m. per min., which, falling through the distance 99.3 m., between the intake and the discharge levels, yielded 3000 kg. x 99.3 m., ÷ 4500 kilogram-meters per min., or 66.2 h.p. In order to test the efficiency of the installation, at full capacity, a test was made during which the flow of water was measured by a weir, and the amount of compressed air was measured by the filling of a receiver of known capacity. It was found that 3.2 cu.m. of water per min., falling the 99.3 m., afforded 10 cu.m. of air per min., at an effective pressure of 5.1 atmospheres (90 lb. per sq.in.). The work required to compress 1 cu.m. of air, adiabatically, to 5.1 effective atmospheres is approximately 24,300 kilogram-meters, so that, under the above conditions, the compressor was performing 10 × 24,300 ÷ 4500, or 54 h.p. The theoretical power of the water was 3200 × 99.3 ÷ 4500, or 70.5 h.p., showing an efficiency of 77 per cent.

The turbine wheel had an efficiency of about 75 per cent., including in the computation the water, 4 or 5 liters, used for cooling the compressor, and the compressor had an efficiency of 85 per cent., so that the combined efficiency of the installation that was displaced by the hydraulic apparatus was only 64 per cent., as against 77 per cent. efficiency of the new installation. Assuming the same conditions as in the above mentioned test, the older combination of machines would have yielded only 0.64 x 70.5 x 4500 ÷ 24,300, or 8.3 cu.m. of air per minute.

The superiority of the hydraulic installation is seen not alone in the greater capacity and efficiency. In the following tables are compared the cost of compressing air by three different means, viz., (1) by a piston compressor, belt-driven from a water turbine consuming the same amount of power as the hydraulic plant. (2) By an electric-driven compressor of the same capacity and using the same amount of power as the hydraulic plant. (3) By the hydraulic installation itself.

1. *Water-driven Plant—*

Investments:	
Belt-driven compressor	$1,250
Pelton wheel, complete	1,125
Building, foundations, etc	450
	$2,825
Interest and Depreciation:	
Interest on plant at 5 per cent	$ 141
Depreciation of machines at 10 per cent.	238
Depreciation of building at 3 per cent	15
Operating expenses:	
Wages (night and day shifts)	600
Lubricants, ½ pound per hour	75
Repairs and waste	75
Total annual expense	$1,144

Assuming 6000 working hours per year, and an output of 7.8 cu.m. per min., the year's output by the above arrangement would cost $0.38 per 1000 cu. meters.

2. *Electric-driven Plant*—Assuming the efficiency of the compressor to be 0.90, of the belt or gear drive, 0.95; of the motor, 0.90; and of the current transformer, 0.95, the total efficiency of the elcetric-driven plant would be 73 per cent., and for the exertion of 54 h.p. would require the purchase of 74 h.p. from the central generating station.

Investments:	
Belt-driven compressor	$,1500
Electric motor, 70 h.p	1,200
Buildings, foundations, etc	450
	$3,150
Interest and depreciation:	
Interest on plant at 5 per cent	$ 158
Depreciation of machines at 10 per cent.	315
Depreciation of building at 3 per cent	15
Operating expenses:	
Wages (day and night shift)	600
Lubricants	95
Repairs and waste	100
Electric power, 74 h.p. for 6000 hr. at ½c. per h.p.-hr	2,220
Total annual expense	$3,503

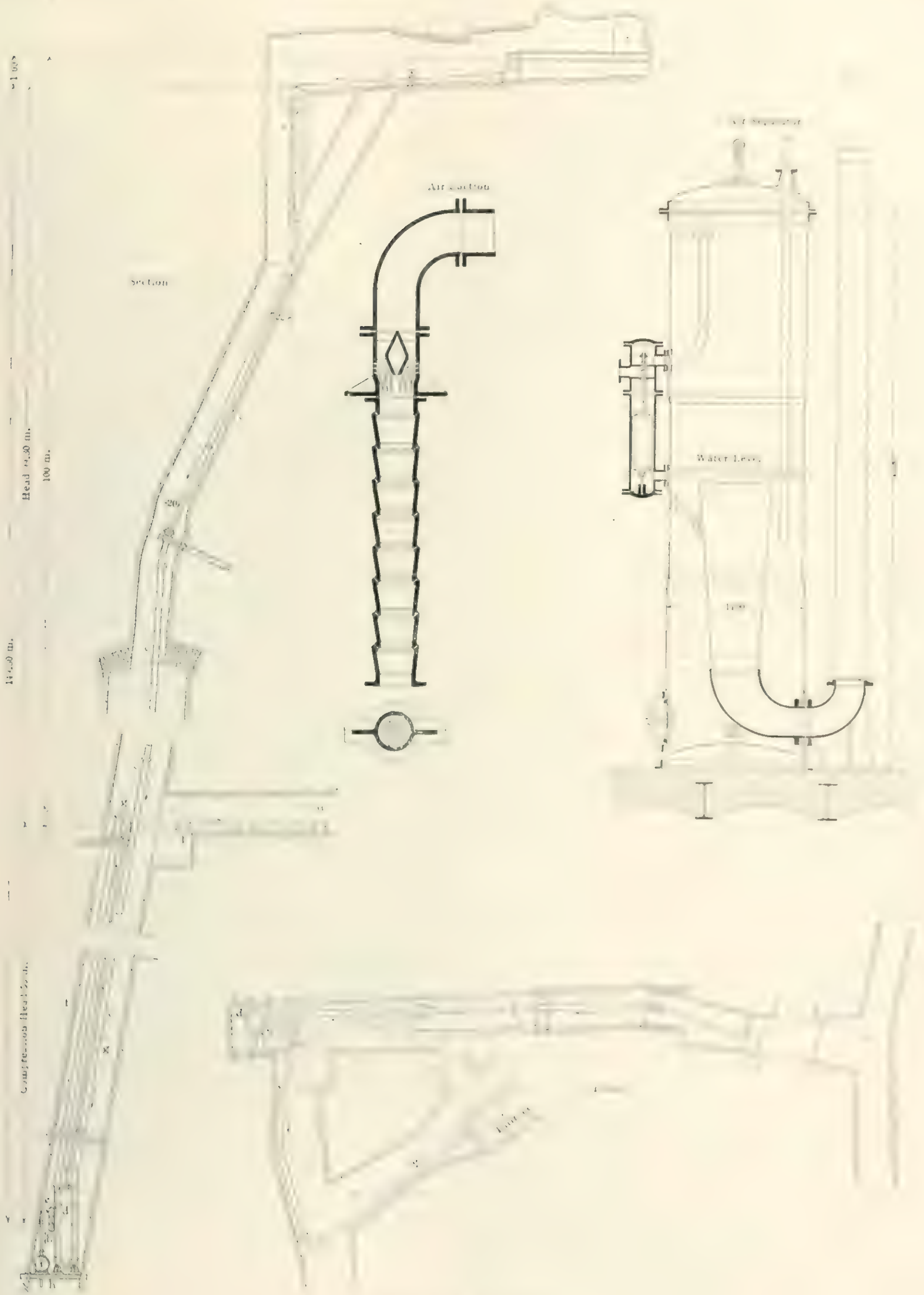
With an output of 10 cu. m. per min., the year's output by the above arrangement would cost $0.98 per 1000 cu. meters.

3. *Hydraulic Compressor—*

Investment.	
Compressor, installed	$3,750
Interest and depreciation:	
Interest at 5 per cent	$ 187
Depreciation at 5 per cent	188
Operating expenses;	
Lost wages during shutdowns	30
Repairs	20
Total annual expense	$ 425

With an output of 10 cu.m. per min., the year's output by the hydraulic compressor cost only $0.12 per 1000 cu.m. It may be added that 10 cu.m. of air at 5.1 effective atmospheres, is equivalent to 353 cu.ft. at a pressure of 90 lb. per sq. inch.

A writer on the brass and copper industries states that in muffle or crucible furnaces for brass melting, the joints between the firebricks should be as close as possible. Furnaces requiring high temperature, such as for refining copper, are best built of silica brick set in silica cement. The composition of the fireclay used should be as nearly as possible the same as the brick.



HYDRAULIC AIR COMPRESSOR

A Discussion of Mine Curve Problems

The Output of a Coal Mine Is Often Limited by Haulage Roads Having Steep Grades and Abrupt Turns. Approved Methods of Alinement

BY J. E. TIFFANY[*]

The most frequent demand made upon mine officials is for an ever increasing output. Although a coal mine may be provided with a number of electric-haulage motors, which ought to insure a large production, their work will be hampered unless the haulage roads are in first-class condition and free from abrupt turns, which latter are a common cause of wrecks and consequent delays.

It is often impracticable to make the main haulage road perfectly straight, but it is always possible to drive this haulway on sights in a given direction, until the necessity arises to make a change in its course. When such occasion arises, it should be carefully determined what the new direction should be and the two tangents then connected by a curve of as long a radius as possible.

The more hastily you build a railroad by skipping the work, and neglecting good alinement, the slower will be the travel upon it. A principle is here involved which applies to the development of a mine, for if the laying out of a mine is not given proper consideration, and if the main haulage roads are not driven with curves of long radius, also if cross-headings are broken off square instead of being connected with the main haulage headings and cross-headings by a curve, a method has been adopted, which will cause a slow recovery of the coal. Having driven the headings, it is not so easy to improve their condition as it is to improve the alinement of a railroad; furthermore, such neglect will cause an undeterminable extra cost per ton on the coal production.

From a theoretical point of view all curves should be of as long a radius as possible, but a radius of more than 50 ft. is not often used in mine practice in turning off cross-headings. It is the object of this article to give drawings of a number of mine curves explaining the same and showing how these can be applied to suit particular conditions. From a careful study of these problems there should be no difficulty to select the curve most suited to individual needs.

GENERAL METHOD OF LOCATING A CURVE

The methods used all require the use of a transit. For accuracy in driving a curve there is no better method than by the use of chords 10 ft. long, whose extremities are located in the center of the track. The point of curve is located by marking it with a survey station. From the line of tangent of the main heading, a deflection angle for a chord of 10 ft. is turned and a point placed about 3 ft. from the survey station. The latter station and the point ahead of it constitute the sights by which to drive the heading.

When the heading has been driven in a distance of about 10 ft. there is then room for the transit to be set up at the end of the first chord. The transit, however, is again set up at the point of curve and the same deflection turned as before. A distance of 10 ft. is measured in the direction of the deflection turned and the second survey station is located and marked. The transit is now moved to this last point and a deflection angle turned from this chord equal to twice the first deflection angle, giving by this means the direction for the second set of sights. The process is continued until the curve is driven to the point of tangent.

This work requires considerable attention on the part of the engineer and is not a convenient method unless the transitman can give it daily attention. Under these circumstances it becomes necessary to devise some method by which the work of driving a mine curve can be performed without such close attention on the part of the engineer. The 10-ft. chord method is shown in Fig. 1, while in the succeeding figures, methods are shown which do not require the same amount of attention. Before taking up the consideration of these problems, it is advisable to look at the calculations necessary for the method illustrated in Fig. 1. Let:

Δ = The deflection of the cross-heading tangent from the main heading tangent, in this case = 90 deg.

R = The radius of curve along the center of the track, in this case = 50 ft.

C = The length of the chords, in this case = 10 ft.

C_l = The length of the last chord.

X = The number of chords equal to 10 ft.

d_1 = The first deflection from the line of tangent of the main heading, then the deflection angle which two chords make with one another is equal to 2 d_1.

d_{l-1} = The deflection which the last chord makes with the one preceding it.

d_l = The deflection which the cross-heading tangent makes with the last chord.

In this case the values C_l, X, d_1, d_{l-1}, and d_l have to be determined by calculation.

By referring to any book of tables on railroad curves, we find that:

$$Sin.\ d_1 = \frac{\frac{1}{2} C}{R}. \tag{1}$$

Substituting the valves of C and R given for this case, we get:

$$Sin.\ d_1 = \frac{5}{50} = 0.1 = sin.\ 5^\circ\ 45';$$
$$d_1 = 5^\circ\ 45'.$$

The value of X is determined by

$$X = \frac{\Delta}{2\ d_1} \tag{2}$$

$$\text{Substituting} = \frac{90^\circ}{11^\circ\ 30'} = 7 + 9^\circ\ 30'.$$

Thus we see that $X = 7$ chords, each having a length of 10 ft. Before reaching the point of tangent we have another chord subtended at the center of the curve by an angle of 9 deg. 30 sec., the length of which we have represented by C_l

d_l = Half the remainder, when Δ is divided by $2\,d_1$, which in this case = one-half of $9^\circ\ 30'$
$= 4^\circ\ 45'$

$d_{l-1} = d_1 + d_l$
$= 5^\circ\ 45' + 4^\circ\ 45'$, or by substitution $= 10^\circ\ 30'$.

$C_l = 2\ R\ sin.\ d_l$,
$= 100\ sin.\ 4^\circ\ 45' = 8.28$.

By the above calculations, we find that $C_l = 8.28$, $X = 7 +$, $d_1 = 5^\circ\ 45'$, $d_{l-1} = 10^\circ\ 30'$ and $d_l = 4^\circ\ 45'$.

In the first case illustrated, it is not absolutely necessary to make a drawing of it, but in the cases about to be discussed a sketch is imperative. For this purpose I will first consider the location and direction of the two tangents to be connected by a curve. Having fixed these, we proceed to make a drawing on a large scale. The ordinary mine-plan scale of 1 in. = 100 ft. is too small a scale to use. A suitable scale is 1 in. = 8 ft. The foreman who has charge of driving a heading is rarely provided with an engineer's rule, but by using the scale mentioned above, the plan can be scaled with an ordinary measuring rule, marked in inches and eighths of an inch. The necessary dimensions should, however, be stated in figures on the plan.

CONDITIONS TO BE OBSERVED

Should the deflection angle which the two tangents make with one another be less than 46 deg. 10 sec., then for a curve

---

[*] Civil and mining engineer, Berlin, Penn.

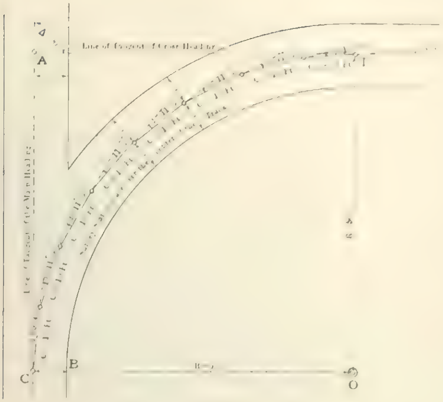

A
Line of Tangent of Cross Heading
T
Line of Tangent of the Main Heading
B
R
C
O

FIG. 1

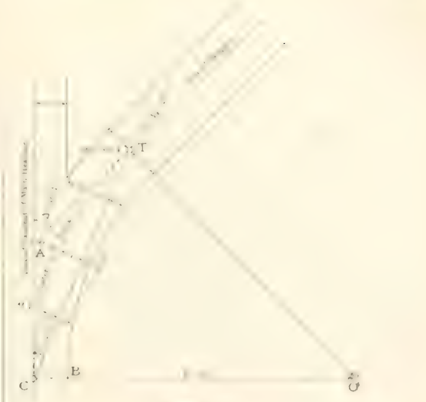


FIG. 2

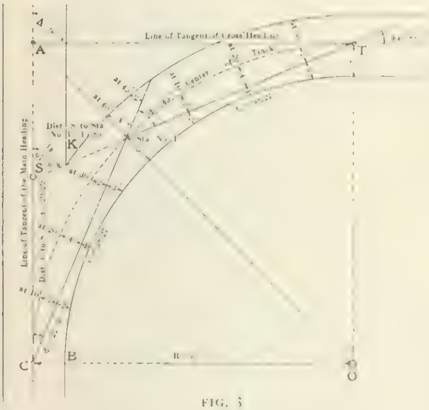

A
Line of Tangent of Cross Heading
T
Track
Center
K
S
Sta. No. 1
Line of Tangent of the Main Heading
B
R
C
O

FIG. 3

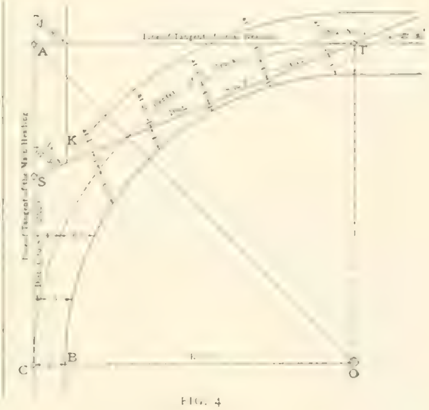

A
Line of Tangent of Cross Heading
T
K
S
Line of Tangent of the Main Heading
B
R
C
O

FIG. 4

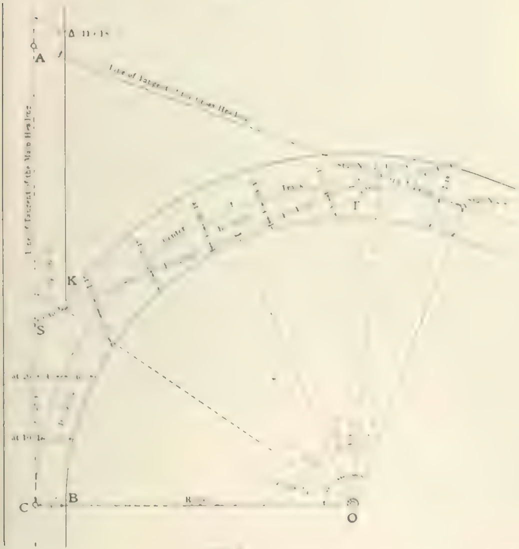

A
Line of Tangent of Cross Heading
Line of Tangent of the Main Heading
Center
Track
T
K
S
B
R
C
O

FIG. 5

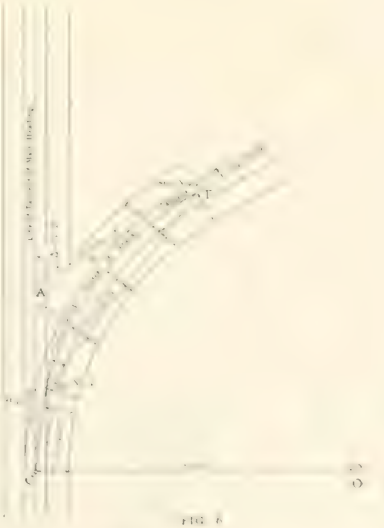


FIG. 6

PLANS FOR VARIOUS METHODS OF LOCATING CURVES IN COAL MINES whose radius is 50 ft. one chord can be used from the point of curve to the point of tangent, so illustrated in Fig. 2. If we, however, increase the radius of the curve, the maximum for the deflection angle is decreased and also if the deflection angle should be greater than 46 deg. 10 sec. a radius can only be used which is correspondingly less than 50 ft. This method along with those illustrated in Figs. 4, 5 and 6 only requires one set of sights from the point of curve to where the sights are given for the tangent. Figs. 2 and 6 show what might be called a one-chord method, while those illustrated in Figs. 4, 5 and 7, although allowing a greater value of △ cannot be described in the same way, because the lines used for bases are not chords to the curve used.

then the distance from the center of the curve to the center of the basal chord is the radius less 4 feet.

Let the symbols △, *R*, *d* and d_1 be the same as those used for Fig. 1 and have the same numerical value for *R*. The value of *C* will have to be calculated and stands for the length of the only chord.

The value of d_1 can be obtained by the equation.

$$\cos d_1 = \frac{R - 4}{R} = \frac{46}{50} = 0.92 \qquad (3)$$

$$= \cos.\ 23^\circ\ 05', \text{ or } d_1 = 23^\circ\ 05';$$

but $d_1 = d_1 \therefore d_1 = 23^\circ\ 05'$,
and $\triangle = 2\, d_1 = 46^\circ\ 10'$.

By transposing equation (1), we get:

$$C = 2\, R\, \sin.\, d_1$$

$$= 100 \sin\ 23^\circ\ 05' = 39.21.$$

former. In Fig. 3 the main heading sights are carried in the center of the track from which the curve is turned and are also 5 ft. from the side of the heading.

Drawing the Plans

In making the drawing, first of all lay off the line of sight of the main heading and then that of the cross-heading and let the two lines intersect. The intersection in Figs. 3 and 4 takes place at *A*. The point of curve is a distance of 50 ft. from *A* and the point of tangent of the cross-heading is likewise 50 ft. from *A*.

By drawing lines from *P. C.* and *P. T.* respectively, at right angles to the lines of sight of the main heading and cross-heading they will intersect at *O*. The distances from *O*, the center of the curve, to the *P. C* and *P. T.* should be equal to one another if the drawing has been made correctly.

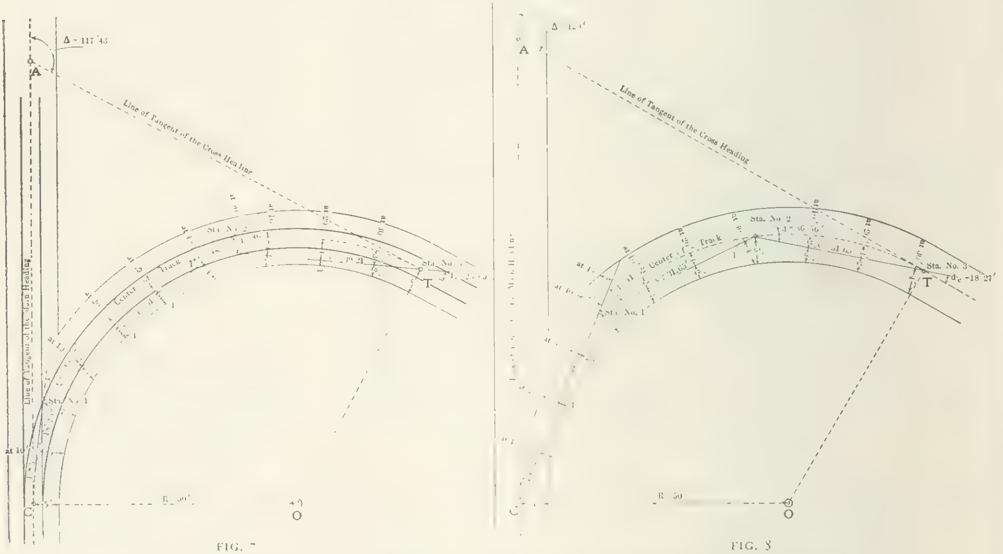


FIG. 7 FIG. 8

GENERAL SCHEME FOR THE LOCATION OF ENTRY CURVES IN UNDERGROUND DEVELOPMENT

The calculations for the Fig. 2 type of curve depend on an assumed limiting principle that the nearest point on the basal chord to the side of the heading shall not be less than 1 ft. Supposing that the distance from the center of the track to the side of the heading is a distance $\frac{w}{2}$; then the distance from the center of the basal chord to the center of track will be $\frac{w}{2} - 1$, which expression, if $w = 10$ ft., will equal 4 ft. All the cross-headings drawn in figures which illustrate this article have a width of 10 ft., even where a greater width than 10 ft. is used in driving cross-headings, it is rarely advisable to use the full width until the curve has been driven to the point of tangency. If the distance from the center of the basal chord to the center of the track is 4 ft.,

With the exception of the methods shown by Figs. 4 and 7, all the survey stations used in driving the curve are located in the center of the curved track.

Applications of the methods shown in Figs. 2, 3, 6 and 8 are preferable to those shown in Figs. 4, 5 and 7, as there is a tendency, when points are set ahead of the point of curve, not to take the side off from the *P. C.* to where the sights are set, but to commence immediately at the sights; of course under these circumstances it is impossible for the day-men to put down the track properly.

Figs. 3 and 4 show two different ways of making plans to drive the same curve; for reasons just enumerated above, I prefer the method illustrated by Fig. 3. Both plans are for curves connecting a main heading with a cross-heading, the latter having a direction at right angles to the

We now describe the arc of the circle representing the curve along the center of the track between the *P. C.* and the *P. T.*; this is done with the center at *O* and a radius of 50 ft. Other arcs are drawn, having the same center, and with radii of 45 and 55 ft. respectively. These latter curves represent the right- and left-hand sides of the heading. Join *A—O* by the line which intersects the curved line representing the center of the track, and divides it into two equal arcs, each having chords that are used as bases in the subsequent work. By the use of a scale where 1 in. equals 8 ft., commence at the *P. C.* and measure off along the first chord successive distances of 10 ft. and continue the operation until the first chord produced intersects the arc representing the left-hand side of the heading. In Fig. 3 along the first chord produced are points marked off at 40 and 45 ft. from the *P. C.* Now make station No. 1 a new starting point and mark off points every 10 ft. until the *P. T.* is reached. Lines can now be drawn from these points at right angles to the chords.

By further use of the scale measure the offsets between the chords and the right-hand side of the heading and to the left of them measure the distance to the center of the track. The distances thus determined are shown on the plan.

By means of the offsets from the produced portion of the first chord, the heading can be driven a distance of 10 ft. ahead of station No. 1, thus giving the engineer a better chance to set his sights, and should he not be there by the time the miners have reached this point, the work can proceed.

The length of the chords can be scaled or calculated; the latter is the method advised and for this purpose most of the symbols used in Fig. 1 are employed with the same meaning. The same assumed numerical values for Δ and R are ascribed; these are 90 deg. and 50 ft. respectively. Considering that,

$x = 2$ chords of equal length c, the value of which has to be determined by calculation.

$$d_1 = \frac{\Delta}{4} = \frac{90^\circ}{4} = 22^\circ\ 30'.$$

$d_2 =$ Deflection angle which the two chords make with one another and is equal to $2\,d_1$ which is $2 \times 22^\circ\ 30' = 45^\circ$, also,

$d_1 = d_t = 22^\circ\ 30'$.

The length of C is calculated from the transposed form of equation (1).

$C = 2\,R\ sin.\ d_1.$

$= 100\ sin.\ 22^\circ\ 30' = 38.27.$

In making our calculation for the construction of Fig. 4 new symbols have to be introduced:

$d =$ The distance from the *P. C.* to the supplementary point *S*.

$Z =$ The distance from *S* to station No. 1.

$T =$ Tangent distance; in this case 50 ft.

$t_1 =$ Distance from *P. T.* at *A* to the point *S*; this is equal to $T - s$.

The following equation is used to solve s:

$$s = \frac{2\,R\ sin.\ \frac{\Delta}{x}\ sin\ \frac{\Delta}{2\,x}}{sin.\ \frac{3\,\Delta}{2\,x}}. \qquad (4)$$

$$= \frac{C\ sin.\ \frac{\Delta}{x}}{sin.\ \frac{3\,\Delta}{2\,x}}$$

Substituting the numerical values given for Fig. 3, we have:

$$s = \frac{38\ 27\ sin.\ 45^\circ}{sin.\ 67^\circ\ 30} = 29.29.$$

The solution of Z is as follows:

$$Z = \frac{2\,R\ sin\ \frac{\Delta}{2\,x}\ sin\ \frac{\Delta}{2\,x}}{sin\ \frac{3\,\Delta}{2\,x}} \times \frac{2\,R}{2\,R}$$

$$= \frac{c^2}{2\,R\ sin.\ \frac{3\,\Delta}{2\,x}}. \qquad (5)$$

The above equation (5) is capable of general application, while in cases shown in Figs. 3 and 4, the following relation can be particularly applied:

$$\frac{Z}{sin.\ 22^\circ\ 30'} = \frac{c}{sin.\ 67^\circ\ 30'}$$

$$\therefore Z = \frac{c\ sin.\ 22^\circ\ 30'}{cos.\ 22^\circ\ 30'}$$

$= c\ tan.\ 22^\circ\ 30'$, by substituting

$= 38.27\ tan.\ 22^\circ\ 30' = 15.85.$

The values of c, s and Z are proportional to R when $\Delta = 90$ deg., thus the values for these, when $R = 50$ ft., which have been determined and stated above, can be calculated for other radii by direct proportion. For instance, if we want a curve with a radius of 45 ft., then:

$$c = \frac{45 \times 38\ 27}{50} = 34.44\ ft.$$

$$s = \frac{45 \times 29.29}{50} = 26.36\ ft.$$

$$Z = \frac{45 \times 15.85}{50} = 14.26\ ft$$

The values for x, d_1, d_2, d_t remain the same in Figs. 3 and 4 when Δ is 90 deg. and R is the only given quantity changed.

The value of the radius for the above case, Fig. 3, must not exceed 60 ft. There is only a clearance with this radius between the centers of the basal chords and the side of the heading of about 6 in. But if a radius of 52 ft. is used the clearance is increased to approximately 1 ft.

By referring above you will find that the symbol s is described as the distance from the *P. C.* to the supplementary point *S*. This point is so called because it embodies the same principle used in Fig. 4, but can also be used in the method used in Fig. 3 to great advantage. When the sights have been set at c, supplementary sights could have been set at s, it being a point on the main heading, where the second chord produced back intersects the line of sight of the main heading.

Plans similar to Fig. 3, where $\Delta = 90$ deg. can be used for curves of any radius less than 60 ft.; over 60 ft. the method shown in Fig. 8 can be applied.

INSTRUMENTAL WORK UNDERGROUND

Having drawn the plan and made all necessary calculations we now go underground, to set the sights and give the requisite instructions. The point of curve is first located by driving a spad, or whatever method is in use to establish underground survey stations.

The instrument is moved to the *P. C.* and a deflection from the line of sight of the main heading is turned: in this case, $d_t = 22^\circ\ 30'$, which is the angle used in Fig. 3. A point is now set at a distance of about 3 ft. From these two points plumb-bobs are suspended to sight the direction of the basal chord.

When a distance of 10 ft. has been driven, it will be seen by the plan, Fig 3, that the right-hand side of the heading should be 2 ft. from the line of sight; at 20 ft. the offset is 1 ft. and so on.

At a distance of 49 ft. from the *P. C.*, the line of sight intersects the left-hand side of the heading. When a distance of 45 ft. from the *P. C.* is reached, the engineer should be notified. The transit is again set up at the *P. C.* and deflection, $d = 22^\circ\ 30'$ is again turned. A distance of 38.27 ft. is measured off in this direction, giving the location of station No. 1. The transit is moved to station No. 1; a back sight taken on the *P. C.* and a deflection of 45 deg. is turned; this latter gives the direction for the new sights. The sights last put in are used until there is room for the point *T* to be located and a deflection of 22° 30' turned to the right, giving the sights for the portion of the cross heading driven on tangency.

The supplementary point s above described can also be located and sights turned. But in using these sights a skip has to be taken off the corner *K*, just enough to enable a clear sight. The distance s has been calculated and shown for our given case to be equal to 29.29 ft. We therefore measure, from c along the line of sight of the main heading, the calculated distance. The angle for the sights is a deflection represented by d_s and equal to $d_1 + d_2 = 67^\circ\ 30'$. If we do not use the first basal chord in Fig. 3, but only the sights at *S* in Fig. 4, we commence by setting out first sights at s. By these sights the heading can be driven to the point *T*, a distance equal to $z + c = 15.85 + 38.27 = 54.12$ ft. At *T* the deflection from the base line *S T* is 22 deg. 30 min. for the line of tangent.

Two equal basal chords similar to those shown in Fig. 3 can be used for any value of Δ up to 92 deg. 20 min., at which angle the basal will have a clearance of 1 ft., when $R = 50$ ft. Unfortunately the method shown by Fig. 4 is practically limited to 90 deg. as a maximum value for Δ, for above this value there is not sufficient clearance between the base line and the corner marked *K*, in fact a skip has to be taken off in both Figs. 3 and 4.

A S[illegible]

Let us consider for a moment the greatest [illegible] Δ [illegible] one base line. In the first place we will assume that such a base line has a clearance of 1 ft. from the corner *K* (see Fig 5), and that it has also the same clearance from where it approaches closest to the inside edge of the heading; furthermore that the said base line terminates within 3 ft. of the other side of the heading, thus allowing ample room to set up the transit. In order to give the sights for the line of tangent as before, this curved heading has a width of 10 ft., and a radius R. The distance from the center of the curve to the corner K is $R+5$, and from the same point to B is $R-5$. The figure $K\,B\,O$ is a right-angled triangle and, therefore, $B\,K = \sqrt{20\,R}$.

In order that the line $S\,T\,U$ may clear the corner K by one foot, the intersection of said line with $B\,K$ will take place at a distance of $\sqrt{20\,R} - 1$ from B, which we will represent by the letter D.

D subtends a central angle whose tangent is $\frac{\sqrt{20\,R} - 1}{R-5}$, this we will say is equal to *tan. d*. Below are given equations, which are applicable for any value of R, and by adding together the values solved for the angles d, e, f, g and h we obtain the maximum value of Δ for any given value of R. Opposite the equations are given the values of angles, when R equals 50 ft.

$$\left.\begin{array}{l} D = \sqrt{20\,R} - 1 = 30.62, \\ \text{when } R = 50 \text{ ft.} \end{array}\right\} \quad (6)$$

$$\left.\begin{array}{l} \text{tan. } d = \dfrac{D}{R-5} = \dfrac{30.62}{45} = \\ \text{tan. } 34^\circ\ 14' \end{array}\right\} \quad (7)$$

thtrefore,

$$d = 34^\circ\ 14', \text{ when } R = 50 \text{ ft.}$$

$$\left.\begin{array}{l} E = \sqrt{10 - \sqrt{20\,R} + 18\,R} \\ = 29.09 \text{ when } R = 50 \text{ ft.} \end{array}\right\} \quad (8)$$

$$\left.\begin{array}{l} \text{tan. } e = \dfrac{E}{R-4} = \dfrac{29.09}{46} \\ = \text{tan. } 32^\circ\ 19' \end{array}\right\} \quad (9)$$

therefore,

$$e = 32^\circ\ 19', \text{ when } R = 50 \text{ ft.}$$

$$F = 2\sqrt{2\,R - 4} = 11.6, \text{ when } R = 50 \text{ ft.} \quad (10)$$

$$\text{tan. } f = \frac{F}{R-4} = \frac{19.6}{46} = \text{tan. } 23^\circ\ 05'$$

therefore,

$$f = 23^\circ\ 05', \text{ when } R = 50 \text{ ft.} \quad (11)$$

$$\left.\begin{array}{l} G = \sqrt{12\,(R-1)} - F \\ = 24.25 - 19.60 = 4.65 \end{array}\right\} \quad (12)$$

$$\left.\begin{array}{l} \text{tan. } (f+g) = \\ \dfrac{\sqrt{12\,(R-1)}}{R-4} = \dfrac{24.25}{46} \\ = \text{tan. } 27^\circ\ 48' \end{array}\right\}$$

whence

$$f + g = 27^\circ\ 48', \text{ or}$$

$$g = 27^\circ\ 48' - 23^\circ\ 05' = 4^\circ\ 43', \text{ also}$$

$$\left.\begin{array}{l} H = 2\sqrt{R+1} = 2\sqrt{51} \\ = 14.28, \text{ when } R = 50 \text{ ft} \end{array}\right\} \quad (13)$$

$$\text{tan. } h. = \frac{H}{R} = \frac{14.28}{50}\ \text{tan. } 15^\circ\ 75'. \quad (14)$$

therefore,

$$h = 15^\circ\ 57'.$$

Let B = The length of the base line $S\,T\,U$

$$= \frac{5}{\text{sin. } d} + E + F + G. \quad (15)$$

$$= 5.45 + 29.09 + 19.60 + 4.65 = 58.70.$$

s = The distance from the *P. C.* to the supplementary point s

$$\left.\begin{array}{l} = D - 5 \text{ cotan. } d_s = 30.62 \\ - 2.17 = 28.45, \end{array}\right\} \quad (16)$$

when $R = 50$ for both values.

d_s = The angle of deflection between the line of sight of the main heading and the base line $S\,T\,U$

$$\left.\begin{array}{l} = d + e = 66^\circ\ 33' \text{ when} \\ R = 50 \text{ ft.} \end{array}\right\} \quad (17)$$

d_t = The angle of deflection between the base line and the line of tangent of the cross heading,

$= \Delta - d_s = 43^\circ\ 45'$, when $R = 50$ ft., Δ having a maximum value of 110° 18′; but when Δ is, say, 100 deg., d_t is only 33 deg. 27 min.

The maximum value for Δ equals $d + e + f + g + h$, substituting the values determined above when $R = 50$ ft., we get 110 deg. 18 min.

Let us now consider the calculation necessary to determine the value of G and H, when Δ is less than the maximum and greater than $d + e + f$, then,

$g - h = \Delta - (d + e + f) = 10^\circ\ 22'$ when $\Delta = 100$ deg.

$$G = \frac{R\,[1 - \text{cos. } (g+h)]}{\text{sin. } d_t} \quad (18)$$

$$= \frac{50\,(1 - \text{cos. } 10\ 20)}{\text{sin. } 33^\circ\ 27} = 1.48$$

when $R = 50$ and $\Delta = 100$ deg.

$$H = R \left[\begin{array}{c} \text{sin. } (g+h) - \text{cot. } d_t \\ \{1 - \text{cos. } (g+h)\} \end{array} \right] \quad (19)$$

$$= 50 \left[\begin{array}{c} \text{sin. } 10^\circ\ 22' - \text{cot. } 33^\circ\ 27' \\ \{1 - \text{cos. } 10^\circ\ 22'\} \end{array} \right]$$

$= 7.70$, when $R = 50$ and Δ 100 deg.

When Δ lies between $d + e + f$ and $2f$, with the latter value, we have the case illustrated in Fig. 2, and with any such value G and H vanish, and F and f have the same values as before, being solved by the same formulas:

$$d_t = f \text{ and } d_s = \Delta - f \text{ when } \Delta = 60 \text{ deg. and } R = 50 \text{ ft.}$$

$$d_t = f = 23^\circ\ 05' \text{ and } d_s = 60^\circ - 23^\circ\ 05' = 36^\circ\ 55'.$$

$$d + e = \Delta - 2f = 13^\circ\ 50'.$$

$$\left.\begin{array}{l} s = R \text{ sin. } (d+e) - R \text{ cot. } d_s \\ (1 - \text{cos. } (d+e) \end{array}\right\} \quad (20)$$

$$= 50 \text{ sin. } 13^\circ\ 50' - 50 \text{ cot. } 36^\circ\ 55' \ (1 - \text{cos. } 13^\circ\ 50')$$

$$= 10.03 \text{ when } \Delta = 60^\circ \text{ and } R = 50 \text{ ft.}$$

$$B = \frac{R\,\{1 - \text{cos. } (d+e)\}}{\text{sin. } d_s} + 2\,F. \quad (21)$$

$$= 41.62 \text{ when } \Delta = 60 \text{ deg. and } R = 50 \text{ ft.}$$

With a reasonable allowance for clearance, we have seen by the methods illustrated, that for a given value of R, there is a maximum value for Δ, for example in Fig. 2, the maximum for Δ, with $R = 50$ ft. is 46 deg. 10 min.; in Fig. 3, the maximum is 90 deg. 20 min., but by an application of the method shown in Fig. 6 these maximum values can be increased by 15 deg. 21 min., and a curve can be driven with one set of sights, under the following conditions, that the gage of the track shall be 3.5 ft., $R = 50$ ft. and Δ not to exceed 61 deg. 21 min. The maximum value of Δ decreases as R increases, or g decreases. In this case the first station on the curve is set over the rail on the side, the cross heading is turned off the main heading, and in the center of the curved track.

The location of this point is determined as follows and depends on the gage of the track:

$$\text{cos. } 2\,d_1 = \frac{2\,R - g}{2\,R} = 15^\circ\ 12', \quad (22)$$

when $R = 50$ ft.

also $g = 3.5$ ft.; d_1 is the first deflection angle, and g = the gage of the track.

Another good method, Fig. 7, which is similar to this one is to locate the position of the frog used in switching off the curve, and setting the sights for the first base line at this point. When this method is applied to the case given in Fig. 3, we have (with a radius of 50 ft.) a maximum value for Δ of 117 deg. 43 min.; the method can also be applied to Fig. 2 giving maximum Δ = 71 deg. 33 min. The former value of Δ is the largest thus far discussed for a radius of 50 ft.

By the use of three equal basal chords Δ can attain a maximum value of 138 deg. 30 min., and with four such chords

184 deg. 40 min. is the maximum, or we can use a chord like that used in Fig. 2 and two equal chords for the balance of the curve when △ lies between 46 deg. 10 min. and 138 deg. 30 min., as illustrated in Fig. 8. By adding another base line to Fig. 5 we are able to use a value of △ up to 165 deg. 54 min.

Curves of long radius, such as are used on main haulage roads should be driven with basal chords 10 ft. long, or equal chords can be selected, which will give an offset from the center of the chord to the center of track, which offset shall not exceed 1 ft. By not exceeding this, the curve can be driven with great accuracy.

If the latter course is adopted, the length of the chords used are calculated as follows:

$$C = 2\sqrt{2R - 1} = 44.74$$

for a 23-deg. curve.

and

$$\sin. d_1 = \frac{C}{2R} = 5°\ 07'. \qquad (24)$$

Thus we see that for a 23-deg. curve, which has a radius of 250.8 ft., that chord fulfilling the required conditions would have a length of 44.74 ft. subtended at the center by an angle of 10 deg. 14 min.

The number of combinations of the methods shown above is limitless, however, I trust that the formulas and drawings may be found of some use in framing and suggesting this often neglected question of mine curves. As a general rule two or three standard drawings are usually all that is needed for the curves at any particular mine, because the conditions requiring such curves are nearly always the same.

Colliery Notes

In mines where compressed air is used the pipe lines can often be utilized to carry water in case of fire.

The soft-coal mines of the United States employ nearly half a million people, while the anthracite mines give work to about 170,000.

In the last fifteen years, 25,000,000 tons of small sized coal has been reclaimed from the anthracite culm piles of the United States.

Even when firing with electricity which is without doubt the safest method, the miner should not return directly to the hole after a misfire.

The safety of mines where open lights are used will be increased if the driver who delivers cars to the heading faces is equipped with a safety lamp.

The rate at which air circulates through a coal heap has more to do with fires in storage piles than any other condition aside from the character of the coal itself.

Officials of coal companies in the Schuylkill region have recently discharged a number of mine bosses for drinking, and employees who indulge in intoxicants are also being put under the ban.

It is stated that in Ireland and Spain a seam of anthracite coal is found in rocks of the Devonian system, while in another part of Ireland, a seam of coal is found traversing rocks of the Silurian age.

The ordinary method of taking the temperature of a coal pile, by lowering a thermometer down pipes scattered through the pile, is not satisfactory as the heat of such piles is irregular, and the location of greatest heat may be missed altogether.

Handling coal on the Great Lakes is now accomplished with amazing rapidity: 54,273 tons of coal, [illegible] anthracite, the remainder bituminous, were recently unloaded in one day at Superior, Wis. In 17 hours, 7152 tons were unloaded; this is at the rate of 140 tons per hour.

It has been estimated that a square foot of uncovered pipe, filled with steam at 100 lb. pressure, will radiate and dissipate in a year the heat obtained by the economic combustion of 398 lb. of coal. Ten square feet of bare pipe corresponds approximately to two tons of coal per annum.

The principal [illegible] when the thrust is in a vertical line, is the size of the pillars left standing; however, if the thrust comes from an angle of any great degree [illegible] the form of the pillars for the cause. The removal or splitting of pillars which should have been left standing is a fruitful cause of squeezes and creeps.

All water-pipe valves should be closed slowly; this precaution should be strictly observed when the diameter of the pipe is large. When silting anthracite culm into old workings, it has been found that if the momentum of the running slush is suddenly arrested, a great pressure against the pipe in all directions is created which often results in bursting the pipe line. All stop-gates should be closed by screws to avoid sudden shock.

Direct-acting steam pumps, both single and duplex, are extravagant in the consumption of fuel even under the best of conditions, and are liable to great additional losses from the use of leaky steam valves and pistons. Careful tests, under favorable conditions, and the data obtained from actual practice, shows the following consumption of steam or fuel per horse-power per hour. Triplex power pumps require 1½ to 5 lb. of coal per horse-power per hour; small steam pumps, 25 lb.; large steam pumps, compounded, 13 lb.; pulsometer pumps, 60 to 70 lb.; injectors and inspirators, 100 lb. per horse-power per hour.

When [illegible] a sump to its finished depth before driving the headings a short distance into the seam, especially heavy timbers should be provided for covering over the sump. These timbers must be arranged so that the water may be easily hoisted, or pumped if required; they should project well over the sump-shaft walling to get a good surface bearing on the strata and also to take any weight that may come on the timbers by falling rock. If light timbers are used for covering the sump, they are apt to be crushed by heavy falls of stone when blasting out the sides or roof. Holes about two or three inches square should be made in this timber covering to allow for the escape of any gases generated in the sump.

Shallow shafts with a wash of from 50 to 75 ft. should be lined with [illegible] from the top of the shaft to the floor of the seam. This lining should vary in thickness from 18 in. at the top to 2½ ft. at the bottom of the shaft. Such shafts should also be fitted out at the bottom with a concrete arch which acts as a roof support and as a protection against the surface water which often gives trouble in shallow seams. When opening such a seam, and it has been decided to put in the arch before the headings are driven out any distance, great care should be taken not to get the arch too high or too low to meet the haulage requirements and various road gradients. If placed in a wrong position in relation to the seam, it is apt to prove a costly annual expense; therefore, careful observations should be taken of the direction and rate of dips; the line of cleats should be found as accurately as possible.

Sand has been successfully used in England to fight culm-bank fires. Sand obtained as a waste product is loaded on tipping trucks, and hauled to the top of the heap by an endless rope. The distributing plant, which can be removed from place to place as required, consists of a metal scaffolding provided with an electrically-operated bucket elevator, which carries the sand up to a hight of about 20 ft. At this elevation it is discharged into a hopper and mixed with a strong flushing current of water; the mixture is then carried down a delivery pipe about 100 yd. in length, to that part of the heap which is to be covered with sand. The space in question should have been previously surrounded by a low bank of height to compel the water to run down into the heap and leave the sand on the surface. This method has given remarkable results. At the Dudrocider colliery, in England, a culm pile 12 acres in extent has been covered and [illegible] of all [illegible] of smoke. The cost of the plant was $1750, and [illegible] the 12 acres [illegible] per acre for labor and water, the sand having been obtained for nothing.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec'y.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks, or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507.500 *copies of* The Engineering and Mining Journal.

Our circulation for July, 1908, *was* 44.500 *copies.*

August 1.............. 12.000

None sent free regularly, no back numbers.
Figures are live, net circulation.

Contents

PAGE
Editorials:
The Protection of Coal Miners....... 236
High and Low Prices A Contrast.... 237
The Proposed Mexican Legislation.... 237
Iron and Steel Depression in Europe 237
The Copper Market................. 237
*The Silver-Lead Mines of Santa Barbara, Mexico....... *Claude T. Rice* 207
Short Talks on Mining Laws VI. *A. H. Ricketts* 212
*Holman Air-cushion Stamp. *Edward Walker* 213
*Pumping Problems of the Joplin District................ *Doss Brittain* 214
*An Improved Swinging Staging....... 217
*Steam Churn Drill in Hot and Cold Climates......*John Power Hutchins* 218
*Shaft Sinking by Concentration. *L. Morin* 221
Discovery of the Camp Bird Mine. *Thomas F. Walsh* 223
*The Great Boulder Perserverance Mine. *Special Correspondence* 224
*Copper for the Foundry. *F. L. Antisell* 225
Ore Shoots at Butte, Montana. *Reno H. Sales* 226
*A Novel Washing and Leaching Apparatus..........*Alfred Gradenwitz* 227
Iron Ore in the Dominican Republic.... 228
*Efficiency of Hydraulic Air Compression 228
*A Discussion of Mine Curve Problems. *J. E. Tiffany* 230
Colliery Notes.......................... 235
Correspondence:
Machine Sampling.......*L. S. Austin* 238
The Origin of Coal...*Hiram W. Hixon* 238
Tapping Mine Water Under Pressure. *W. S. Hutchins* 239
Over-balanced Weight for Single-drum Hoist.....................*J. J. Smith* 239
The First Six Months of 1908 in South Africa 240
Chronology of Mining in July.......... 240
New Publications...................... 241
The Cottrell Fume-condensing System at the Selby Smeltery............... 242
Nova Scotia Steel and Coal Company... 242
Magnesite in California............... 242
Personals, Obituaries, Societies and Technical Schools..................... 243
Special Correspondence............... 244
Mining News.......................... 247
Markets, etc.......................... 253
Prices Current, Chemicals, Minerals, Rare Earths, etc..................... 258
Mining Index.......................... 259
**Illustrated.*

The Protection of Coal Miners

The attention of all engaged in coal mining, and of the general public as well, has recently been directed with especial concentration upon the loss of life and limb in this industry. The sad disasters of 1907 were the inspiration of renewed agitation respecting this important subject, which, of course, has been prominent in the minds of colliery engineers ever since coal mining has been an industry. That the latter is the case is apt to be forgotten. We have read many essays and discussions upon the subject which convey the idea that Americans in particular have but little knowledge respecting the principles of safety in coal mining. Such an idea is of course absurd.

It is not to be doubted that our present methods of mining coal can be greatly improved. Also it is not to be doubted that better knowledge respecting the properties of coal dust and explosive gases, and the correct methods of shot-firing, and many other details of practice, will lead to a reduction in the number of colliery accidents. But the most effective and at the same time the simplest means for increasing safety in coal mining, as we have repeatedly pointed out, is a faithful observance of the laws governing mining operations that are already on the statute books of the coal-mining States. If the coal-mining companies would do this and would carefully investigate local conditions at their mines and would formulate strict rules of their own to be observed in each operation, there would be fewer accidents. There are some companies which act on this principle of self-help, which is far more commendable than the shedding of crocodile-tears over the frightful loss of life and imploring the Federal Government to protect them (against themselves).

Among others, the United States Coal and Oil Company, of West Virginia is an admirable example of the rational system of operating with care and caution. The methods of this company as summed up by Mr. Beebe, its general manager, are as follows:

1. Vigilant supervision of ignorant labor.

2. Tamping with clay.

3. Prohitition of any needles except copper.

3. Prohibition of any needles except cept copper-tipped.

5. Compulsory snubbing of coal before shooting.

6. Employment of patrol, or shooting bosses, not shot-firers.

7. All breakthroughs cut the same size as air courses.

8. Sprinkling of roadways and rooms.

9. Compulsory removal of all dust from coal-cutting machines before shots are fired.

10. Particular attention to position of holes, and the amount of powder used.

11. Strict enforcement of mining laws enacted by the State of West Virginia.

12. Area of overcasts in all cases the same as all entries.

13. All parts of mine workings, whether old or new, visited by the mine foreman, or his assistants, every day, and a personal visit by the mine foreman himself to every working place, at least once a week.

14. Prohibition of the use of coal dust for ballasting mine tracks.

15. Requirement of 20 min. between shots in any working place.

16. We check all men in and out of the mines under all circumstances, from the general manager down to the trapper.

17. Haulageways and air courses kept absolutely clear of rubbish.

18. The glad hand always extended to the mine inspector.

As a result of the enforcement of the above simple and rational rules, the United States Coal and Oil Company has had but three fatal accidents in its mines since shipments were commenced in January, 1905.

Although the rules suitable for one mine will not thoroughly cover conditions at all other properties, those prescribed by the United States Coal and Oil Company, with certain additions and modifications, would afford greater safety at all bituminous coal mines. It is doubtful if even a copper-tipped tamping bar is perfectly safe. A rule that might well be included in those enumerated is, "the observance of atmospheric conditions through careful barometric readings, and the exercise of special precautions upon a sharply falling barometer." By an observance of barometric conditions, the dangers due to outflows of gas during periods of atmospheric depression can be greatly reduced through exercising greater caution and the regulation of the speed of the fan.

The many mine disasters that have occurred are not due to an absence of knowledge respecting the dangers of dust, gases or explosives; nor have such accidents resulted because we are ignorant concerning proper methods of ventilation and timbering; the chief difficulty exists in the mine management neglecting to follow well-known common-sense rules, and the carelessness about obeying strictly the mine laws already in force. When mine operators awaken to their own deficiency and then rigidly enforce the methods and rules they know to be safe and proper, the list of fatalities now occurring each year will dwindle to figures much inferior to those at present recorded.

High and Low Prices—A Contrast

An example of the effect of practical and half-way reductions in prices is found in the bar and structural steel markets in recent weeks. A reduction in steel bars was made, nominally from $1.60 to $1.40 per 100 lb. to meet the competition of iron bars, in which the market is practically an open one, and in which bars had sold down to $1.25 or even $1.20. The nominal reduction was not by any means the real limit, as it is understood that large contracts for steel bars were made at $1.25 and $1.30, Pittsburg, to meet the urgent competition that existed. Large contracts were thereupon closed, the chief buyers being found in the important agricultural implement industry, in which manufacturers are apparently confident that they can sell their goods to the farmers, if the price is made attractive. In the short period since the reduction was made, good authorities estimate that the contracts placed for iron and steel bars exceed 650,000 tons, a figure quite satisfactory to the mills.

On the other hand, the reduction made in structural steel was only $2 per ton; a figure not at all commensurate with the previous drop in pig iron, but sufficient to arouse expectations of a further concession. There is no lack of building projects and plenty of money to back them, provided the advantages of cheap material can be secured. Erecting firms have even closed contracts conditioned on getting lower prices on steel. But the structural market is practically dead, and the amount of new orders placed in recent weeks is trifling, compared with the capacity of the mills.

Would not all conditions be vastly better if the structural orders had been on a parity with those for bars? And no one can really doubt that they would have been large, had builders been encouraged by substantial reductions.

The Proposed Mexican Legislation

Our correspondent in the City of Mexico in his letter under date of July 20 presents a new view respecting the proposed legislation in Mexico affecting the ownership of property by foreign corporations. It has appeared that the proposed legislation is unwise, but without doubt its probable effect has been greatly misrepresented. According to later despatches, it has been officially announced that the cabinet has decided to refer the proposed law to President Diaz with power to act. As we have previously expressed ourselves and as our correspondent reiterates in this issue, President Diaz "has always treated capital with great consideration and fairness, and will in all probability continue to do so." We feel that the present case may safely be left to his hands.

Iron and Steel Depression in Europe

The iron and steel markets in Europe, like our own, are in a depressed condition, and the decrease of business is noted everywhere. The British markets are in better condition than those of Germany, but production this year so far has been considerably below that of 1907 with no present sign of improvement. Manufacturers are uncertain as to the future, and are not inclined to put in stocks or to work ahead of orders, so that their contracts with producers for future delivery are unusually small. The export trade up to the end of May had fallen off about 20 per cent.; an important item to British iron-masters, who depend much more on foreign sales than our own. An effort to maintain prices on certain finished materials failed, and there has been a considerable reduction; ship-plates and structural forms, for instance, selling at 25 per cent. less than a year ago.

In Germany conditions are even worse. The syndicates, which control the pig iron and steel output to a considerable extent, have supported home prices, but do not succeed in securing orders. The greater part of the new business coming in is for export, and much of this is taken at prices which barely cover cost, and sometimes fall below it. There is dissension in the pig-iron syndicate, and negotiations for its renewal in 1909 have been unsuccessful so far. The general belief is that it will not be renewed, and that the pig-iron market next year will be an open one, with consequent heavy reductions in price.

The contraction in business abroad began a little earlier than here, but it was not so abrupt nor so great as in this country. It has continued to increase, however, and the prospects are for even a slower revival than our own.

The Copper Market

The improvement in the copper market, which has been manifested increasingly during the last month, reflects an unquestionable improvement in the general business situation. The optimistic reports have not been confined to the copper market, but have come also from many other lines of business, and the improvement is evidenced, moreover, by the reduction in the number of idle freight cars. The encouraging feature in the copper market has been that the large sales effected recently have been to an important extent for domestic consumption and for early delivery.

However, it will not be safe to look for a quick return of the high prices for copper that prevailed in 1906 and 1907. There is a fairly large stock of refined copper still on hand and several new and important supplies are now being added to the market, especially the outputs of Ely and Cananea. At the beginning of 1907, the unsold stock of refined copper was about 120,000,000 lb. During the first half of 1908 there was a restriction of output and the withdrawal from the supply, for domestic consumption and for export, reduced the stock. Just how much was the reduction is uncertain, no statistics being available. However, it is believed that the unsold stock of refined copper on July 1, 1908, did not exceed 70,000,000 lb., and it may have been considerably smaller than that. The question that will determine the price in the near future is whether consumption will increase faster than the new production (including the restoration of old production). At present, the outlook in the race appears to be in favor of consumption, but production will doubtless make a good showing and the stock still on hand will be a restraining factor.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Machine Sampling

Mr. Church's article on "Conditions Necessary to Accurate Sampling by Machines" in the *Journal* of July 18, 1908, brings out clearly the fact that in sampling mills, as ordinarily arranged, there is a segregation of the coarse from the fine by which the latter travels faster than the former, so that in sampling we may, at one cut of the sampling scoop, take out a sample of the finer ore, and, at the next, some of the delayed coarser portion which should accompany it. In sampling an ore the aim is to have every part of the lot properly represented, and certainly the later portion is represented in the running stream equally with the more advanced portion. When such a stream of ore has been cut 13,200 times in 10 hours all parts of it should be properly represented, especially when the retained sample is 9 out of 60 lb. of the ore.

Henry A. Vezin, whom we older engineers took for an authority on sampling, used to emphasize the necessity of mixing after each crushing before the ore was again cut to a smaller bulk. To prevent the too impetuous flow of the ore, and to promote this mixing, he introduced between the crushing unit and its following automatic sampler a revolving drum like a trommel, having within it a set of blades set staggering, so that the ore was mixed, then passed on to the automatic sampler. Mr. Church's proposal for an improved method is somewhat along the same lines with the substitution of a feeding shoe for the revolving drum. To my mind the drum has an advantage that it not only slows down the flow but does some mixing of the arriving portion of the ore.

There is bound to be some irregularity in the stream of ore, but the automatic sampler acts indiscriminately, taking out, as it should, much from the full stream, less from the thinner ore, but in the case cited by Mr. Church always the required 15 per cent.

I may add that Vezin's practice was in many cases to let the automatic sample pile up and mix on the sampling floor. It was then for another reduction shoveled to the elevator leading to the same automatic sampler. It may be noted in the crushing and automatic sampling of ore that a shovelful put at once into the crusher, by the time it has arrived at the sampler, is strung out over several feet, so that for that shovelful, two cuts may be made by the machine. Now, where the ore is so frequently taken, can we not be sure of its proper representation throughout?

Mr. Church has much in favor of his contention that sampling can be better conducted by the use of feed shoes or similar appliances for mixing. One of the objections which has been urged against the Bridgeman sampler is that between the successive cuts there is no chance for this.

As regards the larger lumps flying down the chute, this is in part remedied both by covering it and by lessening the slope. It will also be well to give the ore-stream such a direction of flow that it will enter the sampler with little shock.

That a portion of ore sent to the final storage bin has been separated from its neighbor need not interfere with the fact that it has been represented in the sample. Indeed we may freely say that the sampling operation need not at all tend to making all parts of a lot alike in such a bin, even though properly sampled.

Mr. Church has cited the case of a number of samples made by Paul Johnson in 1902, and has shown that they vary from one another, but it can by no means be proved that this is due to segregation. I have known greater variations in automatic sampling which at the time I attributed to the salting of the lot by the preceding one due to some ore lodged from the earlier sample upon a beam and shaken down into the later one. Hence the importance of conscientious cleaning up between samples, remembering also that the more machinery, samplers and shoes we employ the more difficult it is to do this. Can we always trust the sampling man, and, if he neglects some detail of this kind, who is the wiser? Moreover, errors may easily creep into the finishing methods in which the personal equation counts when we come to the question of precision.

Variations in the gold determinations may easily arise from the coarseness of the screen used on the final assay sample.

At the mill of the Metallic Extraction Company, near Florence, Colo., Mr. Argall thoroughly tested out the automatic method, taking samples in duplicate until he had satisfied himself upon the reliability of such sampling and then threw the second sampler out of commission. In this case he had particularly difficult Cripple Creek gold ore to treat, where the fines carried twice the value of the coarser ore, and where the richer ore was spotty because of the presence of coarse gold. He was particular that the final sample should be ground to pass at least 120 mesh.

The greatest fault that I can find at the Great Cobar sampling mill is that but one carload out of five is sampled. In presence of such a practice why object to the slight irregularities which might creep into the sampling? The fifth car might be anything but representive of the four adjoining ones.

L. S. AUSTIN.

Houghton, Mich., July 13, 1908.

The Origin of Coal

The article on the origin of coal by H. M. Chance, which appeared in the JOURNAL of July 4, calls attention to many points which are at variance with the generally accepted views on this subject. The impossibility of preserving fallen vegetation from decay, except it be covered by water, is so apparent that it is difficult to understand how it could accumulate on the land surface to the extent necessary to make thick coal seams. Logs and large stumps completely disappear in less than a century, and the finer material is consumed from year to year by the natural process of oxidation when exposed to the air. If, however, the vegetation is of such a character that it grows on the surface of water and at its death falls to the bottom, it is conceivable that it may accumulate to any thickness until some geological or geographical change causes it to be covered with a bed of slime or sediment which will be converted into slate.

The bottoms of all large bodies of water are much more even and have much fewer irregularities than the surface of the adjacent land. This is due to the eroding effect of surface drainage and the transportation of the eroded material to the water areas, where it tends to even up the irregularities. The same forces which tend to form irregularities of the land surface even up the bottom inequalities under all bodies of water other than flowing streams.

Any traveler on the tropical seas has the opportunity to observe the great quantity of sea weed which is growing upon the water, supported by small air cells attached to the stems. It continues to flourish and increase in extent until, torn to pieces by storms, it is swept out of its latitude and dies. The air cells decay and burst and the vegetable matter accumulates at the bottom of that part of the ocean to which the prevailing ocean currents sweep the storm-torn fragments. Such accumulations, protected from atmospheric decay, may attain to any thickness and in the course of geological time be covered by sediments, and another accumulation of the same character be laid down on top. These changes from vegetable matter to sediment and back again, alternate as often as the burden of the ocean currents change.

It is not necessary, for the benefit of this theory of the origin of coal, to assume that the surface of the earth went up and down like the top of a blacksmith's bellows in order that it might be above water to allow vegetation to grow, below water to allow it to receive a covering of sediment, and these cycles repeated to suit the imagination of the theorist. It is highly probable that such an accumulation of sea weed on the ocean floor is taking place along the margin of the Gulf Stream, where the warm waters carrying the growing vegetable matter encounter the cold waters from the north Atlantic. All similar conditions would tend to produce like results and it is certainly interesting to know that the world's store of fuel is being added to probably as fast as it is being exhausted, even though it may not become available yet a while. This theory of the marine origin of coal is not new, as I am informed that it was proposed by Professor Mohr, of Bonn University, some 50 years ago. Professor Mohr was the inventor of the burette used in volumetric analysis and is sometimes spoken of as the father of volumetric analysis. He called attention to the presence of bromine and iodine in chimney soot as an evidence of the marine origin of the vegetable matter in coal.

Hiram W. Hixon.

Mining Engineer and Metallurgist.

Worthington, Ont., July 22, 1908.

Tapping Mine Water Under Pressure

The work herein described was done in connection with the operations of the Whitman Mining Company, of St. Louis, Mo., the property of which is situated at Pearl, Idaho. The property is opened near the west end line by a crosscut tunnel, reaching a depth of 90 ft. From this point a drift has been run a distance of 1300 ft. on the vein; at a point 1030 ft. east of the crosscut tunnel, a raise was started to connect with an incline shaft, which had been sunk to a depth of 159 ft., including a 16-ft. sump, some time previously. This shaft was 4 ft. by 7 ft. 6 in. in the clear. From the bottom of the shaft a drift had been extended 136 ft. easterly, and another 84 ft. westerly; these drifts were 4x6 ft. Water stood at a hight of 56 ft. from the bottom of the sump; both drifts, of course, were full of water.

Where the raise was started the vein was found to be over 5 ft. in width, with only a slight dip from the horizontal. Knowing that the shaft was sunk on the vein, it was first necessary to cut into the footwall and square the timbers. When this was done, ore and timber chutes, and a good ladderway were put in, and raising commenced. When the raise had been extended a distance of 40 ft. quite a flow of water was encountered from the hanging-wall side. This necessitated changing the system of timbering from stulls and stringers to square sets, in order to carry a bridge on which to drive the roof lagging. Air drills of the George Leyner type were used. After reaching a point of 160 ft. from the drift a small chamber was cut out and securely timbered for the protection of men and the storage of machines in case the water should break through unexpectedly. The chamber was cut on the manway side and close to the ladder-way. Thereafter, similar chambers were cut every 20 ft. until the water was encountered, which was at a point 204 ft. from the drift.

After the first chamber was cut, one 9-ft. drill hole was kept ahead all of the time. In drilling the last round of holes before tapping the water, the point of the drill struck the end of the cap on the last set of timbers in the old sump. Owing to the amount of sediment and the number of decayed timbers which had accumulated in the sump it was necessary to blast the last hole a second time. In order to accomplish this, primers were made of an extra quality powder and the caps greased to keep them from getting damp. The holes were successfully blasted and this large body of water was liberated without a mishap of any kind. The tapping of this water served to establish an air course and the mine is now perfectly ventilated.

W. H. Hutchings, Gen. Supt.,
Whitman Mining Company.

Pearl, Idaho, July 20, 1908.

Over-balance Weight for Single-drum Hoist

In the Journal of May 2, S. A. Worcester described an over-counterbalance hoist for single-cage hoisting in shafts. The description was extremely interesting and the benefits from such a system are undoubted, but two points may with propriety be pointed out: (1) The addition of a separate drum for the counterbalance rope is not at all necessary, for the counterbalance rope can be wound on the hoisting drum, one-half of a wrap behind and opposite to the hoisting rope. It will then wind up when the hoisting rope unwinds and unwind when the hoisting rope winds up, staying always just out of the way of the hoisting rope. This is a matter of some importance for plants where there is no room for an auxiliary drum; (2) Mr. Worcester intimates that he has a patent or patents on the process of over-counterbalancing. Without having looked up the patent records, I do not believe that any valid patent can be obtained on this process. The different tricks about hoisting have nearly all been tried so long ago that the benefits of overbalancing for such service have almost certainly been known to those skilled in the art for more years than the life of a patent. In fact this system is almost obvious.

In extreme cases, where sufficient hight of travel for the counter weight is not obtainable, the counter-weight drum may be connected by gearing to the hoisting drum and the counterweight increased in proportion to the reduced travel. This is an undesirable system, but may occasionally be necessary. The writer knows of one case in which a self-acting plane with only one car was installed inside a mine, a geared counter weight being attached to the drum, which worked in a vertical raise cut just under the latter. This is only cited as an illustration of what may occasionally be necessary. This, however, is rather beside the mark of Mr. Worcester's article, which was so interesting that it is with great regret that the writer makes anything like a criticism upon it. At the same time it would be a pity to have any one debarred from using the system described because they thought that the scheme as a whole was patented.

John J. Smith.

Washington, D. C., July 24, 1908.

Aspen, in Pitkin county, Colo., began to produce a considerable quantity of lead ore in 1884, and for several years following made rather a large output, but the value of its ores being chiefly in silver, the mines to a large extent became unprofitable upon the drop in silver in 1893, since which time they have operated only on a small scale. The Aspen ores, which were chiefly of oxidized character and usually associated with lime and baryta, were found generally at the intersections of a series of vertical cross-faults with two bed-faults in carboniferous limestone and dolomite, but also in less important deposits, although in similar relations to faults, in strata both older and later. The Aspen ores were especially noteworthy because of their large percentage of barium sulphate, an objectionable constituent from the smelter's standpoint. Their tenor in lead was not high as a rule, and Aspen has always been essentially a silver camp, rather than a lead camp, although it has furnished much calcareous lead ore that has been desired by the smelters because of its fluxing qualities.

It is said that if a bearing begins to run hot it may be cooled, in many cases without stopping the engine, by oiling with good castor oil.

The First Six Months of 1908 in South Africa

The closure of the half year, with its imposing list of dividend declarations amounting to upward of $20,000,000, marks an opportune moment for a retrospective glance at the recent advancement of the Rand gold industry. Broadly reviewed, the first six months of 1908 appear to have been productive of results doubly gratifying in that very substantial progress has been made by the producing mines in spite of Chinese repatriation and without the assistance of fresh capital derived from foreign sources. Whether the unprecedentedly abundant supply of Kafir laborers can be regarded as a new feature in the economic situation of any permanence is a question too wide for discussion here. But the fact remains that for months past there have been more unskilled laborers available for service than there are positions for them to fill.

Owing to the increase in stamp duties, as well as in the number of stamps dropped, the gold yield for the half year shows a substantial advance in rate of production. Excluding the large amounts of gold held in reserve, the half year's production for the Rand alone may now be safely estimated at over $68,000,000, as against $120,000,000 for the year 1907. This aggregate is made up of the declarations of 66 mines, of which 41 have made dividend distributions exceeding $19,000,000.

Turning from the industry as a whole to its strongest factors, we find the Simmer & Jack, Robinson, and Robinson Deep easily maintaining their lead as the greatest producers and profit makers. The former two mines have for some time maintained a close rivalry for the premiership, but as soon as the Robinson has erected an extra 50 stamps, resolved upon as a result of the determination to extract large sections of Main Reef previously left in the footwall of Main Reef Leader stopes as unpayable, this mine will hold easy precedence among the gold mines, not only of South Africa, but of the world. The 1907 yields of the two leading mines were:

	Tons Milled.	Gold Produced.
Robinson	410,927	$6,320,000
Simmer and Jack	736,930	5,830,000

The monthly averages for this year have been 25,560 and 25,820 fine oz. respectively.

A fact not widely realized in connection with the changed conditions upon the Rand and which strikingly illustrates the growing tendency for magnitude in reduction plants appears in comparison between the analysis of production in 1898 (before the war) and in the half year under notice. The rate of output is now almost twice in value the "pre-war" record, and yet the number of contributors is less. The full significance of this circumstance may be shown clearly as follows:

Crushing Tons.	December, 1898.	May, 1908.
Over 50,000 tons	Nil	2
40,000—50,000	1	4
30,000—40,000	Nil	14
20,000—30,000	5	14
10,000—20,000	21	18
Under 10,000	42	14
	69	66

From this table it is to be seen that whereas only one mine in ten crushed over 20,000 tons of ore per month in 1898, today over one-half of the producers surpass that standard of capacity. The tendency of future advancement will be, of course, to still further increase the proportion of large capacity units.

Whatever may be its occasional abuse, the policy of working-cost reduction is beyond all doubt beneficially influencing the attitude of the European investor toward the Rand industry, though his favor can only return slowly after the disastrous term of instability, political and industrial, through which the field has passed. There is another feature, less manifest in financial circles, giving cause for considerable satisfaction. Although the market is moribund, money is still provided with surprising freedom for the prosecution of outside mining ventures, by speculators of the salary-earning class. Mine dividends, however, are now more the aim than Stock Exchange gambling profits and we find, notably in the last few weeks, many thousands of pounds being subscribed for the opening up of some new base-metal proposition or for the resuscitation of gold mines in the Klerksdorp, Barberton, and Lydenburg districts, closed down under company control.

Then again, the departure of practical men for Rhodesia, with a thousand dollars or so in hand, continues to indicate the steadfast faith of South Africans in the country's minerals, a confidence barely shaken by the enormous losses incurred in outside development in the last few years. To some extent the "rush" to Rhodesia has shown signs of abatement and several of the ultra-optimistic have returned to issue warnings to those contemplating the northern journey and to explain that all the promising blocks of ground have been taken up. It is not a little amusing to note the glib assumption of authority with which so many of the returning prospectors are able to condemn wholesale a territory of thousands of square miles in extent, as remarkable as western Australia for the wide distribution of its auriferous quartz veins. Rhodesia is a land of many hardships, but it offers very exceptional opportunities to the energetic prospector and miner, backed by a little capital, whose knowledge of new land exploitation has not been merely derived from running machines in a Rand deep level. The expansion of the country's gold industry, comprising in May 196 independent producers which recorded a yield of nearly $11,000,000, is more assured than that of its rivals in the world of gold production, Canada, New Zealand, Queensland and India.

Chronology of Mining in July

July 1—A new wage scale for the year in the sheet and tin-plate industry in adopted with slight reductions.

July 2—The steel syndicate in Germany withdraws from the price agreement. International Tube-makers Association is dissolved. An explosion of gas in the Rikovsky coal mine, Yusovo, European Russia, kills about 200 men. The courts of Venezuela decide that the New York & Bermudez Asphalt Company must pay its $15,000,000 fine.

July 11—The smelting plant of the Cananea Consolidated Copper Company resumes operations with numerous improvements.

July 15—Explosion in a coal mine of the Susquehanna Coal Company, at Williamstown, Penn., kills 12 men and seriously injures eight.

July 18 -The Detroit wage scale involving a reduction of puddlers' wages is signed by the Republic Iron and Steel Company.

July 20—It is announced that on Sept. 1 the Mexican government will put into effect the advance in freight rates on ores authorized several months ago in spite of the protests of smelter and mining interests.

July 22—The De Beers Company decides to shut down the De Beers diamond mine, Kimberley, South Africa, on July 31.

July 23 The first cargo of 12,000 tons of iron ore arrives at the docks at Gary, Indiana, the new plant of the U. S. Steel Corporation.

July 25—The Mexican cabinet refers the proposed anti-foreign law to President Diaz with power to accept, enforce or reject the measure.

Southeastern Missouri and the Cœur d'Alene are the only lead-producing districts that have been developed in the United States, which have evidenced such permanence as render a study of their cost of production a matter of economic value. In most of the other lead-producing districts, the lead has been essentially a by-product, as at Joplin, or the ore has been obtained from bonanzas as at Alta, Frisco, Nicholia, and the greater ones at Eureka, Nev., and Leadville, Colo., which have been characterized by a rise and fall and extremely variable cost of production. Southeastern Missouri and the Cœur d'Alene, on the other hand, have developed very large bodies of low-grade ore, in the exploitation of which engineering has been a greater factor than in extracting the richer bounties of nature.

New Publications

SCIENTIFIC AMERICAN INDEX OF MANUFACTURERS. Pp. 55. 5½x8 in.; paper, 25c. New York, 1908: Scientific American.

PRACTICAL IRRIGATION, ITS VALUE AND COST. By Aug. J. Bowie. Pp. 232, illustrated. 6¼x9½ in.; cloth, $3. New York, 1908: McGraw Publishing Company.

AUSRICHTUNG, VORRICHTUNG UND ABBAU VON STEINKOHLENLAGERSTÄTTEN. By F. Freise. Pp. 151; illustrated. 7x10 in.; paper, 6 m. Freiberg, 1908: Craz & Gerlach.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MECHANICAL ENGINEERS. Vol. XXXVIII. Pp. 961; illustrated. 6¼x9½ in. paper. New York, 1908: Published by the Institute.

PEAT AND LIGNITE: THEIR MANUFACTURE AND USES IN EUROPE. By E. Nystrom. Canada Department of Mines. Pp. 247, illustrated. 6¼x9½ in.; paper. Ottawa, Canada, 1908.

CURVES FOR CALCULATING BEAMS, CHANNELS AND REACTIONS. By Sidney Diamant. Pp. 38; illustrated. 7¼x10¼ in.; cloth, $2. New York, 1908: McGraw Publishing Company.

HANDBOOK OF NEVADA MINING COMPANIES. Revised Edition. Compiled by Todd Information Bureau. Pp. 102. 6x9 in.; paper, $1. Goldfield, Nev., 1908: The Goldfield News.

THE MINING AND QUARRY INDUSTRY OF NEW YORK STATE. By D. H. Newland. New York State Museum Bulletin No. 120. Pp. 82. 6x9 in.; paper. Albany, 1908: University of the State of New York.

REPORT ON GOLD VALUES IN THE KLONDIKE HIGH LEVEL GRAVELS. By R. G. McConnell. Geological Survey of Canada. Pp. 34, 1 map, illustrated. 6½x9¾ in.; paper. Ottawa, 1907: Government Printing Bureau.

A PRELIMINARY REPORT ON THE UNDERGROUND WATERS OF GEORGIA. By S. W. McCallie. Geological Survey of Georgia, Bulletin No. 15. Pp. 370; illustrated. 7x10 in.; cloth. Atlanta, Ga., 1908: The Franklin-Turner Company.

LES NOUVEAUX LIVRES SCIENTIFIQUES ET INDUSTRIELS. Vol. 1. Années 1902 à 1907 (Livraisons 1 A 20) Bibliographie des Ouvrages publiés en France du 1er Juillet 1902 au 30 Juin 1907. 7x10¼ in.; cloth. Paris, 1908: H. Dunod et E. Pinat.

DIE CHEMISCHE UNTERSUCHUNG DER GRUBENWETTER KURZGEFASSTE ANLEITUNG ZUR AUSFUEHRUNG VON WETTERANALYSEN NACH EINFACHEN METHODEN. By Otto Brunck. Pp. 111; illustrated. 6x9 in.; paper. M.3, Pfg. 60. Freiberg, 1908: Craz & Gerlach.

MINERAL RESOURCES OF ALASKA. REPORT ON PROGRESS OF INVESTIGATIONS IN 1907. By Alfred H. Brooks and Others. U. S. Geological Survey, Bulletin No. 345. Pp. 285; illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

BERGMÄNNISCHES RETTUNGS- UND FEUERSCHUTZWESEN IN DER PRAXIS UND IM LICHTE DER BERGPOLIZEIVORSCHRIFTEN DEUTSCHLANDS UND ÖSTERREICHS. By Ferdinand Hagemann. Pp. 159; illustrated. 7x11 in.; paper, M. 6. Freiberg, 1908: Craz and Gerlach.

HENLEY'S ENCYCLOPEDIA OF PRACTICAL ENGINEERING AND ALLIED TRADES. Edited by Joseph Horner. Vol. I, A-Boi. Pp. 240, illustrated. Vol. II, Bol-Fil. Pp. 240, illustrated. 7x10 in.; half leather, $6 per vol. New York, 1906: Norman W. Henley Publishing Company.

THE STRENGTH OF CONCRETE BEAMS. Results of Tests of 108 Beams (First Series) Made at the Structural-Materials Testing Laboratories. By Richard L. Humphrey. U. S. Geological Survey. Bull. No. 344. Pp. 58; illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

THE GOLD PLACERS OF PARTS OF SEWARD PENINSULA, ALASKA, INCLUDING THE NOME, COUNCIL, KOUGAROK, PORT CLARENCE, AND GOODHOPE PRECINCTS. By Arthur J. Collier, Frank L. Hess, Philip S. Smith, and Alfred H. Brooks. U. S. Geological Survey, Bull. No. 328. Pp. 343, illustrated, including maps. 5½x9 in.; paper. Washington, 1908: Government Printing Office.

REINFORCED CONCRETE. A MANUAL OF PRACTICE. By Ernest McCullough. Pp. 128; illustrated. 5x8 in., cloth. Chicago; *Cement Era* Publishing Company.

This book is what its sub-title indicates, a manual showing the latest practice in the design and construction of different classes of buildings from reinforced concrete. It contains formulas and directions for estimating the strength of beams, columns and other units of cement construction; directions for making forms and building up structures of different kinds; and, in short, much that an engineer should know when he is intrusted with the work of erecting a concrete building. Now that structures of this type are coming into extensive use, it will be a very useful book.

STOICHIOMETRY. By Sydney Young. Pp. 381. Illustrated. Cloth, 5x7½. Price, 7s. 6d. London and New York: Longmans, Green & Co., 1908.

This valuable work is one of a series of text-books of physical chemistry, edited by Sir William Ramsay, which alone is a sufficient guarantee of their authoritative character. Several books of the [illegible] this one on stoichiometry is naturally the first, and consequently an elaborate essay [illegible] Physical Chemistry," already published in one of the previous volumes is reprinted as the introduction to this.

The subject of physical chemistry is abstruse, and many of us who graduated from college before it was known as a special science, find it difficult to follow all of the reasoning and deduction of its exponents, although we recognize its immense importance and the fact that this is the science which holds the keys to future progress in chemistry and metallurgy.

Its branch called stoichiometry comprises the various methods employed to determine atomic and molecular weights, and the classification of compounds, including the properties of gases, liquids and solids. The treatment of this subject fell into competent hands when it was entrusted to Professor Young, who has produced a work which is an admirable introduction to the broad subject of physical chemistry.

THERMOCHEMISTRY. By Julius Thomsen. Translated from the Danish by Katherine A. Burke. Pp. 495. Illustrated. Cloth, 5x7½ in. Price, 9s. London and New York, Longmans, Green & Company, 1908.

This is another of the series of text-books of physical chemistry, edited by Sir William Ramsay. It is a condensation of Professor Thomsen's classic "Thermochemische Untersuchungen," published during the years 1882-1886. Every chemist is, of course, acquainted with that famous work as the source of most of the data existing as to the heats of formation, dissociation, etc., of chemical compounds. [illegible] Thomsen has reviewed the whole of the numerical and theoretical results without devoting much space to experimental details, which has made it possible to reduce the size of the work to about one-fifth of that of the original. It is not to [illegible] be glad of the ability to obtain these data in a cheap and convenient form.

Yet this appreciation is tempered by some surprise at the inclusion of this work in Sir William Ramsay's new series inasmuch as from the standpoint of modern physical chemistry Thomsen's results are hopelessly out of date. We know now and accept the application of the laws of thermodynamics to chemical equilibrium and determine reactions rather by the free energy that is available than the balance of the heat of formation.

However, in spite of all the criticisms that may properly be directed to much of Thomsen's work, it has a great deal that is of permanent value and the present book is one that every chemist who studies his science will want to own. The translation has been admirably done.

The Cottrell Fume-condensing System at the Selby Smeltery

The troubles of the Selby Smelting Company, of San Francisco, whose smelting plant is at the entrance of Carquinez straits, are rather strenuous just at present. The board of supervisors of Solano county, on the opposite side of the straits, have finally ordered that any and all of the roasters of the company must be closed down until the Cottrell fume-condensing device is installed and proved to be effective. The people of Benicia complained that the smelter fumes were destroying vegetable and animal life in and near their town, and the judge of the superior court granted an injunction against the Selby company some time ago. By permission of the district attorney of the county, however, the works have continued operations, but on a reduced scale. The decree of injunction having been granted, the smelting company now has the opportunity to ask for a rehearing on the ground of "new evidence." If this hearing is not granted the company will have a legal right to appeal. The company still operates one roaster by permission of the district attorney, in order to complete its experiments with the Cottrell process of fume-condensing. The works cannot, of course, continue to operate with only one roaster, so it is now a case of "fight." The blast furnaces are in full operation as the "bag house" has proved successful. The first cotton bags used did not accomplish the purpose, so woolen bags were put in. These have proved entirely satisfactory.

It is interesting to note that in accordance with an agreement both the blast and roasting furnaces of the Selby works were closed down on May 28 last, and were not operated until June 4, so for seven days no sulphurous fumes escaped. On May 31, however, the people of Benicia claimed that the fumes were as bad and strong as ever. The company has already spent more than $100,000 to prevent the escape of fumes from stacks. At present the Cottrell process is used in the parting room; it precipitates all the sulphuric acid in suspension, and experiments are being continued with this to precipitate all the objectionable particles in the roaster gases. Orders have been placed for transformers and as soon as these are installed an actual diminution of the gases from the roasters will be shown.

Harry East Miller, the chemist of the Western Precipitation Company, which is handling the Cottrell system, assures a representative of the JOURNAL that the process is a complete success. He is confident that it will not only remedy all the difficulties at the Selby smelting works, but will also convince those opposed to the construction of the new Guggenheim smelter, at Point San Bruno, San Francisco bay, that the works may be constructed and operated without danger of any possible damage whatever from smelter fumes. Several minor changes have been made in the electrical appliances in use, and each time to the improvement of the system. As soon as completed, all the roasters there will be equipped with the Cottrell device.

Nova Scotia Steel and Coal Company

This company owns blast furnaces and steel works at Trenton and New Glasgow, N. S., iron ore and coal mines in Nova Scotia and iron ore mines in Newfoundland. The report for the year 1907 gives production as follows: Coal mined, 692,970 long tons; coke made, 90,749; iron ore mined, 346,505; limestone quarried, 74,557; pig iron made, 57,618; open-hearth steel made 70,222; billets rolled, 54,661; finished steel and iron products, 120,797 tons.

The net earnings for the year were $994,791. Interest and sinking-fund charges were $364,411; depreciation and renewals, $158,905; balance, $421,475. From this dividends of 8 per cent. on the preferred and 6 on the common stock were paid, amounting to $381,656, and leaving a surplus of $39,819. Adding the balance from 1906, gave a total surplus of $1,202,604 at the end of the year. The capital account shows $1,030,000 preferred stock, $4,987,600 common stock and $3,752,000 bonds.

President R. E. Harris says, in his report: "The mines and plant of the company were kept busy throughout the year, except the works at Trenton, which were closed during a part of December. The output of iron and steel was the largest in the history of the company, and exceeded that of the previous year by about 25 per cent.

"On the ground that working double-shifts increased the cost of mining, the board decided to single-shift No. 3 colliery, and to cut off certain unprofitable contracts, feeling that if the same, or a larger profit, could be obtained by mining a smaller quantity, it was better to reduce the output and leave the balance of the coal in the ground. A decrease in quantity of coal mined was, therefore, in pursuance of a deliberate policy. During the year work was carried on in opening up No. 4 colliery; it was also decided to reopen No. 2 colliery, and the work of pumping has since been carried on. We hope to have both of these collieries producing about May 1, 1908. With five collieries in operation, we expect that our output during 1908 will be larger than that of any previous year. Practically the whole of the estimated output of our mines has been disposed of.

"The work of driving slopes to our submarine iron-ore areas at Wabana, Newfoundland, was carried on throughout the year most successfully; these slopes are working in ore at a distance of over 2200 ft. from the shore. A new air-compressor plant has been installed and we expect to have three shifts at work, each of eight hours. It now looks as if we should be able to mine ore from these submarine areas early in 1909. I have frequently expressed my opinion as to the enormous value of these areas and the work done during the past year goes far to confirm this opinion.

"The sum of $378,386 was expended during the year on capital account in equipping the new colliery at Sydney mines, new forge buildings at New Glasgow, the purchase of iron-ore properties, the development of the submarine iron ore areas at Wabana, and for plant improvements."

Magnesite in California

All the magnesite produced in the United States comes from California, and virtually all in the State is derived from the mines at Porterville, in Tulare county. There are numbers of known deposits in Napa, Sonoma, Placer, Santa Clara, Alameda, Tulare, and a few other counties but none are utilized on any scale except those worked by W. P. Bartlett, of Porterville. These deposits are extensive; but what is more to the purpose from an economic point of view, they are close by the line of a railroad, so that there is little haulage from the mine.

A traction engine hauls the crude ore to the kilns where it is calcined and thence shipped to the coast manufacturers of wood pulp, and a few hundred tons of the crude mineral are used annually by the manufacturers of carbonic acid gas, who also sell their material after calcination to the paper makers. The new mine on South Tule opened by Mr. Bartlett for the paper men, will soon be shipping mineral. Meantime his kilns at Porterville are run on mineral which has previously not been utilized. This is the dark-colored rock, carrying more or less iron which has not been held of much account. Some that was roasted and calcined, however, was sent to the paper mills to be tested, with such satisfactory results that this rock is now being run through the furnaces instead of the white rock usually utilized. The first regular run on this material is now being made.

Little or no magnesite is now coming from any other mines in California. The consumption of this substance on the Pacific Coast is limited and does not run above 5000 tons a year, but a much larger product could be made were there sale for it. It is impossible to ship the material East from California owing to high freight rates. There is a movement on foot in the State to ask Congress to put a duty on foreign magnesite in the interest of the miners of California.

The production of sulphur in the United States in 1907 was 307,806 long tons.

Personal

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

O. N. Posey, of Los Angeles, is examining mines in southern Mexico.

W. C. Greene, of Cananea and Chihuahua, Mexico, is in Japan for his health.

James M. Kercel, of Salt Lake City, is in southern Mexico on professional business.

John Hayes Hammond is spending the summer at his residence at Magnolia, Mass.

J. H. Lang, of the American Metal Company, visited Joplin during the past week.

J. R. Finlay, mining engineer, of New York, is examining mines in the Joplin district.

F. B. Irvine, of New York, has been examining mining properties in Jalisco, Mexico.

J. Kirby, a British mining engineer, has joined the staff of the Dominion Coal Company.

W. N. Smith, of Wisconsin, has been studying mining and milling operations in the Joplin district.

Henry P. Lowe, of Denver, has left for Europe, visiting London and Paris, on mining business.

Prof. Arthur L. Walker, of Columbia University, has just returned from a professional trip in the West.

Juan R. Carey has been appointed superintendent of the Refugio mine near Parral, Chihuahua, Mexico.

Robert T. Hill, mining geologist, of New York, returned last week from a professional trip in Mexico.

R. L. Lloyd is now in charge of the blast furnaces of the Garfield Smelting Company, near Salt Lake City, Utah.

Robert Linton, who has been in Sonora and Durango, Mexico, for the last six months, is now in Los Angeles, California.

A. L. Queneau, metallurgical engineer of Philadelphia, has returned from Europe, where he has been engaged on professional business.

E. H. Crabtree, a Tonopah, Nev., operator, has been looking over property in Clear Creek, Boulder and Gilpin counties, Colorado.

H. W. Pring, formerly of Cripple Creek, Colo., has been appointed superintendent of the Aduddell property near Central City, Colo.

A. F. Holden, managing director of the United States Smelting, Refining and Mining Company, is visiting New York and Boston.

Allen Hazen, of New York, is in Toronto, engaged in the preparation of plans for the filtration plant to be established there.

J. C. Hutchinson, of Philadelphia, Penn., has been looking after mining interests in Gilpin county, Colo., during the last week.

Lafayette Hanchett, manager of the Newhouse interests, has returned to Salt Lake City, after a business trip to New York and Boston.

O. B. Thompson, manager of the Fifty Gold Mines Corporation, operating in Gilpin county, Colo., is making a business visit to New York City.

Geo. W. Bryant, vice-president of the Guanajuato Development Company, has returned to Mexico after several weeks in New York on business.

Philip S. Smith, of the United States Geological Survey is engaged in geological work in the Seward Peninsula, Alaska, for the department.

H. W. Hardinge left New York on July 22 for a professional trip to the West, covering a week or ten days, and will visit Cobalt before he returns.

W. F. Jennison has been commissioned by the Canadian government to prepare a monograph on the gypsum deposits of Nova Scotia and New Brunswick.

J. Parke Channing, consulting mining engineer, of New York, is at present at Globe, Ariz. He is expected to return to New York in about a week or ten days.

Horace V. Winchell has resigned his position as Chief Geologist for the Great Northern Railway and will take up consulting engineering at Minneapolis, Minn.

John Leggett Pultz, mining engineer, of New York, has gone to Birmingham, Ala., to take charge of some coal-mining operations. He expects to reside at Birmingham for a year or more.

Arthur S. Dwight, consulting mining engineer, of New York, has gone to the West upon business in connection with his new roasting and sintering process. He expects to be absent several months.

Henry D. Boddington, mining engineer, El Paso, Texas, and managing director of the Uruachic Mining and Smelting Company, Chihuahua, Mexico, is in England, and will return in September.

George S. Rice, of Chicago, consulting colliery engineer of the U. S. Geological Survey, sailed for Europe, July 25, to investigate foreign methods of mining, having in view the prevention of waste of coal and the loss of life in mining.

John S. Smith, chief engineer for S. Pearson & Son, London, Eng., who are extensively engaged in construction work in Mexico, is in Toronto. For several months he has been at Minitiblan, on the Isthmus of Tehuantepec, where the firm has established a large oil refinery.

Joseph A. Holmes, chief of the technologic branch of the U. S. Geological Survey, has gone to Europe to make investigations in connection with the coal-mining experiments which are to be conducted by the U. S. Geological Survey. Upon his return, in August, Doctor Holmes will be accompanied by representatives of the British, Belgium and German governments, who have been invited by the U. S. Government to participate in the tests to be conducted by the U. S. Geological Survey.

Obituary

Frederick S. Harris died, July 17, of typhoid fever, in the Agnew hospital, San Diego, Cal., after an 18-weeks' illness. Mr Harris was born in Chicago, Oct. 22, 1859, and was well known in mining circles throughout the United States and Mexico, devoting the latter part of his life to consulting engineering, with offices at Goldfield, Nev. He joined the American Institute of Mining Engineers in 1897. He is survived by a widow.

Captain John Wilkes, the eldest son of Admiral Charles Wilkes, U. S. N., and Jane Renwick, New York City, died on July 6, 1908, aged 81 years. He was born March 31, 1827, and was graduated from the United States Naval Academy in 1847. In 1853 he was interested in gold mines in North Carolina and later made his home near Charlotte, N. C. In 1861 he and his brother Edmund built the railroad between Greensboro, N. C., and Danville, Va., for the Confederate government. For 40 years Captain Wilkes was manager of the Mecklenburg Iron Works, at Charlotte, N. C., and built up the business from a wayside repair shop to the present high-class foundry, machine, carpentry and sheet-metal shops. During the Civil war these works were seized for war purposes. Mrs. Wilkes, four children and 10 grandchildren survive him.

Societies and Technical Schools

[illegible] started immediately upon the new thermodynamics and hydraulics building. Only the main portion of the building will be erected at present. The cost will be about $100,000, leaving two wings to be added in the future. The building is expected to be completed in November.

Missouri School of Mines—The summer field work in mining and geology for the junior class was carried on in southeast Missouri. Part of the time was given to geology, part to ore dressing, and part to mining and mine surveying. The class was accompanied by L. S. Griswold, professor of geology; H. B. Litchman, professor of mine engineering; E. G. Harris, professor of civil engineering; Durward Copeland, professor of metallurgy, and Director L. E. Young.

The class visited Iron Mountain, Flat River, and other towns in the adjacent district. The work in mine surveying was done in the mine of the Madison Land and Lead Company, at Fredericktown.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Mexico City and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 22—Calaveras county is coming to the front as a dredging field. Some dredgers are at work at Jenny Lind and others are contemplated. At Chili gulch two or three dredgers are contemplated. This gulch has been the dumping ground for half a century for nearly all the rich gravel mines of the Mokelumne hill region. The drift-mine tailings of the early-day miners, who are not supposed to have saved 75 per cent. of the gold, were first deposited and concentrated and subsequently covered by hydraulic-mine tailings which have also been concentrating for many years. The Green Mountain Company, recently organized, has about 300 acres in a tract having two gravel channels and also much of the Chili gulch tailings. Chicago men have an option on the Moser tailings in Spring gulch, and intend using a dredge. Mr. Bedford, of Oakland, owning the adjoining ground, also expects to have a dredge. This will make three dredges on the Chili and Spring gulches. So large is the extent of ground and tailings in Chili gulch that years ago a company was formed to run a long tunnel to the Mokelumne river and sluice the tailings, but the anti-débris law came into effect and stopped the enterprise. Dredges can, however, be used without violating any laws, and there is a large amount of ground on which they may be worked.

The Chicago Copper Refining Company, through its attorneys, has finally leased the Tom Head copper properties in Tehama county from the California & Massachusetts Copper Refining Company, which has been developing them for the past year or two. The mines have not as yet made any production. The new leasing company binds itself to continue tunnel No. 3 and other levels and block out sufficient ore for smelting purposes until it is assured that 250 tons daily may be delivered to a smelter. When that time arrives the leasing company is to erect a smelter adapted to reduce chalcopyrite ores. The process may be modified, to suit the ore mined and extracted.

Supervisor Morrison, of Yuba county, who is at present going "hot-foot" after alleged violators of the Caminetti law, devised the plan now being tried of enjoining the mine instead of the owners or managers. He is of the opinion that the case of the "People vs. the Gold Run Ditch and Mining Company," 66 California, page 149, settles the matter. In that the Supreme court after deciding that all who contribute to a nuisance are properly joined jointly as defendants, it is the nuisance itself which if destructive of public or private rights or property, may be enjoined.

In the case of "Yuba County vs. the North America Consolidation Gold Mining Company," which is now pending, the anti-débris men have asked in the complaint that the North American mine be enjoined and restrained from being worked or operated by said defendants, their agents, servants, employees, successors and grantees in interest, in such a way or manner that the tailings, débris, etc., from the same will be dumped, discharged or deposited in the Yuba river or any of its forks, branches or tributaries. The preliminary injunction granted in the case runs against the North America mine from being worked. In addition to enjoining the mine they have enjoined the persons. When the injunction is filed with the recorder of the county where the property is situated that is enjoined, that is notice to the successors in interest of the injunction granted. Supervisor Morrison says this has not heretofore been done. By this method they cite the successors and grantees in interest to the property enjoined to show cause why they should not be punished if they violate the injunction. The plaintiff is not by this method required to prove his complaint or bring witnesses to prove injury, but all he has to do is to show that the injunction has been violated. It is highly probable that the hydraulic miners will find some legal way to get around this new move of the anti-débris men, as represented by Supervisor Morrison.

A factory has been established in Sonora, Tuolumne county, in the heart of the Mother Lode gold-mining region, for the manufacture of dental gold. The place is provided with rolls, wire-drawing apparatus, punching and stamping machinery, retorts, assaying outfit, and everything to refine and prepare the crude gold for its ultimate use.

Northern Sierra county showed more activity last spring in gravel mining than has been the case for a long time. At Gibsonville, Table Rock, Howland Flat, and other small towns more or less hydraulic mining has been going on, and spies of the Anti Débris Association have been visiting the scenes of operations and inspecting the dams. As these dams have been built under supervision of the Government engineers of the California Débris Association, the miners are indignant that they cannot be left unmolested in their work, which, at best, is only being done in a small way and a long distance from any navigable streams.

So much silicious ore is now coming from the Utah mines to the Mammoth Copper Company's furnaces in Shasta county, that 50 or more men have been laid off at the Quartz Hill mine, at Whitehouse, not far from the smelter, which has been shipping heretofore 3000 to 4000 tons of ore monthly. For the present the mine will only ship what is taken out in development work. Not being able to smelt its gold-bearing ores, carrying sulphur, in Utah, the present corporation of the Mammoth Copper Company is shipping these ores to California for treatment, pending the settlement of an injunction suit in Utah concerning the smelter fume question.

A large amount of prospecting is now being done in the region around Randsburg and Johannesburg in Kern county, this local activity being largely due to the expected advent of Southern Pacific's Owens Valley railway, which will pass through the center of the Rand district. Better arrangements than ever are also being made for suitable water supply for the mines and mills, lack of water having always been a drawback in that region. Several water companies are now looking up the development of water. Numerous discoveries of low-grade ore have lately been made, but these will only be available when there is abundant water supply for milling purposes. The Yellow Aster mine, the most productive in southern California, already has a 100-stamp mill, but such large bodies of low-grade ore have been developed that one of 500 stamps is to be erected and this is now being planned. To bring this new machinery the Santa Fe railroad will build a spur from Johannesburg, 1½ miles to the proposed mill-site.

The Board of Underwriters of the Pacific, which fixes insurance rates for the coast, has announced a reduction of 25 per cent. in premiums to effect all policies written since May 1 on smelting and mining plants. Rebates may be obtained by all who have paid their premiums. This brings insurance in these plants back to the rate it was before the great fire in San Francisco. Just after that catastrophe, rates were increased on mills, smelters, etc., in the interior counties of this and neighboring States. The mining companies and smelters are all large patrons of the insurance companies.

Goldfield, Nevada

July 21—Postmaster Collins has completed his annual report for the fiscal year ending June 30. It shows some interesting figures regarding Goldfield business conditions. The volume of business was little less than the previous year when the promotion companies were sending out mail matter by the cartload.

High-grading, which has reached greater hights of impudence and greater extent in amount in Goldfield than any other gold camp known, is still a prolific industry here. Two men were caught in the Mohawk in old lease workings one night this week and failing to comply with the order to throw up their hands, were shot by the deputies in waiting. One man was fatally wounded and the other is in jail.

That high-graders were at work in that particular neighborhood was known for some time, but despite careful watching the deputies were unable to find where the thieves made their entrance owing to the numerous openings and the network of old leasers' workings underground.

Two swindlers and bogus mining stock brokers, of Los Angeles and Chicago, who used Goldfield stocks as a lure, have been caught in the toils and are now under Federal arrest. Such procedure will help dispel the distrust of Nevada securities against which Goldfield has been struggling for a year.

The new oilfields' excitement still lasts. The Nevada Bay State Oil Company is shipping supplies to its camp, 15 miles northwest of Goldfield where it has 12 men already at work. Drilling apparatus is on the way from Los Angeles. A 1500-ft. hole will be sunk as fast as possible.

Checks were mailed on Wednesday last to the Florence-Goldfield stockholders for the third dividend since last fall, this one amounting to $105,000. This company is a lease-made property, for little underground work has been done for some time on company account. The new mill, which was the illegitimate offspring of a would-be engineering concern, is being remodelled and reconstructed before it has been finished. Much of the concrete work has been dynamited and the whole mill is undergoing a remodelling. Parsimony and ignorance on the part of the management is the primary reason for this trouble. Yet, thanks to the royalties from the leases, the company is paying regular 10-c. dividends amounting to $105,000 quarterly.

Aside from the Wingfield and the Reilly leases of early days, the Engineers' lease has in the past 30 days shipped $300,000; the Annex during its brief career took out $165,339. The Gem and Baby have just begun producing but already have a credit of $15,000. The Mohawk-Florence which was in ore only a short time and in trouble a much greater time took out $488,232: The Little Florence despite injunctions, fighting miners and high-grading officials took out $1,215,558 and the Rogers Syndicate has taken out $675,000 worth of ore and still has ore on the dump awaiting shipment.

Salt Lake City

July 22—Three furnaces of the United States lead smelter at Bingham Junction are in operation on an oxidized charge, and just as soon as the roasters are finished, which will be about August 10, three more will be running on sulphide ores.

An event of importance to the Utah mining industry is the blowing-in on July 24 of the new smelter, built at a cost of approximately $300,000, in the Tintic mining district by the Tintic Smelting Company, of which Jesse Knight, of Provo, Utah, is president. A smelter right in the district is hailed with much satisfaction by producers for the reason that, although freight rates to the Salt Lake valley plants are eminently fair, at the same time there is a vast tonnage in the camp which is of hardly high enough grade to ship out, but is profitable to treat on the ground.

There has been a marked improvement in general mining conditions at Park City and Alta during the past month. In the former camp, aside from the increased energy being displayed by the larger producers, many of the smaller mines are giving employment to more men. Properties that were closed when the panic of last year came on are being started up again. The plans of the Daly-West Mining Company, outlined several years ago and so important to its well-being, are being carried out after the three years' delay occasioned by the caving-in of the Ontario drain adit. This work consists of opening the orebodies of the Daly-West mine on an even level with the drainage avenue. The drift has but a short distance yet to go before reaching the vertical side line between the Daly-West and Daly mines; hence it ought to be a matter of only a few weeks until the ore reserves at depth will have been penetrated. The Daly-West company is operating its concentrator on ore from the upper portion of the mine.

The Utah Copper Company's copper production in June is estimated at 4,500,000 lb., which is a substantial increase over May. An official statement will be forthcoming in a few days showing the result of the operation of its properties during the second quarter of the year.

From an official high in authority in the Harriman system it has been ascertained that plans are practically complete for the construction of a railroad into the Yerington copper district in Nevada. Harri- [illegible] proposed line last year, the total length of which, from Wabuska on the main line of the Nevada & California railway to the [illegible] camp is a little more than 30 miles, and would take it through the rich Mason and into the upper end of Smith valleys which are immensely productive, agriculturally speaking. Whether the road will be constructed by the Harriman system outright, or by three of the principal mining corporations operating in the Yerington district has not been definitely stated. However, it is known that the road will be built soon. Representatives of the Nevada Douglas, Mason Valley and Bluestone mining companies recently held a conference at which railroad matters were discussed and the prevailing sentiment was that if necessary, the trio would form a railroad corporation, finance it, and operate it independently. Again, it is stated, officials of the Western Pacific, the new Gould transcontinental line now building from Salt Lake City to the coast, appreciate the importance of the western Nevada camp and have expressed a desire to penetrate that territory. Salt Lake is the headquarters of nearly all the principal mining companies of Yerington, and for that reason much local interest is attached to the movements now being made.

Denver

July 24—Three different firms of building contractors have gone from Denver to Steamboat Springs, in Routt county, to look up the deposits of white sandstone for building purposes, and the onyx, so-called, which is found there. The sandstone for purity and hardness is pronounced by stone experts to be the finest discovered in the entire West.

Notwithstanding the steam and electric roads which encircle the Cripple Creek gold-producing area, and reach nearly every mine above and below them, it may be interesting to know that the first aërial tram in the district has been completed and is successfully running at the Cresson mine. It has a capacity of 10 tons an hour, and is stated to be transporting ore at a cost of 5c. per ton. At the same time there are still from 20 to 30 operators loading ore on teams today from mines which are not reached by the railways.

J. F. Manning and John J. Hoban, connected with the Gold Leaf Consolidated Mining Company, have been re-indicted by the Federal grand jury on the old charge (which had been quashed) of fraudulently using the United States mails.

It is reported that a sorting mill is to be built by Denver men at the old Caribou and Poorman mines, to treat the dumps of 25 years ago, which were mined by Hollanders, who bought the mine in [illegible]

Indianapolis

[illegible]

has prepared a bill which he will ask the next Legislature to enact into law providing for a small tax on each ton of coal mined in Indiana, and a certain tax on each dollar earned by miners for the purpose of creating a fund from which the State may pay benefits to miners injured while at work and to families of miners killed while at work in the mines. "Both operators and miners are in favor of such a law," said Mr. Epperson, "and I believe that miners or their families should have damages without having to go through the courts for four or five years fighting for them." Mr. Epperson said he had not determined just how much of a tax should be provided, but it will be a very small percentage, and he thinks the money should be paid into the State treasury through the counties and paid out by the State. He says he will also ask that a section be placed in the law providing a small pension for miners who pass the age at which they are able to work.

Toronto

July 24—The Canadian government has appropriated the sum of $35,000 to be expended in boring for coal, oil, gas, etc. Hon. W. Templeman, minister of mines, stated that it was intended to devote this sum, or the greater part of it, to boring for coal on Prince Edward island, where the geological indications are favorable, although no deposit is known to exist.

Officials of the Canadian Pacific Railway announce the discovery of extensive deposits of iron ore in Laurentian mountains within 100 miles of Montreal. The exact locality is kept secret. It is claimed that the ore shows 60 per cent. iron. The St. Maurice forges, which produce a limited quantity of high-grade iron, are in the same range.

Mexico City

July 20—The all-absorbing topic of conversation—in the papers—is the proposed new mining legislation. Everyone is interviewed. A visiting Englishman was given a column to say that any legislation which made English capital timid would probably frighten English capital and prevent its investment in the mines of Mexico, when, as a matter of fact, there is no English capital here.

Other mine owners won't play, are going right home if this law passes. No one seems to remember that several of the good United States will not allow a foreigner to own property, much less a foreign company, yet foreign money seems to have little fear. The point about the whole thing is that really the mining companies should be entirely under the jurisdiction of Mexican courts, and most of the promoters do not want to comply with the Mexican corporation laws. If English promotors could, by raising a newspaper flurry, accomplish the repeal of some of the strict regulations governing company promotions, it certainly would be done.

This newspaper talk is rather funny in Mexico as it is not for the purpose of creating public opinion, but merely to influence the few who have the influence necessary to stop or pass the bill, and it would seem that inasmuch as capital has a better chance here than in most of the civilized countries, it might be well to leave the decision to those who have made the preceding laws. The older Mexicans will frankly tell you that when Diaz granted concessions to American companies for railroads, the outcry was great from the Mexicans, who said with one accord that these precious privileges should be given to Mexicans. They realize the wisdom of his action now. There is no Mexican money with which to build railroads.

The President has always treated capital with great consideration and fairness, and will, in all probability, continue to do so.

In the meantime, the papers distort everything to the one end of proving that capital has become timid and charge it all to this proposed legislation, forgetting that money is scarce in other lines as well. Mining enterprises which have been for sale for years without buyers and propositions which have been dead as long, are stood up, given a new coat of capitalization and then knocked down with this bludgeon of adverse legislation, so-called.

London

July 17—The prospectus of a new mining company, called the Lena Goldfields Ltd., has been issued. The company has been formed to acquire from the Russian Mining Corporation, Ltd., the benefit of a contract to purchase shares equal to 70 per cent. of the total issued capital of a Russian company, called the Lena Gold Mining Company, and to acquire such portion of the remaining capital not secured under such contract as can be purchased with a view to the acquisition of the entire capital stock of that company. The new company will also acquire from the Russian Mining Corporation the benefit of a contract to purchase the Bodaibo railway by which access to the mines is obtained.

The share capital of the new company is £1,405,000 in £1 shares, of which 1,251,100 shares are to be now issued. Of these, 954,600 fully paid shares will satisfy the consideration payable to the Lena Gold Mining Company if all the shares in that company are acquired, 60,000 fully paid shares will be paid to the Russian Mining Corporation, the vendors, and 236,500 shares are now offered for subscription. There will be consequently 153,900 shares unissued or in reserve. The new company, which is in the nature of a trust company, will be entitled to nominate the board of the Lena Gold Mining Company, and the prospectus states that three of the present directors of that company will be nominated. The public who subscribe for the 236,500 shares now offered will with the Russian Mining Corporation, which receives 60,000 fully paid shares, acquire in round figures a quarter interest in the property of the Lena Gold Mining Company. The Lena Goldfields or English company has as stated above, the right to nominate the board of the Russian company. It will, however, only represent a quarter of the capital and it is not explained what the position will be if the shareholders in the Lena Gold Mining Company, who retain a three-quarter interest, seek to acquire control of the property.

The property acquired consists of extensive gravel deposits, situated about 1100 miles northeast of the town of Irkutsh on the Trans-Siberian railway. The Lena Gold Mining Company was established in 1863 and to October, 1906, had obtained 2,392,021 oz. gold of a value of £9,000,000. For the year ending October, 1907, the output was valued at £843,000, which is stated to be approximately one-fifth of the total gold production of the Russian Empire. The property has been favorably reported on by Charles M. Rolker, who spent two months in examining the mines. There are four groups of mines, and from one alone, the Bodaibo, a working profit of £1,389,110 is expected. The Lena Gold Mining Companys equipment for the purposes of carrying on its mining operations, in addition to the ordinary appliances for gravel mining and sluicing, consists of an electric power plant of 1660 h.p. and pumping plant of 1,200,000 gal. per hour capacity. The company employs 3000 miners and workmen, for whose use hospitals, schools, churches and bath houses have been provided. For the year ending October 13, 1906, the gold production was £742,000, giving a working profit of £164,034 for the year 1906-7, gold production £843,000, working profit £232,490, and for the year 1907-8 a profit of £250,000 is anticipated. The directorate of the Lena Goldfields, Ltd., includes the names of Lord Harris, Chairman of the Consolidated Goldfields of South Africa, Ltd., and of R. T. Fresheville, director of the Consolidated Mines Selection Company, Ltd., the well known mining engineer.

The gold deposits occurring in the properties consist of gold-bearing gravels in ancient river-beds, and are worked for the most part as drift mines, the development and extraction of gravel continuing during the whole year, the actual production of the gold by washing being carried on from the middle of May to October. The average value of the gravel worked for the three years ending October, 1906, has been approximately 36s. per cu.yd. and for the year ending October, 1907, it was 39s. per cubic yard.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Cochise County

Copper Queen—A third air compressor, which was formerly in the old Czar power house, is now being installed in the new power plant. This completes the new plant. The prospect and development work at the mines progresses steadily, and the showing for the past month has been satisfactory, particularly in the deeper levels of the Lowell mine. Nearly all the drifts on the 1300-ft. level are being pushed ahead, and during the past week one of them encountered a body of good sulphide ore, the extent of which is yet unknown. On the 1000-ft. level a body of good sulphide has been found in the new crosscut between the Lowell and Gardner, and a second is now being developed on the south side of the Lowell. The 1400-ft. station of the Lowell shaft has been cut and a new drift started to explore the country west of the Del Norte claim of the Hoatson mine where good ore is known to exist. A pump station is also being cut on the 1400-ft. level. The Uncle Sam shaft in the western part of the property has been sunk to a depth of 650 ft. Work on this shaft will probably be stopped in about two weeks when it reaches the main 200-ft. level 50 ft. farther down.

Superior & Pittsburg—In the Hoatson shaft a strike of oxide ore has recently been made on the 1300 level. The ore was found in a crosscut about 550 ft. from the shaft. A raise, up about 20 ft., is still in ore which averages 15 per cent. copper. The Hoatson shaft is shipping 300 tons of ore daily, and will ship a larger tonnage in a few months when the orebodies recently discovered can be mined to advantage. In the Junction shaft a depth of 1500 ft. has been reached. Some high-grade orebodies have been opened up on the 1300-ft. level. The Cole shaft is furnishing about 250 tons of ore daily. A strike of ore carrying 10 per cent. copper on the 1100-ft. level has recently been made.

Calumet & Arizona—The copper production at the smelter in Douglas for the month of June was approximately 4,200,000 pounds.

Shattuck & Arizona—The drift on the 600-ft. level passed through about 40 ft. of ore in the recently discovered orebody and is now being driven in ledge material of favorable appearance.

Imperial Copper Company—The strike recently made on the 400-ft. level of the Mammoth claim is proving to be the largest body of high-grade ore yet encountered in that mine. The smelting plant owned by this company at Sasco has been running with success since it was blown in. The plant is producing from 650,000 to 700,000 lb. of copper a month, all of which is being sold in New York, assaying 99.3 per cent. copper, with a fairly good proportion of the precious metals. The second unit, which will double this output, should be in operation before the end of July, and at about the same time the 300-ton concentrating plant should start up.

Tombstone—Both of the large Corliss cross-compound pumping engines, recently installed on the 1000-ft. level, were successfully started on June 25, and have since been running without a hitch. They pump from the 1000-ft. level to the surface, and the management has been able to cut out the relay pumps on the 700-ft. level and one of the Dow pumps on the 1000-ft. level. This has resulted in a saving of fuel of about $56 daily. The miners have started crosscutting west from the pump shaft in the limestone toward the contact between the limestone and the Contention dike 400 to 500 ft. distant from the shaft. Crosscutting east from the 1000-ft. level to get under the large leached orebody encountered on the 800-ft. level has also begun.

Santa Cruz County

Four Metals—The copper strike at the Red Hill tunnel is showing up larger with every day's work. The tunnel has cut 50 ft. into the vein of concentrating sulphide ore, without encountering the hanging wall. The tunnel is now in about 500 ft. with a depth of more than 400 ft. The directors announce their intention to put in a concentrator.

National Consolidated—The shaft is down 200 ft., and crosscutting has been begun. The new hoist is in place and sinking will be continued to the 400-ft. level.

Yavapai County

[illegible] to H. J. Beemer, of New York City. It adjoins the Storm Cloud group, now the property of Mr. Beemer. Development on the Storm Cloud has exposed large bodies of high-grade gold-copper ore, and the same ledges run through the Wilson property.

[illegible]—Lessees working [illegible] have about 100 tons of $150 ore on the dump, taken out during the past six months. Large bodies of this kind of ore are exposed in the mine, four miles east of Prescott.

Monica—The company has added 10 stamps to its mill near Kirkland, making a total of 20 stamps. The output should be about doubled. The average value of the ore being milled is reported to be about $18.

[illegible] company is sinking a shaft on its properties in Copper Basin, seven miles west of Prescott. At a depth of 65 ft., a body of copper-bearing sulphides was broken into. The body cut is about 3 ft. wide, and assays 4 per cent. copper besides some gold and silver. The extent of the find has not been determined; neither wall has been reached.

United Verde—This company will start its new No. 5 furnace in a few days. The new furnace is 4x20 ft. and is said to be one of the largest blast furnaces in the southwest.

United Verde Extension—This property lies just east of the famous United Verde. A crosscut on the 300 level is in about 45 ft., and is showing ore in the face.

California

Nevada County

Defender—At this property, F. B. Joyce, superintendent, the clean-up of the 10 stamps last month showed an average yield of $6 per ton exclusive of metal in the sulphurets.

South Eureka—The 20-stamp mill running day and night is crushing an average of 90 tons per day; 20 stamps will soon be added. The main shaft is to be sunk to the 2700 level. W. H. Finchley is superintendent.

Butte County

Gunn Drift—This mine near Paradise, in the Magalia Channel region, is being examined by Los Angeles men with a view to purchase.

[illegible] considerable work is being done, and some prospecting is being done by means of drills.

Calaveras County

Paragon—L. J. Hutchinson and others have relocated this placer claim in the Angels district, near the Kentucky placer mine.

San Antone—This quartz mine at West

Point has been bonded by Phillips & Macher to H. W. Norman, of the Ritter mine. The property is equipped with a hoisting and pumping outfit.

Blue Bell—This mine near Glencoe has been bonded by the Golden Era Mining Company, of San José, Cal., and a 40-stamp mill is to be put up this year.

Horswell—The gravel mine operated a few years ago by Mr. Horswell on the Haupt place, near San Andreas, is about to be reopened.

Ritter—At this mine, Mountain Ranch, a 6-ft. vein of good milling ore has been cut on the north drift on the 200 level.

Inyo County

Britain—Some very high-grade gold ore is coming out of this mine in Beveridge district, owned by Spear Brothers, of Lone Pine. Rich silver ore has also been found in this ground.

Ella—This mine adjoining the old Union at Cerro Gordo and owned by C. Krohn, has been bonded to Thomas Varden and T. W. Parker for $25,000. It is a silver-lead property and has been worked for years.

Four Metals Mining Company—The five-mile tramway being built will be ready for operation in September. The company's furnace will be able to handle 250 tons of ore daily.

Kern County

Kern County Consolidated Gold Mining Company—At this property on Piute mountain, F. W. Gwynne, superintendent, the veins are at present producing very high-grade quartz.

Pine Tree—A fine body of gold ore is reported found in this mine at Tehachapi. A new incline has been sunk on the ledge above the water tunnel.

Mariposa County

Mariposa—At this mine, Mount Bullion, a five-stamp mill is to be erected and leases will then be let on the property.

Nevada County

Delhi—At this mine, owned by the Champion Mining Company, the chlorination works have been started up on accumulated sulphurets.

Gray Eagle—This mine at Maybert is being reopened under superintendence of C. A. Marriner.

Ancho—At this property, Graniteville, Harry Overman, manager, a 15-ft. vein has been intersected in the lower tunnel.

Plumas County

Nugget—A cucumber-shaped nugget valued at $625 has been found in one of the hydraulic mines in Onion valley.

Gruss—At this mine, Genesee, five stamps are now dropping on ore from the old shaft.

Shasta County

Evening Star—James Sallee has purchased this mine at Old Diggings and put a force of men at work under C. Lanyan.

San Bernardino County

Dry Washers—The Italie Company at Twenty-Nine Palms district is experimenting with dry washers. The Westerfield separators recently set at work, are reported satisfactory, but larger ones will be built.

Sierra County

Twenty One—Crary, Armstrong and the Courtney Brothers, who hold the bond on this mine at Alleghany, have made an important strike at depth. The ore is of very high grade.

Trinity County

Mountain Boomer—R. L. Skinner, C. F. Meckel and D. B. Fields, of Weaverville, have bonded this property at New River. The mine has been a producer for some years.

Tuolumne County

Little Bonanza—This mine, near Sonora (formerly Last Chance) has been pumped out and mining operations have been begun by four leasers.

Colorado

Boulder County

Cashier Mining Company—This company, operating at Camp Albion on low-grade ores, is having its 25-ton mill thoroughly tested and the successful treatment of the ores will mean the erection of a mill capable of handling several hundred tons daily. Thomas L. Wood, Boulder, Colo., is manager.

Livingstone Leasing and Holding Company—New York men have become interested in this property at Sugar Loaf and propose extensive developments, with W. R. Doty, Boulder, as general manager.

United States Gold Corporation—Plans are being drawn for this company's proposed cyanide plant of 100 tons initial capacity at Sugar Loaf. The contract is to be let at the stockholders meeting in Boulder on August 1.

Longfellow Mining Company—R. G. Mann, of Boulder, manager of this company, is going to purchase new machinery for the property at Jamestown.

Alton—Ore carrying as high as $4000 per ton has been found in the tunnel workings of this property near Caribou.

Clear Creek County

Gold Leaf—This property is reported purchased by Dr. Barber, of Tamaroa, Ill., and a new plant of machinery is to be installed, with the intention of erecting a mill at a later date. The property is in the Gold Dirt district.

Waldorf Consolidated Mining Company—It is reported that the extensive holdings of this company in the Argentine district have been leased for ten years to a Kansas City., Mo., syndicate.

Gilpin County

Druid Mining Company—Arrangements are being made for the installation of a larger hoisting plant on the Searle mine, and the Gilpin Tramway Company will build a switch for handling the ores. C. M. Anderson, Central City, is manager.

Decatur Mining Company—Decatur, Ill., men are interested and are figuring on increasing the capacity of the mill in Moon gulch. Good mill and smelting ores are being taken out. G. M. Ashmore, Rollinsville, is manager.

Mackey—It is reported that Eastern men are arranging to pay off the indebtedness on this property in the Pine Creek district and for the early resumption of operations.

Champion—The company is planning the installation of an air compressor at the Lone Star mine, near Rollinsville. A regular product is being taken out of the Champion mine and milled, giving an average of about $10 per ton.

Aduddell—Colorado Springs and Eastern capitalists have secured the Aduddell group under lease and bond and are carrying on extensive shipments, under the management of H. W. Pring, of Central City. The company is arranging for the purchase of a mill to treat the heavy tonnage of low-grade ores.

Bezant Gold Mining Company—Iowa and Colorado capital is interested in the purchase of the Quartz Mill mining group in Leavenworth gulch, and J. H. Bawdem, Central City, has been placed in charge.

Senator Mines Company—A good strike is reported in the 300-west level of the Senator mine near Black Hawk.

East Notaway—A shipment of smelting ores from the 555-ft. level carried 27.98 oz. gold, 9.18 oz. silver, and 4.80 per cent. copper, or a value of $554 per ton. The property is owned by the Town Topics Gold Mining Company.

Amethyst—Central City and Denver men have organized and will work the New Brunswick property in Russell district. Forbes Rickard, Central City, will have charge of the operations.

Lake County—Leadville

New Monarch—Two carloads of high-grade gold ore are shipped daily to the Salida smeltery, the average production of the mine being about 50 tons per day. Work on this property for several months has been confined to the old region; a large acreage of unexplored ground remains to be gone over.

Huckleberry—Two carloads of gold ore were recently shipped from this property in the St. Kevin district, that netted nearly $20 per ton. A highly mineralized body has been encountered from which extensive shipments will be made.

Margaret—Steady shipments of high grade ore which averages about 12 oz gold to a ton, are made from the property to the local smelters. The ore also carries a fair percentage of lead.

Ibex—Between 300 and 400 tons of sulphide ore are produced daily by the company and are shipped to the Arkansas Valley plant.

Favorite—The lessees on this property in South Evans gulch are producing good-grade ore and have a large body exposed in the workings. The ore is particularly acceptable at the Arkansas Valley smelter, as it carries from 30 to 50 per cent. lead and from 1 to 1½ oz. gold, also from 5 to 10 oz. silver. More than 700 tons of this material have been shipped during the past two months and the shoot is still strong and maintaining its grade.

Starr Placer—Operations on this property in California gulch show that while some of the ground has previously been washed out, there still remains sufficient gold to make the work pay.

Idaho

BONNER COUNTY

Idaho Smelting and Refining Company—This company, which owns one of the finest smelter sites in the Northwest, and which has a 200-ton plant on the shores of lake Pend d'Oreille, has just secured deposits and guarantees of funds amounting to $200,000 with which to begin operations at once. For many months the management has been trying to get money to pay off $217,000 in debts and provide an operating fund. S. W. Gebo, of Montana, has deposited a large proportion of the amount, and repairing and enlarging work is now in full swing again. Two roasters and a blast furnace are to be installed, and when the plant is ready for operation it will be able to handle 250 tons of ore a day. Contracts are already made for ore and coke. Much of the ore will come from independent shippers in Montana and the Cœur d'Alene.

SHOSHONE COUNTY

Monitor—The old equipment will be replaced by one 60- and one 50-h.p. boiler, a compressor and other minor pieces of machinery. The mine has been cleaned up by a small crew and now 25 men are at work. Sinking from the 400-ft. level will commence at once. The company will not ship till a large ore reserve is developed.

Midnight—Rich galena has been struck in this property, near Mullan and the Morning mine. The strike was made in an adit at a depth of 700 ft. and revealed 18 in. of galena. At 1000 ft., where the Morning No. 5 tunnel crossed the lead, the vein was found to contain about 10 ft. of concentrating ore, and its dip was throwing it close to the Midnight end lines. The upper adit was driven to determine the dip of the vein, and with the present strike it is found to apex on Midnight land. Work will be continued for some time on this level. The property is under bond to eastern capitalists for whom William Q. Ranft, of Missoula, Mont., is agent.

Silver Mountain Mining Company—A contract for 100 ft. of tunnel has been let and the work is now in progress. The tunnel is in 400 ft. and it is thought that 100 ft. will tap the lead. This will give a depth of 300 feet.

Cañon Creek Fraction—Two stringers of galena have just been discovered in this property, which is near the Hercules mine. The full width of the ledge has not yet been determined.

Park Copper—An assessment of three mills a share has been levied on the stock of this company for development purposes.

Golden Chest—This mine, near Murray, will resume operations at once. Superintendent Auerbach has just returned from a trip to New York, where he attended a meeting of the directors.

Sonora—Ore has just been encountered on this property near Mullan; conditions are reported to be improving as the work progresses. The drift has been run 70 ft. from the crosscut. At a recent meeting of stockholders, an assessment of 2½ mills was levied for carrying on the development.

Interstate—Work will be started in a few days on a long crosscut tunnel which is designed to cut three leads at a depth of 1200 ft., or 800 ft. lower than the present workings. The crosscut will be 2800 ft. in length, and will be started at water level. Work has been carried on in the third level and this will continue. The crew will be increased materially.

Granite-Allie—Commercial galena one foot wide has been opened up in the bottom of an 85-ft. shaft. At 60 ft. the bottom of the shaft was all in ore and this continues to the bottom. After 15 or 20 ft. more of sinking, a crosscut will be run to the wall. This property is said to have the only contact vein in the Murray district.

Rex—Resumption of work is [illegible]ly delayed owing to financial difficulties. Until a few weeks ago development work was being done and some excellent bodies of galena had been developed.

Paymaster—Galena, high in silver, has been encountered, and drifting is said to show an increasing quantity. The streak is 2 ft. wide, and is carried in a vein 5 ft. in width. Drifting [illegible] ft., the entire distance in ore.

Indiana

GREENE COUNTY

Summit—This mine, near Linton, claims the State record for work during the last year, having worked [illegible] would have operated 10 days longer but for strikes. The mine also claims one of the best records for tonnage in the State. During the past year the tonnage of coal was 241,000.

PARKE COUNTY

The question as to whether underground coal ought to be assessed for taxation as real estate or personal property when the mining company owns no surface ground, came up before the State Tax Board on an appeal by Vandalia Coal Company, the Parke County Coal Company and the Divian Coal Company. The coal land was assessed at $30 an acre as personal property, but the State board held that it should have been assessed as real estate, and the price, $20 per acre, for which it was assessed last year, must stand for four years.

PIKE COUNTY

Frederick—Fire on July 18 destroyed the engine house and boilers at the coal mine, nine miles south of Petersburg. Operations have been suspended at the mine until new machinery can be installed, a work requiring several weeks.

Michigan

COPPER

Copper Range—The shaft on the Globe tract, which is held under option and is being developed by the Copper Range Consolidated, is bottomed at a depth of 1000 ft. A station has been cut at this point, and as soon as the shaft can be put in shape to accommodate regular hoisting, drifting will be started. At the above depth the shaft, which is vertical, encountered the formation, and in cutting out for the level some copper-bearing rock was exposed. This will be opened up extensively, as a thorough search is being made to locate the Baltic lode. Diamond drill cores exposed the lode on this tract and it was calculated that the shaft would cut the formation at a depth of between 800 and 900 ft. In cutting the station at the sixth level, a distance of 850 ft. from surface, the lode was encountered, but it carried no copper, and sinking was again resumed. All developments for the present will be confined to opening the ground tributary to the 1000-ft. level.

Adventure—The diamond drill which tapped the copper-bearing formation from the crosscut of No. 3 shaft has been pulled and a second hole will be put down from there to cut the formation at another point. Should the drill core from this proposed point prove as rich as the first, the company will, in all probability, take [illegible] shaft to open up this new strike.

[illegible] are being made to crosscut to the lode at the 10th level. The openings in the upper [illegible] tons of rock daily, as soon as everything is in shape to begin regular shipments to the mill. Work of grading the railroad is progressing and the framework for the temporary shaft house is being assembled and will soon be delivered to the shaft. During development a stock pile of approximately 25,000 tons of stamp rock has been accumulated; this, together with the rock coming from the openings, will amply supply the two heads which this company has leased from the Atlantic company.

Michigan—Diamond drill operations have been started by this company in an attempt to disclose the same favorable formation that has been exposed in the Adventure drill cores.

Missouri

Joplin—Zinc-lead District

Catherine—Frank Nicholson is overhauling his mill preparatory to reopening the mine.

Porto Rico Milling Company—This company has been incorporated with a capital stock of $25,000, with L. Gilbreath, E. M. Gilbreath, J. W. McCullough, E. McCullough and E. J. Cooper, of Joplin, as stockholders.

Old Dominion—The Whitsett mine of this company at Porto Rico has reopened and is producing.

Red Fox—This mine at Midway is to be reopened.

Evans Mining Company—This company has taken a lease on seven acres, and a 100-ton mill upon the Weyman land, and will reopen the mine at once.

White Star—This company has taken a 20-acre lease on the Luscombe land at Cave Springs, and has already started to open up the ground.

Montana

Butte District

Boston & Montana—During the past week work has been stopped on the Greenleaf and the pumps have been withdrawn. It is reported that the results of the development work done thus far have failed to meet the expectations of the management and that no further work will be done on the claim. The shaft is down over 1000 ft. Much interest was taken in the work at the Greenleaf inasmuch as it was the deepest shaft on any property east of the known copper zone. It was hoped that the work would determine the presence of copper in that locality.

Pilot-Butte—The property lies between Senator Clark's Elm Orlu and the claims of the Butte & Superior. The shaft is down 500 ft. From the station on the 500-ft. level one crosscut has been driven 300 ft. to the southwest, and another 350 ft. to the northeast. The property was shut down last February, but work was resumed the latter part of June when the shaft was unwatered. An electric compressor has been installed and it is also planned to put in a new electric hoist.

Reins Copper Company—The board of directors, at a meeting held the latter part of June, issued a call for a special meeting of stockholders to be held Aug. 12. It is proposed to place before the stockholders the question of issuing $600,000 of company bonds for the purpose of paying off the company's present indebtedness and to provide for its future operations.

Fergus County

Barnes-King—The June report of Manager McGee states that the bullion shipments for the month amounted to $28,000. The operating expenses were $20,000, leaving a net profit of $8000. This showing is considered rather encouraging by the stockholders in view of the setbacks occasioned by excessive rains during the month. The company was reorganized and the mine placed under new management a little less than a year ago.

Nevada

Esmeralda County—Goldfield

Production—Tonnage for the week just passed amounted to 2159, with a total valuation of $198,785. The Combination mill treated 595 tons of Consolidated ores. The Western Ore Purchasing Company handled from the Gem Florence, 12 tons; Baby Florence, 50 tons; Eisen dump, 161 tons; Rogers Syndicate, 154 tons; Engineers Lease, 236 tons; Victor, 24 tons; Van Riper dump, 43 tons. The Nevada-Goldfield Reduction Works handled from the Combination Fraction 535 tons; Sandstorm No. 5, five tons; Little Florence, 25 tons; Baby Florence, 25 tons; Mohawk Combination, 95 tons; Black Butte, 20 tons; Curtis Jumbo, 118 tons; Commonwealth, 35 tons; Hayes-Turner Mohawk dump, 41 tons; Hayes Oddie dump, 20 tons; from the old Western mill, 25 tons.

Rogers Syndicate—The syndicate's lease on the Florence ended without any sensation on July 11 at midnight. This lease had ore only about five months of its existence, but during that time it shipped about $600,000 worth of ore; $245,000 have been paid in dividends, and it is expected that the final disbursement will bring this amount to or above $300,000. A royalty of 25 per cent. on all ore extracted was paid to the lessors.

Baby Florence—This lease has at last encountered the rich Florence vein and has entered the list of shippers.

Little Florence—The dump of the lease was purchased by A. C. Eisen, who put expert sorters to work culling it for shipment. A lot of high-grade was encountered, about a ton being secured that averaged $3 per lb. High-graders in the mine are supposed to have sent it to surface as waste for the benefit of outside confederates. When the Florence mill begins running this whole dump will probably be treated.

Consolidated Jumbo—Norrington & Campbell have been granted a lease on the southerly 400 ft. of the Grizzly Bear claim. They are installing an electric hoist.

Diamondfield Black Butte—Another lease has been let on this property adjoining the Baumgartner lease which recently shipped six tons assaying $1090 per ton.

Commonwealth—The Wilber & Peck lease, known as the Tokop, has made its fourth shipment of ore averaging about $40. The pay portion of the vein is about 4 ft. wide and the ore is being taken from a depth of only 50 ft. The work of finding the vein and ore-shoot from the workings of the old shaft will be begun at once.

Victor—The Victor Mining and Leasing Company has begun breaking ore on the 250-ft. level in the upraise.

Engineers' Lease—This lease on the Florence is the big thing of the camp at present. It is owned by Messrs. Taylor, Price, and Niven, all local mining engineers, and is a close corporation. The first shipment was made in June and in the following 30 days the output amounted to $300,000. One lot settled for last week averaged more than $1000 per ton.

Milltown Fraction—The Milltown Fraction will purchase a more powerful hoist and will sink the shaft an additional 150 feet.

Laguna—The Hazel Goldfield lease on the Laguna has let a contract for sinking the shaft from the 450- to the 550-ft. level. The contract price is $38.50 per ft., with a bonus of $3.50 per ft. if the work is completed within 30 days.

Esmeralda County—Cuprite

Sulphur—Los Angeles and Boston men have acquired title to the sulphur claims near Cuprite and are carrying on systematic tests of the product mined with very satisfactory results thus far. The sulphur is 93 per cent. pure as it is mined, and the deposits are very large and situated very near the two railroads.

Humboldt County—Seven Troughs

Reagan Hayes Lease—This lease has just made a 30-ton shipment to the smelter so rich that Mr. Reagan accompanied the shipment to Salt Lake; 60 sacks will average $2500 per ton.

Prior Chadbourne Lease—This lease adjoining the Reagan Hayes lease is installing a hoist.

Nye County—Tonopah

Shipments—Ore shipments from the Tonopah mines for the past week were: Tonopah mining, 2950 tons; Belmont, 450 tons; Montana-Tonopah, 1000 tons;

North Star, 80 tons; Midway, 100 tons; MacNamara, 150 tons; West End, 45 tons; a total of 4775 tons.

Tonopah Mining—This company's 100-stamp mill at Millers treated almost 14,000 tons of ore during the 30 days of June and made a metallurgical recovery of between 88 and 90 per cent. Development work to the amount of 392 ft. was accomplished the past week in addition to stoping 3460 tons of ore.

MacNamara—The motors and transformers have arrived and have been installed, and from now on the compressor and fans will be run by electric current. The Tonopah mines show an increase in temperature of one deg. F. for every 36 ft. in depth in some mines and for every 56 ft. in others.

Belmont—Prospecting on the 1000-ft. level north of the Mizpah fault is being pushed ahead, the crosscut being in now more than 100 ft. Stringers of quartz ore from 2 to 10 in. in width have been cut continually. One 10-in. stringer about 50 ft. north of the fault is being drifted on. The finding of a pay orebody on this side of the Mizpah fault would be of inestimable value to the camp.

NYE COUNTY—BULLFROG

Montgomery-Shoshone—J. G. Kirchen, who is manager of the Tonopah Extension, has taken hold of the Montgomery-Shoshone in addition to his other work, and is directing the development of the mine. Walter Techow has been made mill superintendent.

NYE COUNTY—CACTUS PEAK

Cactus Range Gold Mines Company—This company operating about 22 miles east of Goldfield is installing an air compressor and a Cameron pump. Ore was found on the 100-ft. level, but water interfered with further development. The shaft will now be sunk 250 ft. deeper.

New Mexico

GRANT COUNTY

Comanche Mining and Smelting Company—The interest of this company has passed into the hands of H. B. Hovland and Hovar A. Smith, of Bisbee, Ariz., and capitalists from Duluth, Minn., who are in control of the Copper Gulf Mining Company. A new company has been formed with a capitalization of $2,000,000, to work the property.

South Dakota

CUSTER COUNTY

Mariposa—The main ledge for which the company has been working for many months, has been struck 90 ft. from the main tunnel. The ore shows well in free gold.

LAWRENCE COUNTY

Pluma—Secretary Harding, of Des Moines, is financing a sale of stock or mortgage bonds to raise money for a 500-ton mill and deeper development of the property.

Minnesota Mines Company—The first cleanup after two months of irregular operation is highly pleasing. The one shift in the mill has been increased to three and cleanups will now be regular.

Safe Investment—The property will be reopened within a few days and the 40-stamp mill will be run to full capacity.

Portland—The rich gold ledge struck some months ago is supplying regular shipments of ore.

Imperial—Crosscuts are being driven east and west from the shaft at the 600-ft. level and the ore is steadily looking better. More than 150 tons daily are shipped to the mill.

PENNINGTON COUNTY

Ama Queen—The mill will soon be in shape for operation and the unwatering of the shaft is about to commence. The old Tremain mill has been supplanted with gravity stamps and water power is used instead of steam.

Golden Summit—In connection with the operation of the Golden Medal property near Keystone, this ground is also to be worked. New machinery has been put in and a new shaft house.

Ivanhoe—If the test runs now being made are satisfactory, only the high-grade ore from the small veins will be run until the 50-ton mill is ready, when the lower-grade ledges will be tapped for a supply.

George—The owners of this placer ground near Rockerville are preparing to start operations. New machinery has been installed and the work will continue until late in the fall.

Arundel—New machinery is going in on the property and Superintendent Truax is preparing to ship tungsten ore east regularly.

Golden West—Work with the diamond drill is prosecuted in several locations to find the supposed higher-grade orebodies at greater depth. The mill will not be operated until the drill completes its work.

Wisconsin

[illegible]

Platteville—The Empire and Acme mines resumed this week with light forces and full crews will be added next week. The Cruson started development again and is hand-cobbing its ore dump. The Forest City company is preparing to continue prospecting. The St. Rose, the only producer in the Platteville camp since June 1, is turning out green concentrates assaying 55 per cent. metallic zinc, which is higher than the average milled product in this district. The West Main street company is drilling on the mining school campus; some jack and lead have been encountered in two holes; a shaft will be sunk if the drillings warrant it.

Highland—In this district the Highland Mining Company is working a full crew of men and is operating both its concentrators, one turning out lead and jack and the other drybone or zinc carbonate. The Franklin and St. Anthony have resumed with light forces, and are milling. The Milwaukee-Highland has been reorganized under the name of the Milwaukee Mineral Company; the lease covers a good run of lead ore, which can be worked independently of the zinc deposit. The Wallace is taking out jack and will haul its ore to the Milwaukee-Highland mill for treatment. Shaffra & Girman, on the old Section 4 range, and John Kreuhl, on the land just east of the Highland Mining Company, are running drybone.

Linden—In this district the Ross, Glanville, Dark Horse, Stevens, Rajah and Pollard mines are producing, and a little prospecting is in progress; in all about 100 men are employed, practically all of the mines working light forces. The Ross is holding its ore, and has 1600 tons of zinc concentrates on hand; it has always been the policy of this company to hold its ore in periods of low prices.

Mifflin—The Sunrise, Gruno, Slack and Peacock mines, in this district continue producing. The new Peni mill shipped its first car of jack this week. The D. D. C. mill is practically completed and will soon be put in operation. The Big Tom is installing the pumping equipment obtained from the Ebenezer.

Canada

Mineral Production of Ontario—Returns made to the Ontario Bureau of Mines show the output of the mines and metalliferous works of the Province, for the first three months of 1908, as follows:

	Quantity.	Value.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

ONTARIO—COBALT DISTRICT

Ore Shipments, Cobalt—Shipments of ore for the week ending July 18 were as follows: Cobalt Lake, 95,228 lb.; Crown Reserve, 44,000; La Rose, 362,610; Nipissing, 253,000; Nova Scotia, 40,230; O'Brien, 63,870; Right of Way, 60,050; Trethewey, 121,640, total 1,011,000 pounds.

Chambers—Ferland—Rich ore is being extracted at the 100-ft. level on the main vein. This is an extension of the O'Brien main vein, which crosses the property. At the O'Brien at a depth of 300 ft., rich ore was also found. The wall rock is heavily shot with silver on each side. A plant will be installed as soon as buildings are ready.

Crown Reserve—This mine, which is held from the Ontario government subject to a royalty of 10 per cent., has made its initial payment of $4000 to the public treasury.

Nipissing—The shaft on vein No. 40 is down to a depth of 105 ft., at which point the mineralized portion of the vein is 4 in. wide and assays 3000 oz. silver per ton. This is the vein which caused such a sensation in the camp in December, 1906, when the silver gave out at a point higher up.

O'Brien—The Ontario government has received $38,264 from the O'Brien mine, as royalties for the three months ending June 30. The royalty consists of 25 per cent. of the value of the output.

Right of Way—Rich ore has been struck on a continuation of the La Rose vein on the second or 145-ft. level. The vein at this point is about 8 in. wide. This is the first high-grade ore found on Right of Way at the lower level.

Silver Queen—Owing to the damage by fire to the compressor plant the company has arranged to secure power from the Cleveland-Cobalt company, and is operating the regular number of drills until the burned plant can be restored.

ONTARIO—HASTINGS COUNTY

Deloro Smelter—A number of additions and alterations have been made to this plant since it started about the first of the year; these have more than doubled its capacity. Shipments to Deloro from Cobalt have steadily increased and the daily output of silver amounts to about three-quarters of a ton.

SASKATCHEWAN—LAC LA ROUGE DISTRICT

New Discoveries—Samples of ore taken from the north of Prince Albert, Sask., where there has recently been a rush of prospectors, have been brought to Winnipeg by George Moorehouse, Secretary of the Board of Trade. They include gold quartz, silver and copper. The Pinche brothers of Winnipeg and J. Sinclair have located a nickel deposit on an island in Lac La Rouge, the seam being 30 ft. wide and two miles long. There is an iron cap on the vein. Samples are being sent to Sudbury for analysis.

ONTARIO—PORT ARTHUR DISTRICT

Loon Lake—A number of test pits have recently been sunk and hundreds of tons of iron ore have been exposed. The ore is red hematite associated with "taconite," similar in character to that of the Mesabi range. D. D. Lewis, superintendent of the Algoma Steel Works, Sault Ste. Marie, inspected the properties recently.

Mexico

It is officially announced that at a meeting of the Cabinet on July 25 it was decided to refer the proposed new mining law to President Diaz with power to act. A brief of the arguments for and against the measure will be submitted to the president. With this as a basis President Diaz will decide either to enforce the law at once by presidential decree or to refer the whole matter to the session of Congress which convenes on September 16.

CHIHUAHUA

Parral Production—The production of the camp for the week ending July 11 amounted to 7350 tons, of which 3510 tons were shipped to smelters and 3840 locally treated. This is a slight falling off, as compared with the preceding week.

Grand Central—High-grade silver ore is being developed at this new property, situated on the Sabinal district along the Rio Grande, Sierra Madre & Pacific. W. F. Thompson is the owning operator.

Santo Domingo—This old mine in the San Pedro district is being extensively worked by an El Paso, Texas, company, of which Capt. Britton Davis is president and E. H. Wells manager.

Greene Gold-Silver—Rumors affecting this company's affairs have been varied and frequent of late, and it is now the general opinion that operations may be shortly suspended at the Ocampo properties. One of the late reports is to the effect that there is in process of organization a new and well-financed company which will acquire and operate jointly the properties of the Greene Gold-Silver Mining Company and of the Belen Mining Company in the Ocampo camp. Included in the latter company's holdings is the famous Matulera mine, which has been for a number of years and now is a regular producer.

Republica—The report of the May operations of this company, with property, has been issued by the United States & Mexican Trust Company, of Kansas City, Mo. It contains the following items: 500 tons of ore milled, yielding 38 tons of concentrates of gross value of 48,347 oz. silver; silver bullion amounting to 20,137 fine oz. produced in cyanide plant; total value of output, 64,356.06 pesos; operating costs, 26,001.26 pesos; net profit, 38,354.80 pesos.

La Fortuna—This company is reported to be carrying on very encouraging development operations in the San Joaquin district, 25 miles from Nueva Casas Grandes. A force of 100 Mexicans under the direction of Supt. L. E. McBane is employed. The main shaft is down 600 ft. and a considerable tonnage of milling-grade silver ore is exposed.

Dolores—This company is adding two batteries of five stamps each to its milling plant, making a total of 25 stamps, in addition to several Huntington mills. The company is also treating a large tonnage of slimes in its cyanide plant. The monthly output is now about $40,000.

Rosario Mining and Smelting Company—This company has in progress of erection at its property in the Urique section a 10-ton reverberatory furnace. It is also the plan to erect during the year a 25-ton wood-fired reverberatory, on the completion of which the smaller furnace will be utilized for bullion melting. The manager is G. B. Jacobs and the assistant manager L. H. Skeels.

Choreras—Messrs. J. D. Evans and Charles Heflin, of Texas, are developing a promising copper property in the Choreras mountains east of Chihuahua, along the Orient railroad.

DURANGO

Lustre Mining and Smelting Company—This company has, according to reports, its pyritic smeltery in satisfactory operation. It is also stated that plans have been perfected for the building of a 65-mile narrow-gage railroad from Rosario, the westerly terminal of the Parral branch of the Mexican Central railway, to the company's mines and reduction works. The Baring Brothers' banking house, owning properties in the same section, is said to be interested in the railroad enterprise.

Inde District—The State government has approved of the plans for the proposed railroad line from Rosario, the terminal of the Parral branch of the Mexican Central to the camp of the Gold Mining Company. It is also the plan to extend this line to Tepehuanes and Magistral, as well as other sections of the Inde and Santiago Papasquiro districts.

GUANAJUATO

The week ending July 11 was an active one, there having been an increase in shipments of concentrates, their total value being $137,000. This amount exceeds the previous week's shipments by $37,000. The shipments of bullion amounted to $154,000, making a total for the week of $291,000. The amount of freight received at the new station of the Mexican Central is about twice as much as when the road centered at Marfil. The amount of machinery consigned to the different mining companies here has increased greatly. Quantities of machinery have arrived awaiting transportation to the Guanajuato Development Company.

Guanajuato Reduction and Mining Company—An aërial tram is being constructed from the Tepeyac mine to the Bustos mill for the conveyance of ore from the mine to the mill.

TEPIC

Rosa Morada—At the Frontal mine, owned by the Cambio Gold Mining Company, of Cincinnati, and situated in the Rosa Morada district of Tepic, the 35-ton concentrating mill has been completed, but the installation of the cyanide plant will be delayed until fall.

VERA CRUZ

Dos Bocas—An oil gusher of S. Pearson & Son, at Dos Bocas, near Ozuluama, has been burning for several weeks, and it is estimated that more than 10,000 bbl. of oil per day are being consumed.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 29—Trade throughout the country continues dull and not even temporary activity is noticed. Eastern dealers have been looking to the West to improve conditions, but no results have followed. Large accumulations of coal are reported at the lower Lake ports and this condition will continue until grain and ore shipments arrive from upper Lake ports. There is an optimistic feeling in the trade that business will soon become better, but no specific reasons are noted.

The coal trade in the South is nearly at a standstill and the strike among the miners has seriously curtailed production in Alabama. The disturbance has spread to the coke ovens, but the manufacturers of iron do not expect to curtail production inasmuch as arrangements have been made to receive coke from West Virginia. The operators have organized an association with the intention of running their mines on the open shop plan.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 18, short tons:

	1907.	1908.	Changes.
Anthracite......	3,106,737	2,859,672	D. 247,065
Bituminous.....	20,829,195	17,535,290	D. 3,293,905
Coke.............	7,734,995	3,670,466	D. 4,064,529
Total..........	31,670,927	21,065,428	D. 7,605,499

According to official reports the shipments of coal from the mines on the Norfolk & Western Railway for the month of June were 919,964 tons, of which 800,343 tons were commercial and 119,621 tons were company coal.

Shipments of coal and coke by the Pittsburg Coal Company for the six months ending June 30 were as follows, in tons:

Coal	1907.	1908.	Changes.
Pittsburg district	8,374,965	5,033,901	D. 3,341,064
Hocking (Ohio) dis.	607,271	388,151	D. 219,120
Total...	8,982,236	5,422,052	D. 3,560,184
Coke			
Pittsburg district..	244,198	4,146	D. 240,052

The gross earnings of the company were $2,525,100 in the first half of 1907 and $868,060 in the same period of 1908. The net earnings in the first half of 1907 were $1,128,012 and the net loss in 1908 was $393,030.

New York

ANTHRACITE

July 29—In the hard-coal market No. 1 buckwheat continues scarce with a brisk demand; pea coal is inclined to be short, but the other small sizes are in abundant supply. There are no features in the market, and dealers seem reconciled to the prevailing dull times. Circular prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

The demand for soft coal is very light, and no improvement is evident except at a few points in the far East. Consumers of fuel for manufacturing purposes are working principally on their stocks of manufactured goods and are not manufacturing now. It is, therefore, to be expected that until the stocks are disposed of, these consumers will not come actively into the market. New York harbor seems to be duller than almost any other consuming territory and good grades of steam coal go begging at $2.45@2.50 per ton. Slack is quoted at 50c. per ton at the mines, run-of-mine gas coal at 65c. and ¾-in. coal at 90c. per ton.

Transportation from mines to tide is slow. In the coastwise-vessel trade there seems to be a slight improvement, and freight rates are firmer. The rates from Philadelphia are as follows: Boston, Salem and Portland, 55c.; Lynn, 60@65c.; Newburyport, Gardiner and Bangor, 70@75c.; Portsmouth, 55@60c.; Saco, 90@$1; Bath, 65@75c.; to the Sound, 45@50 cents.

Birmingham

July 27—The coal production in Alabama is down to its lowest mark at present, caused by the strike. A large number of strike breakers are being brought in and the mining fields are still under martial law. A State organization has been perfected among the coal producers here; representatives of all but about 10 per cent. of the production were at the first meeting held in Birmingham last week. H. L. Badham was appointed temporary executive officer of the organization. An agreement is said to have been entered into to operate the mines on the open-shop plan.

[illegible] pany officials heard of this the men were discharged.

The strike breakers are in the main men who have worked in coal mines before and, while some are quitting when they hear that a strike is on, many are remaining at work.

Chicago

July 28—The only demand for coal is for the harvesting trade. For steam purposes the demand has not nearly come up to the hopes of the trade and domestic coals are lifeless.

The best grades of western and smokeless lump profit from the demand by the harvester manufacturers and this has made smokeless, large sizes, hard to obtain. Illinois and Indiana lump sells for $1.75@2 in carload lots, run-of-mine brings $1.60@1.75 and screenings are strong at [illegible]

Eastern prices are under circular quotations, smokeless run-of-mine bringing [illegible] and $3.25 for ¾-in. gas; and Hocking fetches $3@3.15 for standard products.

Anthracite is very dull and probably will be so to the end of the summer. Lake receipts do not come up to anything like a normal movement and graduated discounts do not stir the consumer to lay in stock. There is much demurrage coal constantly on tracks, from Eastern and Western mines.

Pittsburg

[illegible] remain practically the same as a week ago. About 75 per cent. of the railroad coal mines are running, but they are not being operated in full. Prices remain on a basis of $1.15 per ton for mine-run coal at the mine, but for what little current business is going, a slightly higher price is asked. Slack is down to 50c and sales have been made at a lower rate. Indications pointed to a rise in the rivers yesterday and coal was brought down from the pools to the harbor, where fully 6,000,000 bushels are now ready for shipment. The rivers stopped rising last night when within a foot of being navigable and indications are that shipments will have to be postponed for the present.

[illegible] is being greatly increased and before the end of the week it is expected that over one-half of the ovens in the Connellsville fields will be in operation. The H. C. [illegible] to start many idle ovens owing to the increase of pig-iron production at plants of the United States Steel Corporation. [illegible] works in operation next week. Prices re- [illegible] shipment low prices prevail. Furnace coke on contract remains at $1.65@1.75 and foundry $2.10@2.25. The *Courier* in its summary for the week gives the production in both fields at 185,093 tons. The shipments were 6846 cars as follows: To Pittsburg, 2688; to points west of Connellsville, 3734; to points east of Connellsville, 424 cars.

Iron Trade Review

New York, July 29—The pig-iron market has broadened slightly especially for basic iron. Buying orders developed during the week but only on a small scale and at moderate prices. Sales of 200 tons of bessemer were made at $15.75 Valley furnaces and it was also reported that 200 tons of basic and malleable were sold at $15.25. This last price is questioned because these grades have been offered recently at $15 Valley with no takers.

Within the last few days contracts have aggregated 10,000 to 12,000 tons of basic iron for delivery during the third quarter at $15.25@15.50 Eastern furnaces. This brings the total during the last two weeks up to nearly 50,000 tons of basic iron.

New interest is shown in finished steel products. The principal feature is the increase in specifications on suspended contracts which include some railroad work. A number of contracts for steel for buildings developed this week. The contract for heavy rails for the Mexican Central railroad was increased from 10,000 to 11,000 tons. There was also an order for seven miles of 6-in. and smaller gas pipe for Ohio and an inquiry for 10 miles of 3-, 4- and 5-in. pipe from the same district.

The National Tube Company put additional blast furnaces on blast at Loraine and McKeesport and is now operating 55 per cent. of its capacity. The port of Gary, Ind., was opened this week by the arrival of 12,000 tons of iron ore from Lake Superior. This inaugurates the first step in the operation of this new plant of the United States Steel Corporation.

The Zanesville, Ohio, plant of the American Rolling Mills Company, started work with a force of 200 men and 100 more men will be given employment within a week. The plant has been closed since November.

Baltimore

July 27—Exports for the week included 927 short tons of copper in ingots, cakes and bars to Holland and England; 1127 short tons of steel billets to England; 528 tons of steel rails to Costa Rica and 443 tons of tin scrap to Holland. There was imported 5800 tons of iron ore from Cuba.

Birmingham

July 27—Despite the strike of the union coal miners in Alabama the Southern pig-iron production is holding up well and the furnacemen assert that there will be no shutting down of furnaces. The furnaces in blast in this State are doing well and the production is being shipped out about as rapidly as it is made. Quotations are $11.50@12.50 per ton, No. 2 foundry; the average is $12 per ton, No. 2 foundry. The foundries and machine shops in the Birmingham district report better conditions with orders coming in steadily, though not in great volume.

There is some inquiry for iron for delivery during the last quarter of 1908. Some of the largest consumers of pig iron in the country are also sounding the market and making inquiry as to the probable production in the future. There are three furnaces about to be blown in in the immediate Birmingham district and two other iron makers can soon be in a position to produce.

The operations at the steel plant at Ensley and the rolling mills at Bessemer, in this district, are being increased. The output at both places is most satisfactory just now. There is a fair demand for steel rails and the product is being shipped from Ensley as quickly as it can be loaded.

Chicago

July 28—The iron market continues dull. Sales of pig iron are confined to small lots of Southern at $11.50@12 Birmingham ($15.85@16.35 Chicago) and $17@17.50 for Northern. There is little difference in prices between early and late delivery within the last half of the year. Contracts generally are almost non-existant, sales being confined to the next 60 days. Southern gets most of this business and efforts are being made to hold up the price to $12 without general success.

Iron and steel products continue dull. Structural materials are faintly active and in a few products, such as sheets and bars, there is slow progress upward.

Coke is moving slowly at $4.90 for the best Connellsville and $4.15@4.75 for West Virginia grades.

Philadelphia

July 29—There are a number of inquiries for foundry, forge and pipe iron. Bids have been made, but as our people have to bid against outside makers, it is impossible to tell how much of the new business will come to eastern Pennsylvania furnaces. Some pipe iron is needed for immediate delivery. The bids made here do not show any shading. Most of the iron called for is wanted for September and later melting. The situation is gradually clearing and consumption requirements are enlarging. The demand for basic is more promising than for a long time, and some business is being done under close cover at $15. No. 2 leads all other and is held closely to $16. Bessemer pig continues dull.

Steel Billets—More business has been arranged for than for many weeks and billets are once more on the move.

Bar Iron—Retailers and jobbers, who have been running very scant of stock, are now showing some interest in bars. Large consumers have been urged not to delay placing their orders for the remainder of the year.

Sheet Iron—An undertone of improvement has manifested itself during the week. Quite a good week's business has been done.

Pipes and Tubes—Some of the large mills have gathered in business for oil-pipe-line extensions, and more business of this character is on the way. Prices remain low, and consumers are acting accordingly.

Merchant Steel—Negotiations have been opened for larger fall supplies among some Eastern jobbers who want to have stocks on hand.

Plates—The shipyards are gathering in enough new work of small dimensions to send them to the mills for supplies. Construction requirements are very light.

Structural Material—There is a little new business. The railroads are not ordering much in the East. Our manufacturers are anxious concerning the prosecution of a lot of railroad-bridge work that is still held up.

Steel Rails—It is given out that several railway systems will order rails in September. At present there are no orders on the market.

Scrap—Eastern railway systems have more good steel scrap on hand than they have had for years.

Pittsburg

July 28—Satisfactory conditions in the iron and steel trade continue. All of the plants of the Republic Iron and Steel Company are running this week and at the general offices of the company in this city it was stated that enough new business had been booked yesterday and today to warrant the operation of all the mills, except, possibly, the steel works at Youngstown, all of next week. No large orders are being received, indicating that buyers are taking only enough material for actual needs; this is considered encouraging, as it shows that everything bought is going into consumption, and there will be no big stocks anywhere when an active buying movement begins. The Carnegie Steel Company has more business than at any time since the opening of the year. Its Homestead, Duquesne and Ohio works are running practically full and Clairton and other plants are in partial operation. The company put on two more blast furnaces during the week, increasing the number to 29, which is more than 60 per cent. of its pig-iron capacity, as the furnaces that are running are the largest producers. The steel-rail trade continues to be disappointing and the company is not operating its Edgar Thomson rail plant to more than 25 per cent. of its capacity. The Pittsburg Steel Company expects to start four of its new open-hearth steel furnaces at Monessen next week. It will receive its basic pig iron from the Midland furnace, the contract for which was mentioned recently. The other four open-hearth furnaces are likely to be started before the end of August and more pig iron will have to be bought. Other iron and steel plants in the Pittsburg district are operating more fully than last week and altogether the situation is very satisfactory.

Pig Iron—The pig-iron market is in a remarkable condition. Despite the fact that the demand is improving, there is a softening in prices for all grades. Large furnace interests have been endeavoring to keep up old prices, but it is impossible to stop shading. This was noticed when a steel interest entered the market for 100 tons of bessemer for August delivery and 300 tons for later shipment. Several interests quoted the minimum price of $15.75 at furnace, but this rate was shaded until it is reported today that the contract likely will be placed at $15.50. Another steel interest closed today for 300 tons of standard bessemer at a shade under $15.75. One dealer closed several contracts for different grades of pig iron aggregating nearly 1500 tons and all at the regular rates, which are as follows: Bessemer, $15.75; malleable bessemer and basic, $15; No. 2 foundry and gray forge, $14.75, all at Valley furnaces. There also are a number of good inquiries in the market that will develop into contracts shortly. Among them is that of the Standard Sanitary Manufacturing Company, a large buyer of foundry iron. It wants 8000 tons, about one-half Northern and one-half Southern, with a small tonnage of Virginia iron. The iron is for September and October deliveries, and it is expected that with the strong competition for the business, a low price will be obtained by the company. The contract will be closed this week.

Steel—Some business was done this week in bessemer and open-hearth billets, but no large tonnages were placed. The price of $25, Pittsburg, is strictly maintained. Sheet bars continue firm at $27.50, Pittsburg; plates at 1.60c., and steel bars at 1.40c.

Sheets—The sheet market shows a slight improvement and prices are firm. Some idle mills have been started by the leading producer and also by independents. Black sheets are quoted at 2.50c., and galvanized at 3.55c., for No. 28 gage.

Ferro-Manganese—The market remains unchanged and for prompt and future delivery prices continue at $46@47 per ton, Pittsburg.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 29.

At all U. S. Ports in June and year.

Metal.	Exports.	Imports.	Excess.	
Gold:				
June 1908	$8,626,718	$[illegible]	Exp.	$5,[illegible]
" 1907	23,872,140	2,165,342	"	[illegible]
Year 1908	[illegible]	26,368,198	"	27,139,777
" 1907	36,300,732	21,40[illegible]	"	[illegible]
Silver:				
June 1908	[illegible]	3,366,182	Exp.	1,071,178
" 1907	5,360,599	3,476,546	"	1,884,053
Year 1908	25,514,545	21,0[illegible]	"	4,4[illegible]
" 1907	29,219,[illegible]	22,395,[illegible]	"	[illegible]

Exports of specie from New York, week ending July 25: Silver, $1,317,300 to London and Paris. Imports: Gold, $112,948, from Central and South America, Mexico, West Indies, France and England; silver, $108,842 from West Indies, Europe, South America and Mexico.

Specie holdings of the leading banks of the world July 25, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$316,610,900
England	$188,857,340	....	188,857,340
France	636,385,100	$182,535,160	818,920,260
Germany	196,925,000	81,605,000	278,530,000
Spain	78,310,000	134,385,000	212,695,000
Netherlands	38,522,000	21,154,000	59,676,000
Belgium	20,323,335	10,161,665	30,485,000
Italy	18,137,000	21,500,000	39,637,000
Russia	680,265,000	39,375,000	719,640,000
Aust.-Hungary	234,810,000	67,065,000	301,875,000
Sweden	19,640,000	....	19,640,000
Norway	8,400,000	....	8,400,000
Switzerland	18,940,000	....	18,940,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
23	4.8680	52[illegible]	24[illegible]	27	4.8690	52[illegible]	24[illegible]
24	4.8675	52[illegible]	24[illegible]	28	4.8690	52[illegible]	24[illegible]
25	4.8675	52[illegible]	24[illegible]	29	4.8690	52[illegible]	24[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 16:

	1907.	1908.	Changes.	
India	£6,736,174	£4,31[illegible]	D.	£2,41[illegible]
China	......	516,400	I.	516,400
Straits	544,012	90,510	D.	453,[illegible]
Total	£7,280,186	£4,921,818	D.	£2,35[illegible]

Receipts for the week were £177,300 from New York and £5200 from Mexico; total, £182,500. Exports were £2615 to Egypt and £117,750 to India; £120,365 in all.

The price of silver has remained fairly steady at [illegible] until July 28, when it was advanced to $24\frac{3}{8}$d. upon the reopening of the Bombay market which has been closed the past week.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS

July.	Copper. [illegible]	Copper. [illegible]	Copper. [illegible]	Tin.	Lead.	Spelter. [illegible]	Spelter. [illegible]
23	13[illegible] @13[illegible]	12[illegible] @13[illegible]	[illegible]	[illegible]	4.45 @4[illegible]	4.45 @4[illegible]	4.30 @4[illegible]
24	13[illegible] @13[illegible]	$12\frac{7}{8}$ @13[illegible]	[illegible]	[illegible]	4.[illegible] @4[illegible]	4.[illegible] @4[illegible]	4.[illegible] @4[illegible]
25	13 @13[illegible]	12[illegible] @13[illegible]	[illegible]	[illegible]	4.[illegible] @4[illegible]	4.[illegible] @4[illegible]	4.35 @4.40
27	13[illegible] @13[illegible]	12[illegible] @13[illegible]	[illegible]	[illegible]	$4.47\frac{1}{2}$ @4[illegible]	$4.52\frac{1}{2}$ @4[illegible]	4.[illegible] @$4.42\frac{1}{2}$
28	13[illegible] @13[illegible]	$12\frac{7}{8}$ @13[illegible]	[illegible]	[illegible]	4.47[illegible] @4[illegible]	4.[illegible] @4[illegible]	4.42[illegible] @$4.47\frac{1}{2}$
29	13[illegible] @13[illegible]	12[illegible] @13[illegible]	[illegible]	[illegible]	4.47[illegible] @4.52[illegible]	4.[illegible] @4[illegible]	$4.47\frac{1}{2}$ @4.52[illegible]

London quotations are per long ton (2240 lb.) standard copper, [illegible]. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Under a steady demand from domestic consumers, some of whom have placed large orders, the price for copper has risen further. The strength of the situation has been enhanced by a good business from abroad, along with the improvement in domestic business. The total sales for the week, July 23-29, amount to many millions of pounds, including large transactions both in Lake and in electrolytic copper. The supply of copper is sufficient to meet all present demands, but at the close of the week several producers are holding for higher prices. However, sellers in general have refrained from any attempt to put up the market too quickly, the policy being rather to advance quotations gradually as business develops.

The market closes firm at $13\frac{1}{8}$@$13\frac{1}{4}$c. for Lake and $12\frac{7}{8}$@$13\frac{1}{8}$c. for electrolytic in ingots, cakes and wirebars. Business in casting copper during the week has been done at an average of $12\frac{5}{8}$@$12\frac{3}{4}$c., the closing prices being $12\frac{3}{4}$@$12\frac{7}{8}$c.

The London standard market has advanced in sympathy with refined copper, and closes firm at £$59\frac{1}{4}$ for spot and £$59\frac{7}{8}$ for three months.

Refined and manufactured sorts we quote: English tough, £$61\frac{1}{2}$@$62\frac{1}{2}$; best selected, £$61\frac{1}{2}$@$62\frac{1}{2}$; strong sheets, £[illegible];

Tin—The London market has shown renewed strength, heavy transactions in futures [illegible]. The close is cabled at £$137\frac{1}{2}$ for spot, and £$138\frac{5}{8}$ for three months.

Business in the domestic market has [illegible], consumers not being very anxious to take hold of the metal at present figures. The main transactions were made in spot tin, which is still rather scarce and for which a premium is still exacted. The close is quoted at about 30¾c.

Manufactured Copper—Sheets, cold-rolled, 17½c.; hot-rolled, 16½c. Wire, 14¼c. base.

Lead—Business in this metal has been on a larger scale at advancing prices. The market closes at 4.47½@4.52½c., New York.

London also reports a firmer market, a scarcity of sellers, and quotations at the close of £13 3s. 9d. for Spanish lead, £13 0s. 3d. for English lead.

Spelter—A much more active demand than for sometime past has made itself manifest in this market, and the unwillingness of holders to part with their metal at the lower prices has brought about a gradual advance. The market closes firm at 4.47½@4.52½c., St. Louis, 4.62½@4.67½c., New York.

The London market has been quiet, but maintained its firm undertone, and the close is cabled at £19⅛ for good ordinaries, and £19⅜ for specials.

Other Metals

Antimony—No sales of importance took place this week, and prices are only nominal. Quotations are 8½c. for Cookson's, 8⅜c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Platinum—Prices remain unchanged at $22.50 per oz for hard platinum, $20 for ordinary and $15 for scrap.

Foreign Coal Trade

Welsh Coal Trade—Messrs. Hull, Blythe & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of July 18: Best Welsh steam, $3.96; seconds, $3.72; thirds, $3.54; dry coals, $3.84; best Monmouthshire, $3.54; seconds, $3.30; best small steam, $2.22; seconds, $1.98. All per long ton, f.o.b. shipping port.

Mexican Imports of Coke—Importations of coke into Mexico, according to the Mexican Treasury department were 400,464 tons in 1907 and 424,441 tons in 1906. In these years the United States supplied 323,279 tons and 358,251 tons respectively.

Missouri Ore Market

Joplin, Mo., July 25—The high price of the week for zinc ore was $38 per ton; the assay base price was $34.50 for 60-per cent. zinc, the base ranging down to $32 per ton, and averaging, all grades, $31.72 per ton. The high price for lead ore remained at $60 per ton, but a much larger quantity was sold at this figure than in the previous week, the market being strong at the week-end. Medium grades brought $58@59 per ton, and all grades averaged $59.20.

Shipments of zinc ore decreased 715 tons from the previous week, being only 4068 tons; with an output approximating 4400 tons, stock is rapidly accumulating in the bins, even with the restricted output.

Following are the shipments of zinc and lead from the district for the week ending July 25:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,074,100	599,520	$51,170
Joplin	1,852,000	314,320	39,819
Galena	699,030	155,330	15,765
Duenweg	517,140	73,190	10,460
Alba-Neck	485,860	......	8,459
Oronogo	424,720	...	7,522
Prosperity	378,880	20,740	6,683
Granby	345,120	33,000	6,175
Spurgeon	166 560	133,270	5,595
Aurora	340 220	12,280	4,415
Carthage	193,710	......	3,292
Badger	95,290	28,700	2,416
Miami	181,890	......	2,304
Carl Junction	120,000	2,660	2,058
Zincite	105,540	......	1,688
Sarcoxie	62,500	......	1,000
Peoria	58,070	......	464
Wentworth	34,560	......	426
Totals	8,135,180	1,373,020	$169.719
Seven months	274,804,350	43,085,670	$5,809,867

Zinc value, the week, $129,061; 7 mos., $4,640,117
Lead value, the week, 40,658; 7 mos., 1,169,750

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	32.07	June	73.66	60.48
July	45 79	......	July	58.18	.....
August	43.22	......	August	59.54	....
September	40.11	......	September	53.52	....
October	39.83	......	October	51.40	....
November	35.19	......	November	43.40	....
December	30.87	......	December	37.71	....
Year	43.68	......	Year	68.90	....

Wisconsin Ore Market

Platteville, Wis., July 25—The base price for 60 per cent. zinc ore this week was $33@35 per ton. No premium is reported to have been paid. The best grade of lead ore sold at $58@60 per ton, the same as last week. The tonnage of zinc ore shipped from this district comprises more carbonate ore than for some months. A number of "jack" mines have resumed within the last two weeks, but most of them have as yet put on only light forces.

Shipments, week ended July 25:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	400,270	....	156.100
Highland	314,900	....	....
Days Siding	264,000	....	....
Hazel Green	250.200	80.000	....
Mineral Point	198,560	......	....
Linden	195,020	....	....
Harker	152,630	....	....
Benton	134,440	......	......
Dodgeville	120,000	....	....
Livingston	120,000	....	....
Cuba City	......	124,100	... ...
Total	2,150,020	204,100	156,100
Year to July 25	51,228,541	6,190,805	781,165

In addition to the above there was shipped to the electrostatic separator at Platteville, from Linden, 66,500 lb.; from Highland, 58,200 lb.; from Rewey, 124,910 lb.; from Benton, 425,960 lb. Shipped to the Joplin separator works at Galena, from Benton 75,070 lb.; from Linden, 48,000 lb. Shipper to the Enterprise roaster at Platteville, from Strawbridge, 150,000 lb. all zinc ore.

Chemicals

New York, July 29—The market continues dull and little new business is reported. The trade does not look for any improvement until fall buying begins. In all industries consuming chemicals the demand continues for immediate consumption only and few orders for futures have been booked.

Copper Sulphate—There is no activity in the market and the few offers of goods by independent makers at $4.50 have not had a ready market. Standard copper sulphate remains at $4.65 per 100 lb. for carloads and up to $4.90 for smaller quantities.

Nitrate of Soda—There is a little better demand and prices are firm. Quotations remain at 2.30@2.32½c. for spot and 2.25 @ 2.35 for other positions of 1908.

Mining Stocks

New York, July 29—The week has been one of strength for the mining stocks on the Exchange, and sales have been heavy. Amalgamated Copper rose to $74¼ and closed at $73½. American Smelting common, touched $88½ and closed at $86⅞. United States Steel common showed great strength, rising to $45⅞ on heavy buying and closed at $44⅝; the preferred closed at $108¼. Utah Copper declared an initial quarterly dividend of 50c. per share and the stock rose a point to $39.

On the curb Standard Oil and Guggenheim Exploration were the features. The reversal of the decision by the United States Court of Appeals in the $29,000,000-fine case caused a sharp rally in Standard Oil stock, the price advancing to $665. Later it receded to $645 and closed at $649. Guggenheim Exploration closed at $160. Nevada and Cobalt stocks were moderately dealt in, but the range in price was narrow.

Boston

July 28—The market for mining shares is active and broad. Interest has been centered in the Lake stocks following activity in the Butte issues.

Calumet & Hecla is off to $669. Amalgamated has risen $3.50 to $74.25 ex-dividend. North Butte has been the leader this week, selling up over $7 to $81.75. Quite a spurt was recorded in the Lake properties. Adventure rose $3 to $8; Allouez, $3.50 to $34.50; Atlantic, $1 to $15.50; Centennial, $2.50 to $28.25; Elm River, $1.12½ to $2.62½; Franklin, $2.37½ to $12; Isle Royale, $1.75 to $22.50; Mass, $1 to $7; Michigan, $3.75 to $13.50; Mohawk, $3.50 to $62; Osceola, $3 to $105; Quincy, $7.25 to $96; Rhode Island, $1.12½ to $5; Tamarack, $11 to $77; Victoria, $1.62½ to $6.62½; Winona, $1 to $7; and Wolverine, $8 to $140. Utah Copper advanced over $3 to $39.62½ on the announcement of an initial quarterly dividend of 50c. per share. Utah Consolidated has been bought for New York account and is up $2.75 to $46.50. Persistent buying of Boston Consolidated put the stock up $1.50 to $14.25. Butte Coalition rose $1.25 to $26.75; Boston & Corbin, $1 to $18.25; Arizona Commercial, $2 to $21.50; Calumet & Arizona, $3 to $118; Old Dominion, $2.37½ to $39.37½. Parrot, $1.25 to $27; Shannon, $1.12½ to $15.12½; and United States Smelting, $3.62½ to $41.62½. The curb has responded to the better feeling, but it is only a question of time when the better class securities now traded in there will be listed on the Stock Exchange.

STOCK QUOTATIONS

NEW YORK Name of Comp.	July 28 Clg.	BOSTON Name of Comp.	July 28 Clg.
Alaska Mine	½	Adventure	7
Amalgamated	74	Allouez	34½
Anaconda	46	Am. Zinc	†28
Balaklala	3½	Arcadian	4
British Col. Cop.	5	Arizona Com.	21½
Butte & London		Atlantic	15½
Butte Coalition	26¾	Bingham	35
Colonial Silver	¼	Boston Con.	14
Cum. Ely Mining	8¼	Calumet & Ariz.	118
Davis Daly	2	Calumet & Hecla	669
Dominion Cop.	2 1/16	Centennial	28¼
Douglas Copper	4¼	Con. Mercur	42
El Rayo	2 1/16	Copper Range	77
Florence	3¼	Daly West	11
Foster Cobalt	38	Franklin	11
Furnace Creek	13	Greene Can.	11
Giroux	3	Isle Royal	22½
Gold Hill	⅓	La Salle	14¼
Goldfield Con.	5 1/16	Mass	7
Granby	†101	Michigan	13
Greene Gold		Mohawk	62
Greene G. & S.	[illegible]	Nevada	14
Greenw'r & D.Val	75	North Butte	81¾
Guanajuato	2	Old Colony	40
Guggen. Exp.	175	Old Dominion	39
Hanapah	†.20	Osceola	105
McKinley Dar.	71	Parrot	27
Micmac	2	Quincy	97
Mines Co. of Am.	1½	Rhode Island	5
Mitchell Mining	[illegible]	Santa Fe	2¼
Mont. Sho. C.	1.00	Shannon	15
Nev. Utah M. & S.	3	Superior	14½
Newhouse M. & S.	6½	Tamarack	77
Nipissing Mines	7¼	Trinity	14
Old Hundred	¼	United Cop. com.	6¼
Silver Queen	1.09	U. S. Oil	24
Stewart	¼	U. S. Smg. & Ref.	41⅝
Tennessee Cop'r.	36	U. S. Sm. & Re. pd.	46
Tri-Bullion	11/16	Utah Con.	46
Union Copper	†1 1/16	Victoria	6
Utah Apex	4	Winona	7
Utah Copper	39⅝	Wolverine	140
Yukon Gold	4¼	Wyandotte	1

*Ex. Div. †Ex. Rights ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24
Am. Smelt. & Ref.	87
Am. Sm. & Ref. pf.	107
[illegible]	19
[illegible]	32
Federal M. & S., pf.	[illegible]
Inter. Salt	18
National Lead	71
National Lead, pf.	103
Pittsburg Coal	12
Republic I. & S.	21
Republic I. & S. pf.	[illegible]
[illegible]	62
[illegible]	610
[illegible]	14
[illegible]	45
[illegible]	108
Va. Car. Chem.	32

BOSTON CURB	
[illegible]	17
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	13
Troy Man.	.45

ST. LOUIS N. of Com.	[illegible] High	Low
[illegible]	[illegible]	[illegible]
Am. Nettie	.03	[illegible]
[illegible]	1.75	1.50
[illegible]	68.00	[illegible]
C.C. & C. pd.	[illegible]	[illegible]
Cent. Oil	[illegible]	[illegible]
Columbia	[illegible]	3.00
Con. Coal	18.00	16.00
Doe Run	120.00	110.00
[illegible]	[illegible]	.18
[illegible]	[illegible]	12.00

LONDON Name of Com.	Clg.		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Camp Bird	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1	3	9
[illegible]	0	9	0

Cabled through Wm. [illegible]

NEVADA STOCKS [illegible]
Furnished by Weir Bros. & Co. New York

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	22
Belcher	25	[illegible]	4
Best & Belcher	50	Triangle	06
Caledonia	14	BULLFROG STOCKS	
Chollar	15	Bullfrog Mining	04
Comstock	[illegible]	[illegible]	[illegible]
Con. Cal. & Va.	[illegible]	[illegible]	[illegible]
Crown Point	[illegible]	[illegible]	[illegible]
Exchequer	17	Homestake King	[illegible]
Gould & Curry	.15	Montgomery Mt.	27
Hale & Norcross	22	Mont. Shoshone C.	[illegible]
Mexican	79	[illegible]	02
Ophir	2 35	[illegible]	18
Overman	08	MANHATTAN STOCKS	
Potosi	12	Manhattan Cons.	08
Savage	24	Manhat'n Dexter.	[illegible]
Sierra Nevada	32	Jumping Jack	02
Union	31	Stray Dog	[illegible]
Utah	04	MISCELLANEOUS	
Yellow Jacket	47	Golden Boulder	[illegible]
TONOPAH STOCKS		Bonnie Clare	[illegible]
Belmont	18	Lee Gold Grotto	
Extension	88	Nevada Hills	1.62½
Golden Anchor	02	[illegible]	.87½
Jim Butler	.30	[illegible]	1.13
MacNamara	08	[illegible]	21
Midway	45		
Montana	1 48		
North Star	10		
Tono'h Mine of N.	7 [illegible]		
West End Con.	[illegible]		
GOLDFIELD STOCKS			
Adams	06		
Atlanta	28		
Booth	19		
Columbia Mt.	27		
[illegible]	1 57		
Cracker Jack	06		
[illegible]	20		
[illegible]	17		
[illegible]	78		
Great Bend	37		
Jumbo Extension	60		
Katherine			
Kendall	16		
Lone Star	10		
May Queen	06		
[illegible]	15		
Red Hill	29		
Roanoke			
Sandstorm	52		

COLO. SPRINGS July 25

Name of Comp.	Clg
Acacia	[illegible]
Black Bell	
[illegible]	[illegible]
[illegible]	[illegible]
Doctor Jack Pot	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Findlay	[illegible]
Gold Dollar	[illegible]
Gold Sovereign	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Jennie Sample	[illegible]
Jerry Johnson	[illegible]
Mary McKinney	[illegible]
[illegible]	[illegible]
Portland	[illegible]
[illegible]	[illegible]
Vindicator	[illegible]
Work	[illegible]

Assessments

Company.	Delinq.	Sale.	Amt.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Chollar, Nev.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Ingot, Utah	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Lucky Calumet, Ida.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Mexican, Nev.	[illegible]	[illegible]	[illegible]
Missoula Copper, Ida.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Signet	Aug. [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Monthly Average Prices of Metals

SILVER

Month.	New York 1907	1908	London 1907	1908
January	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	68.144	[illegible]	[illegible]	[illegible]
August	[illegible]		[illegible]	
September	[illegible]		[illegible]	
October	[illegible]		[illegible]	
November	[illegible]		[illegible]	
December	[illegible]		[illegible]	
Year	[illegible]		[illegible]	

New York, cents per [illegible]

COPPER

	NEW YORK Electrolytic 1907	1908	Lake. 1907	1908	LONDON 1907	1908
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	12.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	12.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	12.743	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	12.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]		[illegible]		[illegible]	
August	18.356		19.255		[illegible]	
September	[illegible]		16.047		[illegible]	
October	13.169		13.551		60.717	
November	13.391		13.870		61.226	
December	13.163		13.393		[illegible]	
Year	20.004	..	20.661		[illegible]	

New York, cents per pound. Electrolytic is [illegible] London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	..
February	[illegible]	[illegible]	August	[illegible]	..
March	[illegible]	[illegible]	September	[illegible]	..
April	[illegible]	[illegible]	October	[illegible]	..
May	[illegible]	[illegible]	November	[illegible]	..
June	[illegible]	[illegible]	December	[illegible]	..
			Av. year	38.166	

Prices are in cents per pound.

LEAD

Month.	New York 1907.	1908.	London 1907.	1908.
January	[illegible]	3.691	[illegible]	14.469
February	6.000	[illegible]	[illegible]	14.250
March	[illegible]	[illegible]	[illegible]	[illegible]
April	6.000	[illegible]	[illegible]	13.469
May	6.000	4.253	19.688	[illegible]
June	[illegible]	4.466	20.188	12.600
July	[illegible]		[illegible]	
August	[illegible]		[illegible]	
September	4.813		[illegible]	
October	4.750	......	18.531	
November	4.376		[illegible]	
December	3.658		[illegible]	
Year	5.325	......	19.034	

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York 1907	1908	St. Louis 1907	1908	London 1907	1908
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	6.441	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]		[illegible]		23.850	......
August	5.701	......	5.551	......	21.969	
September	[illegible]		5.086	......	21.050	
October	[illegible]		[illegible]	......	21.781	
November	[illegible]		4.775	......	21.438	
December	[illegible]		4.104		[illegible]	
Year	[illegible]		5.812	......	23.771	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, good drill quality, carat..		$85.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum,	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05⅜@.06
Emery, in kegs: Turkish flour	"	.01¾@.02½
Grains	"	.03½@.04½
Naxos flour	"	.01¾@.02½
Grains	"	.03½@.04½
Chester flour		.01½
Grains	"	.03½@.04½
Peekskill, f.o.b. Easton, Pa., flour	"	.01¼@.01½
Grains, in kegs	"	.02¼@.02½
Garnet, per quality,	... ton	25.00@35.00
PumiceStone, Am. Powd.	100 lb.	1.60@2.00
Italian, powdered	"	.01⅛@.01½
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.02¼@.04½
Lump, per quality	"	.05@.25
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.026@.03
Boric	"	.08@.08¼
Hydrofluoric, 30%	"	.02⅜@.03
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb		1.25@1.50
Nitric acid, 38°	per lb.	4.25@4.62½c.
Sulphuric acid, 50°, bulk, per ton..		$12 up.
60°, 100 lb. in carboys		.85@1.12½
60°, bulk, ton.		16.00@18.00
66°, 100 lb. in carboys		1.00@1.25
66°, bulk, ton		18 00
Oxalic	"	.07@.07¼
ALCOHOL—Grain 95%	gal.	2.63
Denatured		.39@.45
Refined wood, 95@97%	"	.41@.47
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	lb.	.05¼@ 05¾
ALUMINUM—Sulphate, com'l.	"	1.10@1.75
AMMONIA—24 deg. lb.		04½@.05½
" 26 " "		.04⅜@.05⅜
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.07⅝@.08
Muriate grain	"	.05¾@.06⅛
Lump	"	.09¼@.09½
Sulphate, 100 lb		3.05@3.10
Sulphocyanide com	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lump lb..		.03⅞@ 04
ARSENIC—White	"	.03⅜@.03⅝
Red	"	.07½@.07¾
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.12@.14
Gilsonite, Utah ordinary	per ton.	33.00
Trinidad	"	28.00@30.00
California	"	21.00@27.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%		31.50@35.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	38.00@40.00
Nitrate, powdered, in casks	lb.	.05½@.06
Blanc Fixe	per lb.	.02⅜
BARYTES—		
Am. Ground	sh. ton.	14.00@21.00
Floated	"	22.00
Foreign floated	"	19.50@22.50
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%,	100lb	1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb		4.65
BONE ASH	lb.	.02¾@.04
BORAX	"	.04½@.05¼
CALCIUM—Acetate, gray,	100 lb.	2.00@2.05
Acetate, brown	"	1.25@1.30
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.00
CEMENT—		
Portland, Am. 500 lb	bbl.	1.55@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	17.50@20.00
Bricks, f.o.b. Pittsburg,	M.. "	175.00
CLAY, CHINA—Am. common ex-dock, N. Y	"	8.00@9.00
Foreign	"	10.00@17.50
COBALT—Oxide	lb.	1.45

COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR—Ground best	sh. ton.	10.50@15.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis No. 1	"	18.00
" No. 2	"	15.00
Extra	"	20.00@23.00
FIRE CLAY—F. o. b. St. Louis.		
St. Louis, extra quality	per ton	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	11.50@13.50
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump,	100 lb.	.75@.85
Powdered	"	.75@.85
GRAPHITE—Ceylon		
Flying dust, finest to best	lb.	.01@.04
Dust	"	.01¾@.05
Chip	"	.02¾@.07½
Lump	"	.04@ 10
Large lump	"	.07@.10
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	sh. ton.	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. best	lb.	.01¾
French	lg. ton.	56.00
German	lb.	.02½@.02⅝
LEAD—Acetate (sugar of) brown	lb.	.07⅜
Nitrate, com'l	"	.08¼@.08¾
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	8.00@10.00
Calcined, powdered	sh. ton.	26.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.80@1.00
Sulphate (Epsom salt)	100 lb.	.85@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	18.00@40.00
MARBLE—Flour	sh. ton.	8.50@10.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up.
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained..		.47
Sulphate, single	lb,	.09@.11
" double	"	.06½@.08
NITRATE OF SODA—100 lb. 95% for '08		2.30
95% for 1909		2.30
95% for 1910		2.32½
96% is 5c higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.06½@.06¾
English glassmakers'	"	.08¼@.08½
Lithopone	"	.03¾@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.26
Red lead, American	"	.06½@.06¾
Foreign	"	.08¼@.08½
Turpentine, spirits bbl., per gal.		.42½
White lead, Am., dry	lb.	.05⅝@.06
American, in oil	"	.06½@.06¾
Foreign, in oil	"	.10⅛@.10⅜
Zinc white, Am. extra dry	"	.05⅛@.05⅜
French, red seal, dry	"	.08¼@.08¾
" Green seal, dry	"	.10½@ 10¾
PHOSPHATES—Acid		60c per unit
*Fla., hard rock		9.25@9.75
land pebble 68%		4.00@4.25
†Tenn., 78@80%		6.00@6.50
75%		4.50@5.00
68@72%		4.00@4.25
‡So. Car. land rock		6.75@7.00
" " river rock		7.00@7.25

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.09@.09½
Bichromate, Am	"	.08⅝@.09
Scotch	"	.10½
Bromide	"	.15@.17
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.04½@.05½
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb..		1·90
Chlorate, powdered	"	.09¼@.09¾
Crystals	"	09@09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	.09½@.10
Prussiate, yellow	"	.14@.14½
Red	"	.32@.36
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported non-arsenical, furnace size, per unit		.12½@.13
Imported, arsenical, furnace size, per unit		.12@.12½
Imported fines, arsenical, per unit.		.08½@.09
" " non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.18
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.50@5.00
Refined, crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry	lg. ton	10.00@15.00
Silex	"	13.00@40.00
Lump Quartz	"	5.00@6.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.37½@.4
SODIUM—		
Acetate	lb.	.04¼@.04½
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.10@1.40c.
Soda, caustic, per 100 lb., 76/60		1.75@1.85
" " powdered		.02⅜@.06¼
Salt cake, per 100 lb, bulk		.40
" " bbl		.65@.85
Soda, monohydrate, per lb		1.4@1.75c.
Bichromate	lb.	.07⅛@.07¼
Bromide	"	.15@.17
Chlorate, com'l	"	.09@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am	"	1.35 up
German	"	1.60@1.70
Phosphate	100 lb.	2.10@2.30
Prussiate	"	.08¾@.09¼
Sal soda, f.o.b. N. Y	100 lb	.65@.70
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	100 lb.	.80@1.15
Sulphate, com'l, (Glauber's salt)	100 lb.	.60@.75
" " calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07¾@ 8½
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton	22.00
To Philadelphia or Baltimore	"	22.00
Roll	100 lb.	1.85@2.15
Flour	" "	2.00@2.40
Flowers, sublimed	" "	2.20@2.60
TERRA ALBA—French & Eng.	100 lb.	.65@1.00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	16.00@25.00
Italian, best	"	35.00@40.00
TIN—Bi-chloride, 50%	lb.	.09½ up
Crystals	"	.19⅜ up
Oxide, lb		.33@.35
URANIUM—Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02¼
Chloride, granular	"	.04½@.05
Dust	"	.04¾@.05¼
Sulphate	"	.02@.02¼

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

CALCIUM CARBIDE

6840—FURNACE—Ueber die Fortschritte in der Verwendung grosser elektrischer Oefen zur Fabrikation von Kalziumkarbid und Hochprozentigem Ferrosilizium. Walter Conrad. (Stahl u. Eisen, June 10, 1908; 10½ pp.) Describes the latest European improvements in furnaces for calcium carbide manufacture. 40c.

CEMENT

6841—CEMENT MILL—A 12,000 Barrel Cement Mill in California. (Eng. Rec., June 20, 1908; 5 pp.) A description of a cement mill in California which has a capacity of 12,000 bbl. per day. The construction of the plant together with the equipment and working are described. Illustrated. 20c.

6842—ELECTRIC POWER for Cement Plants. J. B. Porter. (Eng. and Min. Journ., July 11, 1908; ¾ p.) Discusses the economy obtained from using electric power in the manufacture of cement. 20c.

6843—PORTLAND CEMENT—How Portland Cement is Made. T. B. Rennell. (Min. and Met. Journ., June 12, 1908; 2¾ pp.) A description of the steps involved in the manufacture of Portland cement as practiced in plants of recent construction. Methods in testing products. Illustrated. 20c.

6844—PORTLAND CEMENT PLANT—Maryland's First Portland Cement Plant. (Mfrs. Rec., June 18, 1908; 2 pp.) Describes the first Portland cement plant of importance to be erected in Maryland. Illustrated. 20c.

COAL AND COKE

6845—AERIAL ROPEWAY at Dinnington Main Colliery. (Coll. Guardian, June 12, 1908; 1 p.) Describes a rope haulage for conveying washed slack from the washery at the Dinnington Main Colliery to the storage bunker over the coke ovens. Illustrated. 40c.

6846—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., July 1, 1908; 6 pp.) This is the second article and deals with the operation of the mines of the Glace Bay basin. Illustrated. To be continued. 20c.

6847—CHEMISTRY OF COAL. Myles Brown. (Sci. and Art of Min., June 27, 1908; 1½ pp.) The calorific power of coal and some useful notes on calorific units and elements, factors, etc., are given for various grades of coal. 20c.

6848—COAL HANDLING—The Storage and Handling of Coal and Ashes in Power Plants. Werner Boecklin. (Cassier's Mag., July, 1908; 22 pp.) Describes the economic handling and storage of coal and ashes in power plants. Illustrated. 40c.

6849—COAL HANDLING—Three Tramway Bridges on the Coal Storage Dock of the Berwind-White Coal Mining Company, Superior, Wis. R. W. Wetherill. (Eng. News, June 18, 1908; 2¼ pp.) Describes a new dock at Superior, Wis., which is of the bridge-tramway type; each one of the bridges has a total length of 506 ft. and a span of 295 ft. at the center of the tower. Illustrated. 20c.

6850—COLLIERY DISASTERS. F. A. Hill. (Eng. and Min. Journ., July 4, 1908; 2/3 p.) It is pointed out that the laws are aimed at the operator rather than at the miner. It is suggested that all miners should carry a clearance card showing their ability as miners. 20c.

6851—COST OF HANDLING COAL, How to Compute the. C. L. Moore. (Black Diamond, July 11, 1908; 1 p.) Discusses systematic method of keeping [illegible] to know accurately how much it costs per ton to handle coal. 20c.

6852—ELECTRICITY FOR COAL MINES—Stations Centrales D'Electricité pour Charbonnages. J. Kersten. (Rev. Univ. des Mines, April, 1908; 35 pp.) An outline of the principles governing the selection of electric appliances for given conditions, and a careful discussion of the economies secured by a centrally located plant.

6853—ELECTRIC POWER—Is the Electric Current Safe in Coal Mines? Rush N. Hosler. (Eng. and Min. Journ., July 4, 1908; 2⅓ pp.) The death rates in foreign countries has been reduced one-third as a result of investigations. Apparatus to prevent firedamp ignition. 20c.

6854—EXPLOSION—Facts Concerning Cardiff Mine Explosion. George S. Rice. (Eng. and Min. Journ., July 11, 1908; ½ p.) Calls attention to some errors in the communication of H. M. Dodge, concerning the explosion at Cardiff, Ill., several years ago. 20c.

6855—EXPLOSIONS—Coal Dust as a Factor in Mine Explosions. Henry M. Payne. (Eng. and Min. Journ., July 4, 1908; 5½ pp.) Liability of coal dust to explosion increases almost directly with its percentage of volatile combustible matter. The size is also of importance. 20c.

6856—FIRE—Fighting Fire in an Anthracite Coal Mine. P. H. Devers. (Eng. and Min. Journ., July 11, 1908; 3⅓ pp.) Describes a successful attempt to extinguish the fire in the Jersey mine of the Delaware, Lackawanna & Western Coal Company. The mine was flushed full of clay and the dangers from gases were overcome. Illustrated. 20c.

6857—FLUSHING—The Advantages of Flushing in Coal Mining. Lucius W. Mayer. (Eng. and Min. Journ., July 4, 1908; 4 pp.) The introduction of filling into mines is an American idea much favored in Europe. This system is necessary at some mines with a bad top. Illustrated. 20c.

6858—GREAT BRITAIN—Reports of Mines Inspectors for 1907. (Iron and Coal Tr. Rev., June 12, 1908; 1½ pp.) Report on the working of the mines in the Durham, England, district in 1907 under the Coal Mines Act, Metalliferous Mines Act and Quarries Act. 40c.

6859—HAULAGE—Recent Electric Locomotives for Mine Haulage. (Eng. and Min. Journ., July 4, 1908; ¾ p.) Describes the Baldwin Westinghouse mine locomotive with traction reel attached. 20c.

6860—HOISTING—Electrical Winding. Granville Poole. (Journ. Brit. Fed. Soc. Min. Students, June, 1908; 14 pp.) Discusses the subject of electrical winding from various points of view, and also discusses the sources of electrical power and its distribution.

6861—KENTUCKY—Mining Coal in the Big Stone Gap Field, Kentucky. John P. Shippen. (Eng. and Min. Journ., June 27, 1908; 3½ pp.) Rotary dumps and coke drawing machines are successfully used. The coke ovens carry a flue which connects with the boilers. Illustrated. 20c.

6862—MARKETING—Preparation of Coal for Market. W. P. Young. (Mines and Minerals, July, 1908; 2½ pp.) The selection and preparation of bituminous and gas coal for the market is discussed. Paper before the Coal Mining Institute of America. 20c.

6863—MECHANICAL EQUIPMENT—Modern Mining Plant Located at Pana, Ill. (Black Diamond, June 20, 1908; 2 pp.) The tipple, [illegible] house, railroad [illegible] of the Penwell Coal Mining Company were destroyed by fire and replaced in record time. [illegible] Illustrated. [illegible]

6864—MINING MACHINES—[illegible] (Eng. and Min. Journ., July 4, 1908; ¾ p.) The [illegible] mined by longwall machines has given rise to a [illegible] operating [illegible] and-pillar work. 20c.

6865—MINING METHOD—[illegible] Method of Mining a Coal Seam. [illegible] Mayer. (Eng. and Min. Journ., July 4, 1908; 1½ pp.) [illegible] ous system of coal mining, little used in the United States, but which should be more generally adopted. 20c.

6866—MINING METHOD—Methods of Working the Thick Coal of Warwickshire. James Cunliffe. (Min. Eng., July, 1908; 1 p.) Describes briefly the methods of working thick coal seams in Warwickshire, England. Paper read before the So. Staffordshire and Warwickshire Institute of Min. Eng. 20c.

6867—MINING METHOD—Mining in Flat Coal Seams Under Heavy Cover. Audley H. Stow. (Eng. and Min. Journ., July 18, 1908; 5 pp.) A technical consideration of costs and details of operation. Economical arrangements of mule and motor haulage system. 20c.

6868—MINING METHOD—Coal Mining by the Retreating Room-and-Pillar System. Harvey J. Nelms. (Eng. and Min. Journ., July 4, 1908; 1⅓ pp.) Shows the plan of development and the general method of driving rooms and extracting pillars on the retreating system of mining. The best scheme is to have four main entries, two intakes and two returns for air. Illustrated. 20c.

6869—MINING METHOD—A Method for Working a [illegible] Coal Seam. Granville Poole. (Eng. and Min. Journ., July 4, 1908; 1⅔ pp.) Great care must be exercised in drawing the ribs and in preventing the dirt from mixing with the clean coal. 20c.

6870—MINE MULES and Their Care. Robert Grimshaw. (Eng. and Min. Journ., July 4, 1908; 1 p.) The diseases and common causes of blindness among mine mules and animals used underground are discussed and certain [illegible]

6871—MISSOURI—Coal Mining Methods in Randolph County, Mo. J. J. Rutledge. (Eng. and Min. Journ., July 4, 1908; 2¼ pp.) [illegible] ing with a special reference to the location and [illegible] rooms. Illustrated. 20c.

6872—ORIGIN OF COAL. H. M. Chance. (Eng. and Min. Journ., July 4, 1908; 1½ pp.) [illegible] coal and fire clay, transportation of the sandstone; other peculiar conditions. 20c.

6873—PEAT—[illegible] Fuel. (Eng. Journ. of Canada, June, 1908; 3 pp.) [illegible] peat and pressing it into briquets. 20c.

6874—[illegible] Extravagance. Henry S. Renaud. (Power and [illegible] ed out that the greatest possibility for saving or wasting about a steam plant is in the [illegible]

6875—[illegible] llery. D. J. Pierce. (Eng. and Min. Journ., July 4, 1908; [illegible] operations incident to the Hamstead mine disaster [illegible]

6876—[illegible] tion für Grubenrettungswesen im Donezbecken [illegible] scribes the equipment used by the rescue corps at these Russian coal mines. 40c.

6877—SAFETY LAMP RELIGHTERS. James Ashworth. (Mines and Minerals, July, 1908; 2 pp.) Gives the British regulations in regard to use of safety lamp relighters underground, and reviews the advantages and disadvantages of electric and other types. 20c.

6878—SAFETY LAMPS—Ueber einige Durchschlagsversuche mit Benzin-Sicherheitslampen mit besonderer Berücksichtigung der Zündvorrichtung des k. k. Bergrates. Dr. Fillunger. J. Mayer. (Oest. Zeit. f. B. u. H., May 30 and June 6, 1908; 8 pp.) Describes and discusses experiments with safety lamps in gaseous atmospheres, with special reference to a lamp with double wire mantle. 60c.

6879—SAFETY MEASURES—Protection of Mines and Miners. James C. Beebe. (Mines and Min., July, 1908; 3 pp.) Measures suggested to the coal operators of West Virginia and used by the United States Coal and Oil Company to protect its mines and miners. 20c

6880—TURBINE PLANT—"Rateau" Turbine at the Auckland Park Colliery. P. J. Mitchell. (Iron and Coal Tr. Rev., June 12, 1908; 1⅓ pp.) Describes the 500-kw. turbo-alternator installed at the Auckland Park colliery. Illustrated. Paper before the Cleveland Instn. of Engineers. 40c.

6881—VIRGINIA—Keokee Coal and Coke Plant. H. E. Judd. (Mines and Minerals, July, 1908; 2 pp.) A description of the coal seams and mechanical equipment of this company, dealing also with the arrangement of coke ovens, tipple and other surface equipment. 20c.

6882—WYOMING—Distilling Oil Increases the Value of Fine Coal. (Black Diamond, July 4, 1908; 2¾ pp.) Oils are to be taken from fine coal and marketed at an immense increase in the sale value of the mine product. The residue will be briquetted giving additional profits. Illustrated. 20c.,

COPPER

6883—ALASKA—Copper Deposits on Kasaan Peninsula, Prince of Wales Island. Charles W. Wright and Sidney Paige. (U. S. Geol. Surv. Bull. 345, 1908; 18 pp.) Contains a description of the geology, ore-deposits and the mines of this portion of Alaska.

6884—ALASKA—Notes on Copper Prospects of Prince William Sound. Fred H. Moffit. (U. S. Geol. Surv. Bull. 345, 1908; 3 pp.) The properties on Prince William sound are all within comparatively easy reach of tide water and their development is not dependent on expensive railroad construction or hindered in the same degree by the severity of the winter as in other districts of Alaska.

6885—ALASKA—The Copper River District, Alaska. Hermann A. Keller. (Eng. and Min. Journ., June 27, 1908; 5¾ pp.) Describes the deposits of copper sulphide ore lying about 150 miles from the coast of Alaska, which will soon be reached by a railroad. Illustrated. 20c.

6886—ALASKA—The Mineral Resources of the Kotsina and Chitana Valleys, Copper River Region. Fred H. Moffit and A. G. Maddren. (U. S. Geol. Surv. Bull. 345, 1908; 51 pp.) This paper embodies the results of last season's work, and includes the copper deposits of the Kotsina and Chitina regions. Enough of the general geology is introduced to give a clear idea of the relation existing between the copper ores and the rock with which they are associated.

6887—ARIZONA—Changes in Equipment of Copper Queen Mine. G. H. Allen. (Min. Sci., July 9. 1908; 1½ pp.) Description of the new equipment lately installed at the property of the company at Bisbee, Ariz. Illustrated. 20c.

6888—COST OF PRODUCING COPPER in Arizona. James Ralph Finlay. (Eng. and Min. Journ., July 4. 1908; 1¾ pp.) The low cost per pound in the four chief districts of Arizona is due to the richness of the ore rather than to favorable conditions. 20c.

6889—LEACHING—The Jumau Copper Leaching Process. (Eng. and Min. Journ., July 18, 1908; ¾ p.) The inventor of this process, Lucien Jumau, has taken out many patents. The process depends upon heating a solution of copper sulphate in sulphurous acid, and is applicable to the leaching of copper ores. 20c.

6890—MINING METHODS — Michigan Copper Mining Methods. Lee Fraser. (Min. and Sci. Press, June 20, 1908; 3⅓ pp.) Describes the methods of mining in some of the principal mines of the Lake Superior district. Illustrated. 20c.

6891—NEVADA—Developments in the Ely District of Nevada. Leroy A. Palmer. (Min. Wld., June 20, 1908; 4¾ pp.) Describes the Steptoe Valley Smelting and Mining Company's plant at Ely, Nev., and gives the steps in the concentration of the ore. Illustrated. 20c.

6892—QUEENSLAND—Cloncurry Copper Mining District. L. C. Ball. (Queens Gov. Min. Journ., May 15, 1908; 7½ pp.) Conclusion of article previously mentioned in this Index, dealing with history, economics, geology, copper ore deposits and iron ore deposits. 60c.

6893—PRODUCTION—The World's Copper Supplies in 1907. John B. C. Kershaw. (Cassier's Mag., July, 1908; 8 pp.) Describes graphically the production of copper in the world and in various countries for a period of ten years. 40c.

6894—REFINING—The Silver Refinery of the New Addition to the Raritan Copper Works. Frank D. Easterbrooks. (Electrochem. and Met. Ind., July, 1908; 4 pp.) Describes the method of recovering gold and silver from the bottoms of the tanks. Illustrated. 40c.

6895—SMELTING—Copper Smelting in Siberia. William A. Heywood. (Min. and Sci. Press, July 11, 1908; ¾ p.) A description of the ore and method of smelting at the Spassky Works in the Akmolinsk district of Siberia. 20c.

6896—TASMANIA—Mining at Mount Lyell. R. C. Sticht. (Am. Min. Rev., June 20, 1908; ¾ p.) Deals with the pyritic smelting practice of this mine. 20c.

6897—UNITED KINGDOM—Copper Mining in the United Kingdom. (Engineering, June 5, 1908; 1 p.) A review of copper mines and districts covering a period of 40 years, with figures of production from various mines in 1906. 40c.

GOLD AND SILVER

6898—ALASKA—Investigations of the Mineral Deposits of Seward Peninsula. Philip S. Smith. (U. S. Geol. Surv. Bull. 345, 1908; 47 pp.) In Seward Peninsula the year 1907 was marked by increased activity in prospecting for both placer and lode deposits, but no rich bonanzas like those found in 1905-6 were discovered.

6899—ALASKA—Occurrence of Gold in the Yukon-Tanana Region. L. M. Prindle. (U. S. Geol. Surv. Bull. 345, 1908; 9 pp.) The placer gold production of the Yukon-Tanana region up to 1907 inclusive, has been approximately one-third of the total gold production of Alaska.

6900—ALASKA—Prospecting and Mining Gold Placers in Alaska. John Power Hutchins. (U. S. Geol. Surv. Bull. 345, 1908; 24 pp.) Discusses the progress in prospecting and mining for gold in Alaska, including handling frozen ground, prospecting in general, the operation of churn drills, the necessity of accuracy in sampling, shaft prospecting, hydraulic mining, open-cut mining, dredging, and drift mining.

6901—ALASKA—The Forty Mile Gold-Placer District. L. M. Prindle. (U. S. Geol. Surv. Bull. 345, 1908; 11 pp.) Discusses the geography, geology, origin of gold, mining developments, and the production of gold in this district of Alaska.

6902—COLORADO—Treasure Mountain, Colorado. C. W. Purington. (Min. and Sci. Press, July 4, 1908; 3 pp.) Describes the geological conditions existing at this Colorado camp which produces gold accompanied by silver, lead and zinc. Illustrated.

6903—COSTS AND PROFITS in Silver-Lead Ore Production. James Ralph Finlay. (Eng. and Min. Journ., June 27, 1908; 3¾ pp.) Factors governing costs of mining, smelting and marketing. Comparisons of conditions in the Coeur d'Alene, Broken Hill and Park City districts. 20c.

6904—CYANIDE COSTS. A. R. Parsons. (Min. and Sci. Press, July 11, 1908; ½ p.) The data in this article refers to the cost of cyaniding at the plant of the Desert Power and Mill Company, Millers, Nev., for the month of May, 1908. 20c.

6905—CYANIDATION in Nevada. A. G. Kirby. (Min. and Sci. Press, June 20, 1908; 4 pp.) Describes actual mill runs on about 700 tons of the sulphide ores taken from the lower levels of the Combination and Mohawk mines at Goldfield. Contains details of all the steps in the tests. 20c.

6906—CYANIDATION — Veta Colorada Cyanide Mill, Parral, Mexico. Claude T. Rice. (Eng. and Min. Journ., July 18, 1908; 2¾ pp.) This is the first mill to introduce cyanide treatment for the silicious silver ores from the Veta Colorada vein. The process proposed is fine grinding, agitation and filtration. 20c.

6907—DREDGING PLACER GRAVELS at Breckenridge, Colo. Arthur Lakes. (Mines and Minerals, July, 1908; 5½ pp.) A description of the ground at Breckenridge, Colo., and the construction and operation of the dredges. Illustrated. 20c.

6908—MEXICO—El Rayo Gold Mine, Near Santa Barbara, Mexico. Claude T. Rice. (Eng. and Min. Journ., July 11, 1908; 2⅓ pp.) Discusses the method of development, mill treatment, zinc-dust precipitation and the percentage of extraction of the El Rayo gold mines near Santa Barbara, Mex. Illustrated. 20c.

6909—MEXICO—Mining and Transportation at Santa Eulalia. Claude T. Rice. (Eng. and Min. Journ., July 4, 1908; 3 pp.) The conditions are favorable, the mines are dry, the country rock requires little support and labor is good and not expensive in this Mexican mining district. Illustrated.

6910—MEXICO—Ores and Mines of Santa Eulalia, Mexico. Claude T. Rice. (Eng. and Min. Journ., June 27, 1908; 4 pp.) In spite of low metal prices this district is fairly active owing to the demand for its oxidized silver-lead ores. Illustrated. 20c.

6911—NEVADA—Geological Possibilities at Goldfield. Arnold Becker. (Min. and Sci. Press, June 20, 1908; 1 p.) Discusses the possibilities of an extension of the producing area at Goldfield indicated by geological formations. 20c.

6912 — NEVADA — Goldfield, Nevada-V. T. A. Rickard. (Min. and Sci. Press, June 20, 1908; 4 pp.) The fifth article of the series treats of the metallurgical development and describes the mill treatment of the ore. Illustrated. 20c.

6913—NEVADA — Goldfield, Nevada-VI. T. A. Rickard. (Min. and Sci. Press, July 4, 1908; 2½ pp.) Describes transportation facilities by automobile in the Nevada desert and the existence of gambling at Goldfield. Illustrated. 20c.

6914—NEVADA — Goldfield, Nevada-VII. T. A. Rickard. (Min. and Sci. Press, July 11, 1908; 3¾ pp.) Deals with the losses which have been experienced by the various mining companies. The mills of the district are described. Illustrated. 20c.

6915—NEVADA—Seven Troughs Mining District. (Min. and Eng. Rev., June 13, 1908; 2 pp.) Describes the principal mines of this district, and also the geology and general conditions. 20c.

6916—NEVADA—The Great Ore Deposits of Eldorado. Will C. Higgins. (Salt Lake Min. Rev., June 30, 1908; 5¼ pp.) The geology and ore deposits of Eldorado cañon in Lincoln county, Nev., are described, and the details of the workings of several mines in this district are given. Illustrated. 20c.

6917 — NEVADA — The Mendha-Nevada Mining Company. Will C. Higgins. (Salt Lake Min. Rev., June 15, 1908; 2¾ pp.) Describes the operation of the old Mendha mine and adjoining property in the Highland mining district, Lincoln county, Nev. The ores of this mine have been much sought after on account of their lead-fluxing properties. Illustrated. 20c.

6918—ONTARIO—Cobalt, Ontario. H. B. Smith. (Min. and Sci. Press, June 27, 1908; 2¾ pp.) Describes the methods of prospecting, the character of the veins, and the geological formations of the Cobalt district. Illustrated. 20c.

6919—ONTARIO—Ores and Rocks of the Cobalt Region. R. E. Hore. (Con. Min. Journ., July 1, 1908; 2 pp.) Describes the ores and rocks and their occurrence in this district. 20c.

6920—ONTARIO—The Market for Cobalt Ores. Alexander Gray. (Min. Journ., June 6, 1908; 1 p.) Reviews the basis of settlement by the various smelteries that purchase Cobalt ore. Includes also a statement of the production of the principal mines together with the capital of each and the dividends paid to date by each company. 40c.

6921—ORE TREATMENT—Treatment of Gold Ores in New Zealand, South Africa, America, and Queensland. G. E. Bray. (N. Z. Mines Rec., April 16. 1908; 3½ pp.) Describes the latest methods of ore treatment at the Waihi mines in New Zealand and compares the practice with that of the United States and in South Africa. Abstract of paper before the North Queensland Min. and Mill-managers' Assn. 40c.

6922—PRODUCTION—The Market Price and Gold Production. A. Del Mar. (Eng. and Min. Journ., June 27, 1908; 1 p.) The author expresses his views regarding the much discussed question as to the price of commodities and the production of gold. 20c.

6923—REFINING—The Silver Refinery of the New Addition to the Raritan Copper Works. F. D. Easterbrooks. (Electrochem. and Met. Ind., July, 1908; 4 pp.) See under "Copper."

6924—SLIME SETTLEMENT—Theory of the Settlement of Slime. H. S. Nichols. (Min. and Sci. Press, July 11, 1908; 2¼ pp.) This is a critical consideration of the factors affecting the settlement of slime, and is illustrated graphically, showing the settlement of slime under various conditions. 20c.

6925—SLIME TREATMENT—The Butters Vacuum Filter. G. H. Clevenger. (Mines and Minerals, July, 1908; 2½ pp.) Considers the general principles underlying the treatment of slimes, and describes the construction and operation of the Butters filter. 20c.

6926—SOUTH AFRICA—Amalgamations Past and Present. (So. Afr. Min. Journ., May 23, 1908; 1 p.) Discusses recent and important combinations of mining properties on the Rand, and mentions plan for further amalgamations which are under way. 20c.

6927—TELLURIDE ORES—Some Observations of the Assay of Telluride Ores. George Borrowman. (Journ. Am. Chem. Soc., June, 1908; 3¾ pp.) Contains data which seems to warrant the conclusion that tellurium as the cause of irregularities in crucible work has been over-estimated. 80c.

6928—VENTILATION of Rand Mines. J. H. Johns, A. W. Stockett, J. Blane, S. H. Pearce, W. L. Honnold, W. T. Hallimond and J. McArthur Johnson. (South African Min. Journ., May 30, 1908; 1 p.) The Committee who studied the subject of ventilation of the gold mines of Transvaal is of the opinion that the ventilation, as a whole, compares favorably with that of metalliferous mines in any part of the world. 40c.

IRON AND STEEL

6929—ALABAMA—The Brown Iron Ores of Alabama-III. William B. Phillips. (Iron Age, June 25, 1908; 2 pp.) Deals with the ore deposits at Baker Hill in Cherokee county, Alabama. Illustrated. 20c.

6930—ALABAMA—The Brown Iron Ores of Alabama.—IV. William B. Phillips. (Iron Age, July 9, 1908; 1 1/3 pp.) Fourth instalment of the paper on the iron-ore deposits of Alabama and deals with the removal of clay and chert from the ore. 20c.

6931—AUSTRALIA as an Iron-Producing Country. (Report, Chamber of Mines of Victoria, May 28, 1908; 8 pp.). Discusses some of the conditions which have an influence upon the production of iron in Australia. It is stated that pig iron can be produced from ore at a cost of 35s.

6032—AUSTRIA—Etat Actuel de la Siderurgie en Autriche. H. Ponthiere. (Ann. des Mines de Belgique, Tome XIII, 2 livr., 1908; 27 pp.) Outlines the present condition of the iron industry in Australia, and describes the plants of some of the most important companies.

6933—CASTINGS—Hard Spots in Steel Castings, with an Account of Certain Diffusion Phenomena. Arthur P. Scott. (Electrochem. and Met. Ind., July, 1908; 5½ pp.). Describes experiments to determine the reason for the occurrence of hard spots in steel castings, to account for certain diffusion phenomena. Illustrated. To be concluded. 40c.

6934—CHAIN MAKING—How Weldless Chains are made. Alexander G. Strathern. (Trans. Min. Inst. Scot., Vol. XXX, Part 4, 1908; 12 pp.) Discusses the history of weldless and other chains covering a period of about 100 years. The Strathern process involves what is known as "segmental rolling" or "tamping."

6935—CHEMISTRY—The Chemist in the Iron Trade. George Auchy. (Iron Age, July 2, 1908; 2 pp.) Discusses the usefulness of the chemical engineer and the analytical chemist in the iron trade. Contains a criticism of colleges for the methods and scope of the training they have so far been giving along the lines of analytic chemistry. 20c.

6936—CHROMIUM AND TUNGSTEN—Function of Chromium and Tungsten in High-Speed Tool Steel. C. A. Edwards. (Iron and Coal Tr. Rev., May 15, 1908; ¾ p.) A research into the effect of chromium and tungsten in high-speed tool steel, together with a discussion of the effect upon the critical temperatures of steel by the addition of these elements. Paper before the Iron and Steel Institute. 40c.

6937—CHROMIUM-TUNGSTEN—Die Wirkung von Chrom und Wolfram in Schnelldrehstählen. C. A. Edwards. (Metallurgie, June 8, 1908; 1½ pp.) Results of a thorough investigation into rapid tool steels hardened with chromium and tungsten. 40c.

6938—COLORADO FUEL AND IRON COMPANY'S PLANT at Minnequa, Colorado. George J. Bancroft. (Min. Sci., June 18, July 2 and 9, 1908; 9½ pp.) Deals with the growth and equipment of the Minnequa plant of the Colorado Fuel and Iron Company. To be continued. 60c.

6939—CUPOLA PRACTICE—Kupelofenbetrieb in Amerika. O. Leyde. (Stahl u. Eisen, May 27, 1908; 2½ pp.) Conclusion of article previously mentioned in this Index. 40c.

6940—ELECTRIC FURNACE—Ein neuer elektrischer Ofen zum Schmelzen von Erzen. B. [illegible] (Metallurgie, June 8, 1908; 2 pp.) Describes a new furnace for electric smelting of iron ore, and enumerates its advantages. 40c.

6941—ELECTRIC FURNACES—Electric Iron and Steel Furnaces. (Engineering, June 12, 1908; 2¾ pp.) Conclusion of article on electric iron and steel furnaces, describing the Kjellin, Schneider, Colby and other electric furnaces. 40c.

6942—FATIGUE—Eine neue Ermüdungsprobe für Eisen und Stahl. A. E. Stanton. (Metallurgie, June 8, 1908; [illegible] pp.) Describes a new machine for testing the fatigue of iron and steel, and compares results of a number of specimens of known composition. 40c.

6943—FERROALLOYS in the Foundry. W. M. Saunders. (Iron Age, July 2, [illegible]; and Foundry, July, 1908; 1½ pp.) Discusses the properties of manganese silicon, titanium, phosphorus, [illegible], nickel, etc., when alloyed with iron and used in the foundry. Paper read before Am. Foundrymen's Assn., June, 1908. 20c.

6944—FOUNDRIES—Iron, Steel, Malleable and Brass Foundries in the United States and Canada. (Foundry, July, 1908; 3 pp.) It is shown that there are 5,812 iron, steel, brass and malleable foundries in the United States. The leading centers are pointed out and the list of the principal cities containing foundries is given. 20c.

6945—FOUNDRY COSTS—[illegible] Foundry Costs. (Iron Age, June 25, 1908; 3 pp.) Discusses a chart which shows the main divisions in a scheme of foundry cost distribution. The paper also takes up various phases of the jobbing foundry, and the large and small foundry selling mostly to the trade and to its own machine shop. 20c.

6946—FOUNDRY PRACTICE—Chemistry: Its Value in Modern Foundry Practice. Milton L. Hersey and Ira B. Lesh. (Journ. Soc. Chem. Ind., June 15, 1908; 3 pp.) Describes the properties of cast iron and points out the advantages to be obtained by employing a chemist in mixing iron for castings. 80c.

6947—GALVANIZED IRON—Testing Galvanized Iron. Sherard Cowper-Coles. (Eng. and Min. Journ., July 4, 1908; ½ p.) From the results of experiment the copper sulphate test has been found to be quite unsuitable for testing electro[illegible]perized surfaces. 20c.

6948—GAS POWER—The Gas Engine for Iron and Steel Work. H. J. Gibbons. (Gas Engine, July, 1908; 2 pp.) The great fuel economy of gas engines as compared with steam engines has made gas producer plants [illegible] el works. 20c.

6949—GERMAN IRON AND STEEL INDUSTRY. T. Good. (Cassier's Mag., July, 1908; 6 pp.) A discussion of the developments of the pig iron and steel industry in Germany, [illegible] the British manufacturer. 40c.

6950—GERMAN POTASH—Deutschlands Kalibergbau. (Der Bergbau, June 11, 1908; 3 pp.) Reviews the present state of the potash salt industry of Germany. 20c.

6951—HYDRO-ELECTRIC PLANT of Penn Iron Mining Company, at Vulcan, Michigan. Thomas W. Orbison and Frank H. Armstrong. (Proc. Lake Superior Min. Inst., June, 1908; 29 pp.) The Penn Iron Mining Company has installed an electric plant at Vulcan, Mich. This installation is fully described and illustrated. [illegible]

6952—IRON WORKS—[illegible] Iron Works Improvements. (Iron Age, July 2, 1908; 5 pp.) Describes the blast furnace, open-hearth and power plants of this Ohio concern as well as its coal and iron mines in Minnesota. A new 72-in. plate, jobbing and sheet mill has been added to the works. 20c.

6953—IRON WORKS LABORATORIES—Zur Organisation moderner Eisenhütten-laboratorien. A. Wencelius. (Stahl u. Eisen, May 27, 1908; 4½ pp.) Conclusion of article previously mentioned in this Index. 40c.

6954—MAGNETIC PROPERTIES—A Laboratory Experiment to Illustrate the Changes in Magnetic Properties Occurring at the Thermal Critical Points in Steel. H. M. Boylston. (Electrochem. and Met. Ind., July, 1908; 1½ pp.) Describes apparatus to determine the critical points in steel and points out that the method might be used commercially for determining the critical points in an unknown high-carbon steel. It is also suggested that the apparatus described might be used as an automatic quenching device for [illegible]

[illegible] tion of iron in [illegible]

[illegible] Am. Chem. Soc., July, [illegible] cusses various methods [illegible]

[illegible] the cost of manufacturing pig-iron [illegible]

6958—ORE TRANSPORTATION—K[illegible] und Eisen in Nordamerika. Baum. (Glu[illegible] article previously indexed; this section [illegible]

[illegible] PHOSPHIDES [illegible] nature of the phosphorus found in iron [illegible]

6960—PHOSPHORUS IN IRON—[illegible] B. Saklatwalla. (Iron [illegible] May 15, 1908; 1¾ pp.) [illegible] physical and chemical properties of iron. 40c.

6961—PRODUCTION—Iron and Steel Production of the World. (Eng. and Min. Journ. [illegible] the pig iron of the world near [illegible] tons of ore, flux and fuel are [illegible]

[illegible] PROPERTIES OF STEELS [illegible] Static and Dynamic Properties of Steels. W[illegible] as well as to the [illegible] strength. 20c.

[illegible] Wärmetechnik des Siemens-Martinofens. F[illegible] 40c.

[illegible] Bau von Blechwalzwerken. W. Schnei[illegible] Describes the latest progress in machinery [illegible]

6965—RUSTING—Das Rosten von Eisen. J. N. Friend. (Metallurgie, June 8, 1908; [illegible] involved in the r[illegible]

[illegible] Randolph Bolling. (Iron Age, [illegible] ¾ p.) This method is rapid [illegible] ard fusion method. 20c.

[illegible] fenschlacken. R. von [illegible] 3 pp.) [illegible] utilized. 40c.

[illegible] Resultate [illegible] mittels N[illegible]

[illegible] Features of the Present S[illegible] in rolling rails, [illegible] 20c.

[illegible]

fluence of sulphur upon iron-carbon alloys. 40c.

LEAD

6972—BULLION Handling Blast Furnace Bullion at the Selby Smelting Works. James C. Bennett. (Eng. and Min. Journ., July 11, 1908; 2¾ pp.) Discusses in detail a new system of handling base bullion at the Selby smelting works, points out the difficulties in casting, and discusses other points of interest. Illustrated. 20c.

6973—MISSOURI—Mining and Milling Methods at Granby, Missouri. Evans W. Buskett. (Min. Wld., July 11, 1908: 2 pp.) Unique method of acquiring and working mineral lands. System of payment for ores. Equipment and operation of mill. Illustrated. 20c.

LITHIA

6974—MANUFACTURE of Lithia From Lepidolite. Wm. Jay Schieffelin and Thomas W. Cappon. (Journ. Soc. Chem. Ind., June 15, 1908; 1¾ pp.) Describes the decomposition of the ore, separation of alumina, the separation of alunite, calcium, iron, etc., and the precipitation of lithium carbonates. 80c.

NICKEL AND COBALT

6975—ANALYTICAL METHODS Contributions to the Volumetric Estimation of Cobalt. Charles D. Test. (West. Chem. and Met., June, 1908; 7 pp.) Describes various rapid methods for separating nickel and cobalt and determining them quantitatively. 40c.

PETROLEUM AND NATURAL GAS

6976—JOPLIN DISTRICT—Natural Gas for Power Use in the Joplin District. Otto Ruhl. (Min. Wld., June 27, 1908; 1½ pp.) Advantages of gas fuel over coal; burners for gas under boilers; consumption of gas under boilers and in engines. The composition and heating value of gas is discussed. The daily consumption of natural gas in the Joplin district is twenty-five million cubic feet, piped from Kansas. 20c.

6977—LUBRICATING OILS—On Viscosity and Lubrication. Charles F. Mabery and J. Howard Mathews. (Journ. Am. Chem. Soc., June, 1908; 10 pp.) Discusses the composition of lubricating oils with reference to the hydro-carbons, or series of hydro-carbons of which they consist. 80c.

6978—OCCURRENCE—The Illusiveness of Petroleum. W. S. Eberman. (Min. Wld., June 27, 1908; 1 p.) Some of the difficulties encountered in locating wells of petroleum and the history of the discovery of some of the greatest wells. 20c.

6979—ROUMANIA—Les Gisements Petroliferes de la Roumanie. Léon Demaret. (Ann. des Mines de Belgique, Tome XIII, 2 livr, 1908; 55 pp. and maps). Describes the geology of the Roumanian petroleum field, discusses the distribution of the industry and proposes a theory to explain the origin of the oilfields.

6980—TESTING—Data and Discussion of Methods of Testing California Oil. J. C. Christensen. (Cal. Derrick, June, 1908; 5 pp.) It is pointed out that the fact that an oil is distilled between certain temperatures is no guarantee that it will be of any value whatsoever as an illuminant or a lubricant. The physical and chemical properties of California oils are discussed and the methods for testing refined oils are given. 20c.

6981—TRANSPORTATION — Review of Statistical and Technical Facts Submitted to the President by the Commissioner of Corporations. L. H. Eddy. (Cal. Derrick, June, 1908; 1 p.) Contains data relative to the cost of pipe-line construction in the Mid-Continental field and pipeline transportation. 20c.

PHOSPHATE ROCK

6982—PHOSPHATES. Richard McMurtie. (Am. Fertilizer, June, 1908; 5½ pp.) Notes on phosphates, superphosphates, phosphatic slag and reverted phosphates. Discusses land rock, river rock, mining, washing and drying, pulverization and the manufacture of fertilizers. 20c.

PLATINUM

6983—SOLUBILITY—Ueber die Passivitat des Platins. Rudolf Ruer. (Zeit. f. Elektrochem., June 5, 1908: 5½ pp.) A study into the solubility of platinum in sulphuric acid of various strengths, and under varying electrolytic conditions. 40c.

RARE METALS

6984—SEPARATION OF RARE EARTHS—A Scheme for the Separation of the Rare Earths. C. James. (Journ. Am. Chem. Soc., June, 1908; 12⅓ pp.) Contains a comparatively simple scheme for the separation of mixtures of the rare earths. 80c.

6985—TITANIUM — The Estimation of Titanium. G. B. Waterhouse. (Chem. Engr., April, 1908; 2½ pp.) Titanic acid may be separated from the large mass of iron in an iron ore by strongly heating the sample in a stream of hydrogen until the iron is reduced, then dissolving the iron with dilute acids and separating the silica by hydrochloric acid; the titanic acid is then brought into soluble condition by fusing with acid potassium sulphate. 40c.

SLATE

6986—QUARRYING—The Penrhyn Quarry. Henry Briggs. (Mines and Minerals, July, 1908; 3¼ pp.) The method of working and the arrangement of labor in the largest quarry in the world. The Penrhyn slate quarry is situated near Bethesda, North Wales. Illustrated. 20c.

STONE

6987—ALASKA—The Building Stones and Materials of Southeastern Alaska. Charles W. Wright. (U. S. Geol. Surv. Bull. 345, 1908; 11 pp.) The only stones of value in southeastern Alaska, so far as known, are the marble and granite. These stones together with gypsum and cement rock are discussed.

SULPHUR

6988—SICILIAN SULPHUR INDUSTRY. (Min. Journ., June 27, 1908; ¾ p.) Discusses the Sicilian credit bank. American competition; the export trade in sulphur and the sulphur trade with British colonies. 40c.

TIN

6989—ALASKA—The Seward Peninsula Tin Deposits. Adolph Knopf. (U. S. Geol. Surv. Bull. 345, 1908; 17 pp.) This paper summarizes the results of the geologic investigations which have been carried on in Seward Peninsula since the close of 1906. The known Alaskan tin deposits that are of a character sufficiently encouraging to warrant prospecting, are limited to the extreme western part of Seward Peninsula, and are embraced in an area of about 400 sq. miles.

6990—FRANCE—The Mines of Montebras. (Min. Journ., July 4, 1908; 1 p.) A description of the developments, dressing plants, the mineral reserves, the alluvial deposits, geology and other features of this mining district in France. Illustrated. 40c.

6991—ORE DRESSING—The Final Stages of Tin and Wolfram Dressing. S. L. Terrell. (Min. Journ., June 13, 1908; 1 p.) Deals with the final treatment of tin and tungsten after concentration, and takes up calcining and acid treatments. 40c.

6992—ORE DRESSING—Tin-Dressing at Stannary Hills, North Queensland. W. Lauder Cleveland. (Proc. Aust. Inst. Min. Eng., April, 1908; 12 pp.) The methods employed in dressing tin ore up to the required percentage of purity depends principally upon whether the ore is free milling or is a complex milling ore. Contains a description of the mill and some of the principal machinery. Illustrated with working drawings.

6993—REFINING—Die Elektrische Raffination des Zinn. O. Steiner. (Elektrochemische Zeit., June, 1908; 2½ pp.) Conclusion of article previously mentioned in this Index. 40c.

6994—SOUTH AFRICA — Potgietersrust Tin Fields. (So. Afr. Min. Journ., May 23, 1908; 1½ pp.) Output to date, geology of the district, Dr. Merensky's opinions, failure of government scheme and success of private producers. 40c.

TUNGSTEN

6995—CONCENTRATION — Magnetic vs. Hydraulic Concentration of Tungsten Ores. Harold H. Goe and Sydney W. French. (Min. Sci., July 2, 1908; 1½ pp.) Experiments to determine the relative advantages of magnetic and hydraulic concentration of tungsten ores as conducted by students in the Colorado State School of Mines, Golden, Colo. 20c.

6996—ORE DRESSING—The Final Stages of Tin and Wolfram Dressing. S. L. Terrall. (Min. Journ., June 13, 1908; 1 p.) See under "Tin."

ZINC

6997—BRANGLE ORE. H. A. Wheeler. (Eng. and Min. Journ., June 27, 1908; ½ p.) The term "brangle" is used in Wisconsin to designate the upper, highly leached portion of the Galena limestone. 20c.

6998 — METALLURGICAL CALCULATIONS. J. W. Richards. (Electrochem. and Met. Ind., July, 1908; 2¼ pp.) These problems deal with the condensation of zinc and mercury vapors, and are of interest not only to students, but also to metallurgists. 40c.

6999—MILL CONSTRUCTION in the Joplin District. Otto Ruhl. (Eng. and Min. Journ., July 18, 1908; 3⅓ pp.) The increased capacity has introduced changes in practice and the probable removal of the building to a new site is provided for in the plans. Illustrated. 20c.

ECONOMIC GEOLOGY—GENERAL

7000—ALASKA—The Distribution of Mineral Resources in Alaska. Alfred H. Brooks. (U. S. Geol. Surv. Bull. 345, 1908; 12 pp.) Gives a review of the principal minerals found in Alaska.

7001—ALASKA—The Mineral Deposits of the Lost River and Brooks Mountain Region, Seward Peninsula. Adolph Knopf. (U. S. Geol. Surv. Bull. 345, 1908; 4 pp.) The Lost river region displays a various mineralization, and prospecting has disclosed, in addition to the tin deposits, silver-lead, tungsten-lead, copper and perhaps gold deposits.

7002—ALPS—Notizen über einige Mineralvorkommen der Ostalpen. F. Cornu and K. A. Redlich. (Centralblatt f. Mineralogie, May 1, 1908; 7 pp.) Describes the occurrence of various interesting and economic minerals in the eastern Alps. 40c.

7003—COLORADO—Rock Oxidation at Cripple Creek. Philip Argall. (Min. and Sci. Press, June 27, 1908; 4 pp.) A description of the ore deposits at Cripple Creek, especially the oxidized portion of Globe hill, and a description of the deposits of gypsum found in this locality. Illustrated. 20c.

7004—IDAHO—The North Side of the Coeur d'Alene District. Herbert S. Auerbach. (Eng. and Min. Journ., July 11, 1908; 5¾ pp.) Describes the deposits of lead, silver and gold in this region which promise to become as productive as those in the more famous south side. 20c.

7005—ORE DEPOSITION—Diffusion as a Factor in Ore Deposition. Lewis T. Wright. (Min. and Sci. Press, June 20, 1908; 2 pp.) The author discusses the theory that the flow of minerals by aqueous diffusion in rocks is frequently the cause of forming ore deposits. 20c.

7006—ORE DEPOSITION—Evolution of Knowledge of Veins and Ore Deposits. Arthur Lakes. (Min. Sci., July 2, 1908; 2 pp.) A brief review of the various character of veins and ore bodies from which the knowledge of occurrence has been advanced. Illustrated. 20c.

7007—ORE DEPOSITION—Waters, Meteoric and Magmatic. T. A. Rickard. (Min. and Sci. Press, June 27, 1908; 3½ pp.) In discussing the article by J. F. Kemp in a previous issue, the author gives some additional information concerning meteoric water and their relation to ore deposits. 20c.

7008—SPAIN—Die Erzlagerstätten von Cartagena in Spanien. R. Pilz. (Zeit. f. prak. Geol., May, 1908; 14 pp.) A thorough study of the geology, the occurrence and the mining of lead, zinc, copper, iron and tin deposits at Cartagena. 40c.

7009—SOUTH AFRICA—Uebersicht über die nutzbaren Lagerstätten Südafrikas. F. W. Voit. (Zeit. f. prak. Geol., May, 1908; 27 pp.) A careful geological study of the deposits of all the useful and valuable minerals of South Africa, including gold, diamonds, copper, tin, and iron ores, magnesite, asbestos, etc. 40c.

7010—SOUTH AUSTRALIA—Report of Geological Reconnaissance from Van Dieman Gulf to the McArthur River, etc. (Adelaide, 1908; C. E. Bristow, Government Printer; 15 pp.) A detailed description of the expedition, containing a study of the geology of this Australian district.

7011—TUNIS—L'industria Mineraria in Tunisia. (Rassegna Mineraria, June 11, 1908; 3 pp.) Reviews the progress of the mining industry in Tunis, with special reference to zinc and lead ores, and phosphate rock. 40c.

MINING—GENERAL

7012—ACCOUNTING—Monthly Company Audits. (Report Chamber of Mines of Victoria, May 28, 1908; 2½ pp.) Points out the relationship existing between auditor and manager and shows how these two departments may work together for the benefit of the mining company.

7013—ALASKA—Lode Mining in Southeastern Alaska, 1907. Charles W. Wright. (U. S. Geol. Surv. Bull. 345, 1908; 21 pp.) Discusses the geology and ore-deposits of southeastern Alaska, including the mines on Douglas Island, and the copper, silver, lead and zinc prospects of this portion of Alaska.

7014—ALASKA—The Mining Industry in 1907. Alfred H. Brooks. (U. S. Geol. Surv. Bull. 345, 1908; 24 pp.) Discusses the progress of the mineral industry in Alaska during 1907 and gives data of the mineral production during 1906 and 1907.

7015—ALASKA—Water Supply of the Fairbanks District, 1907. C. C. Covert. (U. S. Geol. Surv. Bull. 345, 1908; 8 pp.) These investigations were for the purpose of determining both total flow and the distribution of flow during the open season, and of collecting data regarding the general conditions affecting the water supply and its development.

7016—ALASKA—Water Supply of the Nome and Kougarok Regions, Seward Peninsula, 1906-7. Fred F. Henshaw. (U. S. Geol. Surv. Bull. 345, 1908; 14 pp.) Describes the systematic measurements of the flow of streams in Seward Peninsula to determine the total flow and the distribution of flow of various streams during the mining season; collecting facts in regard to general conditions affecting the water supply; and gathering statistics with regard to the diversion and use of water.

7017—AUSTRALIA—Mining in Australasia in 1908. F. S. Mance. (Eng. and Min. Journ., July 18, 1908; 2 pp.) Conditions of the mining industry in the southern Continent in the current year. Gold, silver, lead, copper, tin, and zinc, are produced. 20c.

7018—BRITISH COLUMBIA—Annual Report of British Columbia Mines. (B. C. Min. Exchange, June, 1908; 3 pp.) Contains the statistics of the ore production of British Columbia which amounted to nearly a million dollars more than the production of 1906. Contains a review of coal mining in British Columbia during 1907. From Report of the Minister of Mines. 20c.

7019—BRITISH COLUMBIA—Mineral Production of British Columbia. Ernest Jacobs. (Eng. and Min. Journ., June 27, 1908; 2½ pp.) Official returns from the leading mineral province of Canada. Decreased production of gold, silver, and lead, but gains in coal and coke are shown. 20c.

7020—BURMA, CHILE AND BOLIVIA—Recent Mining Wanderings in Burma, Chile, and Bolivia. J. H. Curle. (Min. and Sci. Press, June 27, 1908; 4 pp.) An account of the travels of the author through Burma, Chile, and Bolivia, and his description of the mining industry in these countries, together with some interesting accounts of the conditions existing at various mining camps. 20c.

7021—CHINA—Mineral Production of China in 1907. Thomas T. Read. (Eng. and Min. Journ., June 27, 1908; 2¾ pp.) The empire has abundant resources but the mineral industry is slow in developing and little information is available. Deals with the production of coal, iron-ore, gold, tin, copper, other minerals and foreign capital in China. 20c.

7022—COMPRESSED AIR—The Dangers of Working in Compressed Air. (Min. Journ., June 6, 1908; ¾ p.) Describes the dangers of working in compressed air and precautions which should be taken; valuable data is given relative to this class of work. 40c.

7023—COMPRESSED AIR—The Dense Air System. George S. Binckley. (Am. Min. Rev., June 20, 1908; 2½ pp.) The basis of this system is the maintenance of a high "artificial atmosphere" in the closed system within which the air circulates as the medium for the transmission of energy from the prime mover to the machine to be driven. Illustrated. 20c.

7024—CONVEYING OF MATERIAL—The Elements of Chemical Engineering. (Chem. Engr., June, 1908; 8¼ pp.) This is the third article of the series and deals with the conveyance of solids. The subjects treated are screw conveyers, belts and chain elevators, and bucket elevators. Illustrated. 40c.

7025—COSTS—Variations in Mining Costs. T. A. Rickard. (Min. and Sci. Press, July 4, 1908; 2¼ pp.) The author adds some valuable information relative to the cost of mining at the Bunker Hill and Sullivan mine. 20c.

7026—DAM CONSTRUCTION—[illegible] [illegible] data of the building of a dam for a small [illegible] giant fed by a 4-inch centrifugal pump. Illustrated. [illegible]

7027—ELECTRIC EQUIPMENT—Zur Frage der Wirtschaftlichkeit elektrischer Förderanglagen aur Kaligruben. W. Philippi. [illegible] potash mines. 40c.

7028—EXCAVATION—[illegible] the Cost of Wheel Scraper Work, with Com[illegible]

7029—EXPLOSIVES—[illegible] (Eng. News, June 25, 1908; ½ p.) Describes and illustrates the construction of a thaw house built and tested by the Aetna Powder Co. 20c.

7030—FIRE EXTINGUISHING—[illegible] tungstruppe der Zeche Rheinpreussen bei Homberg a. Rhein. O. Dobbelstein. (Glückauf, June 6, 1908; 6 pp.) Describes the equipment for fighting mine fires and saving [illegible] at this mine. 40c.

7031—GEORGIA—Mining and Metallurgical Industry of Georgia. Henry A. Mather. (Min. Wld., June 20, 1908; 1¾ pp.) A description of the geology of the Dahlonega district, together with a discussion of the gold, china, clay, talc, and rare-ore deposits of Georgia. This State has produced, since 1825, ten million dollars in gold. 20c.

7032—GREAT BRITAIN—Twenty-five Years of Mining. Edward Ashmead. (Min. Journ., July 4, 1908; 2¼ pp.) A review, covering the years 1880-1904, of mining companies registered in Great Britain, with notes and comments and the names and capitalization of the principal mines. (To be continued.) 40c.

7033—HAULAGE SYSTEM of the Yak Tunnel. E. C. DeWolf. (Min. and Met. Journ., June 26, 1908; 2½ pp.) A description of the methods employed in handling ore and waste at the Yak tunnel, Leadville, Colo. This property is equipped with one of the most improved haulage systems in the West. 20c.

7034—HOISTING ROPES—Wie Sollen Seil und Kettentriebe mit Rücksicht auf die Haltbarkeit des Zugorgans konstruiert [illegible] Ernst Heckel. (Stahl u. Eisen, [illegible] 1908; 8¼ pp.) A valuable exposition of the manner in which wear occurs in hoisting ropes and chains, with suggestions for reducing the deterioration of such ropes. 40c.

7035—IDAHO—Mining in the Coeur d'Alene District. J. F. Rowe. (Mines and Minerals, July, 1908; 2 pp.) A description of the country, the history, the geology, the principal mines and long tunnels of this Idaho mining district. Illustrated. 20c.

7036—LAKE SUPERIOR MINING INSTITUTE. (Eng. and Min. Journ., July 11, 1908; 1 p.) Describes the meeting of the Lake Superior Mining Institute held recently on the Mesabi range and gives an account of the excursion taken in this Lake Superior mining district. 20c.

7037—MEXICO—The Mines of Northwestern Altar, Sonora, Mexico. George W. Maynard. (Eng. and Min. Journ., July 11, 1908; 1¾ pp.) Description of La Abundancia mine, the [illegible] group on the west [illegible] mountain, the Ruizena group, and the general prospects of the mines of northwestern Altar, Sonora, Mex. 20c.

7038—MINE METHODS and Timbering. W. H. Storms. (Am. Min. Rev., June 20, 1908; ¾ pp.) Cutting and timbering stations at shafts; advisability of pockets beneath the level; skips vs. cages. (To be continued.)

7039—MINE METHODS and Timbering. W. H. Storms. (Am. Min. Rev., June [illegible] 1908; 1½ pp.) [illegible] by bailing, fenders for the protection of the [illegible] mat. Illustrated. 20c.

7040—MINE SURVEYING. [illegible] W. Helmick. (The Transit, Published by Eng. Soc. State Univ. of Iowa, 1908; [illegible]) Contains some notes upon the salient features that present themselves in the general routine surveying in mining work.

7041—MINING ENGINEERING—The Human Side of a Mining Engineer's Work. Edmund B. Kirby. (Eng. and Min. Journ., July 18, 1908; 1½ pp.) Discusses the [illegible] of a mining engineer and gives [illegible]

[illegible] sion. 20c.

[illegible]

of the claim, and the right of possession. 20c.

[illegible] made. (Min. Wld., June 27, 1908; 3¾ pp.) [illegible] of the ore deposits, [illegible] per mines of the district. Illustrated. 20c.

7046—NORTH CAROLINA—The Mining Industry in North Carolina During 1906. Joseph Hyde Pratt. (N. C. Geol. and Econ. Survey, Economic Paper No. 14, 1907; 142 pp.) This report deals especially with a description of the producing gold mines, and a general discussion of the occurrence of mica in North Carolina. In addition the economic [illegible] for 1906 and previous years.

7047—PERU as a Field of Interest to Mining Men and Investors. L. Lema. (Min. Wld., June 18, 1908; [illegible]) [illegible] of article previously indexed, giving a short account of the topography, climate, mineral resources and other interesting facts. Illustrated. [illegible]

7048—RESCUE WORK—How Rescue Work [illegible] W. J. Miligramm. (Min. Wld., June 27, 1908; 1½ pp.) Rescue stations and their equipment for mines. Selecting and training men for rescue work. [illegible] asphyxiated persons. 20c.

7049—RESCUE WORK—Truppe und Gerätewagen der Bergwerksgesellschaft Hibernia für dem Rettungsdienst. F. Hagemann. (Glückauf, June 6, 1908; 5 pp.) Describes an emergency wagon for carrying the apparatus needed for extinguishing fires and rescuing laborers at this mine. 40c.

7050—RESCUE WORK—Die Zentralstelle für Grubenrettungswesen in Beuthen O. S. [illegible] wicklung des Grubenrettungwesens im oberschlesischen Industriebezirk. Mandel. (Glückauf, June 6, 1908; 10 pp.) Describes in detail the building and the equipment used at this mine for doing rescue work and for training the corps of life savers. 40c.

7051—ROCK EXCAVATION by Mechanical Power Instead of Explosives. (Eng. News, June 25, 1908; 1 p.) Describes the excavation of rock submerged under water. It is comparatively easy to excavate in this manner, but the cost is high. 20c.

7052—STOPING—Notes on Hand Stoping and Underground Management on the Rand. J. A. Wickes. (Min. Journ., June 20, 1908; ¾ p.) This is an article on hand stoping written especially for surveyors, samplers or shift bosses, and takes up the subject of timbering and underground organization. 40c.

7053—TUNNEL DRIVING at Low Cost. Walter H. Bunce. (Min. and Sci. Press, July 11, 1908; 1 p.) Although the driving of the Chipetaadit tunnel at Ouray, Colo., was not especially notable, the driving was rapid and [illegible]

7054—TUNNEL LINING—[illegible] ing Concrete Tunnel Lining. (Eng.-Con., [illegible] 1908; [illegible]) [illegible] handling material economically. 20c.

7055—TUNNELING—[illegible] Under a River. Clarence Mayer. (Eng. Con., [illegible]) [illegible] struct a small tunnel. The costs of each class of work are given in detail. Illustrated. [illegible]

7056—TUNNELING—[illegible] an Earth Tunnel for a Railroad. (Eng.-Con., [illegible]) driving an earth tunnel including the pay of all labor, cost of explosives, tunnel excavation, timber lining and other items of construction. 20c.

7057—WEST AUSTRALIAN MINING PRACTICE—VII. E. Davenport Cleland. (Monthly Journ. Chamber of Mines of W. A., April 30, 1908; 21½ pp.) In the seventh instalment of this article the underground transportation of ore is discussed which includes tracks, cars, cages, skips and safety appliances. Illustrated by photographs and working drawings.

7058—WIRE ROPE—The Stress in Wire Ropes Due to Bending. R. W. Chapman. (Proc. Aust. Inst. Min. Eng., April, 1908; 21 pp.) Gives formulas for the determination of bending stress in wire rope, and also changes in the curvature of the wires of a rope when bent around a pulley. Contains useful tables and data on the subject of stress in wire rope. Illustrated.

ORE DRESSING—GENERAL

7059—ORE SAMPLING by Machines. John A. Church. (Eng. and Min. Journ., July 18, 1908; 2¾ pp.) Conditions necessary to accurate sampling. The disturbing effects of uncontrolled gravitation. The control of feed would be a valuable novelty.

7060—SARDINIA—Les Laveries Sardes. M. Minette d'Oulhaye. (Rev. Univ. des Mines, April, 1908; 27 pp.) Describes and discusses the eight leading concentrating works on this island, giving general conclusions.

METALLURGY—GENERAL

7061—ALLOYS—New Application of Electro-Metallurgical Alloys. Ad. Jouve. (Engineering, July 3, 1908; ¾ p.) Discusses the use of metallic alloys of silicon to resist the action of acids when the alloy is made into vessels or dishes for chemical purposes. Paper read before Faraday Society. 40c.

7062—ALLOYS—The Valuation of Engineering Alloys. Richard K. Meade. (Chem. Engr., June, 1908; 9 pp.) Gives the composition and uses of various alloys including bearing metals, solders and fusible alloys, foundry, rolling-mill, and various other alloys. 40c.

7063—BRONZE AGE—The Metallurgy of the Bronze Age. W. M. Corse. (Foundry, July, 1908; 2½ pp.) A discussion of the bronze age in Europe including a reference to mixtures and early practice. 20c.

7064—CHIMNEY—A Tall Concrete Smelter Chimney. (Eng. Rec., June 6, 1908; 1¼ pp.) The gases from this chimney located at the Colusa-Parrott Mining and Smelting Company, at Butte, Mont., are corrosive and the chimney stands on a foundation of slag from the smeltery. 20c.

7065—MOLDING SANDS—Relative Values of the Physical and Chemical Examinations of Molding Sands. Heinrich Ries. (Foundry, July, 1908; 2½ pp.) Discusses the physical and chemical examination of molding sands for cohesiveness, chemical analysis, refractoriness, textures, structures, permeability and porosity. Paper before Am. Brass Founders' Assn. 20c.

7066—SMELTER SMOKE—The Chronic Arsenical Poisoning of Herbivorous Animals. W. D. Harkins and R. E. Swain. (Journ. Am. Chem. Soc., June, 1908; 19 pp.) Discusses the effects of arsenical poisoning upon animals used in and about the works. 80c.

7067 — SMELTER SMOKE—Smoke in Smelting Works. E. H. Messiter. (Min. and Sci. Press, July 4, 1908; 1¾ pp.) Discusses the production of smoke from a furnace or flue discharging incorrectly; from furnace doors and when given off by molten or heated materials from the furnace. 20c.

7068—SMELTING Ore Contracts from the Smelter's Standpoint. Clarence A. Grabill. (Eng. and Min. Journ., July 11, 1908; 4⅓ pp.) Smelting involves a great many varying items of cost which cannot be fairly apportioned under a flat rate. Discusses Mr. Adkinson's article on the relation between the producer of ores and the smelter. Illustrated. 20c.

MINING AND METALLURGICAL MACHINERY

7069—AERIAL TRAMS—Die neuen Transportanlagen der Gewerkschaft Grossherzog von Sachsen in Dietlas. (Glückauf, May 30, 1908; 3 pp.) Describes a German wire-rope tramway containing a number of novel features. 40c.

7070—AIR COMPRESSORS—The Steam Consumption of Air Compressors. W. A. Macleod and J. P. Wood. (Proc. Aust. Inst. Min. Eng., April, 1908; 17 pp.) Some tests with remarks and suggestions for the standardization of specifications are given.

7071—AIR COMPRESSORS of the Present Day. (Min. Machy., June, 1908; 11 pp.) The leading types of machines are illustrated, and described by the different manufacturers. Second instalment. 20c.

7072—BOILER FEED WATER—Boiler Compounds and Their Application. P. S. Nice. (West. Chem. and Met., July, 1908; 4 pp.) Discusses various methods of treating feed water to prevent the formation of scale in boiler tubes. 60c.

7073—BOILER INSPECTION—The Personal Factor in the Care and Inspection of Boilers and Machinery. J. W. Raush. (Iron Age, July 9, 1908; 1⅓ pp.) Discusses the advantages of a better understanding between the management of a power plant, and the inspectors, and points out that the inspections are not made merely to criticize the workings of the plant. 20c.

7074—BOILER TESTS—Report of Evaporative Tests on a 200-Horsepower Parker Water-Tube Boiler Using Oil as Fuel. R. F. Chevalier. (Cal. Derrick, June, 1908; 4¾ pp.) Describes tests made upon a boiler using fuel oil and also the burner and the apparatus for handling and weighing the oil. 20c.

7075—BUCKET SINKING APPARATUS—Berry's Safety Crosshead for Sinking. J. Berry. (Eng. and Min. Journ., July 4, 1908; 1⅓ pp.) Describes safety catch for the crosshead of sinking buckets, which has few joints, pins, leaders, etc., to get out of order. Illustrated.

7076—DRILL SHARPENING FURNACE—The A. E. G. Electric Furnace and Its Application to Drill Sharpening. Baron Mannerheim. (Journ. Trans. Inst. Mech. Engrs., June, 1908; 14 pp.) Contains notes on heating and hardening of steel in general, and describes the use of an electric drill-heating furnace used in South Africa. 60c.

7077—GAS POWER PLANTS—Suction Gas Plants and Their Application to Mining. G. D. Stephen. (Brit. Fed. Soc. Min. Students, June, 1908; 22 pp.) Discusses the use of illuminating and coke-oven gases, producer gas and semi-water gas. The suction gas plant at Threlkeld mine, Cumberland, England, is described; also other plants, giving details of the producer—shell and lining—course of the air, scrubbers, fuel consumption, etc.

7078—GAS PRODUCER—The Carbon-Monoxide Gas Producer. W. Y. Lewis. (Cassier's Mag., July, 1908; 12 pp.) It is suggested that a straight carbon monoxide gas producer will obviate some of the difficulties at present existing in gas producer plants. Illustrated. 40c.

7079—GAS PRODUCER OPERATION. Frank P. Peterson. (Power, June 16, 1908; 1½ pp.) Describes conditions which would have to be met in changing from a steam plant to a gas producer plant. 20c.

7080—HOISTING MACHINERY—Automatic Throttle Closing Device for Hoisting Machinery. Spencer S. Rumsey. (Proc. Lake Superior Min. Inst., June, 1908; 5½ pp., 4 plates.) Description of a means to prevent overwinding in mine hoists. By attaching the throttle closing device to the reversing gear on the engine it is possible to open the throttle after the engines are reversed.

7081—HYDRO POWER TRANSMISSION. Harold J. Wright. (Aust. Min. Stand., May 6, 1909; 1⅔ pp.) Coal costs 30s. per ton at Belgrade, N. S. W., so advantage has been taken of the natural water power to develop hydro-power transmission. Illustrated. (To be continued.) 40c.

7082—MACHINE SHOPS—The Calumet & Hecla Modern Machine Shops. Robert H. Maurer. (Min. Wld., June 6, 1908; 1⅓ pp.) Describes the buildings, equipment, and methods employed in the machine shops of the Calumet & Hecla Mining Company; illustrated. 20c.

7083—MECHANICAL HANDLING—Neuere Gesichtspunkte bei Hüttenwerkstransporten. C. Michenfelder. (Oest. Zeit. f. B. u. H., May 30, June 6 and 13, 1908; 10 pp.) Describes some of the new appliances and structures for handling coal and iron ore in large quantities. (To be continued.) 80c.

7084—OIL BURNING—Burning Liquid Fuel Without Steam or Compressed Air. Robert Schorr. (Min. and Sci. Press, June 20, 1908; 1½ pp.) Describes the use of oil under boilers and discusses the mathematics of oil for fuel. 20c.

7085—OIL BURNING—Burning Oil for Power and Heating. William D. Ennis. (Power and Engr., June 16, 1908; 4⅓ pp.) Practical discussion of conditions under which best results are obtained; the various types of equipment are described and illustrated. 20c.

7086—OIL BURNING—Burning Oil for Power and Heating. William D. Ennis. (Power, June 23, 1908; 4¼ pp.) Discussion of temperature, draft and smoke; properties, possibilities and limitations of fuel oil; how to buy oil. Illustrated. 20c.

7087—OIL BURNING—Liquid Fuel in the Brass Foundry. W. N. Best. (Iron Age, July 9, 1908; 1¼ pp.) Discusses the use of liquid fuel and the theoretical quantity of air required to perfect the combustion of oil. Illustrated. Paper read before Am. Brass Founders' Assn., June, 1908. 20c.

7088—POWER TRANSMISSION. C. A. Smith. (Cassier's Mag., July, 1908; 6 pp.) It is pointed out that since the development of the gas producer, gas power transmission is incroaching into the field heretofore controlled by electric power. 40c.

7089—PRODUCER GAS—Vergassungsversuche mit dem Morgangenerator. K. Quasebart. (Metallurgie, Apr. 23 and May 8, 1908; 28 pp.) Describes the apparatus employed, and gives results of a careful series of tests on the efficiency of this gas producer when working under varied conditions. 60c.

7090—PRODUCER GAS POWER PLANTS in Mines. Louis Bendit. (Gas Engine, July, 1908; 3½ pp.) Describes and illustrates the installation of the Weber suction gas producer at the Nancy Helen mine, Cobalt, Ont. 20c.

7091—PROSPECTING DRILL—The Banka Prospecting Drill. E. Middelberg. (Min. Journ., June 20 and 27, 1908; 3 pp.) The principle of the drill, description of tools, size of borehole and other data relating to the use of this prospecting drill. Also describes the weight of the complete drill, the method of operating and results obtained from its use. 60c.

7092—PUMPS—Cornish Pumps. Ernest P. Woakes. (Min. and Sci. Press, July 11, 1908; 2 pp.) Contains data relative to the working of Cornish pumps at Linares, Spain, and shows that, in this district at least, this style of pump is not obsolete. 20c.

7093—RESCUE APPARATUS—New Rescue Apparatus for Mines. (Eng. and Min. Journ., July 4, 1908; ½ p.) Describes the demonstration given at Siebe & Gorman's works, of rescue apparatus used in mines. 20c.

7094—RESCUE APPLIANCES—Lessons from Glencoe. H. Kestner. (Journ. Chem. Met. and Min. Soc. of South Africa, April, 1908; 5¾ pp.) The author points out the requirements of various breathing apparatus, and describes in detail that known as the Shamrock. Illustrated. 60c.

7095—RESPIRATOR—Die letzen Neuerungen an den Atmungsapparaten des Drägerwerks in Lübeck und der Armaturen- und Maschinenfabrik Westfalia in Gelsenkirchen, Grahn. (Glückauf, June 6, 1908; 3 pp.) Describes an improved appliance for protecting a rescue worker when going into a burning mine. 40c.

7096—RESPIRATOR—Neuerungen an dem Atmungsapparat "Aerolith." Schümann. (Glückauf, June 6, 1908; 2 pp.) Describes the latest improvements in the "Aerolith" respirator. 40c.

7097—ROCK DRILL BITS—The Proper Shape for Rock Drill Bits. D. J. O'Rourke. (Eng. Con., June 24, 1908; 2 pp.) Describes the shape of the bit the method of sharpening, the length of upset, the gage, temper and other points of interest with regard to the use of drill steel. 20c.

7098—ROCK DRILL MAKING and Sharpening by Machine, and Treatment of Drill Steel. W. E. Kimber. (Journ. Transvaal Inst. Mech. Eng., May, 1908; 10½ pp.) Goes into the quality of steel, the shape and making of the drill, heating of the steel preparatory to sharpening, the process of sharpening by machine, and tempering the drills.

7099—SAMPLER—The Cole Sampler. (Eng. and Min. Journ., June 13, 1908; ¾ p.) This sampler consists of a cutting arm mounted on a vertical shaft and is intended to cut a sample at intervals by passing the cutter through a stream of ore as it is discharged from a belt conveyor or other similar carrier. 20c.

7100—SEPARATING APPLIANCES—II. Oskar Nagel. (Electrochem. and Met. Ind., July, 1908; 3½ pp.) Second paper describing various forms of separating apparatus and dealing with presses of different kinds, extractors, separation by ventilating and freezing, mechanical separation of solids, screens, and other forms of apparatus. Illustrated. 40c.

7101—STOPE DRILL CONTEST. (So. African Min. Journ., May 16, 1908; 3⅓ pp.) Contains an announcement of the rules and regulations governing the stope drill contest which is to be held on the Rand in 1909. 20c.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, AUGUST 8, 1908. NO. 6.

Zinc and Lead Smelting in Silesia

Notes on Zinc and Lead Smelting; Recovery of Cadmium; Manufacture of Sulphuric Acid. A Remarkably Large Lead Blast-furnace

BY J. S. G. PRIMROSE*

Even the most casual visitor to the remote eastern corner of Silesia would be struck by the enormous industrial activity evinced on all sides. Every few miles there lie groups of smoke-vomiting stacks, indicating a large smeltery, and each is working at full pressure. To the metallurgist there is here material for many lessons, and the adaptation of new modifications to very old methods makes the varying practice at different works as instructive as interesting.

Ore Roasting.

Since quite one-half of the ores smelted in Upper Silesia is burnt blende, large provision has to be made for roasting furnaces. These are almost always of the multiple-hearth, muffle type where manual labor is used. For example, at the Walter Croneckhutte, near Rosdzin, they have 20 blocks of modern Hasenclever furnaces, with four furnaces in each massive, fired from the ends. These are all three-hearths high, and three men per eight-hour shift can work off about four tons of blende to close on 1 per cent. of sulphur, using one-quarter of that weight of the lean brown coal obtainable locally. After drying [illegible] the ore is raked down counter to the di-

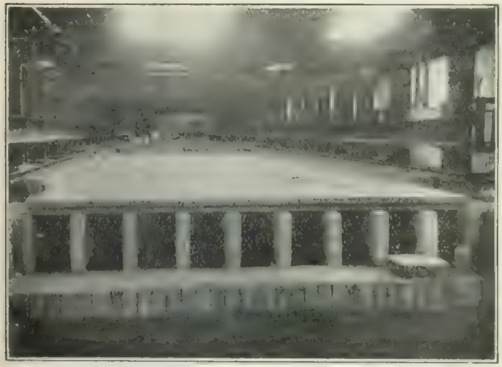


FIG. 1. "BROWN" STRAIGHT FURNACE AT BERNHARDIHUTTE; 250 FT. LONG

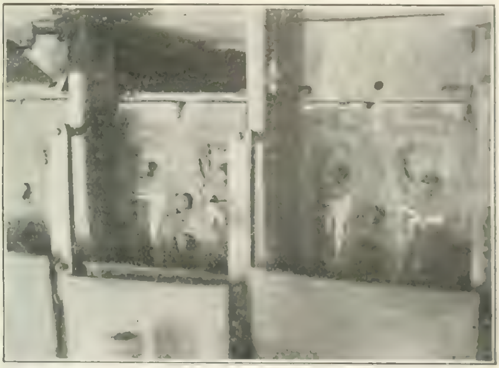


FIG. 2. [illegible] FURNACE AT WALTER [illegible], SHOWING DAGNER CONDENSERS

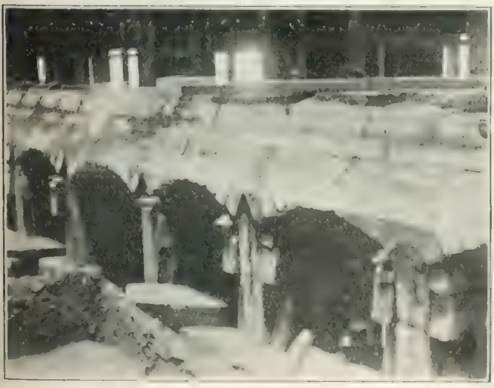


FIG. 3. INTERIOR VIEW OF NEW FURNACES AT [illegible] (IN COURSE OF ERECTION SHOWING ONLY ROW OF TOP NOTCHES)

FIG. 4. [illegible] HUTTE, NEAR ANTONIENHUTTE

rection of the fire gases in the flues. Thick walls and small, tight doors keep down the heat radiation, and regulate the inlet of excess air to the requisite quantity. The greatest care is of course necessary in the top and middle hearths to keep the ore from fritting while the main portion of the sulphur burns out, thus maintaining a roasting temperature with very little extraneous heating. Mechanical furnaces similar to the Brown straight muffle are being largely installed at all the big smelteries, as, for example, at the Bernhardi and Hugo, where several roast houses, each with three 75m. (250 ft.) furnace, are on constant work. Fig. 1 shows a view from the discharge end of one in course of erection, illustrating the steel buckstays, rail for running rabbles, and channel bar for the skewback of the arch. The floor width is 3m. and in the length are four equal-spaced gas ports on each side for firing. Double end flap doors for the entry and exit of the rabbles prevent any gas escape, and the two-minute return over the furnace affords ample time for the rabbles to cool down. The roasted ore falls into a tube subway, whence a screw conveyer removes it to an automatic elevator outside the house.

---

*Lecturer in metallurgy, Glasgow Technical College, Glasgow, Scotland.

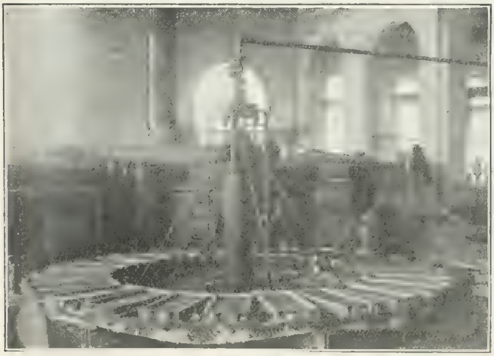


FIG. 5. SPELTER REFINING REVERBERATORIES AND CASTING TABLES

FIG. 6. SIPHON TAP LEAD BLAST-FURNACE AT SILESIAHUTTE

The calcination of calamine to drive off its water and carbon dioxide is a comparatively simple affair, usually conducted in hand-rabbled reverberatory furnaces, which seem to be preferable to the old-fashioned shaft calciners.

Acid Recovery.

As government regulations prohibit manufactories from passing waste gases into the atmosphere with more than 1 or 2 per cent. of sulphur dioxide, those small works which have not space whereon, or capital wherewith, to erect plant for the chamber process of recovering the sulphur as sulphuric acid, must neutralize their acid fumes. This, as at at the Liebehoffnugshütte and elsewhere, is effected by drenching the roasted gases with milk of lime as they ascend scrubbers filled with brushwood; or sometimes less efficiently by passing the gases over moist slaked lime. The calcium sulphate thus obtained is somewhat of a drug on the market, and is not nearly so paying a by-product as sulphuric acid. The latter is most extensively made in Upper Silesia by the lead-chamber process, but the plant for that, with the necessary concentrators, Glover towers, etc., occupies a very large ground area.

Recently, several of the more up-to-date works, as, for example, the Silesia and Lazy works, have been employing the Winkler contact, or catalytic process, which gives acid of excellent purity and 50 deg. B. without much attention. At first, trouble arose through clogging of the platinum sponge, but the modern mechanical modification obviates this quite successfully. There is also in operation at the Silesiahütte a plant erected nearly 20 years ago, for the Schroeder process for recovery of sulphur-dioxide gas in liquid form, but even the thousand tons it makes annually is in excess of the demand. After utilizing some of the heat of the roast gas, the latter is passed up a 100-ft. absorption tower, yielding a 1-per cent. aqueous solution, which on boiling gives up the sulphur dioxide. By cooling the distillate and then compressing it to three atmospheres, the water is removed and the gas is liquefied in the pure state.

Distillation Furnaces.

The distillation of the zinc ore is variously carried out in Upper Silesia, where the tendency of late has been to follow the Rhenish practice in furnace design. Perhaps the oldest type of furnace exists in two of the benches at the Walter Croneckhütte, where direct firing is still used. Almost everywhere else the Siemens open-bottom, or, in rare instances, steam-blown, producers are used, two open-grate fires (gasifying little more than 10 lb. of fuel per square foot of hearth per hour), providing the necessary gas for each 60-muffle block. As seen from Fig. 2, the old-style knee-condenser has been replaced by sets of Dagner condensers for single-row muffle furnaces, as in this way much better condensation is secured. By simply swinging round the swivel mold into position and gradually knocking in portions of the lower condenser luting, the spelter flows out at each 12-hour tapping, and is thereafter ladled into shallow spelter ingots. Maintaining a good fire and removing the ashes in the narrow space available is rather troublesome. In charging, too, it is difficult, with the constant rubbing of the narrow scoop, to avoid wear on the condenser sole; hence some of the chargers use an iron guide strip.

By far the most prevalent practice now in Upper Silesia is the use of gas-fired furnaces of the three-high, Siemens-Belgian reversing type, as, for example, at Hugohütte. In this case there are checker-works for both air and gas, the currents being alternately deflected by the water-seat valve shown at the side of Fig. 4. This must be done frequently, say, each half hour, to avoid unequal heating of the top and bottom rows of retorts. To the retorts are fitted condensers of the leg-of-mutton shape, from which the zinc is periodically ladled. Once the brown fumes of cadmium are well off and the carbon monoxide coming away freely and ignited, the ballons (prolongs) are set in position to catch the fume. Frequently the furnaces are arranged only two rows of muffles high, with one in the top niche for each two resting in the lower, so as to break-joint and deflect the flame upon the retorts, no matter which way the flow is going. A large pocket, or blind-chamber, is often arranged in the flues to catch metal, slag, and a large amount of dust before passing the products of combustion into the regenerators, thus helping to prevent the clogging up of the checker-work.

A New Type of Furnace

Perhaps the last word in Silesian practice is the substitution of counter-current recuperation for reversing regeneration in the new bench of furnaces at the Silesiahütte, a side view of which is given in Fig. 10. In this form of furnace two producers are employed to each block, carrying 24 small retorts on top and 12 larger ones below on each side. The heat of the escaping waste gases is recuperated by air alone, and the combustion chamber, 30 in. wide, runs the whole length of the furnace in the center. The flame is reverberated, by the arched roof, over on each side to the retorts, and no reversing of the direction of the gas, brought directly from the producers, or elaborate regenerative chambers, are necessary. The ease of control over the heating up and the steadiness of the temperature maintained give longer life to the muffles, and less distillation losses through cracked muffles.

Muffle Making

The newest machinery of any in the field is here (Silesiahütte) employed for insuring uniformity in the preparation of the muffle material. Indeed, it is now only in rare cases that the old method of making muffles by hand survives. Nearly everywhere, edge runners do the grinding and pug-mills the first admixture and compression of the requisite proportions of "rotted" fat clay, rough burnt clay and pot chippings. The cakes cut from the roll discharged by the pug-mill are taken to a hammering machine, where a cam-lifted weight drops on the material and gradually thumps it into a 12-in. to 14 in. cylinder as the piston bottom is lowered. When heavy and solid enough this mass is transferred to the hydraulic press—commonly top fed—and on bolting down the die and cover plates, the central ram makes its way up through the plastic material, forces back the annular ring and shapes the muffle into a D-shape about 14 in. high by 9 in. wide. When the pressure gage shows a sudden rise over 2000 lb. per sq. in., the valves are opened, the plunger drops down and the top block is swung aside, after which the muffle is pushed up carefully by raising the annular ring, great care being taken (by using a guide counter-poised from the roof) to prevent bending of the emerging muffle. Cutting off the muffle with a wire at the required length, about 6 ft., it is removed to the drying room for a period sometimes extending over a year before it is called into use. Only the very largest muffles, approximately 7 ft. long by 2 ft. high, are now made by hand, but in many places the peculiarly shaped condensers are still made by hand.

Charging

The depth of the Silesian muffles makes the keeping open of the charge an important point, so the fine roasted blende is mixed with about its own weight of calcined calamine, chief of which is smithsonite, broken to the size of small road metal, i.e., lumps of from 3 to 5 cu.in. The reducing material is a partially degasified coal of about walnut size, the gas being taken off in a cinder oven, and burned under boilers for steam raising. First thing each morning the day-shift men, one crew for each side of the bench of furnaces, set about removing the ballons, or prolongs, dumping out the blue powder and sending it off to be ground, sifted and barreled for the trade. A well known peculiarity of this fine zinc dust is its liability to explode, as evinced by one grinder-house completely shattered and burned, too much air having got access to the blue powder. Next the work of tapping or ladling from the condensers proceeds; any spills fall on the charge prepared the day before, so very little loss thereby results. Ashes or residues are next raked out, a suitable chute conveying them to wheeled buckets in the tunnel below the platform and level with the regenerators. Carefully luting up again with clay after discarding cracked muffles, the condensers are replaced and charging proceeds. Long, narrow scoop shovels are used. One laborer fills the shovel from the charge on the floor, then the charger lifts it, introduces it through the front, and overturns the scoopful to empty when home in the retort. This very laborious method is almost universal, and only in one smelter have they tried a machine. It was actuated electrically, and had to be fed by an overhead conveyer. Thence the charge passed from the hoppers down six separate tubes, from which the material poured into horizontal pipes 4 in. in diameter, and placed muffle-width apart. These feeders could be elevated or sloped to slip right up the condensers, and in them worked a continuous screw driven from behind, which forced the charge forward and into the six muffles simultaneously. The drawback to its use in Silesia was the coarse character of the charge, wherefore it had to be abandoned, but for finer material it seems to be a feasible method.

When the charges are all in along the block, the first lot will be ready for affixing prolongs and lighting up, the carbon monoxide burning with its characteristic blue flame, which soon becomes tinged with green from burning zinc. Draft excluders are then lowered away, and the charge for the next day made up. Usually from 5½ to 6 tons of ore are drawn from the stock-yard and run into the house, mixed in a pile on the working platform before each furnace with from two to three tons of reduction material, spread out and swept against the length of the furnace front to a depth of about 2 feet.

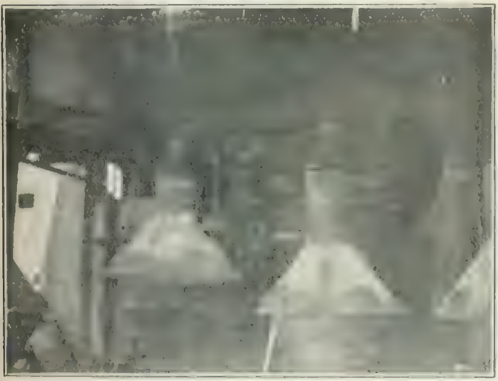


FIG. 7. CONVERTERS FOR HUNTINGTON-HEBERLEIN PROCESS AT FRIEDRICHSHÜTTE

FIG. 8. [illegible] SI- [illegible]

ECONOMIC CONSIDERATIONS

From 70 to 75 per cent. recovery is considered good practice in Silesia. Means for reducing the losses have been found to work well in Silesia as follows: (1) Letting the temperature of the roasting rise as little over 900 deg. C. as possible, pyrometers being occasionally used to aid this regulation of the temperature, and carefully collecting the flue dust. (2) While by making very dense muffles the absorption may be lessened, such muffles do not usually stand well; so recourse is always had to smashing up the cracked muffles by hand, roughly sorting out the spinel, which assays up to 5 per cent. zinc, for return to the furnace, and sending the best of the clean portion to the muffle maker. (3) Washing the ashes has been tried in some places, but not very successfully. The unconsumed carbon seems to sponge up the zinc slags, and mere washing does not make either serviceable again. Lead concentrates are sometimes got from the ashes where blast-furnace smelting is worked in conjunction with zinc smelting. (4) Even firing keeps breakage of muffles down to about 2 or 3 per cent. at most, and most of the well-made muffles stand usage for five or six weeks before needing replacement.

TREATMENT OF SPELTER

The crude spelter ladled from the condensers in Silesia is too rich in lead for most purposes. Redistillation has not as yet found favor in Silesia, where simple remelting in a reverberatory furnace with sloping hearth is all that is done as a rule. The charge often runs up to 30 or 50 tons, melted slowly in a double-fired hearth, upward of 20 ft. long by 8 to 10 ft. broad, the bath being seldom more than 20 in. deep at the end under the discharge doors, from which the zinc is ladled into flat molds arranged on a swing-table as shown in Fig. 5. This refining process takes out almost all the iron and leaves not more than 1 per cent. of lead in the slabs, which are slowly cooled under a cover and for the manufacture of sheet zinc are rolled out before becoming cold, then reheated and further rolled often enough to give the required thinness. The lead which gravitates to the bottom of the refining furnace is removed about once a week by a metal screw working in a pipe immersed to the bottom of the bath. A siphon tap has been advantageously employed at several rolling mills for removing this lead-zinc bottom layer.

Only one smelter has tried the electrolytic refining of zinc, but the plant seems to be very costly to work, and has not been augmented despite the very high grade of zinc it produces. A new method of filtering the zinc vapor so that it will be free of lead has just been taken up and promises good results, either for ore smelting or spelter refining.

CADMIUM

In a few of the Silesian zinc smelters the ore is often sufficiently rich in cadmium to make extraction of that metal worth while. This is done by fractional distillation. When the brown flame due to burning cadmium is very pronounced, the powder from the ballons is removed after distillation has gone on for about two hours; by then all the cadmium has come off. This is sent to a small furnace at the end of the bench, which is heated by the waste gases before escaping to the chimney. Here small retorts are charged with the dust and nearly one-half its weight of small cinder. From the powder, holding very little over 2 per cent. cadmium, this redistillation affords a product with close on 50 per cent. Such an auxiliary furnace is shown in Fig. 9.

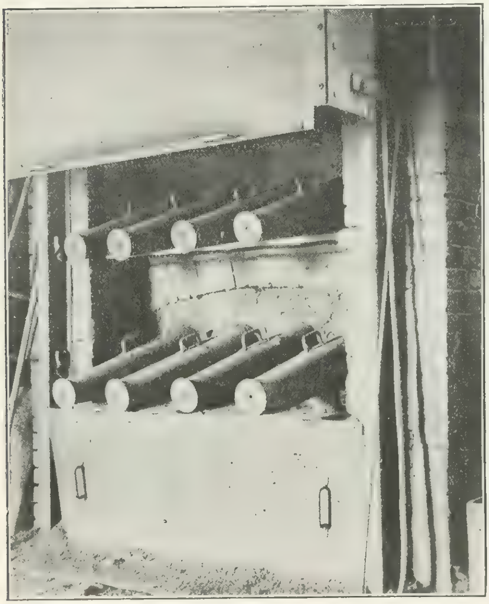


FIG. 9. CADMIUM DISTILLATION FURNACE AT LIEBEHOFFMENGSHUTTE

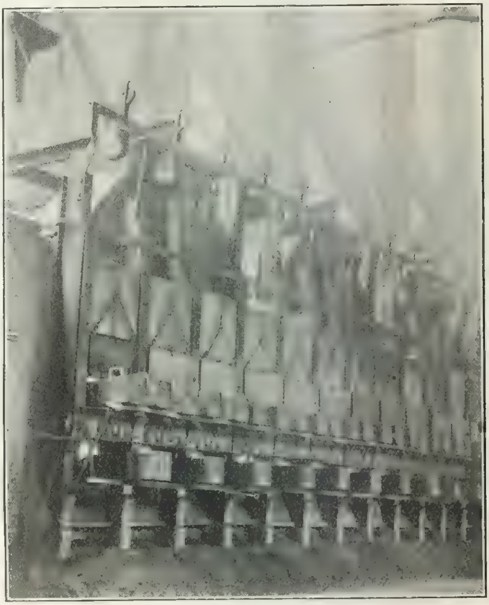


FIG. 10. LATEST FORM OF FURNACE AT SILESIAHUTTE, NEAR LIPINE

The distillate is now taken to a separate house with a small furnace, often carrying not more than two or four retorts, and coal-fired from the side. Here the material is mixed in 250-lb. lots with 50 lb. of coke, charged into a cylindrical iron retort 6 ft. long and 14 in. in diameter, and distilled at a dull red heat. The metal is condensed in a vertical hoop-shaped condenser, or "snake," as it is called, so arranged as to run the cadmium out at the foot. The cadmium is mostly over 98 per cent. pure and sometimes as high as 99 per cent. Any oxide collected during this distillation is charged back into the retort for the next run.

LEAD

Although there is frequently 4 or 5 per

cent. of lead in the Silesian zinc ores, there are only a few of the smelters which have furnaces for lead recovery. The Silesiahütte keeps three small furnaces going for the production of a very zinkiferous lead, working on the residues from the surrounding smelters. From Fig. 6 it will be seen that the siphon tap is here in use, even although the furnace is comparatively small, being about 20 ft. high and not more than 2 ft. diameter in the hearth. These furnaces yield nearly 25 tons of lead per day. By far the greatest amount of lead produced in this district, however, is made at the Friedrichshütte, near Tarnowitz, where for some time they have been employing the Huntington-Heberlein process on a large scale. The ores sent here are only slightly zinkiferous, and are mainly galena. After crushing and mechanically mixing the ore with about one-tenth its weight of calcined lime, it is elevated to an automatic feed hopper above the center of a Heberlein roasting furnace. When the charge has had free excess of air for 40 to 50 min. at over 600 deg. C., and a good part of the lead has gone to sulphate, the temperature is slackened off a little and a scraper throws about five tons of the charge through an end door into a converter shaped like an inverted cone, perforated at the bottom, and mounted by trunnions on a four wheel carriage. This is next transferred to a position over a blast-pipe, and under a hood with small doors in it, as shown in Fig. 7. Blast from 8 to 10 oz. per sq.in. is turned on, and for upward of an hour the workmen have to keep the charge tamped down to prevent the air from cutting channels and thus fail to permeate the whole mass. The further details of the Huntington-Heberlein process have been frequently described in the JOURNAL.

In addition to the bench of over 20 five-ton converters, the works at Tarnowitz have recently erected a much larger vessel, as shown in Fig. 12. This is designed to work 15 tons at a time, and is carried on a very strong steel frame 20 ft. above ground level, in order that the large mass of partially-frittered material may be shattered by the fall and thus save hand labor in breaking it up. In this large pot almost 2½ hours are required to complete the blowing of the charge. Even with the best attention there is some lead reduced and this splashes badly in the fall.

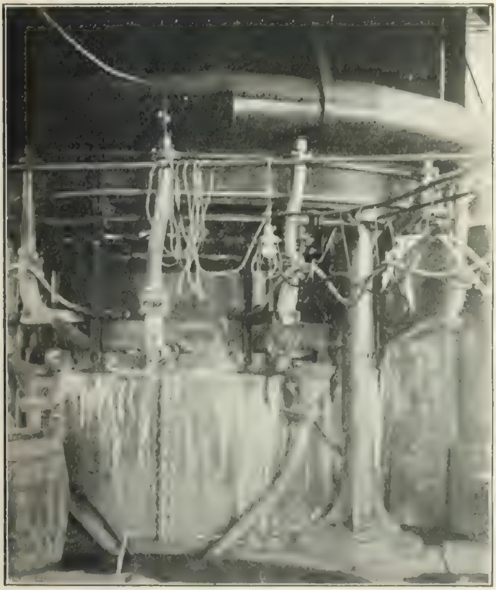


FIG. 11. WATER-COOLED BOSH OF 30-FT LEAD BLAST FURNACE AT FRIEDRICHSHUTTE

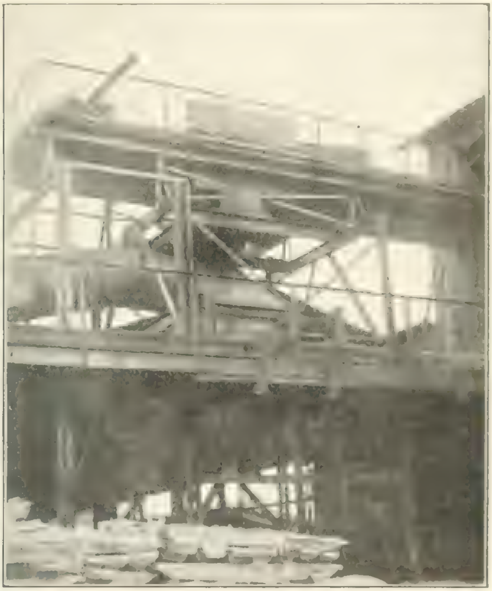


FIG. 12. [illegible]

One blast furnace produces all the lead in these works, but it has a capacity of close on 500 tons per day, so rapidly does it run on the ore sintered by the H-H process. From Fig. 11 it will be noted that the bosh is cooled by spraying water upon it. [illegible] is almost 5 ft. wide and about 2 ft. across, allowing two men to work at the ladling.

The lead is desilverized by means of the Parkes process, but the zinc scum, instead of being treated in the old way by distillation in the tilting Faber du Faur furnace, is retorted in a small muffle furnace (see Fig. 8) with vertical prolongs attached to the condensers.

Building Stone, Sand and Clay in California in 1907

The [illegible] to the production of mineral structural materials in California, according to figures published by the State mineralogist, produced materials in 1907 to the total value of approximately $9,225,000 as follows:

Paving blocks, $200,440; lime, $743,740; limestone, $388,014; cement, $2,291,077; granite, $451,085; rubble, $682,996; slate, $60,000; serpentine, $3000; glass sand, $8,178.80; sandstone, $100,184; marble, $97,863; clay, (pottery) $219,179; brick, $2,965,770; macadam, $951,198.15. The largest increase, as compared with 1906 is to be credited to the brickmakers, who increased their output from $2,538,848 to $2,965,770, or practically $425,000. The cement industry shows a gain of about $325,000, as compared with the previous year.

The ores of Tombstone, Arizona, occur in fissure veins intersecting a series of sedimentary rocks, and also in irregular bodies of limestone. The ores are of two kinds, viz., (1) quartz ores containing silver and gold with some lead, which were treated by amalgamation with quicksilver, and (2) basic ores, the characteristic of which is manganese. Tombstone was formerly a producer of lead, the ore being smelted locally, but the output was never of much consequence in the lead industry of the United States. Now it promises to become a producer of copper.

Alumina in Copper Blast-furnace Slags

A Study of a Variety of Slags with Evidence to Show That Alumina Invariably Acts as an Acid Combining with More Basic Oxides

BY CHARLES F. SHELBY*

Is alumina an acid or a base; is it both or is it neither and simply a foreign substance carried in a slag menstruum? These questions have been, and are still, repeatedly asked and discussed, with men of recognized prestige and valuable opinions ready to take the defensive for each side.

The stand which I have taken is that the oxide, Al_2O_3, is an active acid and enters into definite chemical union with the bases present, and that the prevalent slag produced by the great majority of copper-matting blast furnaces is a true bi-silicate-aluminate with oxygen ratios of both the silica and alumina to that of the metallic or earthy bases of 2 to 1. While my impression is that my opinion coincides with what I consider to be that of the majority of operating metallurgists, who have had constant experience with it in appreciable quantities in copper-matting blast-furnace slags (say 8 per cent. or more) in the western part of the United States and Mexico, and whose opinions are fixed, still a few notes gathered in connection with a study of this subject may be interesting.

A Much Discussed But Still Unsettled Question

Dr. Edward Dyer Peters has long been recognized as an authoritative writer on matters pertaining to copper smelting, and his various works will probably form our most complete compendium of available data on this subject. It is not at all improbable that every English-speaking copper metallurgist in the world has gleaned at least a part of his knowledge from the writings of Dr. Peters. Still it remains a fact that even the latest work of this eminent authority, his 1907 edition of "The Principles of Copper Smelting," leaves the subject of alumina in copper-matting blast-furnace slags dubious and unsettled.

I quote from the opening paragraph of his discussion of this subject, as follows: "Alumina (Al_2O_3)—I have left to the last the discussion of this very dangerous and uncertain substance as a constituent of copper slags."

In the closing paragraph, I find the following: "I am aware that, in spite of the amount of space devoted to aluminous slags, I am leaving the subject in as doubtful and unsatisfactory a condition as at the beginning of the section. This is unavoidable until the matter has been thoroughly and scientifically investigated. All that the metallurgical writer can do to assist the student is to lay before him the results of experience, as typified by analyses and criticisms of alumina slags from various smelting plants, and to warn him of the necessity of extreme caution when he is obliged to smelt ores containing any considerable proportion of this substance."

A quotation from Prof. L. S. Austin's writings on this subject, which appears in the same work on page 398, is as follows: "The behavior of zinc and alumina in a slag is such as to obscure the mutual action of its acidic and basic elements, and we are finding today a portion of our metallurgists adopting a very different way of looking at these relations, which has resulted in their using a working hypothesis, capable at least of satisfying the varying conditions of their practice. This consists in looking upon both zinc and alumina, not as bases, but as elements singly dissolved in the molten magma; that is, they are non-effective bases, which, as their relative proportion increases, singly stiffen the slag, much as sand stiffens mortar."

These quoted statements, and verbal discussions with others, have inspired me with sufficient confidence that some of the results of my studies of this subject will be interesting and instructive to a large number of readers, even though they may contain nothing new to the majority of those who at the present moment are most actively interested.

The Oxygen Ratio

It is generally conceded that the copper-matting furnace is selective in its action, delivering two molten products, the matte and slag, the first of which is subject to wide variations of copper and iron contents; a correct balance is then presumably always available to make its standard chemical union for the slag. If this is not available, the furnace commences to accumulate the excess, build accretions and slow up. Should the excess happen to be silica, the charge remains in the furnace longer and is subject to the oxidizing action of more air per unit of time, and the oxidation of the iron that previously went to the matte will go after this accumulation and take it away while more is being formed. The process will continue, and the grade of the matte will be raised, but at the expense of hearth activity; and to get the furnace to its normal running capacity, the charge will have to be corrected.

In this manner the furnace may be continually taking care of charge variations, accumulating one part or another, slowing down or speeding up to accommodate itself to changing conditions, but all the time delivering its regular type of slag, so far as the ratio that exists between the acids and bases is concerned. Of course there are exceptions when the ratio I have given may be altered, but it brings in policies that are not common with the standard practice under consideration, the quantity of fuel used and the temperature in our furnaces.

The accompanying Table I, of different slags selected at random and from all sections of the country, shows that the proportion of the oxygen of the acids to that of the bases is rather commonly 2 to 1. That they are not exactly so in every instance can probably be explained by those who made them, or may be attributed to one or more of the following reasons: (1) errors in analyses; (2) incomplete analyses; (3) unfluxed material in the slag.

We may deal with reason (1) in a general manner and then refer to each slag by itself. The majority of these slag analyses are either arithmetical averages of a number of daily results or simply a single analysis. They were all made in a rapid manner to check furnace work and, while sufficiently accurate for the purpose for which they were intended, the results cannot be considered scientifically correct. It is a common error in the smelter laboratory to report low silica results on a well chilled slag if the silica is below 38 per cent. and to report high results if above 40 to 42 per cent. Alumina may be high or low, depending on the method used, and the personal factor and other considerations may slightly affect all the results.

Slag No. 1, the analysis of which is given in the first column, is the average slag made at Cananea during the first three months of 1907. The oxygen ratio of the acid to bases is almost exactly as 2 to 1. The furnaces ran well, and conditions were normal. The results are the averages of about 200 analyses representing about 200,000 tons of smelted material.

No. 2 is the average slag at Cananea for the month of October, 1907. The oxygen ratio is a very little greater than 2 to 1; the sum of the analyses is 2.5 per cent. higher than those of No. 1. The

---

*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Mexico.

furnaces ran well and conditions were normal. The results are the average of about 60 analyses representing about 70,000 tons of material.

No. 3 is the average slag made at Aguascalientes for the 12 months ending April 30, 1903. The oxygen ratio of acids to bases is almost exactly as 2 to 1, and still the slag is quite different from those previously mentioned. The silica and lime are much higher, but the alumina and ferrous oxide are correspondingly lower. The furnaces ran well and conditions were normal, and the figures given represent the average of approximately 1000 analyses and the smelting of probably 300,000 tons of material. (I was connected with the operating department of the plant while these slags were made.)

No. 4 is a slag which was reported to me as having been made at Aguascalientes March 20, 1906. The oxygen ratio is almost exactly 2 to 1, but a part of both the ferrous oxide and the lime of the previous slag is replaced by magnesia and baryta. The slag is reported to have been very satisfactory, and the furnaces ran well.

Slag No. 5 is reported to have been made at the same place the following day; the oxygen ratio of acids to bases is very much greater than 2 to 1. The slag is also reported to have been "slow and thick like molasses" and had to be abandoned, implying that the charge was too acid for the proportion of fuel and for other conditions.

No. 6 is the average of the daily slags at Morenci, Arizona, for the year 1903. The oxygen ratio is almost exactly 2 to 1, and the type of slag is again different from those previously cited. The furnaces ran well and conditions were normal.

No. 7 is the average slag for the two years ending December 31, 1906, at the Old Dominion, representing nearly 2000 analyses and the smelting of about 800,000 tons of material. The oxygen ratio is less than 2 to 1, and to a peculiar circumstance can be attributed, in part, the cause. The furnaces ran exceptionally well, and the supply of ore demanded that they be pushed to their maximum capacity all the time. A part of the charge was a hematite ore that was used as a flux, but which contained sufficient copper to leave a margin of profit. This ore also contained quite an appreciable amount of fines, and owing to the rapid running of the furnaces, a part of these fines, especially the purer and harder granules, would sift down through the interstices of the charge, either by gravity or a jigging action of the blast, and be caught up by the slag before reduction could take place and washed out of the furnace by the slag. That some of this iron was not chemically combined was made evident by its segregation in ladle samples of the slag, by the rusty color on the tops of the pots of slag and on the outside of each layer on the dump, and the presence of ferric oxide in the chilled sample of the slag dissolved in hydrochloric acid (the iron contents of which are included in the analysis as tabulated). A further examination of the dump would reveal that this rusty discoloration would only be present on the outside of the layers or scales as an excresence, and that if they were peeled off and broken the fracture would be as black as desired.

This will serve as only one instance to prove that unless all the conditions under which a furnace plant is operating are known or stated, a few figures such as a slag analysis shows may sometimes be more misleading than instructive. I have also witnessed a fast-running furnace carrying out unaltered silica in pieces from 1/8 to 1/4 in. in diameter, in such quantities that if the silica had been combined chemically with the slag, it would not have run. While the ore from which it came was reasonably rich, neither an analytical nor a microscopical examination could show that a trace of the valuable metals had been left; in this manner the furnace made as clean a gossan in a few minutes as nature might produce in centuries.

No 8 is the average of the daily slags at the Copper Queen for the month of October, 1907, and represents the smelting of probably 100,000 tons of material. The oxygen ratio is almost exactly 2 to 1. It is the highest in alumina we have dealt with, and the lowest in silica; and the lime and ferrous oxide contents are at variance with any examples so far considered; still, the ratio remains constant. The furnaces ran well, and conditions were normal.

Slag No. 9 is a specimen analysis from Teziutlan, having higher baryta contents than any other shown. It is low in acids to correspond with the formula, but not knowing the conditions we can offer no explanation. Possibly the discrepancy may be traceable to analytical errors or unfluxed material in the slag.

No. 10 [illegible] me as representing that produced by the furnaces of the Tennessee Copper Company some time during the year 1906, the furnaces [illegible] (the [illegible] different). It is the [illegible] thus far [illegible]. It closely approximates the formula of 2 to 1 with slightly high acid results.

No. 11, is [illegible] Deadwood-Delaware slag made in 1899. It is the [illegible] analized, and still the oxygen ratio of the acids to bases is almost exactly 2 to 1.

[illegible] a number of the important copper producers, and [illegible] similar results. They illustrate slags of widely varying composition, but all closely adhering to the [illegible]. We find the silica ranging from 34.3 to 48 per cent., the alumina from [illegible] per cent., the ferrous and manganous oxides from 19.9 to 37.6 per cent., the lime from 8.21 to 25.83 per cent., the magnesia from none to 12.9 per cent. and the baryta from none to 6.2 per cent.

High silica slags, in districts where lime and iron fluxes are scarce or costly, have always been the aim of the smelter metallurgist, and the inability to produce them has often embarrassed the unfortunate superintendent, while their production has been a source of pride to the more fortunate. Still I can see no more cause for glory in the 48-per cent. Deadwood slag (No. 10 of the table) than in the 34.3-per cent. Copper Queen slag. I consider them both as adhering to nature's rules, and in accordance with these laws subservient to laws we cannot change.

[illegible]

In these [illegible] reported [illegible] con-

TABLE I ANALYSES OF TYPICAL COPPER BLAST FURNACE SLAGS

Constituents.	Per Cent. Oxygen	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
SiO_2	52.9801	35.8	37.1	42.68	42.40	[illegible]	[illegible]	[illegible]	34.3	[illegible]	41.36	48.0
Al_2O_3	46.9667	10.1	11.4	4.00	2.05	6.80	12.60	[illegible]	[illegible]	[illegible]	6.16	[illegible]
FeO	22.2531	37.6	36.0	20.71	19.20	16.20	[illegible]	[illegible]	30.9	[illegible]	36.91	13.0
MnO	22.5352		0.5	0.85	0.70	0.45		1.3				
CaO	28.5205	12.5	12.9	25.83	21.90	21.80	18.19	[illegible]	16.9	[illegible]	8.21	20.0
MgO	39.7022		0.6		2.20	1.20	3.16	[illegible]	1.8		2.94	12.9
BaO	10.4302				3.10	0.96				[illegible]		
ZnO	19.6560			2.40	7.10	[illegible]				[illegible]	2.45	
Total		96.0	98.5	96.40	98.95	[illegible]	[illegible]	98.1	96.8	[illegible]	[illegible]	[illegible]
					Per Cent Oxygen							
SiO_2		18.97	19.66	22.56	22.46	24.16	19.73	18.86	18.17	18.81	21.91	25.43
Al_2O_3		4.74	5.35	1.88	0.96	3.19	[illegible]	[illegible]	6.06	[illegible]	[illegible]	[illegible]
Total in Acids		23.71	25.01	24.44	23.42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FeO		8.37	8.01	4.61	4.27	3.60	6.21	8.25	6.88	6.21	8.21	2.89
MnO			0.11	0.19	0.16	0.10		0.29				
CaO		3.56	3.68	7.37	6.25	7.07	5.19	3.51	4.82	4.99	2.34	5.70
MgO			0.24		0.87	0.48	[illegible]	[illegible]	0.71		[illegible]	[illegible]
BaO					0.32	0.10				[illegible]		
Total in Bases		11.93	12.04	12.17	11.87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One-half oxygen in acids		11.85	12.50	12.22	11.71	[illegible]	[illegible]	11.61	12.11	10.86	[illegible]	[illegible]
Oxygen in zinc oxide				0.47	1.45	[illegible]				[illegible]	[illegible]	[illegible]

No. 1, Cananea, first quarter, 1907; No. 2, Cananea, October, 1907; No. 3, Aguascalientes, year ending April 30, 1903; No. 4, Aguascalientes, March 26, 1906; No. 5 Aguascalientes, March 27, 1906; No. 6, Morenci, year 1903; No. 7, Old Dominion, two years, [illegible]; No. 8, Copper Queen, October 1907; No. 9, Teziutlan; No. 10, Tennessee ore charge; No. 11, [illegible] 14, 1899.

sidered either as an acid or a base, but is left for the reader to classify as he pleases. There is still a diversity of opinion among metallurgists as to the action of zinc in the slag, and my experience with it has been very limited; since these notes are intended to deal directly with the alumina I will not try to find a definite place for the zinc. It is my belief, however, that although there are good reasons to acknowledge the existence of some of it as the base, ZnO, in combination with the acids, there are also good reasons to believe that all or some of it is either held in suspension in the slag or dissolved without chemical union as the metal, the sulphide and oxide, in the same manner that the sulphide of iron in the matte dissolves more iron or copper than its sulphur contents would permit in accordance with a chemical formula. That some of it originally exists as a metal is evidenced by the characteristic flame when the slag stream leaves the furnace, and is subject to the oxidizing influence of the air. That some of it is similarly present in the matte is more evident for the same reason, while its existence as a sulphide is also proved by the separation of some zinc sulphide which rises to the surface of matte drawn off in pots.

M. W. Iles conducted some experiments at the plant of the Globe Smelting and Refining Company near Denver, Colorado, a number of years ago, by blowing a blast of air through a molten slag carrying an appreciable amount of zinc and collecting the fumes, which were not heavy in zinc; the experiment convinced him at the time that the zinc was present as a silicate. It might have been such, but what the experiment proved fundamentally was that the major portion of the zinc present was not subject to further oxidation and might as well have been the oxide in suspension or, possibly, but not probably, the sulphate, etc. A statement commonly made by those of experience is that zinc increases the silver losses in the slag. Since the statement has been made in reference to experiences with furnaces operated with coke on the charge and consequent reducing action, why is it not possible that some of the zinc may leave the furnace as the metal, and, by reason of its strong affinity for the precious metals, carry them with it and later liberate them in the slag as it is oxidized?

Zinc is frequently the cause of mushy material in the settlers that will neither combine with the matte nor the slag; and its general physical characteristics are such that, when present in either the slag or the matte, indications of a desire for more or less to separate are evident. I should be tempted to believe accordingly that zinc is a foreign substance reluctant to unite with silica, though pressing conditions may call for its combination. The possibility of reducing and volatilizing it almost completely (Dr. Bartlett's practice at Cañon City), in a low-shaft furnace with hot top, suggests a further reason why it does not belong to the strong slag-forming constituents such as silica, alumina or the alkaline earths. It is reduced, volatilized and in turn oxidized in the lower part of the shaft of cold-top furnaces, and then later condensed in the higher and cooler portions, unquestionably causing scaffolding, while the alumina continues its course always to the slag.

TABLE II. PROF. HOFMAN'S EXPERIMENTAL SLAGS WITH CALCULATED OXYGEN RATIOS.

REPLACEMENT OF SILICA WITH ALUMINA.

Analyses	A	1	2	3	4	5	6	7	8
SiO_2	32.10	28.09	24.07	20.06	16.05	12.04	8.03	4.01	0.0
Al_2O_3	0.00	4.53	9.05	13.57	18.10	22.62	27.14	31.66	36.20
FeO	35.90	35.90	35.90	35.90	35.90	35.90	35.90	35.90	35.90
CaO	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Melting point	1150.0	1160.0	1170.0	1190.0	1220.0	1290.0	....	.....	...

	A	1	2	3	4	5	6	7	8
Oxygen in SiO_2	17.01	14.88	12.75	10.63	8.50	6.38	4.25	2.12	0.0
Oxygen in Al_2O_3		2.12	4.25	6.37	8.50	10.62	12.75	14.87	17.00
Oxygen in FeO	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99
Oxygen in CaO	9.13	9.13	9.13	9.13	9.13	9.13	9.13	9.13	9.13
Ratio Acids to Bases, Al_2O_3 as an Acid									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	1.007	1.007	1.007	1.007	1.007	1.007	1.007	1.007
Al_2O_3 as a Base.									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Bases	1.006	1.293	1.676	2.210	3.014	4.348	7.028	15.089	

REPLACEMENT OF FERROUS OXIDE WITH ALUMINA.

Analyses.	B	1	2	3	4	5	6	7	8
SiO_2	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10
Al_2O_3	0.0	2.12	4.24	6.26	8.49	10.59	12.72	14.84	16.97
FeO	35.9	31.41	26.93	22.44	17.95	13.46	8.98	4.49	0.0
CaO	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Melting point	1150.0	1150.0	1135.0	1155.0	1170.0	1190.0	1230.0		.

Analyses.	B	1	2	3	4	5	6	7	8
Oxygen in SiO_2	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01
Oxygen in Al_2O_3		1.00	1.99	2.99	3.98	4.97	5.97	6.97	7.97
Oxygen in FeO	7.99	6.99	5.99	4.99	3.99	2.99	2.00	1.00	0.0
Oxygen in CaO	9.13	9.13	9.13	9.13	9.13	9.13	9.13	9.13	9.13
Ratio Acids to Bases, Al_2O_3 as An Acid.									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	0.895	0.796	0.706	0.625	0.551	0.484	0.422	0.366
Al_2O_3 as a Base.									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	1.006	1.006	1.006	1.005	1.005	1.005	1.005	1.005

REPLACEMENT OF LIME WITH ALUMINA

Analyses.	C	1	2	3	4	5	6	7	8
SiO_2	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10
Al_2O_3	0.0	2.43	4.86	7.29	9.72	12.15	14.58	17.01	19.44
FeO	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9
CaO	32.0	28.0	24.0	20.0	16.0	12.0	8.0	4.0	
Melting point	1150.0	1145.0	1110.0	1140.0	1135.0	1140.0	1170.0	1210.0	1220.0

Analyses.	C	1	2	3	4	5	6	7	8
Oxygen in SiO_2	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01
Oxygen in Al_2O_3		1.14	2.28	3.42	4.56	5.71	6.85	7.99	9.13
Oxygen in FeO	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99
Oxygen in CaO	9.13	7.98	6.84	5.70	4.56	3.42	2.28	1.14	
Ratio Acids to Bases, Al_2O_3 as an Acid.									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	0.880	0.767	0.670	0.582	0.502	0.430	0.365	0.306
Al_2O_3 as a Base.									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	1.006	1.006	1.006	1.006	1.006	1.006	1.006	1.006

REPLACEMENT OF FERROUS OXIDE AND LIME WITH ALUMINA.

Analyses.	D	1	2	3	4	5	6	7	8
SiO_2	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10
Al_2O_3	0.0	2.28	4.55	6.83	9.1	11.37	13.67	15.92	18.20
FeO	35.9	33.66	31.41	29.17	26.93	24.69	22.44	20.2	17.95
CaO	32.0	30.0	28.0	26.0	24.0	22.0	20.0	18.0	16.0
Melting point	1150.0	1190.0	1170.0	1160.0	1150.0	1145.0	1150.0	1170.0	1310.0

	D	1	2	3	4	5	6	7	8
Oxygen in SiO_2	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01	17.01
Oxygen in Al_2O_3	0.0	1.07	2.14	3.20	4.27	5.34	6.41	7.48	8.55
Oxygen in FeO	7.99	7.49	6.99	6.49	5.99	5.49	4.99	4.49	3.99
Oxygen in CaO	9.13	8.56	7.98	7.41	6.84	6.27	5.70	5.13	4.56
Ratio Acids to Bases, Al_2O_3 as an Acid									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	0.888	0.782	0.688	0.603	0.526	0.456	0.393	0.334
Al_2O_3 as a Base									
Acids	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bases	1.006	1.006	1.006	1.005	1.005	1.005	1.005	1.005	1.005

W. Maynard Hutchings in a few notes of his studies of zinc in slags, published in the *Geological Journal* of January, 1890 and the JOURNAL of December 24, 1903, proves to his satisfaction its presence in some slags studied, not only as a silicate, to which he gives the preference, but also as the uncombined oxide and many other compounds with formulas approximating natural minerals.

HIGH ALUMINA SLAGS

That it is as feasible to handle alumina in the copper-matting blast furnace as silica, and that it can replace silica in direct oxygen equivalents without altering fuel and other conditions, is not intended to be inferred. That bi-silicates of ferrous oxide and lime are to a certain degree interchangeable, and that either can be replaced in part by magnesia, no one will dispute; but what happens if we try to replace the ferrous oxide entirely with lime, or, worse yet, with magnesia? If we leave the fuel alone the furnace will stop; and the same would happen if we were to try to replace all the silica with alumina; the nearer we approach the change the greater the difficulties. The causes will not be discussed here, as they would more properly come under another heading; but a study of the heats of formation will reveal the cause, and the reader is referred to Prof. Joseph W. Richards' works on "Metallurgical Calculations" for detailed information on this subject.

Referring again to Dr. Peters' discussion of this subject we note on pages 394 to 397 of his work, a record of some of Prof. H. O. Hofman's scientific researches into the possible action of alumina in slags. After having selected an artificial laboratory slag of the following composition, as his standard:

	Per Cent	Per Cent Oxygen.
Silica	32.10	17.01
Ferrous oxide	35.90	7.98
Lime	32.00	9.12

which we note is almost a perfect mono-silicate, he replaces, according to their oxygen equivalents, each of the elementary constituent parts in turn with the oxide, alumina, and in advancing steps of 1/8 by proportion, studying their physical characteristics and noting their melting temperatures.

I have made an examination into the results of this experiment to note any observations that could be gathered from the changing oxygen ratios that might occur resulting from the alumina substitutions, and in Table II is shown Prof. Hofman's slag compositions with the melting temperatures, and I have appended the oxygen contents of the various constituents, and my calculations of the ratios between the acids and bases.

MEANING OF TABLE II.

My deductions from these results are as follows: That in the substitution of the bases for alumina the melting temperature is either lowered or not appreciably affected, as the slag is changing from the mono-silicate formula through either a mixture of mono- and bi-silicates or intermediate types to the bi-silicate, except when brought under the influence of other well known and recognized conditions, which will be given consideration.

In the replacement of the SiO_2 with Al_2O_3 is noted an immediate stiffening of the slag and a raising of the melting temperature until 75 per cent. of the SiO_2 has been replaced with Al_2O_3, when the temperature could no longer be measured. With the Al_2O_3 as an acid the slag continuously remains a mono-silicate; but considering the Al_2O_3 as a base we note that when 50 per cent. of the SiO_2 has been replaced with Al_2O_3 we still have a mixture fusible at 1220 deg., and with the oxygen contents of the acids at 8.50 and the bases 25.62, indicating a tri-basic slag. What would happen were we to try and make a SiO_2, FeO, CaO combination according to that ratio, and analyzing somewhat as follows: SiO_2, 13.77; FeO, 43.11; CaO, 43.12 per cent.? We would certainly have to accept inevitable defeat from the furnaces. I would deduce from this experiment that the substitution of SiO_2 with Al_2O_3 in mono-silicate slags is accompanied by a rise in the formation temperature.

In the replacement of FeO with Al_2O_3 we notice at first a falling off in the melting point and then a rise until 75 per cent. had been replaced, after which the combination was still fusible but the temperature was above the capacity of the recording instruments. We note at this point that the slag is slightly acid in accordance with the bi-silicate-aluminate formula, whereas it remains a mono-silicate, should we consider Al_2O_3 as a base.

I would deduce from this experiment that considering Al_2O_3 as an acid, the slag indicates an improvement, as it goes through the change from a mono-silicate to a bi-silicate formula, which improvement is in turn counterbalanced by the decreasing ratio of the FeO to the CaO, causing an offsetting increased viscosity and higher melting point.

In the replacement of the CaO with Al_2O_3 we immediately note a lowering of the melting temperature which remains constant until about the point where the slag would be a true bi-silicate-aluminate, and substantially the same observations will be gathered from the experiments on the replacement of both the FeO and CaO with Al_2O_3. We also note in both instances that he found it possible to fuse together slags in this manner that would have a tri-silicate aluminate formula, and in this connection I cannot help but feel as a reasonable deduction that we have arrived at still further proof as to the acid action of alumina in our blast-furnace slags.

A FIELD FOR FURTHER STUDY

It would certainly be most interesting in connection with a further study of this subject, if some of our college laboratories would duplicate Prof. Hofman's experiments, varying his procedure by starting out with a slag of the bi-silicate formula, in which case I would look for very different results. Whereas in Prof. Hofman's mono-silicate experiments the replacement of the SiO_2 with Al_2O_3 was accompanied by marked difficulties and the replacement of the bases with Al_2O_3 indicated an improvement, I [illegible] experiment the indications of troubles in replacing the bases with Al_2O_3 and not such marked difficulties in the replacement of the SiO_2. Were the experiment to be tried with a tri-silicate as the standard, I would expect results similar to those from the bi-silicate, but with immediate and more pronounced troubles in the replacement of the bases with Al_2O_3.

A discussion of the rôle of alumina in lead and copper slags, written by Carl Heinrich and published in the JOURNAL as long ago as July 17, 1886, covers the ground very thoroughly, and the author gives to his satisfaction conclusive evidence as to the existence of alumina in the slags he had to deal with as an active acid. His experience at the works of the Champion Copper Mining Company, of New Zealand, is most interesting, and will in part be noted herein again, in view of the very high proportion of alumina in his slags.

The accompanying table is from his paper:

ANALYSES OF FOUR SLAGS, CHAMPION COPPER MINING COMPANY.

	No. 1 [illegible] First Run.	No. 2.	No. 3.	No. 4.
SiO_2	[illegible]	[illegible]	[illegible]	[illegible]
Al_2O_3	[illegible]	[illegible]	[illegible]	[illegible]
FeO	[illegible]	[illegible]	[illegible]	[illegible]
MgO	[illegible]	[illegible]	[illegible]	[illegible]
CaO	[illegible]	[illegible]	[illegible]	[illegible]
	98.3	100 00	100 00	100 00

PER CENT. OXYGEN.

	No. 1.	No. 2.	No. 3.	No. 4.
SiO_2	[illegible]	[illegible]	[illegible]	[illegible]
Al_2O_3	[illegible]	[illegible]	[illegible]	[illegible]
FeO	[illegible]	[illegible]	[illegible]	[illegible]
MgO	[illegible]	[illegible]	[illegible]	[illegible]
CaO	[illegible]	[illegible]	[illegible]	[illegible]

"Counting alumina as a base, the oxygen ratio of acids and bases in these four slags were as follows:

	1	2	3	4
Acids	[illegible]	[illegible]	[illegible]	[illegible]
Bases	[illegible]	[illegible]	[illegible]	[illegible]

ALUMINA AS AN ACID.

	1	2	3	4
Acids	[illegible]	[illegible]	[illegible]	[illegible]
Bases	[illegible]	[illegible]	[illegible]	[illegible]

"The first way of looking at the composition of these slags threw no light whatever on their behavior in the furnace. It made the worst of all, the scaffold slag No. 3, a correct mono-silicate, while the crucible slag No. 4, which had separated from the other slag, would have a composition more basic even than a sub-silicate, and the two better slags, Nos. 1 and 2, were slightly basic mono-silicates. This way of looking at their compositions surely did not seem rational.

"But looking at their composition the other way, it was found that the two better slags, Nos. 1 and 2, were very nearly correct tri-silicate-aluminates, while the infusible scaffold slag, No. 3, was more acid still than a tri-silicate-aluminate, and the crucible slag, No. 4, which had been separated and settled in the crucible, being too thick to run out of the slag hole, although melted, was a correct bi-silicate-aluminate."

The Furnace Makes Its Own Slag

The writer of the article claims to have secured the best results in his small circular furnace and heavy fuel charge, from the tri-silicate-aluminate slags, and his bi-silicate, No. 4, which was an accidental slag formed by the furnace itself, although abnormally high in magnesia, showed characteristics of a possibility that might have determined a slag policy; but in view of his lack of bases he preferred to make, and succeeded in making a slag with oxygen ratios of acids to bases of 3 to 1, counting alumina as an acid.

As an appendix to his article, he publishes a few more notes in the Journal of August 21, 1886, proving the correctness of his views, in which he mentions having tried his best to make alumina act as a base, but could not get the furnace to help him out, which calls to my mind a humorous incident that it will do no harm to introduce.

On making a morning round in connection with my duties, I was informed by the skimmer in charge of a reverberatory furnace, that it was "strictly on the bum," and he attributed the cause to a bad lot of coal. Mentally, I was forced to coincide with his views, but verbally persuaded him into believing that the coal was all right, and a good grating and careful attention during the day would materially help to straighten it out.

Next day it was, "Good morning, Joe, how is the furnace to-day?"

"Vell, I tells you, Mr. Shelby, dat coal's no good, I don't care wat you says; you can fool me, but you can't fool dat furnace."

And it is the same thing with the alumina; when it goes up the silica must go down, and there is no getting around it without more fuel and another type of slag.

The Mansfeld Slag

Let us give a short consideration to the famous Mansfeld slag, the high silica-alumina content of which would call for an explanation by the believers in alumina's rôle as a base. Following is a recognized analysis:

	Per Cent.	Per Cent. Oxygen.
SiO_2	47 66	25.25
Al_2O_3	16 45	7.73
FeO	5.04	1.12
MnO	0.35	0.08
CaO	18.89	5.39
MgO	4.55	1.81
K_2O	4.89	0.83
Na_2O	0.39	0.10
ZnO	1.92	0.38
	100.14	42.69

Considering alumina as a base, we have acids 25.25 and bases 17.16 per cent., approaching very closely a sesqui-silicate slag, or with an oxygen ratio of acids to bases of 1.5 to 1; which would indicate some unexplainable reasons for their very high fuel percentage, whereas we can easily make bi-silicates with much less fuel. On the other hand, considering alumina as an acid, we find the oxygen of the acids to be 32.98 and of the bases 9.33 per cent., indicating nothing except remote possibilities of a ratio of 3.5 to 1. This does not seem reasonable either, and we must look further.

With plenty of heat and local intensity, conditions will change and slags can be made, which, with our common temperatures, would be impossible. I have melted into a viscid molten mass in what was previously the fire-box of an ordinary reverberatory furnace, and which at the time mentioned was fired with pulverized fuel and an air blast through the back wall, tons of ash from the coal, the ash giving the following analysis: 54.8 per cent. SiO_2, 23.1 per cent. Al_2O_3, 10.4 per cent. Fe and 4 per cent. CaO. It formed principally near the bridge-wall (in the fire-box), and, as the heat was very intense and constant, conditions were good for extraordinary results.

This product was certainly fused, and generally chemically combined. Of course it would not flow; but on being stirred up with an iron bar it would string out more than any silicious slag I have ever seen. I did not have an analysis made of this fused product, but granting that the composition was the same as that of the ash, and that the iron was present as ferrous oxide, we have 29.03 per cent. oxygen in the SiO_2; 10.85 per cent. in the Al_2O_3; 2.98 per cent. in the FeO, and 1.14 per cent., in the CaO. If the alumina were an acid, there would be 10 oxygen in the acid to 1 in the bases, or, were alumina a base, there would have been 2 of oxygen in the acid to 1 in the bases, which should have been easily melted, whereas it only fuses into a pasty viscid mass, although the temperature was high enough to soften the exposed surface of the silica brick.

In the Mansfeld slag we find an appreciable amount of the strong alkalies which might easily be in chemical union, and as a mobile slag under high temperature conditions, with an oxygen ratio of acids to bases of 8 to 1, and in case of such event the 0.93 per cent. oxygen in these alkalies would accommodate 7.44 per cent. in the acids, leaving net for the other bases 25.54 per cent. oxygen in the acids as against 8.40 per cent. in the other bases, or in the ratio of 3 to 1, indicating a tri-silicate slag, quite possible under their conditions, and giving a slag formula of:

3 $SiO_2 + 2$ CaO or 2 FeO, etc. and
$Al_2O_3 +$ CaO or FeO, etc. and
4 $SiO_2 + K_2O$ or Na_2O.

Does this not appear more reasonable?

Glasses and Iron Blast Furnace Slags

Two specimen glass analyses are given as follows:

COMPOSITION OF TWO SAMPLES OF GLASS.

	Per Cent. 1	Per Cent. 2
SiO_2	74.09	66.75
Al_2O_3	0.40	1.31
CaO	5.85	13.37
K_2O	7.32	15.50
Na_2O	12.34	3.07

	Per Cent. Oxygen. 1	Per Cent. Oxygen. 2
SiO_2	39.25	35.36
Al_2O	0.19	0.61
CaO	1.67	3.81
K_2O	1 24	2 63
Na_2O	3 18	0 79

These are two quite different analyses as regards the proportion of alkalies and alkaline earths. Applying our Mansfeld formula, we find in the first 39.44 per cent. acid oxygen with 1.67 per cent. CaO oxygen to satisfy at 3 to 1, 5.01 of the acids, leaving 34.43 per cent. net, with 4.42 in the strong alkalies, or practically at the ratio of 8 to 1. In No. 2 we have 35.97 per cent. acid oxygen with 3.81 per cent. in the CaO to satisfy 11.43 per cent. of the acids, leaving 24.54 per cent. net with 3.42 in the strong alkalies, or a little less than enough to satisfy the ratio of 8 to 1. These glass analyses are not introduced as slag types, but their oxygen ratios have been examined into simply as a comparison with the Mansfeld type from the strong alkali point.

Table III presents a study of a wide variety of blast-furnace slags.

Discussion of Table III

Nos. 1, 2 and 3 are types specified by Thomas D. West in his "Metallurgy of Cast Iron." Nos. 4, 5, 6 and 7 are types specified by Dr. Thomas B. Stillman in his 1900 edition of "Engineering Chemistry," and No. 8 is a slag made by the Cleveland Furnace Company, December, 1907, and analyzed by F. G. Hawley, of the Cananea Consolidated Copper Company. No. 4, as reported by Dr. Stillman, did not specify either Na_2O nor K_2O, but simply 3.98 per cent. alkalies. As a consequence the analysis is repeated in No. 4½, showing the results in No. 4, considering all the alkalies as Na_2O and in No. 4½ as K_2O.

Should we consider Al_2O_3 as an acid these slags range generally between a bi- and a tri-silicate formula; whereas giving Al_2O_3 the rôle of a base, their formulas seem to vary more in accordance with the Al_2O_3 contents than in any other manner. This point is especially noticeable in No. 3, in which the Al_2O_3 contents have dropped off sharply and the slag gets back toward the higher silicate degree.

I do not feel at liberty to criticize these analyses any further and to attempt to show reasons why none of them agree with an exact formula, or to try and make them do so. I have had absolutely no experience in the metallurgy of iron and am unfamiliar with any invisible conditions that might affect these analyses except in the case of No. 8, the sample of which slag was taken by myself personally and analyzed under my supervision. The sample was originally small and practically consumed in endeavoring to locate the remaining 6.5 per cent. before the presence of fluorine in very appreciable quantities was discovered. It is then quite possible that should we accord this element sufficient of the Ca reported as CaO to form CaF_2, that the oxygen contents of the remaining bases would be such as to give the slag an exact bi-silicate-aluminate formula.

A few years ago Thorn Smith brought a Ducktown slag into prominence by having comparative analyses made at 20 different smelter laboratories with No. 1 in the following table accepted as the standard:

TABLE III. PERCENTAGE COMPOSITION AND OXYGEN RATIOS OF A NUMBER OF IRON BLAST FURNACE SLAGS

	1	2	3	4	4a	5	6	7	8
SiO_2	27.68	42.17	61.06	44.27	44.27	43.25	45.46	35.00	[illegible]
Al_2O_3	22.28	13.59	5.38	12.91	12.91	15.94	16.59	14.36	13.4
CaO	40.12	33.02	19.81	19.81	19.81	36.46	32.81	45.37	40.0
FeO	0.80	1.28	3.29	16.50	16.50	0.31	0.27	0.44	[illegible]
MnO	0.26	0.35	3.39	3.19	3.19	0.10	0.08		
MgO	7.27	8.31	7.12			2.1	1.08	1.40	[illegible]
Na_2O				3.98					
K_2O					[illegible]				
	98.35	98.61	99.29	99.94	99.94	98.18	96.29	96.57	93.5
Per Cent. Oxygen									
SiO_2	14.66	22.34	32.35	23.45	23.45	22.91	24.08	18.54	18.28
Al_2O_3	10.46	6.38	2.53	6.06	6.06	7.49	7.79	6.74	6.29
Acids	25.12	28.72	34.88	29.51	29.51	30.40	31.87	25.28	24.57
CaO	11.44	9.42	5.65	5.65	5.65	10.40	9.36	12.94	11.41
FeO	0.18	0.28	0.73	3.67	3.67	0.07	0.06	0.10	0.09
MnO	0.06	0.08	0.76	0.72	0.72	0.02	0.18		
MgO	2.89	3.30	2.83			0.84	0.43	0.56	1.06
Na_2O			..	1.02					
K_2O					0.67				
Bases	14.57	13.08	9.97	11.06	10.71	11.33	10.03	13.60	13.56
Oxygen ratios acids always 1.000.									
Bases:—Al_2O_3 as Acid	0.580	0.456	0.286	0.375	0.363	0.373	0.315	0.538	0.552
Bases:—Al_2O_3 as Base	1.707	0.871	0.386	0.730	0.713	0.821	0.740	1.097	1.085

ANALYSES OF DUCKTOWN SLAG

	1	2	3
SiO_2	33.78	35.92	29.97
Al_2O_3	4.07	3.46	3.55
FeO	40.86	52.73	58.40
MnO	0.53		
CaO	12.48	2.13	2.12
MgO	2.87	1.22	
ZnO	3.55	2.04	2.36

No. 2 is a 1906 specimen analysis from the Tennessee Copper Company's furnaces on the matte concentration charge, and No. 3 is a specimen converter slag. The percentages of oxygen in these slags are as follows:

	1	2	3
SiO_2	17.90	19.03	15.88
Al_2O_3	1.91	1.63	1.67
Total acids	19.81	20.66	17.55
FeO	9.09	11.73	12.99
MnO	0.12		
CaO	3.56	0.69	0.60
MgO	1.14	0.48	
Total bases	13.91	12.90	13.59
ZnO	0.70	0.40	0.46

The study of these slags is purely speculative, for all were made under strongly oxidizing conditions, the converter slag being the most basic of the three. No explanation of these slags will be attempted further than to say they are most likely a physical mixture of mono- and bi-silicates or intermediate types. They are here given merely as presenting a possible reason why some of our pyritic furnaces may depart from the bi-silicate formulas, and under strongly oxidizing influences, a preponderating amount of iron, and in the absence of fuel tend to produce slags of a more basic nature.

The B[illegible] the Copper [illegible] Slag

In my studies of slag analyses, I have certain standard types, as everyone has, of mono-silicates and others; but in studying the types of those produced at our larger copper-matting plants when exceptional conditions do not exist, I have arrived at the firm conclusion that in our standard copper-matting furnace practice the furnace itself will generally deliver a slag closely approximating a true bi-silicate with alumina in combination with the bases as an active acid. In fast-running furnaces it is a frequent occurrence to find uncombined minerals or elementary compounds washed out with the slag almost in the same form as when introduced into the furnace, causing misleading analytical interpretations. I am also convinced that the oxidation of the sulphides of iron on the charge is one of the most important factors that the copper pyro-metallurgist has to deal with, greatly affecting the quantity of fluxes used and hearth activity.

There are exceptions to all rules, and no one of us is infallible, and I present these notes simply as notes. I have given the subject a large share of thought and study, during a long period of time and coincidental with the smelting of a large tonnage of aluminous material. This is my opinion of a subject that has not been definitely settled, offered in the hope that it will save someone who may wish to carry the subject farther the necessity of going over the same ground. I do not wish to be interpreted as endeavoring to lay down the law as to the behavior of alumina in all cases and to call it unequivocally an acid; its combination with silica in nature in many different proportions and its chemical affinity for the mineral acids, would not permit of such a statement; Cr_2O_3 is to a certain extent analogous to Al_2O_3, but it has long been recognized as an active acid in its place. We are able to form chemically calcic-ferrites and acknowledge the weak acidity of Fe_2O_3, but both CaO and FeO are bases in our slags. Lime is a stronger base than ferrous oxide, and silica is a stronger acid than alumina, and as one electro-positive element becomes negative to one more positive than itself, alumina may be chemically negative to silica and silica in turn negative to fluorine, whereas all three are positive to lime or ferrous oxide.

I maintain, and make my metallurgical calculations with the belief that the silica in our blast-furnace slags combines with the metallic, earthy and alkaline bases in the most natural manner that existing conditions control, and I have never observed an instance in which I could bring myself to believe that it was in direct chemical union with the alumina, playing the rôle of a base. Nor do I believe that it can be forced to do so, at least not until after the silica has satisfied itself with the common bases in its highest natural oxygen ratio. Even a study of our iron blast-furnace slags with high silica-alumina contents has given me the impression that they respond better to inquisitive formulas with alumina considered acid rather than basic.

And as a general resumé of these notes, and my study of this subject, I have arrived at the conclusion that in our prevalent copper-matting blast-furnace slags the oxide, alumina, is neither a base nor a foreign substance carried in the slag menstruum, but is always present as an active acid; and that when one may seemingly be replacing an undisputed base with this oxide and thereby causing it to assume the rôle of a base he is simply altering the silicate degree of the slag.

The ore deposits of the Ten Mile district, of Colorado, are of enormous size, but are chiefly pyrites, or pyrites and blende, of low grade of silver. Streaks and pockets of galena occur in the great mass of mixed ore, and there are some strong shoots of lead ore, which have been worked successfully, as in the White Quail mine. The ore-bearing formation of the Ten Mile outcropped at the surface and was easily opened, dipping at a gentle angle, but the oxidized ores, which were richer than the sulphides, extended only to a small depth.

The Silicious Silver Mines of Parral, Mexico

Although Long One of the Large Producing Camps, Parral Now Depends on Deeper Mining and Cyanidation of Its Low-grade Ore

BY CLAUDE T. RICE

Parral is situated in a dry region, bare of timber, about 56 miles west of Jimenez on the branch road of the Mexican Central (completed about 1900), which leaves the main line at that point and extends 41 miles beyond Parral to Rosario. Parral is a town of approximately 15,000 inhabitants, situated among the rolling eastern foothills of the Sierra Madre range and along a stream almost dry in summer. Overlooking the town are the Tajo and the Prieta, two of the mines that in the past have helped to make Parral famous.

PALMILLA MINE, PARRAL

Parral is an attractive town with several plazas, but, of course, it does not rival Chihuahua in size or beauty. It is a supply point for the camps to the west and south, such as Santa Barbara, Guanaceví, Indé, and other camps.

The low metal prices have been especially hard on Parral miners, as the mines were in that critical stage when the smelting ores were being rapidly diminished, and yet the milling of the ores on the spot had not been solved in practice. This, together with the fact that most of the rich ore above water level has been mined, has caused the production of the Parral district proper to become small.

While the Parral district is often considered as including both Santa Barbara and Minas Nuevas, in this article the remarks will only apply to the mines in the immediate vicinity of Parral and those near Minas Nuevas.

History of the District

The mines at Santa Barbara were discovered many years before there is any record of mining near Parral, but in time here also the Spaniards found ore, for the veins generally have strong outcrops. As at Santa Barbara, so also at Parral, the veins were first worked for gold, although the gold in most of the sulphide ore, as well as in the oxidized ore, amounted to only a few grams per ton.

The date of the discovery of the ore is uncertain, but the town was founded about 1600, and the first records in the town hall bear the date of 1612. Probably the discovery of ore was the cause of the founding of the town, or at least ore was found a few years later, for by 1632 there were several mines working in the vicinity, and in 1634, when the first discovery of silver ore is reported, there were four amalgamating works and 20 adobe smelters in operation. From 1641 to 1647, there were 4,557,741 oz. of silver produced, but the output began to decline as the rich stopes near surface were exhausted and the finding of new orebodies became less frequent. In 1645 ore was discovered on the Veta Colorada by Diego Rodrigo, and subsequently that vein aided greatly in maintaining the output from Parral.

Before the completion of the railroad (about 1900) the ore was hauled to Jimenez and shipped thence to Mapimi, or El Paso for treatment, but this was expensive. Consequently, after English-speaking people began to obtain a foothold in the district, the milling of the ore was begun. The hyposulphite process was introduced about 1884 and since that time until within the last year consider-

PRIETA MINE, PARRAL

SAN CRISTOBAL, PORVENIR AND CAYMAN MINES NEAR PARRAL.

able ore has been milled in the district. Although on some favorable ores of the district an extraction of 85 per cent. has been made by the hyposulphite process, the extraction in most cases was below 75 per cent.; furthermore, as roasting is required, this process is expensive. Consequently, owing to the successful cyanidation of silver ores at Guanajuato and elsewhere, recently there has been considerable talk regarding the cyanidation of the Parral ores, and already one cyanide plant of 500-ton capacity is being erected to treat ore from the Veta Colorada mines.

In recent years there have been two notable ore discoveries in the district. About 12 years ago Angel Garcia, or rather leasers working on his property, discovered rich ore at the Refugio mine in a vein parallel to the Veta Colorada and only a few hundred feet west of it. Years before some shallow shafts had been sunk on the property, but no ore was found; it was this work that discouraged further prospecting and delayed the discovery of the large orebodies in that vein.

SOUTH END OF VETA COLORADA, REFUGIO LIXIVIATION PLANT IN FOREGROUND; ESCARPMENTS MARK COURSE OF VEIN

Pedro Alvarado and the Palmilla Mine

About 1900, rich ore was discovered in the Palmilla mine, although the mine had been worked for years without striking any considerable bodies of good ore. This mine has produced several millions of dollars and has made famous its owner, Pedro Alvarado. Wild stories regarding Señor Alvarado have been circulated by men who desired to advertise the district and float nearby properties. All sorts of stories have been told regarding the life of Pedro Alvarado, how he was a *peon* when he found the ore, and countless other stories equally false. Indeed the visitor from the United States, after all the wild and weird stories that he has read, is surprised when he meets Pedro Alvarado to see a quiet, small, dark-complexioned, bearded man, who little resembles the vain-glorious individual whom he had expected to meet.

The Palmilla mine had belonged to the Alvarado family for years and had long been worked by them. Pedro Alvarado never was a miner; he simply directed the work done by *gambucinos* on the property, and it was the *gambucinos* who discovered the real orebody. After that Pedro Alvarado worked the mine extensively on his own account by Mexican methods, long refusing to permit an American even to enter the property. The main fault of Pedro Alvarado has been that he was too credulous; consequently he made many queer purchases, including, among other things, a blast furnace to smelt an ore carrying little lead, no copper and over 60 per cent. silica; and a quantity of 6x14-in. steel I-beams, 32 ft. long, with which to roof over a wide stope in the mine. These I-beams were taken down to the 500-ft. level (quite an engineering feat), but were never put in place, although small drifts mark the site of the "hitches" where they were to have been put.

Much ore was produced from the Palmilla by Pedro Alvarado, and it was even said that he had asked to be allowed to pay the national debt of Mexico, but this is only another of the many untruths reported regarding him, for when asked by a friend about the story he replied that he did not now nor never had cared whether or not the debt was paid. Pedro Alvarado has shown many eccentricities, the most remarkable being his unconcern regarding the large amounts of ore which were stolen from the mine by his employees and his trusted men. Sometimes he discharged the thieves that were caught, other times he only warned them. His attitude seems to have been shown by a remark he is said to have made, during the time that the Palmilla mine was "in bonanza," when informed that certain men were stealing ore: "What does it matter, I have much silver, and the Palmilla mine will be furnishing much rich silver ore when I am gone."

But the Palmilla did not continue in bonanza, for at 600 ft. the water level was reached, and although electric pumps were installed and an electric power plant built, Pedro Alvarado was unable to lower the water. Consequently, he leased the mine to J. A. Coram, of Boston, and associates, for 15 years, in consideration of a cash payment (said to be $500,000) and 45 per cent. of the net profit from the sale of ore. In the meantime Pedro Alvarado is again in luck, for good ore is being obtained from the Maria mine, in the Ronces Valles district, in which he owns a half interest.

Geology of the District

The Parral district is characterized by large areas of igneous extrusions which form the capping to the deeper-lying Cretaceous shales, laid bare by erosion in many parts of the district. Near the Veta Colorada, this eruptive rock, or porphyry as the miners call it, appears to be an andesite, but near the Palmilla the rock appears to be more rhyolitic in character. Through these igneous extrusions cut several prominent dikes, and along and near some of these the veins are formed. As yet, none of the prominent veins, either laterally or in depth, have passed out of the igneous rock into the sedimentaries which outcrop here and there throughout the district.

There are several vein systems in the district, each of which is characterized by a different variety of ore. Near Parral there are two veins, on one of which are the Prieta and the Tajo, and on the other the Aguilereña and the Jesus Maris, two *antiguas* which have not been worked for years. These ores are mixed argentiferous sulphides carrying pyrite, galena, and sphalerite, as well as small amounts of chalcopyrite, in a silicious gangue. In fact, near the permanent water level in the Tajo mine small bodies of oxidized copper ore are being worked. The following is a typical assay of the ore that is generally shipped from this part of the district: Zinc, 17 to 20 per cent.; lead, 12 to 17; iron, 8; silica, 30 to 35; and 30 to 40 oz. of silver per ton.

Near Minas Nuevas, about seven miles northwest of Parral, is the Veta Colorada vein and to the west of it about 600 ft. is the approximately parallel vein on which is situated the Refugio mine. By some this vein is thought to pass into the Veta Colorada, but underground, it is said by the former manager of the property, there is no indication of such a joining (or crossing) of the Veta Colorada and the Refugio vein.

The Veta Colorada

The Veta Colorada is one of the famous veins of Mexico, for much ore has been mined from this vein, which has been productive along a distance of 2½ miles; but as the fault scarp which marks the vein is quite strong and can be traced for a considerable distance on each side of the ore-producing area, frequently the statement is made that the vein is ten miles long. This vein is simply a fault or shear zone in the country rock along which the ore has been formed, partly by deposition in open spaces along the fault, but mainly by silicification and impregnation of the country rock. This impregnation occurs generally on the hanging-wall side, but sometimes the ore also is found extending into the country rock on the footwall side. Consequently the vein is characterized by a well marked footwall and has generally only a commercial boundary for a hanging wall. Throughout the vein many false walls are found on the other side of which the good ore extends. These false walls are often so smooth and well defined that the former miners did not prospect to the other side of them; consequently, much ore has been left in the old stopes of the upper part of the vein. Indeed, almost invariably when the main fault plane was a false footwall, the old miners failed to find the ore. It is from these bodies of good ore and the richer filling that the mines working on the Veta Colorada are at present producing.

[illegible] HILL IN CENTER

The ore from the Veta Colorada is highly silicious and is characterized by a high percentage of calcium fluoride; in fact, much of the ore is silicified country rock. In the upper part of the vein the ore contains much iron oxide, and it is from this fact that the vein takes its name, the "Red vein." Peculiarly, the ore does not carry much iron below water level, indicating that the iron oxide is probably the result of the accumulation from the erosion of vein matter, or possibly has been transported thither by circulating surface water.

In the past the ore milled and shipped from the Veta Colorada has averaged, per metric ton, about 850 grams silver, 0.2 grams gold, ½ per cent. lead, 8 to 10 per cent. iron (above water level), 12 to 15 per cent. calcium fluoride (locally designated as "unavailable lime" and calculated in assays as CaO, instead of CaF_2, as it really occurs), and 60 per cent. silica, the silver in the ore being present above water level as chloride, bromide, or iodide and below mainly as argentite.

The vein strikes N. 15 deg. E. and dips in the upper levels about 50 deg. to the southeast, but flattens somewhat in depth. The vein is often said to be 100 ft. in width, but as the hanging wall is merely a commercial boundary, the width of the vein depends on the speaker's conception of what is ore. As yet the vein has rarely been mined over a greater width than 40 ft., and most of the stopes are nearer 10 ft. in width. This represents the width of the ore available at present, but the successful adaptation of the cyanide process to the treatment of this ore will extend the width of the commercial ore somewhat.

Palmilla-San Juanico Vein System

The other belt of mineralization in the Parral district is that extending north and south through the vicinity of the Palmilla mine. In this belt are the San Juanico, Palmilla, San Cristóbal, Porvenir, Cayman, and other properties. Near this belt there occurs a large north and south dike which is very noticeable on the north side of Palmilla hill. This belt is the scene of much of the recent development in the district which has been encouraged by the history of the Palmilla mine. The ores of this belt are quite silicious as are the other ores in the Parral district, but they are notable as carrying gold along with the silver. Generally this gold amounts to only 5 or 6 grams per ton, but some of the ore from the Palmilla and especially from the San Juanico mine has carried several ounces of gold per ton. For several years the Palmilla mine shipped a high-grade ore averaging 2500 grams silver and 25 to 30 grams gold per ton, but much of the ore shipped was of lower grade, carrying 1500 grams silver and 5 to 8 grams of gold per ton. All the ore in this belt is silicious, carrying over 50 per cent. silica, considerable fluorspar, very little lead, and a trace of copper, the silver being present mainly as a chloride or a sulphide.

The Palmilla Mine

This mine is at present the most famous in the district. The ore occurs in a fairly vertical chimney, several hundred feet long and one to two hundred feet wide, forming the core of Palmilla hill, which rises 400 ft. above the gulches at its base. The walls of the chimney are commercial, for much of the ore is simply silicified country rock. Small veins join this chimney both from the west, south and southwest, but are cut off on the north side by a dike. The ore is mostly of milling grade but in it occur narrow shoots of rich ore. As has been said, several small veins have been traced out of the Palmilla, but in none of these has rich ore been found to extend beyond the Palmilla claim, although considerable money has been spent in prospecting the vicinity.

One of the best signs of the greatness of the Palmilla mine is the peculiar methods of working that it has been able to survive; for instance, Pedro Alvarado sunk nine shafts from the top of the hill, all of which extend to the 300-ft. level and several to the deepest, the 600-ft. level. The vein makes about 800 gal. of water per minute; at present the American company is keeping the water down with the old electric pumps, but new electric pumps are to be installed so as to attain greater depth. Apparently most of the shipping ore in the upper workings has already been mined, for, during the time that Alvarado was trying to lower the water in the mine so as to get deeper on the vein, he sought diligently for shipping ore; but there remains much milling ore above the present water level. The mine is equipped with a tramway 4½ to 5 km. long, this being the only tramway in the district.

Mines at Present Working

As has been said the slump in metal prices, especially of silver, has been hard on the Parral mining companies, consequently few mines are working. The Palmilla mine is shipping considerable ore; the Tajo mine near Parral is at present shipping mainly copper ore; the Veta Grande, the Verde and Los Muertos mines on the Veta Colorada are mining old filling and ore overlooked in the old stopes, all this coming from above water level; the Porvenir is doing some development work and the Prieta mine is being unwatered, 500-gal. electric sinking pumps being used. The other properties are shut down.

The most important work in the district is the building of the Veta Colorada cyanide mill, designed by Robert Allen, of Kalgoorlie, Australia, in which complete sliming in Wheeler pans and tube mills, air agitation in Brown vats and filtering on Ridgway filters will be used.[1]

The future of the district depends on the successful milling of the ores on the spot. Formerly the companies, on account of the high freight and smelter charges, tried hyposulphite lixiviation, but this also was expensive and many of them returned to smelting when the smelters began to encourage the mining of silicious ores by reducing the charges on that class of ore.

OLD OPEN CUT AT TAJO MINE FROM WHICH THE MINE GETS ITS NAME

Recently the district has been greatly encouraged by the success attending the cyanidation of silver ores in other parts of Mexico, so that all the companies are anxiously awaiting the completion of the Veta Colorada mill. The company holding the Palmilla lease is also talking of building a cyanide mill for the treatment of its ores; in order to profitably mine much of the ore on the upper levels, such a mill will be necessary.

The quantity of water found at depth in the Parral mines is ample for all milling purposes. Although it has caused considerable trouble in some cases, the flow of water is not excessive and can easily be handled provided that suitable pumps of ample capacity are installed. On the Veta Colorada vein, where the water trouble is most serious, the main trouble has been due to the fact that, although all the mines drain into one another, no mutual agreement can be made between the companies regarding pumping.

At present the mines of the district obtain wood and timber at fair prices from large tracts of timber land to the west along the Parral and Durango railroad, while a local electric-power company furnishes fuel-generated electricity,

While the chief causes of the quiescence at Parral are low-metal prices and absence of means for cheaply milling the low-grade ore developed while mining the shipping ore, there is another factor which will tend to extend the period of quiet beyond its normal length. This is the fact that in the past many of the mines have been sold at highly exorbitant prices, and consequently, even when good men have been in charge of the properties, the shareholders have received poor returns for the money invested. Unfortunately in many cases men, but little experienced in mining, have been sent down to take charge of the mines and in such cases still smaller returns were received. Besides, several wild-cat companies have been promoted to work mines at Parral. Even when the companies, which have been fooled, own good mines, they are reluctant to advance more money to experiment on the treatment of the ore, but prefer that others should do the experimenting; thus, there is little prospect of much mill building at Parral in the immediate future.

Conclusions

The district has produced much silver in the past, and it will continue to do so in the future, but this production will come mostly from low-grade ore treated locally in cyanide mills and not from ore shipped to the smelters. Therefore, it is to be hoped that the Veta Colorada company will emerge from its difficulties, and that the cyanide plant, which it is building, will soon be in successful operation, for there is no one thing that will have so great an effect upon the future of the Parral district as the successful cyanidation of the low-grade silver ore from the Veta Colorada.

Experiments have been made to reduce the wear on the lining of a cupola above the melting zone by introducing several rows of hollow cast-iron blocks. These blocks resist erosion better than firebrick, and easily withstand the temperature around the charging doors.

According to a writer on copper and brass, in selecting coal for muffles it is advisable to have present as little sulphur as possible; but for furnaces where the products of combustion come in contact with the molten metal, the necessity for sulphur-free coal is increased.

---

[1] Described in The Engineering and Mining Journal, July 18, 1908.

Short Talks on Mining Law—VII

By A. H. Ricketts*

It has been said by the courts that miners used the terms "vein, lode and ledge" found in the United States mining act before geologists attempted to give them a definition, and that a "vein, lode or ledge" within the meaning of those terms, as used in the act, is that which is so called by miners. Among practical miners, generally narrow veins are designated simply as "veins," while veins of great thickness are called "lodes," and when a lode contains more than one vein or is of great width it is popularly called a "broad lode," but the existence of veins within a lode formation does not necessarily make it a broad lode in the eyes of the courts. The courts generally seem to make no distinction between the terms "vein" or "lode," but in several cases it has been held that the definition of a lode or vein must always have special reference to the formation and particular characteristics of the particular district in which the lode or vein is found.

The question of what constitutes a vein or lode within the intent of different sections of the mining act is said to arise (1) between miners who have located claims on the same vein or lode, (2) between placer and lode claimants, (3) between mineral claimants and townsite patentees, (4) between mineral and agricultural claimants, and what is said in one character of cases may or may not be applicable in the other. Loosely speaking, a vein or lode is any seam or fissure in the earth's crust filled with any valuable mineral deposit in place, but it does not follow, as shown in a previous article, that mineral in vein or lode formation is necessarily subject to lode location under the mining act.

Elements of Veins and Lodes

The essential elements of a vein or lode are mineral or mineral-bearing rock and boundaries. A vein need not be of uniform dip, thickness or richness, nor have well defined walls. It may be very thin and it may be many feet thick, or thin in places—almost "pinched out" in miners' phrase—in some places, leaving only a narrow seam of clay to lead the way for the miner to follow his vein until the country rock disappears, and in some places widening out into extensive orebodies. An intrusion of the country rock into a lode or vein is called a "horse." The vein may vary in direction, width and dip. It may split into branches both in length and in depth which may or may not again unite. It should be continuous only in the sense that it may be traced through the surrounding rocks and not consist of detached pieces or bunches of quartz. It must be "in place," that is, inclosed by the fixed and immovable rock forming the general mass of the mountain. If the rock above the vein is in its original position, although somewhat broken and shattered by the movement of the country, or other cause, it is "in place." A fissure in the earth's crust, an opening in its rocks and strata made by some force of nature, in which the mineral is deposited would seem to be essential to a lode in the judgment of geologists. But it has been judicially said that to the practical miner the fissure and its walls are only of importance as indicating the boundaries within which he may look for and reasonably expect to find the ore he seeks. So that a lode within the meaning of the mining act is whatever the miner could follow and find ore.

It is said that the best judicial definition of a lode is "a zone or belt of mineralized rock lying within boundaries clearly separating it from the neighboring rock. It includes all deposits of mineral matter found through a mineralized zone or belt, coming from the same sources, impressed with the same forms and appearing to have been created by the same processes."

So a tilted bed of limestone, broken up, crushed, disintegrated and fissured in all directions so as to destroy to a great extent all traces of stratification and containing mineral sufficiently diffused to justify giving the limestone the general designation of mineralized matter, metal-bearing rock and bounded on one side by a wall of quartzite and on the other side by a belt of clay or shale, was held to be a broad lode or zone. So "yellow porphyry" containing numerous seams, crevices, fissures and deposits where the quartz rock and decomposed earth and rock with mineral sufficiently diffused to give such porphyry the general designation of mineralized matter within a footwall and hangingwall of "purple porphyry" was declared to be a broad lode or zone. In another case it was held that strata lying along the plane of contact between blue and brown limestone, if mineralized to the extent of showing valuable minerals and distinguishable from other parts of the country rock by carrying ore and by association with the plane of contact, constituted a mineralized zone.

A broad lode or zone may contain more than one vein. But if there are within the limits of such lode or zone true fissure veins plainly bounded it cannot be deemed a single vein or lode, although such zone may have boundaries of its own which may be traced. For example, it has been held that "where mineral deposits are separated into three well defined parts traceable for a great distance in their length and depth and having distinct foot- and hanging-walls, each part is a separate vein within the meaning of the mining laws giving the right to follow the dip of a vein beyond the side lines, although there are many ore-bearing cracks and seams running out from each vein and sometimes extending over to the other."

The ownership of the apex of a broad lode confers the right to all minerals within its walls, although one of the walls is within the surface boundaries of adjoining territory claimed adversely, provided the formation is such as to present a unity of the whole mass.

The end lines determine the right to the vein or lode upon its strike and the vein or lode may be pursued underneath the surface beyond either side line and between the end lines upon its dip. The practical idea of the miner when he speaks of following the dip, is when he works downward, leaving the apex farther from and above him at each advance. A location made wholly upon the dip is illegal.

The apex is the top or summit of the vein or lode. It may be a point or a line of great length and may be on or at any distance below the surface. It has been held that unless there is some edge or end as a beginning point in a vein or lode from which it can be followed down at some angle below the horizon, there is no apex from which the vein or lode can be followed beyond the side lines. An outcropping is not necessarily the apex of a vein or lode, nor is a swell in the mineral matter a true apex. The existence of the apex is a question of fact, but what constitutes the apex is a question of law. It is possible that there be an actual and also a legal apex of the same vein or lode.

Rights of Owners

The owner of the apex may invade other territory in the pursuit of the vein or have his own territory invaded, whether the claim is patented or unpatented, and the relative dates of the location or patent are immaterial, except when the dip carries the vein or lode into land previously patented as agricultural land. In the latter case the vein or lode cannot be followed thereon. It is not given to the owner of the apex the right for any purpose to invade the surface, nor to subterraneously explore ground adversely held to determine the continuance of his vein or lode therein. The vein or lode must be followed from his own claim and even then he is regarded as a trespasser until he proves his right of entry.

Veins or lodes may intersect upon their strike or dip, or below the point of union become one vein or lode, in which case the prior location takes the vein or lode below the point of union, including all the space of intersection. Where two or more veins or lodes cross each other, priority of title governs and the senior location is entitled to all ore or mineral contained within the space of intersection, but the junior location has the right of way through the space of intersection for the convenient working of the mine. Where two or more veins unite the prior location takes the vein below the point of union including the space of intersection. The courts are not in accord as to what is precisely meant as to the extent of such right of way, that is, whether it is limited to the space of intersection of the veins or lode, or extends to the space of intersection of the claims. The current of authority is in favor of the more limited view of the law.

---

*Member of the San Francisco bar, San Francisco, Cal.

The right to follow the dip does not attach to a vein or lode within a placer claim held or patented merely as such. The right to follow the dip of a vein or lode within a mining claim carved out of "agricultural" lands held in private ownership, will depend upon the terms of the grant of the claim by the owner of such lands, as there is no "location." The fact that land patented as "agricultural" is subsequently discovered to be valuable for its minerals does not affect the title of the patentee thereto. No adverse entry can be made upon such land for the purpose of prospecting, working or locating the same.

Alaska Mexican Gold Mining Company

The report of the Alaska-Mexican Gold Mining Company for the year ending Dec. 31, 1907 enters into the operation of the mine and of the mill and the costs connected with these operations, in the most minute detail. The following is necessarily greatly condensed:

FINANCIAL STATEMENT.

	Total.	Per Ton Milled.
Receipts:		
From bullion	$347,212	$1.6205
From base bars	4,601	0.0215
From sulphurets	296,165	1.3822
From interest	2,086	0.0097
Total	$650,063	$3 0339
Disbursements:		
Mining and development	$254,829	$1.1893
Milling	56,808	0.2651
Sulphuret expense	25,823	0.1206
General expense	7,269	0.0339
Construction and repair	1,317	0.0061
All other expenses	15,106	0.0705
Total	$361,152	$1.6855
Net operating, profit	$288,911	$1.3484

THE MINE

During the year the development fell short of that done in previous years. The development in 1906 is here shown in parenthesis: Drifts and crosscuts, 1487 ft. (4857 ft.); raises, 493 (1760); stations and skip chutes, 101 (441); shaft sinking, 21 (182); totals, 2102 (7240). The total development in 1905 was 8006 ft.

The total amount of ore mined and sent to the mill in 1907 was 156,987 short tons of which 84.36 per cent. came from the 660-, 770- and 880-ft. levels; a small amount of stoping was also done at the 550- and 990-ft. levels.

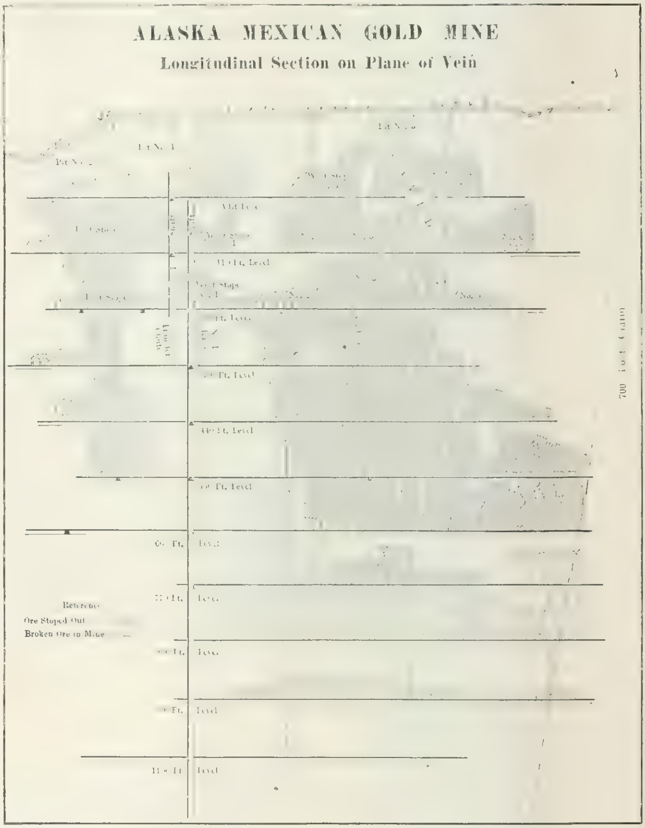
It is estimated that the ore reserves above the 1100-ft. level amount to 794,924 tons including ore in pillars. There were 158.568 ft. of holes drilled during the year by which were broken 157,263 tons of ore and waste making an average of 0.99 tons broken for every foot drilled.

The average assay of 1024 samples show that the ore is gaining in value with depth: From the 550-ft. level, 5 samples showed $1.94 per ton; from 660-ft. level, 215 samples showed $2.45; 770-ft. level, 260 samples, $2.79; 880-ft. level, 194 samples, $2.85; 990-ft. level, 268 samples, $3.52; 1100-ft. level, 82 samples, $4.22; average, 1024 samples, $2.80 per ton.

THE MILL

The 120 stamps in the mill crushed 214,263 tons of ore at a cost of $0.2651 per ton milled. The ore yielded $351,813 in free gold, including copper and base bars, and $296,165 from sulphurets treated. The total yield was, therefore, $647,978 or $3.0242 per ton. The mill ran 172½ days on steam power and 134½ days on water power, the lost time being 54 days. The average duty per stamp was 5.81 tons per 24 hours. The consumption of quicksilver was 60,874 oz., of which the batteries used 56,419 oz.; the plates, 2182 oz.; and miscellaneous places, 2273 oz. The amount of mercury fed per ton of ore crushed was: 0.2633 oz. to the batteries; 0.0102 oz. to the plates; 0.0106 for cleaning amalgam; total 0.2841 oz. per ton of ore crushed. The consumption of quicksilver by the batteries was lowest in the month ended May 15 (0.1771 oz.) and highest in the month ended Dec. 15 (0.3125 oz.). On the plates the lowest consumption was in the month ended Aug. 15 (0.0051 oz.) and the highest in the month ended Feb. 15 (0.0323 oz.).

The average gross value per ton of ore crushed was $3.0913 and the value of the tailings was $0.1941. The extraction, therefore, was 93.72 per cent.



DEVELOPMENT OF THE ALASKA MEXICAN MINE

In 1907 the average number of men employed per day was 143 and the average wage paid each was $3.26 per day.

It is stated by a writer on copper and brass that it is usually safest to use the purest copper for all brass alloys for rolling and drawing into tubes. Arsenic must not be present in a greater amount than 0.05 per cent., antimony, 0.01 per cent., or bismuth more than 0.005 per cent.

The Flushing System at the Gute Hoffnung Mine, Germany

By Lucius W. Mayer*

The Gute Hoffnung mine, one of the Mechernich Lead Company's properties, is situated in a town called Beschier, near Mechernich, Germany. The ore is found in flat seams averaging about 6 m. in thickness, and inclined about 5 deg. from the horizontal; the roof is in many places a soft clay formation. Chiefly for this reason a flushing system has been introduced, tailings from the mill being brought into the mines to replace the pillars.

In general, the method of mining employed is to run 2x2-m. drifts in the bottom of the seam, and extending these drifts so as to block out the ground to the limits of the orebody. From these laterals, cross-drifts are driven and pillars 10x10 m. square blocked out. Having blocked out a sufficient area the next operation is to bring down the roofs over the drifts to the hight of the seam. This operation is carried on in the drifts around the pillars, so that before robbing is begun, the pillar has been blocked out to the full thickness of the seam. The pillars are then attacked, leaving shells standing temporarily. Dams of timber are arranged in the usual way in the adjoining drift openings, and securely wedged in walls, roof and floor of the opening. Very often, it is necessary to leave a shell of ore 3 or 4 ft. thick for a roof under the clay. In the work of robbing the pillar, very little timber is used, the pillar being undercut, and everything above brought down as the work advances A pillar area having been prepared to receive its filling of tailings, a pipe line is introduced into the room. As the sand and water are flushed into the workings a sort of silt lake is formed, the sand gradually settling to the bottom. In the center of the area to be filled is placed a vertical piece of tin pipe perforated with small holes. The water passing through these holes into the pipe flows through a horizontal connecting pipe to the drifts and the pumping station. As the material enters this pond, a man provided with a hoe gradually builds up a surrounding wall or dam which holds the water in place until it drains off. As the filling material accumulates in hight, the center pipe is lengthened by means of additional sections.

More or less difficulty has been caused by clogging of the pipe systems, due to the presence of more or less heavy mineral in the tailings. This material accumulates in the pipes, and is difficult to dislodge. By placing cocks at intervals in the pipe line it has been found possible to locate the blockade more readily. A similar difficulty in France was overcome by reducing the discharge of the pipe.

The pipe through which the sand passes into the mine is connected with a hopper in the concentrating mill. Tailings are dumped into the hopper soon after they leave the tables in the mill. In the hopper sprays of water, discharging about 50 gal. per minute, flush the material away; where the hopper meets the pipe line, a further supply of water, amounting to about 40 gal. per minute, is introduced.

The specific gravity of the material flushed is said to be about 2.8, and the average amount of water used 4000 liters per cu.m. of sand, barely one and one-half times as much water as sand. The figure given for cost per cu.m. of sand filled in is 0.43 marks, or 10.7c., or 3c. less than the cost of dry back filling by hand, as formerly practiced. Using 2.8 as the specific gravity of this material, the cost per ton flushed is 5.01 cents.

---

*Mining engineer, 193 Pearl street, New York

The Huelva Pyrite Deposits, Spain *

By Bruno Wetzig

The masses of pyrite in the Huelva district occur on a plateau, rising to an elevation of about 1300 ft. above sea level, and consisting chiefly of shales and apparently stratified eruptive diabasic rocks, with occasionally a little greywacke and limestone. This plateau is a plain of erosion, for the rocks, which have an east and west strike, and northward dip, are folded and disturbed considerably. Into this mass certain eruptives rich in quartz have been intruded that affect the orebody.

The great masses of ore in the Rio Tinto and Tharsis mines, which are hundreds of feet thick, lead the casual observer to believe that the character and structure of the deposits are uniform, but closer study reveals the existence of separate beds of ore alternating with wedges, or lenticles of barren shale, called *cuña de esteril*. The orebodies, which are purely of sedimentary origin and of pre-Tertiary age, coincide in strike and dip with the shales, and are folded and disturbed in the same manner. Some of the orebodies are characterized by a higher percentage of lead and zinc, others by a high percentage of copper, while in still others, the ore is compact and rich in sulphur, carrying little copper. Occasionally the pyrite is so minutely interbanded with fine laminæ of shale that it assumes the appearance of shale, but the weight of this "shale" indicates to the miner the presence of pyrite.

The orebodies worked in the Carpio, Cruzadillo, Poytos and Lomero mines outcrop for a distance of [illegible]

The outcrop matter, or gossan, which is formed chiefly from the decomposition of pyrite, is an index of the character of the underlying ore, for wherever the gossan is a compact red hematite, the underlying pyrite is compact and poor in copper, but where the gossan is yellow and porous, pyrite rich in copper is generally found at greater depth.

Associated with the gossan, and closely resembling it, is a peculiar deposit, locally called *toba*. This *toba* was formed by the deposition, around pebbles of quartz and shale, of iron oxides formed by the oxidation of iron sulphate, leached from overlying masses of pyrite. In this way a conglomerate with a ferruginous cement was formed, while the gossan appears to be a breccia of iron oxides cemented by infiltrated silica. At the Rio Tinto mines the *toba* forms a large plateau called the Mesa de los Pinos, in which remains of Tertiary plants are found. In the Caridad mine it stands up as isolated veins among Eocene limestones.

Manganese deposits occur in the same formations as the pyrite, and like them, are interbedded with the shales. The manganese ore, however, rarely continues to a greater depth than 70 ft., and only at one mine, the Santa Catalina, have the manganese oxides been worked to a depth of 330 ft. Below the zone of oxidation the manganese occurs as silicates and carbonates in beds and lenticles quite similar in character to the pyrite deposits. These carbonates and silicates of manganese are, undoubtedly, primary deposits of sedimentary origin.

---

*Abstract from paper in *Zeits. f. prakt. Geologie*, Vol. XIV, pp. 173-186. See also *Trans.* A. I. M. E., Vol. XXXIII, pp. 704-707.

Red Cross Dynamite

The E. I. du Pont de Nemours Powder Company is marketing a new explosive called Red Cross dynamite, in which the ingredients are so chosen that the freezing point of the nitroglycerin is lowered to 35 deg. F. When the temperature drops below this point, the dynamite freezes very slowly. On the other hand, when frozen it can be thawed easily and quickly. In most sections of the United States this new dynamite will be frozen only at times when the temperature is unusually low. At such times it can be thawed with only a fraction of the trouble and expense necessary when ordinary dynamites are used. Red Cross dynamite is made in strengths from 25 to 60 per cent., according to both the straight and ammonia dynamite formulas, to suit the requirements of the consumer.

The London *Mining Journal* (May 16, 1908) states that two dredges will be installed at the platinum mines belonging to the Nijne-Taghilski works on the Martian river, Russia. A third dredge will work on Visimo-Shaitan pond and a fourth will work the auriferous sands of the Taghil river.

Losses of Coal in Mining a Flat Seam

Economy of Operation Cannot Be Obtained Where There Are Losses of Rail, Poor Ventilation and Indifferent Haulage. Air vs. Electricity

AUDLEY H. STOW*

Pillar work is not by any means the only class of mining that admits of closer analysis; the arrangement and placing of partings, the grades on the various hauls, the question of interest charges on track, and whether or not the old track is kept in repair and new track properly laid, are points to be carefully considered. It is also well to observe whether mine cars are kept in repair, the number of wrecks and cause of same, the system of timbering, and whether the system of drainage, pumping, ditching and baling will stand close scrutiny.

Considerable progress is being made in the analysis of the cost sheets, although often without as close a correlation as there should be between the apparent costs, and the conditions existing underground. The statement that track has cost less this month than the month before, means little unless it is known that it is as well laid; that haulage costs are less also means little unless the conditions are known; the actual performance of the drivers may have been poor, but the hauls less scattered and shorter. While supplies may have cost less, reserve stock on hand may have been recklessly used up. The cost of timbering may appear less at the time that whole panels of rooms are filling up with slate for the lack of a little timely timbering; the total costs per ton may be less while thousands of dollars worth of coal may have been left in the gob in order to save a fraction of a cent per ton on only a part of the output, and so on through the list. The most thorough comprehensive analysis of costs may be misleading, unless the general conditions in the mines are known and the relation established; not that it is thought practicable to express conditions of track, for instance, in arbitrary degrees of excellence or deterioration. Any apparent reduction in the cost of track should call for the closest scrutiny in the mines by someone independent of the mine organization, in order to determine whether the apparent reduction was at the cost of general efficiency or maintenance. If the inspections merely result in controlling the grade of execution of the underground work, they are not useless additions to cost; made in a fair spirit by competent men, they should save their cost many times over in the run of a year.

It is thought that the mine foremen's best interests are identical with those of the company; if the mine foreman is getting a high recovery of pillar coal at a slight increase in cost, which increase may be only a small fraction of the worth of the coal, if he is holding straight break lines when considerable temporary spurts in output might be made at the cost of lost coal later, if his track, bratticing, etc., is well kept up, necessarily at a slight increase in cost to what it might be, fair inspections should be only too welcome; that they are not desired, may be usually considered as good evidence that they are needed. No matter how good the mine foreman's intentions may be, as long as he knows he is valued in the market solely by the bookkeeper's annual report of the cost of coal per ton, just so long may he be expected to keep down apparent costs, no matter what are the real expenses.

While there are all possible variations in the management of mines, in high coal as well as in medium and low coal, still in a general way, inspection may be said to be needed in low coal more than in a high seam, for low-coal mining is the more difficult proposition.

One Form of Extravagance

One of the most common and expensive forms of extravagance in mine management, is the reckless waste and loss of rail. Much might be done in the way of impressing the mine foreman's assistants with the value of rail in dollars and cents, not per ton, which for some reason or other seems to make little impression, but per single rail; at $36 per ton delivered, a single 16-lb. rail 30 ft. long will cost at the freight depot $2.87, or, say, $3.25 to $3.50 at the working face; 25-lb. rail at $34 will cost from, say, $4.50 to $4.75 per single rail. In reporting six 16-lb. rail left in a certain air course, the rail should be described as $21 worth of rail; in some instances at least, six rail has seemed to make less impression than six spikes—the spikes could be picked up, while a driver would have to be sent after the rail.

The fan may be of a modern type, with large capacity for the requirements; the State mine inspectors may report the ventilation as good, and there may be no complaint on this score from the men. Inspection by the operator would seem useless. If the fan has a capacity of 200,000 cu.ft. of air per min., quite possibly 100,000 cu.ft. will be ample for present needs, although the excess should be utilized in assisting to clear the mines of dust. It is not that the loss is a serious one at present, but that in, say, five years, with another mile of leaky brattices added to the circuit, the situation may be serious, in spite of the ample ventilation capacity. The capacity of the fan should be the standard of comparison, instead of the minimum requirements of the men, in order to prevent accumulated back costs in the way of brattice repairs. Where practicable, the double air course is advisable, as it almost eliminates the brattice as well as the resulting leakage.

Doubling the ventilating cross-section reduces the friction and loss of pressure materially; doubling the air course leaves the main entry and what would otherwise be its air course, as double intakes—in the case of exhaust fans—reducing the friction on this part of the circuit as well, but more particularly in the case of moving trips.

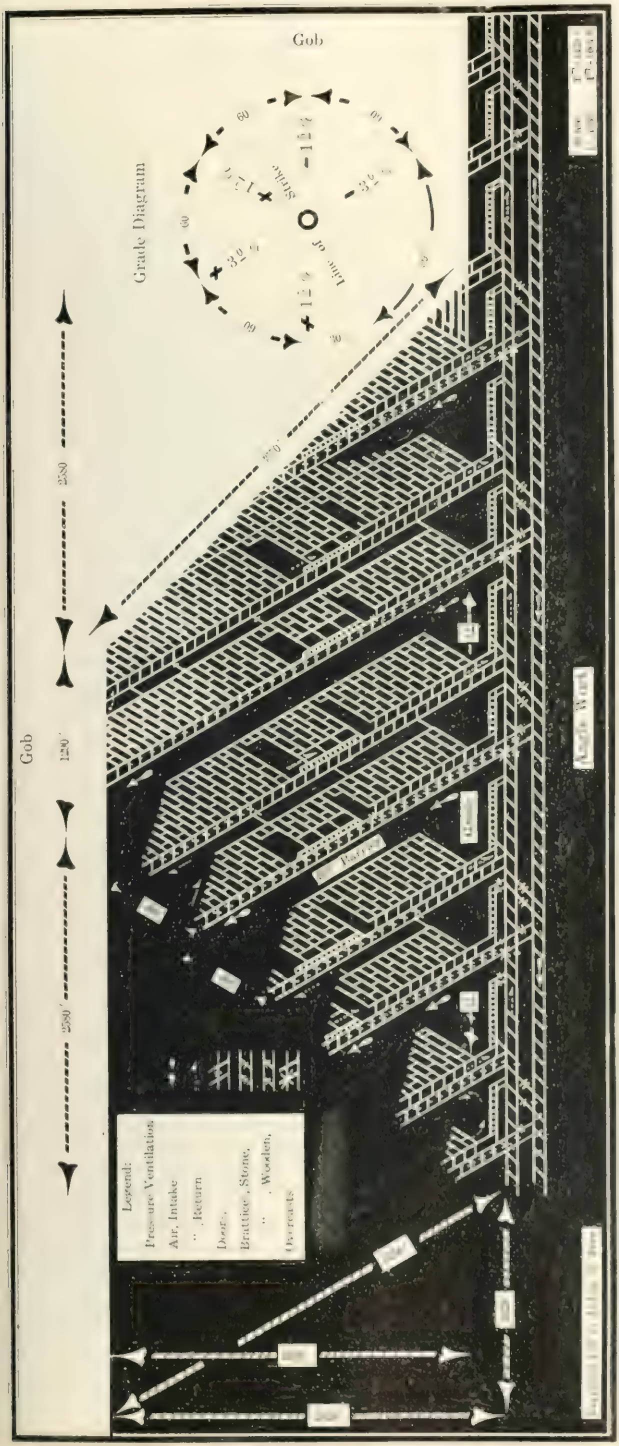
Ventilation

Interesting as is the subject of ventilation, only a few points can be considered at present.

Driving every other room only, as in panel 12-4, Fig. 4, shown on page 894 of The Engineering and Mining Journal for May 2, 1908, will doubtless be seriously criticized by many on the score of ventilation, and thought impracticable for that reason; while it is not contended that every other room only can be readily driven under all conditions, yet it is a fact that instances have been seen in high non-gaseous seams, where work was driven in this way, and the air in the faces of the rooms was quite as good, if not better than in low coal with every room driven. The question of driving every other room only, in high coal, is much the same as whether it is necessary to drive breakthroughs as close together in high coal as in low coal; judging solely from practical experience, without any consideration of theoretical reasons, it seems only too clear where there is no gas that breakthroughs can be driven further apart in high coal than in low coal, other conditions being the same. Again, in a heading with 5000 cu.ft. of air passing through the last crosscut or breakthrough per minute, if say 80 ft. is a suitable distance between breakthroughs, a somewhat greater distance should be allowable with 50,000 cu.ft. of air passing. Were there no objections to breakthroughs, this point would not be worth the space it has already taken; it is hardly possible, however, to get as good a recovery from pillars where the work is badly cut up with breakthroughs. Useless waste of coal is now becoming a matter of national concern; the manager or superintendent should not be forced to

---

*Consulting mining engineer, Maybeury, West Virginia.



METHOD OF DEVELOPING A FLAT COAL SEAM BY DRIVING THE ENTRIES AT AN ANGLE

cut up work further than actually necessary in any given case; not that healthful conditions should be sacrificed to the recovery of coal, any more than the recovery of coal should be handicapped unnecessarily.

In gaseous workings, the life of every man working in that section may be said to be dependent upon the integrity of the entry brattices, although doors, overcasts, etc., are necessary. The closer the breakthroughs are driven, the larger is the number and the greater the danger to every man working in the mines. It may be claimed that no large number of explosions can be traced to this cause; it is true, however, that brattices absolutely without leakage are rather scarce. The smaller the number of brattices the less should be the leakage, and in instances where the ventilation is barely up to the requirements, even the loss of a small amount of air may be of importance; the larger the number of brattices, the greater the chance of some brattice being wrecked by a fall of slate, at a critical time.

Theoretically, there is ample grounds for making the spacing of breakthroughs bear some relation to the thickness of seam and quantity of air passing, although material quantities of gas, when it occurs, will necessarily keep the spacing within close limits. If these points are considered, it would seem that it should be a matter of State regulation to see that room-work is not unnecessarily cut up with breakthroughs, on the score of recovery, and that breakthroughs on entries are not unnecessarily close together, on the score of safety.

In mines where the roof will not stand any length of time after the rooms are driven out, without filling up with slate, the system of driving every other room only, as in panel 12-4, Fig. 4 (before referred to), represents a material improvement in not merely reducing slate and track costs, but in making possible a materially better recovery of coal on the pillars. It is not contended that it would be practicable to drive every other room only, where the volume of air is only sufficient for driving every room; but that in the absence of gas, with, say, three or four times the amount of air that would be a liberal allowance for driving every room, it is practicable to drive every other [illegible] brattice cloth.

Exhausting or Force Fan

Whether it is best to have a fan ex- [illegible] through the workings, or have the ventilator act as a force fan, in which case the men and mules must travel through the dust and gas-laden air, has been so long discussed that there is doubtless little more to be said. The question has suggested itself, whether increasing the volume of air would not act more favorably in the case of a force fan than in the case of the same fan exhausting; doubling the air would certainly assist to retard the deposition of dust and make the mines safer. The excess of air could be admitted at advantageous points along the traveling ways. Where a fan is run as a force fan during the day while exhausting at night in winter time, the dangerous accumulations of ice in the air course, should be partly overcome.

In Figs. 3 and 4, on pp. 893 and 894 of the Engineering and Mining Journal for May 2, 1908, the ventilation is supposed to be straight overcast, without doors. Double cross-entries and double cross-entry air courses, as shown in Fig. 4, should be sufficient. Where the roof is bad and the places must be driven narrow, the additional yardage for triple cross-entries and triple cross-entry air courses would hardly be justifiable. Where the roof would admit of these being driven room width, the resulting ventilating cross-section should be sufficient for a considerable excess over actual requirements. The 11th cross at 1755-ft. centers, would be nearly four miles from daylight; for this distance a triple, if not quadruple, main entry and main-entry air course would certainly be preferable; the additional cost of entry yardage per ton of coal recovered should not be more than half that for the cross-entries.

In the case of panel workings, as illustrated in Figs. 3 and 4, the idea has also suggested itself as to whether some such arrangement as outlined in Fig. 1, which is along the line of the proposed haulage for panel 8-1, Fig. 3, would not be preferable on the score of ventilation. By adopting a somewhat similar arrangement of partings for headings No. 1 and No. 2 in panel 8-1, as proposed for headings No. 1 and No. 2, Fig. 1, No. 2 heading overcast could be located within the panel, thus reducing the number of overcasts on the eighth cross-air course, while not reducing the total number. The saving in expense should in part assist in paying for the additional entry yardage, as the overcast within the panel would not need to be shot as high as on the eighth cross-air course; furthermore, any leakage would only affect No. 2 heading, instead of all the workings above, which, as illustrated in Fig. 4, would be no small object.

If main-entry overcasts are called first class, cross-entry overcasts second class, and heading overcasts third class, it would seem preferable on the score of ventilation, to replace second-class overcasts by third-class, wherever the expense involved admits of it, which also seems more in line with the panel idea on the score of haulage. There would thus be but one break in the cross-entry motor tracks for each panel, instead of two, as illustrated. Where the roof is such as to admit of No. 1 room on No. 1 heading, panel 8-1, Fig. 3, being used as a slab parting for No. 2 heading, and, say, No. 5 room on No. 1 heading as the return-air course for No. 2 heading, there should be no material increase in cost involved in the proposed arrangement.

Scheme of Ventilation

While unquestionably the general scheme of ventilation should be arranged as far as practicable, to throw the entire force of the fan into each and any of the ventilated sections at suitable intervals, particularly in winter time when the mines are dry, it is possible that a movable, quick-running fan might be of material assistance in cleaning out the loose dust that would be likely to be dislodged by an explosion, the idea being to imitate—and thus anticipate—an explosion as far as possible. It would be interesting to determine the different amounts of dust dislodged by increasing the velocity of the air currents. The recurrence of explosions due in part at least to dust, would seem to warrant a bona fide serious effort to prevent the distribution of dust by the mine cars, more particularly along the motor haulways. Such action should be neither difficult nor expensive, and in cases where the slack is coked, should pay handsome returns in the amount of slack saved. Black strap put in the cracks that are not too wide, light strips of sheet iron over the wider cracks, and cleats nailed to the sides of the car around the end gates of badly spread cars, should hold most of the slack or dust; watering the loaded cars also answers well, but represents a considerable outlay in pipe lines, while somewhat objectionable in cold weather at the tipple; preventing the dust accumulating along the haulways would seem preferable to watering the dust after it has accumulated.

Air vs. Electricity

One of the interesting questions in regard to equipment is the selection of air or electricity. Notwithstanding the enthusiasm and arguments of the adherents of electricity, it does not seem good business judgment to disregard the many favorable points of the puncher machine, whatever may be said against a straight air equipment. In high soft coal readily undercut, where the large mules available quickly and easily move the chain machine from place to place and where high voltages, say 500, are practical, a straight electrical equipment has rather the advantage of the argument; but as the coal gets lower and harder, lower voltages are certainly desirable, if not necessary; large mules for the ready handling of the heavy chain machines are no longer available, and the light, easily moved, almost indestructible puncher begins to appear as a serious rival to the chain machine. While in low coal proper, the puncher at least, if not the compressed-air system, seems to have the best end of the argument, the solution may likely be a compromise between the two, although this is thought to involve the use of the motor-driven air compressor, which does not seem to have met with popular approval.

In spite of the many advantages of the puncher, its lightness and simplicity, its insignificant cost of repairs compared with the electric chain machines—depending somewhat, however, on the voltage, the hardness of the coal and the number of sulphur balls—the ease with which it is moved from place to place, the large per cent. of lump coal turned out by the places undercut, and the loss of pressure due to friction in the long air lines, the leakage and careless waste, may easily be sufficient to put the puncher out of service; furthermore with coals having high sulphur contents and extremely acid mine waters, the additional cost of maintenance of the pipe lines may become a serious item. With a straight compressed-air plant, scattered mine workings should be carefully guarded against; no matter how well the rooms and entries may be kept together, the workings may have advanced to such a distance from the power house, as to be beyond what may be called the puncher limit.

Except in the case of small properties that can reach no great limit, a central electric plant, with a motor-driven air compressor at the drift mouth, would seem a safer form of installation; as the workings advance, the compressor can be moved up. On the score of economy alone, as workings advance, all open work as far as practical should be cleaned up behind, and any coal left should be solid and of sufficient width to necessitate working a considerable number of men. If the workings become scattered, or if more extensive developments are decided upon than first contemplated, a relay air compressor can be added to the circuit; additional units can be added to the central electric plant, usually without material loss as far as the original unit is concerned.

Just why the electrically driven air compressor has not become more popular is not quite clear; it is doubtless looked upon by many as one form of decentralization, which in a sense it no doubt is; located at a considerable distance from the drift mouth, particularly in low coal, its accessibility to constant inspection is a handicap, although telephone connections should obviate this objection to some extent. The extra salary is also an item, although the repairs on, say, five chain machines will ordinarily require, depending in part upon the carefulness of the runners, etc., a material part of one good workman's time, while the cost of the supplies for the repairs will easily make up the balance of the salary of an air-compressor man.

Almost any miner can run a puncher—

and without much damage to the puncher either—while careful (chain) machine runners are certainly scarce in some sections of our country. Handling the chain machine, particularly in low coal, is heavy laborious work, and labor in low coal usually costs more than the same amount of work in high coal; the additional cost does not always appear on the face of the cost sheets, the difference being at times that a class of labor is welcomed that would not be tolerated under better conditions. The weight of the chain machine is nearly equal to that of the loaded mine car in a low seam; the mule that often with difficulty gets the empty car back up to the face of a room or entry, has to pull the chain machine—practically a load—up the same grade; the resulting damage to stock is considerable. Although the self-propelling attachment obviates the disadvantage of the great weight of the chain machine as far as moving it is concerned, this is a rather slow way of getting around, compared with the puncher; the chain machine is often brought down the room to the entry and back up the next room, while the puncher runner frequently prefers to roll the puncher through the last breakthrough, rather than wait for the driver.

The favorable effect of the puncher on ventilation is something of an object, while the larger per cent. of lump coal gotten by the puncher often nets quite a nice sum in the run of a month, especially is this true when lump coal is in demand. The number of serious accidents to the runners of the chain machine is much larger than in the case of the puncher. With motor-driven air compressors, there should not be the same objection to say 500-volt motor haulage in low coal, it being comparatively easy to make the main motor roads safe for men and mules, which, however, is quite a different proposition in the case of the general wiring necessary for chain machines. Notwithstanding all this, the electric chain machine has unquestionably displaced the puncher, while parties who have seemed thoroughly familiar with the performance of the puncher have installed straight electric plants. The chain machine no doubt drives entries somewhat faster than the puncher and is better adapted to scattered mine workings, however, it is a question whether we should allow the mine workings to become scattered.

Even after installation, the punchers and compressor part of the motor-driven air compressor require few repairs that cannot be made in the nearest machine shop; however, the manufacturer of the electrical part of the equipment is always in close touch with the purchaser, if only on the score of supplies, and in a good position to discredit the performance of the puncher, no matter what may be the real merits of the case.

The Pneumelectric coal puncher will quite likely prove to be the "missing link" connecting air and electricity in coal-cutting machinery. Comparing this cutter with the electric chain machine, the general design of the Pneumelectric seems to indicate materially lower costs of repairs, and the price is little more than half that of the chain machine. In weight, this new cutter approximates closely that of the puncher, being but 210 lb. heavier than the Sullivan, and 360 lb. heavier than the lighter punchers. Although the Pneumelectric puncher appears to have a bright future, like the gathering motor, it has yet to prove its merits in general service.

Relation of Open Work Area to Working Costs

It has long seemed that there is a clear and certain relation between working costs and the extent to which the mine workings are concentrated. Costs go down as the workings become concentrated and *vice versa,* while on the other hand costs generally go down as output goes up, or up as the output goes down. Costs and area of open work are in direct ratio, while costs and output is an inverse ratio.

While no doubt these two axioms are self evident truths to the practical mine foreman, superintendent or manager, the question is, are they regarded, and is there not room for improvement in the actual practice of today. In many instances there seems to be an impression that a large output necessitates an immense area of open work, sometimes even with extremely vague ideas as to when the pillars will be pulled. Maximum output necessitates the pillar work being kept close up on the heels of the advance work, and usually requires breaks in the solid; the barriers should be of ample dimensions, sufficient to work an economical number of men, rather than have them the minimum dimensions for bare safety.

Eliminating the "Dip" Barrier

Concentration, or maximum output from minimum area of open work, while desirable on many points, appears to involve one objectionable feature in the "dip" barrier. This may seem a minor objection, compared with the advantages that may be gained; the question is, can we gain the same advantage in regard to concentration, etc., by some other plan, at the same time, avoiding the "dip" barrier.

One form of "angle" work is illustrated in the accompanying illustration, Fig. 6. This plan is clear of "dip" barriers, the numerous barriers shown being all recovered on the usual favorable grades of the room work; the only dip coal is the small triangles next the main, and even this dip coal could be recovered on favorable grades were it not for the awkward reversing of the break line, that would thus seem to be necesary. The question, therefore, is what price must we pay in this instance, for the elimination of the "dip" barrier?

Except in the case of flat work, say, under a 2-per cent. maximum rise of the coal seam, grades are an important item in the economies of coal mining; a detailed consideration, hoyever, of the question of grades, will require more space than it is possible to give this point at present. Under the conditions illustrated, with the maximum rise of the coal seam of 3 ft. per hundred, with the direction of the main drive 30 deg. up the pitch, and with the cross headings 60 deg. right off the main, the mule hauls on all cross entries will be 3 per cent. in favor of the loads.

A 3-per cent. grade in favor of the loads, has never appeared objectionable in rooms. With the brakes set hard, or the wheels spragged, the mule having been cut loose, the mine car can be run from the face of the room to the entry, with the certainty that the car will stop at the mouth of the room. If the grades on the cross entry are as flat as illustrated in the square panel work, the balance of the run to the motor partings, under these conditions, is an easy proposition. With gathering motors, the 3-per cent. grades in the rooms is a positive advantage, the loads being simply dropped out, thus saving either one room run per car loaded, or considerable switching.

As illustrated in Fig. 6, we have the flat grades in the rooms; the difference between a 1.5-per cent. and a 3-per cent. grade in favor of the loads, has not seemed of practical importance; when we come to the mule hauls on the entries, however, the difference in the two grades has seemed clearly a different proposition.

Proper Arrangement of Grades

To start down an entry on a 3-per cent. grade in favor of the loads, when the mule is hitched to the car, with even a good type of brake, is usually a mule-killing proposition; sprags are much safer, although reducing the number of cars per day per driver. The number of mules killed in this way will come near paying for a trapper to follow and ride the mule. A saving of 75 cents per day per driver, will make an appreciable addition to the annual dividend; the reduction in the number of cars per driver with spragging, has seemed to amount to about this same amount in cash.

With the common run-of-mine cars, and with a 3-per cent. grade in favor of the loads, there will be considerable coal lost on the partings, due to the severe shock on stopping, which also results in no little damage to the mine car; both of these items, however, are practically negligible.

The disadvantage of the grades on the entry mule hauls, as illustrated in Fig. 6, is of little importance, when the maximum rise of the strata is reduced to less than say 2 per cent.; however, in such cases, it is not evident why the objection to the "dip" barriers, as illustrated in the square panel work, is not also reduced to the same extent. The plan shown in Fig. 6 seems open to the same criticism, on the score of the large amount of open work, as that illustrated in Fig. 2, p. 505 of the ENGINEERING AND MINING JOURNAL, for March 7, 1908.

As will be noticed from the dimensions given in Fig. 6, each 2 ft. of advance of the cross entries in the direction of their drive, only results in one foot of advance in the direction of drive of the main entry; either the main entry must stand idle one-half the time, or it will quickly leave the productive area far behind; in time this advance will permit the opening up of a second working section, similar to that illustrated in Fig. 6, although this plan will double the already large amount of open work.

If only one section of open work is maintained, and the pillar work which follows can advance in the direction of the main drive, at but half the rate at which the main entry advances (which also applies to cross entries), it is not evident how the output can be more than half what would be obtained when employing the system shown in Fig. 2. If we restrict the area of open work in Fig. 6 to that indicated in Fig. 2, we reduce the output to one-half.

The plan shown in Fig. 6 somewhat resembles the method of mining in common use in the Georges Creek field, in western Maryland, as far as the general arrangement of rooms and entries is concerned, although the angle between the main and the cross entries has been made much larger. It should perhaps be stated that it seems possible, by changing the plan, to double the output, without increasing the area of open work, over and above that shown; neither time nor space will permit further discussion of this point, at present.

"Angle" work will generally result in a larger loss on the pillars, and a decrease in the percentage of coal recovered is a cash loss, although this item does not usually appear in the balance sheet.

There are certain items in the working costs of a mine that may be considered as fixed for any given date, and not affected by the area of open work; among these are, the rate paid the miner for digging and loading coal, and the interest charges and depreciation on the plant already installed. In regard to the variable inside items in the cost of mining, an arbitrary rule is, that costs vary directly, not in proportion to the area of the open work, but rather as the square of the open work, and much the same proportion seems to apply to the relation between costs and output.

For every ton of coal coked in beehive ovens, from 80c. to $1 worth of by-product is carried off as waste.

Colliery Notes

Coal tar applied with a brush to mine timber to act as a preservative is not very effective, as the timber is sure to be cracked by the heat.

Exposed electric cables should not be used where mules and boys have to stand to wait for cars. All such cable should be inclosed in wood casing or light steel tubing; the latter is not suitable for damp mines.

The diameter of a drum or sheave for a chain hoist should not be less than 30 times the diameter of the bar of chain iron. All chains for hoisting purposes should consist of short links so as to wrap snugly around the drums without bending. They should also be oval sided so that the surge of the chain links will act as a spring, yielding a trifle with each surge.

Chains used for hoisting and sling work should be tempered at least once a year and then carefully examined before being used again. The chains used at the foot of a shaft, such as are employed on empty car planes, etc., should be oiled with a brush, once a week, or oftener if the place is wet and damp. When oiling, the chain should be slacked so as to get the oil well between the links.

While carbon dioxide has been used with more or less success in extinguishing mine fires, the danger of producing carbon monoxide by the process of reduction from heated carbon, and thus causing an explosion, has rendered its use uncertain; furthermore, the cost of producing carbon dioxide has helped to place the process in the theoretically good, but doubtfully practical methods of handling mine fires.

The mines of the Takashimi coalfield of Japan extend under the sea and cover an area of about 2775 acres. A depth of 1600 ft. below sea level is reached in some places. In spite of this fact, but little water penetrates the mines. In the absence of fresh water, sea water has to be used as feed water for the boilers, and salt is being produced from the water used for this purpose, the production exceeding 5 tons per day.

A new patent slate picker recently installed at the Treverton colliery of the Philadelphia & Reading company has proved a success, and is said to do the work as well as the human pickers. It is a cylinder-shaped drum which revolves and separates the heavy slate and rock from the lighter coal. The work that formerly required nineteen men and boys is now done with six. Other mining men are studying the invention and watching the results.

When no anemometer is at hand the velocity of an air current can be measured by noting the time between the flash of a small amount of gunpowder at one end of a piece of straight entry of uniform section and the appearance of the smoke, caused by the flash, at the other end of the entry. Divide the distance traveled by the smoke, by the number of seconds it took it to appear at the other end and the result will be the approximate velocity of the air current in feet per second.

On account of moisture and the liability of damage from objects falling in the shaft, electric-power cables should be encased in iron piping. The protected cable can be easily supported from the timbers. Where the shaft is deep and the cable heavy, the line can be supported by fastening the cable to the pipe and then lowering sufficient slack in the pipes so that the cable will twist and coil and come in contact with the iron pipe. Friction between the cable and the pipe is then great enough to support most of the weight of the cable, and the remainder can be borne by fastening the top end of the cable.

The waste of our natural gas supply has been estimated at one million cubic feet daily, or the equivalent of ten million tons of coal a year. The record for petroleum is not much better. In the case of coal, there has been waste at every stage of mining and consumption. For each ton of merchantable coal brought to the surface, at least half a ton has been wasted by being left in the ground or thrown upon the culm pile. It is also a fact that less than 10 per cent. of the heat units of coal are utilized under the ordinary steam boiler, and in the locomotive, the waste is said to be not less than 95 per cent.

When contemplating the installation of rescue apparatus, thorough tests should be made before the final decision is reached. It is advisable to purchase one set each of three or four approved types of apparatus and experiment with them over an extended period under all possible conditions and with a variety of men. The last factor is the most important, as it is the men who have to wear the apparatus, and the appliance which is most likely to be successful is that which is worn with the maximum of confidence and ease; this point can only be decided by independent and prolonged experiment.

Mine workings and shafts are not only liable to be filled temporarily with foul air, but also with water; and often some means of penetrating this water is a vital necessity. The subject of diving, therefore, should be of considerable interest to mining engineers. In Westphalia, Germany, where breathing appliances have been so fully developed, a diving apparatus has also been provided at the Bochum Mining School and at one large colliery. During 1907, divers from the Bochum school were called upon 16 times to do important work under water, chiefly in connection with accidental irruptions of water during the sinking of shafts.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for July, 1908, was 44,500 copies.

August 1	12,000
August 8	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
  Demand and Supply 289
  An Extension of the Witwatersrand 290
*Zinc and Lead Smelting in Silesia *J. S. G. Primrose* 265
Building Stone, Sand and Clay in California in 1907 269
Alumina in Copper Blast-furnace Slags *Charles F. Shelby* 270
*The Siliceous Silver Mines of Patral, Mexico *Claude T. Rice* 276
Short Talks on Mining Law—VII *A. H. Ricketts* 281
*Alaska Mexican Gold Mining Company 282
The Flushing System at the Gute Hoffnung Mine, Germany *Lucius W. Mayer* 283
The Huelva Pyrite Deposits, Spain *Bruno Wetzig* 283
Red Cross Dynamite 283
*Losses of Coal in Mining a Flat Seam *Audley H. Stow* 284
Colliery Notes 288
Correspondence:
  Machine Sampling *Philip Argall* 291
  Table for Ready Calculation of Matte Value *A. J. Ireland* 291
Estimation of Cyanide Effluents *Dr. W. J. Sharwood* 292
Pig Iron Production in 1908 292
Questions and Answers 293
New Assay for Cyanide Solution 294
The Latest Strike on the Witwatersrand 294
Grecian Chrome Iron Ore 294
Size of Lime Grains Used in Cyaniding 294
Personals, Obituaries, Societies and Technical Schools 295
Special Correspondence 296
Mining News 298
Markets, etc. 304
*Illustrated

Demand and Supply

In a recent number of the *Quarterly Journal of Economics*, Prof. E. S. Meade, of the University of Pennsylvania, discussed "The price policy of the United States Steel Corporation," the essence of his views being that the Steel Corporation was justified in refusing to reduce prices, its attitude toward the market in this respect having been a subject of much discussion several months ago. The effect of Professor Meade's conclusion is destroyed by the fact that subsequent to the appearance of his paper, the Steel Corporation did in fact bow to the adverse conditions and reduce prices. This practical refutation of his arguments is so complete that it would be scarcely worth while to refer to them, were it not that he attempts to show that the well proved law of supply and demand may cease to be operative under certain conditions, and he presents a brief in favor of his theory so seductive that even so sound a critic as the New York *Evening Post* was led to admit that the theory might be true.

This extraordinary conclusion is based upon the idea that demand being apparently non-existent, nothing advantageous is to be gained by a reduction of prices, while on the other hand the result of a reduction will probably be demoralization which is disadvantageous. Professor Meade says that the facts recited by him "Show that the necessity of adjusting prices to changed conditions of demand, which is generally believed in as one of the economic axioms needing no demonstration, does not exist in the field of materials and machinery. Iron and steel products, aside from the limited amount needed for household purposes, are bought to make money from their use. . . . In this respect, iron and steel differ radically in the conditions of their production and demand from flour and meat, and oil and sugar, which are bought because they minister directly to human wants. The purchase of iron and steel is primarily a question of the condition of trade rather than the price of the article purchased."

It seems to us that it would be more logical to reverse this argument. Flour and meat and oil and sugar are immediate necessities. Important building operations requiring iron and steel may be deferred, but human beings must continue to eat without any substantial restriction of the amount; consequently, the prices for the foodstuffs ought to be the ones which could be held up according to the theory of Professor Meade, while the prices for iron and steel, like the prices for the other metals ought to be reduced in order to tempt buying. It is well known that buying for consumption diminishes upon a declining market, but nevertheless it is an axiom that a point is reached where the low price will be attractive.

For example, take the case of copper in 1907; upon the decline from 25c. per lb. to less than 12c. per lb. the buying was comparatively small, and in October there was a great accumulation of unsold stock, but in the neighborhood of 12c. per lb. there ensued immense buying, which absorbed a large part of the surplus and led to a sharp recovery in the price. That concessions in price do inspire purchases even in the case of iron and steel is illustrated by many new undertakings that are inaugurated when there is the ability to effect an important saving in the cost of construction. What better example of this can there be than in the history of the steel trade previous to the advent of the Steel Corporation? The most important constituent of the latter is the Carnegie Steel Company. Much of its success is attributed to the policy of Andrew Carnegie in keeping his plant in advance of every competitor and doing his construction work during periods of depression when materials and labor were cheap; on the other hand, the failure of Milliken Brothers, a competitor of the Steel Corporation, is attributed partly to the fact that it did its construction when labor and materials were dear.

We have had lately a great deal of academic and specious reasoning that the advent of the trusts created a new condition of things insofar as the law of supply and demand is concerned. It is undeniable that they have had an effect upon the markets; they have clearly showed their ability to control prices upon a generally rising market; but it has been shown with equal clearness that so long as there is any competition worth mentioning (in most cases there is) prices cannot be controlled upon a generally falling market. This has been demonstrated by the experiences in copper and lead. There was no reason to anticipate that iron and steel would be an exception, and the result showed that it was not an exception. Instead of the return of prosperity being seriously delayed by an abandonment of the settled policy on the part of the Steel Corporation, it was the practical opinion at the time that the stand-pat policy of the Steel Corporation and the labor unions was the great impediment to recovery in business activity. Results appear to be bearing out this opinion, although the concession of the Steel Corporation was but a grudging one and of comparatively small account.

"What is needed for the return of good times," says Professor Meade, "is the restoration of confidence, a general conviction that industrial and financial conditions are becoming settled, so that business men can plan for the future in the belief that their calculations of profit will be confirmed by the event." This is undoubtedly an element of the case, but we fancy that no man in business has imagined that a return of confidence is all that has been necessary to secure what the country has been waiting for. Many men have regained their nerve and are exuberant in their confidence, but they are unable to realize, except at a loss, upon their investments in land, factories, railways, etc., entered into upon the inflated basis of some time back, and consequently are temporarily unable to engage in new enterprises. What the country has been waiting for is to save and lay up sufficient money to catch up with the over-extension of interests during the last boom. This natural course of recuperation is facilitated by putting things down to an economical basis, and not trying to hold industry by the throat, which Professor Meade pronounces the Steel Corporation to have been right in doing.

It sometimes appears as if the law of supply and demand were not operative owing to a confusion of ideas as to the identity of the consumer. It is a common error to speak of the rollers of sheet metal, the drawers of wire, etc., as the consumers. Their true position is that of manufacturer. They are only one step ahead of the refiner, just as the refiner is a step ahead of the smelter. The real consumer is the person who ultimately makes use of the finished product and takes it out of the market. The identity of the ultimate consumer cannot always be easily determined. In the case of a large part of the consumption of pig lead, for example, the sequence of hands is clear, the ultimate consumer being the man who makes use of white lead in the painting of his house. On the other hand, the ultimate consumption of the copper drawn into wire, which is used for the construction of a street railway line is uncertain; perhaps it is the person who pays a 5c. fare for a ride. By the time the metal reaches its ultimate consumer, fluctuations in price have been spread over so many interests that individual effects may be imperceptible. Obviously, copper may fluctuate between wide limits without the majority of people knowing anything about it.

Moreover, a change in the price of one commodity may be neutralized by a change in something else. We have seen during the last six months of depression the development of much activity in the trade in white lead. In the painting of an ordinary house, 1000 lb. of white lead at 5c. per lb., or $50, may be required, but this may be only 25 per cent. of the total cost, the remainder being the cost of the oil and the labor, chiefly the latter. A change of 1c. per lb. in the cost of white lead alone does not affect the painting bill very largely, and may easily be offset by a change in the cost of labor. Thus we have seen many persons take advantage of the favorable opportunities of last spring to repaint their houses, and the market for white lead has benefited from the improved demand.

These simple illustrations show how complex are the conditions which govern consumption and prices at the present time. We have seen prices for commodities rise to high figures without restricting consumption. Three years ago it was the belief in the trade that if the price for copper should rise to 18c. consumption would be sharply restricted, but we saw it go to that point and much higher without restricting consumption. However, there came a time when the cumulative effect of high prices for many commodities created a burden which the ultimate consumer could no longer bear, consumption was restricted and prices fell. Professor Meade in upholding the late policy of the Steel Corporation disregarded the condition of general average, so well reflected in the index numbers for commodities, which are computed monthly by several authorities. If among 100 persons, 99 could be made to bear the burden, it would be easy and pleasant for the hundredth man; if upon a rising market for copper, *A* could greatly increase his production while *B*, *C*, *D*, and all the others were restrained from doing so, it would be very profitable for *A*. However, this is not the way that trade works. It is impossible to escape the general average of conditions. The law of supply and demand is as immutable as the law of the conservation of energy. Even the Standard Oil Company, which is nearer to having a monopoly in a great trade than any other trust, shows its wisdom in reducing prices in times of depression in order to stimulate consumption. However, it appears that the law of supply and demand may have the corollary that prices may rise without restricting consumption in the cases of commodities for which there are no substitutes, and when the general average of prices for commodities is stationary, or nearly so. But this is a condition which does not often exist in the trade in the great staples.

An Extension of the Witwatersrand

The exhaustion of the gold mines of the Witwatersrand, which some people have predicted, may be further in the future than these prophets have assumed, if the latest news from the Transvaal is substantiated by fuller reports. The cable announces that shaft No. 2 of the Brakpan Mines, Ltd., has struck the reef at a depth of 3695 ft., finding it at that point nearly 7 ft. wide, undisturbed and fairly regular in values. The dip is only 8 deg., giving a good area to the claim, and samples taken all around the shaft, which is 42x9 ft., hold well up to an average of $16 gold per ton.

The Brakpan is well out on the east flank of the Witwatersrand, and this discovery will give new hope to the mines in that part of the field, concerning which there has been much doubt. "Even Methuselah took a long time in dying," as a distinguished mining engineer once said, and the Rand may follow his example.

Two important events in railway building have been chronicled this week. One is the driving the last spike in the St. Paul extension to Butte, Mont., giving that important mining center the advantage of another railway connection. The other has been the consummation of arrangements whereby the Rhodesian railway is to be extended into Katanga, which will provide transportation facilities for the great copper mines of that region.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Machine Sampling

I have read with much interest the able article on "Ore Sampling by Machines," by John A. Church, which appeared in the JOURNAL of July 18. The Great Cobar sampling mill described in the JOURNAL (May 9, 1908, p. 950), is used by Mr. Church to illustrate his criticism on modern sampling works. The points raised by Mr. Church regarding the use of long spouts, high-velocity ore currents and excessive fall are, it appears to me, well taken; while the alleged ill effect due to retardation of the coarse ore in the crushing machines and the fine ore in the spouts, are at least debatable, I believe these points, even to the extremes stated, are not detrimental to accurate sampling, and that in the crushing machines may even prove beneficial, to the extent that retardation serves to mix the ore.

I can see no good reason why ores should be sampled in any definite order, each coarse particle with its associated fine for example, on which Mr. Church appears to lay much stress; to me it appears that the thorough mixing of the ores is, on the other hand, a prime requisite to good machine sampling, and the crushing machines, elevators and even the spouts help in this mixing process. In addition to this, modern works are usually provided with mixing machines which serve the double purpose of thoroughly mixing the ore, and giving a fairly uniform and continuous feed to the sampling machines.

In the first Simplex sampler with two scoops, the spouts cut the ore stream, say, every 27 seconds, giving a rather intermittent feed for the second gyratory crusher and following machines; and while the crusher and rolls help somewhat to lengthen out this stream, it is well known that with a varying feed they cannot make it continuous. So we have the certainty of other sampler scoops passing the spouts at various times between the successive ore waves and obtaining no sample, and to that extent vitiating the whole result.

EVILS OF INTERMITTENT ORE STREAM

Here, in my opinion, lies the chief defect in the Great Cobar sampling works, a defect that could in great part be cured by the use of feeders on the rolls. An intermittent ore stream is obviously inimical to mechanical sampling, and as each sample cutter gives precisely that kind of stream, means are usually provided in modern works to make it continuous. Probably the best device for the purpose is the conical mixer introduced by the late Henry A. Vezin, in connection with his well known sampler. It consists of a small sheet-iron cone set at slight inclination and rotated slowly; the ore is fed at the base of the cone and emerges from the smaller end in a well mixed, continuous stream which drops vertically over the sampler. The apparatus is simple of construction, easily operated, readily cleaned out and practically indestructible.

Haphazard retardation in mill sampling as developed by Mr. Church, can have little, if any, effect on the final sample, provided the percentage cut out by the scoops is sufficient to give a correct sample of the maximum ore cubes passing the machines, that the sampling machines are fed with a continuous stream, and that the cuts (samples) are taken with sufficient frequency. Should the maximum cubes, for example, be as large as 3 in., and it has been demonstrated that 25 per cent. of the ore is required for a safe sample at that size, it is manifest that a machine cutting but a 15-per cent. sample cannot give correct results on 3-in. cubes. Reduce these cubes to 1 in. and a 1-per cent. sample would probably suffice; to ½ in. and 1/12 per cent. would probably give a correct sample.

Under these conditions a machine cutting a 25-per cent. sample (assumed to be correct for 3-in. ore) will take over 200 times more ore than is required for a correct sample, when the same ore is reduced to ½-in. cubes and well mixed before passing to the sample cutters (scoops). Therefore, I hold that ore crushed to a maximum 3-in. cube, with 25 per cent. as a safe sample of these cubes, it matters not whether we screen the ore to pass ½-in. apertures and run through the coarse at one time and the fine ore afterward, making but one sample, or, following the standard practice, run the ore as it comes to the mill, coarse, medium and fine together; the final samples in either case with an initial 25-per cent. cut, would be similar under the sampling conditions stated.

[illegible]

I would point out in passing that the selection of every fifth car for sampling at the Great Cobar plant can scarcely be called good practice, even though the ore may have been slightly mixed at the breaker plant at the mine. Should it not be possible to complete the sampling at the mine, it certainly would be preferable to cut out by automatic samplers the percentage of ore required for the sampling mill proper. The haphazard selection of the ore in every fifth car on the assumption that it has the same composition and value as that contained in the other four, is not sampling.

The "Tower" form of sampler, of which the Great Cobar plant is an example, has numerous advocates, particularly as a custom sampler where many lots are sampled daily. The one ore elevator offers some facilities in cleaning up between successive lots. I believe, however, that the advantage is counteracted by the excessive wear of spouts, a very large item in the course of a year, the extra cost of the building and the maintenance of the long elevator. For my part, I would prefer in the case under discussion to use two elevators and reduce the hight of the building by half, placing part of the machinery in the very poorly furnished space now occupied by a solitary sample grinder.

Permit me to summarize the conditions I consider necessary to accurate sampling by machines: (1) Take out a sufficient amount in the first cut to form an accurate sample of the maximum cubes; (2) cut the sample from a vertical, free-falling stream with a frequency varying from 25 to 50 cuts per minute depending on the character of the ore, each cut taking the entire stream; (3) crush finer after each cut, thoroughly mix the ore, and feed it in a uniform and continuous stream to the following sample cutter, and so on.

[illegible]

[illegible]

Table for Ready Calculation of Matte Value

I have devised a form of table for the convenience of those who find it necessary frequently to calculate the value of copper ore or matte of a certain percentage at the market price. The method of preparing the table and its use is obvious. In a column headed by the given market price, are given the values per ton opposite different percentages of copper. The percentages are given for each unit up to ten, and above 10 per cent., by tens to 100 per cent. Intermediate percentages are found by shifting the decimal point in the value found opposite the numeral of the decimal of the percentage. Thus, to find the value of a matte carrying 52.84 per cent. copper at 13¼c. per lb., reference to the table gives the following:

Per Cent.	Value.
50.0	$132.50
2.0	5.30
0.8	2.120
0.04	0.106
52.84	$140.026

Again suppose the value per ton of 8.37 per cent. copper ore is desired, the market price of copper being 12⅛c. per lb. Then reference to a table such as I have described gives:

Per Cent.	Value.
8.0	$19.40
0.3	0.7275
0.07	0.16875
8.37	$20.29725

A. J. EVELAND.

Manila, P. I., June 30, 1908.

Estimation of Cyanide Effluents *

By Dr. W. J. Sharwood

A system of "alkalinity numbers" which has been found easy of application and of great convenience, has been employed for the last 10 years, at the Homestake cyanide plant at Lead, S. D. The numbers are based upon the number of cubic centimeters of decinormal acid required to neutralize 100 c.c. of solution. The system does not presuppose the existence of any particular compound, such as CaO, in expressing the alkali present. The alkali, however, may at once be translated into percentage of CaO or NaOH by multiplying by the equivalent weight of either compound. One unit of alkali is equivalent to 0.0028 per cent. CaO or 0.056 lb. per ton; 0.0056 per cent. KOH or 0.112 lb. per ton; 0.0040 per cent. NaOH or 0.080 lb. per ton; 0.0065 per cent. KCN or 0.13 lb. per ton.

A saturated solution of lime in water has an alkalinity of about 45. In a solution of known cyanide strength and with the alkalinity estimated by the above standard the "protective alkali" in pounds CaO per ton can be calculated by the formula: $0.056\,a - 8.6\,k =$ pounds CaO per ton, where $a =$ the alkalinity by the above standard and $k =$ the percentage of KCN.

Determining Alkalinity

In daily practice at the Homestake mine the solution man takes samples of 20 c.c., adds a few drops of a 1-per cent. phenolphthalein solution, and titrates with N/5 sulphuric acid. Each 0.1 c.c. acid used represents one unit of alkalinity. When the "protective alkali" value is required to be expressed in pounds of lime per ton it is read from a table which has been prepared from calculations based on the formula given above. It has been shown by synthetic tests that this method, while not strictly accurate in the presence of the double-zinc cyanide, is liable to no greater errors than are those methods which are based on titration after precipitation with silver nitrate.

The standard sulphuric acid employed in this process is prepared by diluting strong acid to form a stock solution of a medium strength slightly greater than 4N. Exactly 100 c.c. of this is diluted to 2000 c.c. and the H_2SO_4 in a sample of this diluted acid is determined gravimetrically with the greatest care. If, for example, it proves to be 0.2055 N, another 100 c.c. of the stock acid must be diluted up to 2000 to which is added 55 c.c. more in order to obtain standard acid of exactly one-fifth normal strength.

---

*Abstract from "Laboratory Tests on the Use of Coarse and Fine Lime for Cyaniding," *Journ.* Chem., Met. and Min. Soc. of South Africa, April, 1908, p. 295.

Pig Iron Production in 1908

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of pig iron in the United States in the first half of 1908. The figures show the sharpest fall on record in the history of our iron trade. The production of pig iron in the first half of 1908 was 6,918,004 gross tons, against 12,303,317 tons in the last half of 1907 and 13,478,044 tons in the first half of 1907. The production of pig iron in the first half of 1908 was a little over 51.3 per cent. of the production in the first half of 1907, during which period the iron trade was not affected by panic conditions. The decrease in production in the first half of 1908 as compared with the second half of 1907 amounted to 5,385,313 tons, and as compared with the first half of 1907 to 6,560,040 tons. The production in the first half of 1908 was the smallest in any half year since the last half of 1900, when 6,146,673 tons were made.

Classified Production

The production in the first half of 1908, classified according to the uses for which the iron was intended, and compared with the first half of 1907, was, in long tons:

	1907.	1908.	Changes.
Foundry and forge	3,242,559	1,832,688	D. 1,409,871
Bessemer pig	7,185,878	3,388,491	D. 3,797,387
Basic pig	2,671,136	1,481,612	D. 1,189,524
Charcoal iron	205,796	129,720	D. 76,076
Spiegel and ferro.	172,675	85,493	D. 87,182
Total	13,478,044	6,918,004	D. 6,560,040

Bessemer pig includes special low-phosphorus iron. Charcoal iron includes a small quantity of basic iron; also a few tons made with charcoal in the electric furnace. The production of spiegeleisen alone in the first half of 1908 was 67,021 tons. Of ferro-manganese alone the production was 18,472 tons. The total decrease this year, as compared with 1907, was 48.7 per cent.

Production by Fuels Used

The production according to fuel used in the first half of 1908, was as follows:

Fuel.	Long Tons.	Per Cent.
Coke and bituminous coal	6,547,439	94.7
Anthracite and coke mixed	239,151	3.5
Anthracite alone	1,694	....
Charcoal	129,720	1.8
Total	6,918,004	100.0

The production with anthracite alone is now very small. Nearly all the so-called anthracite furnaces use some coke mixed with the anthracite. Allowing for this proportion, coke was the fuel from which 96.4 per cent. of all the pig iron made. Very little raw bituminous coal is used.

The Production by States

The total production by States for the first half of the year was as follows:

States.	1907.	1908.
Massachusetts and Conn.	8,746	5,220
New York	859,115	376,208
New Jersey	195,245	125,143
Pennsylvania	5,964,884	3,032,297
Maryland	221,145	82,785
Virginia	260,912	137,356
Georgia and Texas	26,173	5,260
Alabama	861,771	605,617
West Virginia	151,643	27,901
Kentucky	79,013	21,357
Tennessee	193,371	115,219
Ohio	2,815,174	1,209,399
Illinois	1,263,258	782,865
Indiana and Michigan	197,330	167,063
Wisconsin and Minnesota	160,045	69,303
Mo., Colo., Oregon, Wash. and California	220,209	154,981
Totals	13,478,044	6,918,004

The decreases in Pennsylvania, Ohio and Illinois were larger in proportion than in the Southern States. This agrees with the larger proportionate fall in bessemer pig, which is not made in the South.

Blast Furnace Conditions

The whole number of furnaces in blast on June 30, 1908, was 168, against 167 on Dec. 31, 1907, and 359 on June 30, 1907. The number of furnaces idle on June 30, 1908, was 283, against 276 on Dec. 31, 1907, and 83 on June 30, 1907. During the first six months of 1908 the number of furnaces actually in blast during a part or the whole of the period was 250, as compared with 388 during the last half of 1907 and 382 during the first half of that year.

On June 30, 1908, there were 24 furnaces in course of construction, of which 23 will use mineral fuel and 1 will use charcoal, as follows: New York, 2; Pennsylvania, 6; Ohio, 6; Indiana, 8; Illinois, 1; and Michigan, 1 stack.

On June 30, 1908, there were 17 furnaces being rebuilt, all mineral fuel, as follows: New Jersey, 1; Pennsylvania 11; Alabama, 1; Ohio, 2; Illinois, 2 stacks.

An authority on copper and brass states that thin sheets of brass or copper cannot be heated to as high a temperature as thick sheets of the same composition.

During 1907 there were 26,771 short tons of copperas, valued at $204,481, produced in the United States as compared with 22,830 tons, valued at $228,390, in 1906.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

MARKET FOR CRUDE BARYTES

Can you furnish me the names of firms which buy crude barytes?

W. G. I.

The following companies utilize crude barytes, which they obtain from their own mines or from other sources; as you do not state what part of the country your product is obtained from, we suggest that you write to the company or companies operating nearest your property: Nulsen, Klein & Krausse Mfg. Company, St. Louis, Mo., and Lynchburg, Va.; Point Mining and Milling Company, Mineral Point, Mo.; Pittsburg Baryta and Milling Corporation, Richlands, Va.; John T. Williams & Son, Bristol, Tenn.; Carolina Barytes Company, Stackhouse, N. C.; Delaware Barytes and Chemical Company, Dover, Del.; Barium Production Company, New York, N. Y.; Dix River Barytes Company, Lancaster, Ky.; Hammill & Gillespie, Stamford, Conn.

MICA

What is the price of ground mica in ton lots, f.o.b. New York City or Philadelphia? What is the chemical purity required for electrical work? Who are the largest mica buyers? What is the size of the product when ground?

W. A. P. D.

Ground mica in ton lots f.o.b. New York City is quoted at 1½@3c. per lb., depending on quantity, delivery, etc. For electrical uses, mica should be free from iron. Correspondence with some of the larger electrical concerns will doubtless elicit more definite information in this regard. The largest buyer of ground mica is the National Gum and Mica Company, 502 West Forty-fifth street, New York City. Sheet mica for electrical purposes and stoves is handled by Eugene Munsell & Co., 68 Church street, New York City, and A. O. Schoonmaker, 22 Fulton street, New York City. The size to which mica is ground depends entirely on the specific use for which it is intended; the sizes range all the way from 8 mesh to the finest powder.

MARKET FOR MOLYBDENITE

Where can I find a market for molybdenite? In what form is the ore bought?

W. A. D.

Molybdenite is usually marketed in the form of a concentrate carrying from 90 to 95 per cent MoS_2. Buyers of concentrates are Primos Chemical Company, Primos, Delaware county, Penn.; De Golia & Atkins, San Francisco, Cal.; [illegible] and Fried. Krupp, Essen, Germany.

[illegible]

What are the uses for alum and what is the yearly production in the United States? Any other information you can give will be appreciated?

B. B. H.

The greatest use for alum is probably in the paper trade, where it is utilized for sizing or giving a hard finish to paper. Aluminum sulphate and also crystals of potash alum are used in water purification. Crystals of potash alum are used in the dyeing trade. A small quantity of alum is used in medicines. Recent experiments have shown the possibility of making carbonate of aluminum from alum.

During 1907, there were 10,404 short tons of alum, valued at $391,900 (average value $34.78 per ton) produced in the United States; this was an increase of over 15,000 short tons as compared with the production of 1906. There were also 106,821 tons of aluminum sulphate produced, valued at $2,008,046. The imports of aluminum salts during 1907 were 1562 tons, valued at $35,191.

The market for alum and aluminum salts is fairly good and, as may be seen from the above figures, the supply comes chiefly from the United States.

TUNGSTEN ORES

In what parts of the United States are tungsten ores mined? How much tungsten ore was mined during 1907, and what was its average value? What disposition was made of this ore? What foreign countries produce tungsten ore?

A. K. B.

Colorado is the largest producer of tungsten ores, the output during 1907 being 1170 short tons, valued at $569,905. California and Idaho also produced small amounts. More or less work was done on known deposits in Nevada, South Dakota, Arizona, Montana, Washington, New Mexico and Connecticut. The total production of the United States during 1907 was 1468 short tons, valued at $715,031, or $487 per ton. A large part of this ore was smelted by one or two domestic con- [illegible] German smelters.

We have reports of production from foreign countries during 1907 as follows: Queensland, 87 tons, valued at £10,220; Tasmania, 41 tons, valued at £4411; New South Wales, scheelite to the value of £2378, [illegible] £20,235; United Kingdom, 312 long tons. Mining and discoveries of tungsten ore were reported from other countries.

VANADIUM ORES

What districts supply the vanadium ores consumed in the United States? What [illegible] vanadium ores?

H. E. B.

[illegible] chiefly from two sources; the roscoelite-bearing sandstone in southwestern Colorado, and the recently discovered patro- [illegible] trict of Peru. At Newmire, in the Colorado district, the Vanadium Alloys Company has a reduction and mining plant. The American Vanadium Company, of Pittsburg, imports crude material from the Peruvian deposits. Other companies interested in vanadium ores are the Primos Chemical Company, Primos, Penn., and the Electro-Metallurgical Company of America, Niagara Falls.

[illegible]

What is the source of the manganese used in the United States, and what States [illegible] the uses for manganese?

W. P. F.

The greater part of the manganese used in the United States is obtained from the manganiferous iron ores of the Lake Superior district, Colorado, and Arkansas, these sources being named in the order of their prominence. The production of manganiferous iron ore in the Lake Superior district during 1907 was over 1,000,000 long tons. Considerable [illegible] iferous zinc ores of New Jersey, the production from this source during 1907 being 95,243 long tons.

The mining of true manganese ores is only of secondary importance. During 1907 there were 5604 tons produced, the bulk of which came from Virginia. The superiority of foreign manganese ores, and the small cost at which they can be [illegible] to the industry here.

The bulk of the manganese ore produced is used in the iron and steel industry, in which it is smelted to form an [illegible] facture of steel.

Some of the manganate and permanganate salts are employed, on account of their oxidizing power, as disinfectants and as dryers in oil varnishes. Natural ores [illegible] greenish glass by converting the ferrous into ferric oxide. In this country inferior grades of ore are used for coloring brick. There are several other non-metallurgical [illegible] little importance.

[illegible]

[illegible]

F. S.

The following firms are dealers: Hammill & Gillespie, 240 Front street, New York City; H. J. Baker & Co., 100 William street, New York City; Fuerst Brothers, [illegible]

New Assay for Cyanide Solution

W. H. Barton (*West. Chem. and Met., IV, pp.* 67-68) has rescribed a modification of the Chiddey method of assaying cyanide solutions that overcomes a good many objections to this well known method. Among the objections to the Chiddey method are the following: (1) Each assay requires special attention to avoid having low and uneven results; (2) the attention necessary at the point when the solution of the zinc is complete, for if carried beyond this point the lead will dissolve and break into flakes, which are hard to collect; (3) if the operation is interrupted before the point first mentioned, the retained zinc causes increased cupellation losses. The author's remedy is simply a small piece of aluminum foil dropped into the solution just after the bulk of the lead sponge is formed.

Take 5 to 10 a.t. of solution in a beaker or flask and bring nearly to the boiling point; add 10 c.c. of a saturated lead acetate solution, which is strongly acid with acetic acid, and 0.5 gram of zinc dust. Allow the solution to stand about 2 min. and add 10 c.c. of hydrochloric acid.

The small square of aluminum foil is added when the sponge is fairly well formed and will precipitate any remaining lead and prevent the sponge already formed from disintegrating. Another 10 c.c. of hydrochloric acid may be added after the excess of zinc is apparently dissolved and the whole operation may be carried out on the hot plate. The operation is complete when action appears on the aluminum foil only. The liquor is poured off, the sponge collected with a rubber policeman placed on a 2-in. square of lead foil, rolled with a piece of large glass tubing to squeeze out the moisture, folded and rolled into a ball, punctured to allow the steam to escape and cupelled. The whole assay requires about 45 min. and shows good gold and silver results; it needs no extra precautions and will work equally well on solutions, clean or foul, weak or strong.

The Latest Strike on the Witwatersrand

The secretary of the Brakpan Mines, Ltd., on July 21, received the following cable from W. L. Honnold, the company's engineer at Johannesburg:

"Shaft No. 2 has struck the reef at a depth of 3695 ft. Size of shaft is 42x9 ft. Sampled all around and found average value 16 dwt. 4 grains gold—or $16—per ton over a width of 81¾ in. The reef dips at an angle of 8 deg., and is undisturbed and regular as to values."

As the Brakpan mine is well out on the eastern end of the Witwatersrand district, this strike is of much importance and indicates a possible extension of the accepted limits of the district.

Size of Lime Grains Used in Cyaniding

A series of experiments to ascertain the relative rapidity with which commercial lime, in varying states of division, is dissolved when distributed through a charge of inert sand subjected to the action of percolating water, or cyanide solution, was recently conducted by W. J. Sherwood at the Homestake mine.[1] The results confirm the general practice at the Homestake cyanide plant, which shows that the lime should be neither very coarse nor very fine.

The tailings treated at the Homestake mill are pyritic, and require the addition of about 3.5 lb. of lime per ton of sand, through which the cyanide solution percolates at the rate of about one ton of solution in five days for each ton of sand. Great importance is attached to the aëration of the charge during treatment in the vat and much attention is paid to preventing the slimes from being deposited with the sands. It is found that a free access of air into the interstitial spaces between the sand grains is essential to secure an "envelop aëration."

When the lime granules are coarser than 20-mesh, most of them will remain undissolved at the end of the treatment. Previously slacked lime and particles finer than 100 mesh yield about 90 per cent. of their available alkali in five days leaching; but they yield it at a rate which is not sufficiently uniform. When the lime is so highly comminuted it causes the cyanide solution, at the earlier stages of leaching, to become too highly alkaline, a condition which, with pyritic ores, is very detrimental to the solution of the gold. A "protective alkali" higher than 0.3 lb. per ton of solution gives decidedly low extractions. Moreover, the acidity of the tailings is found to be distinctly cumulative, there being from 5 to 10 per cent. sulphide of iron present.

The experiments were conducted upon an inert charge, but it is believed that in practice with an acid charge—especially with a charge constantly developing acidity—the CaO added would have disappeared even more rapidly. In the experiment the whole of the lime was added to the charge, whereas in actual work this is not done.

When the lime is too finely divided a large amount of it either dissolves or remains suspended in the water, conveying the tailings, while the vat is filling and so passes off at the peripheral overflow. In some cases such overflow water has been found to be nearly a saturated solution of caustic lime.

---

[1] Journ. Chem., Met. and Min. Soc. of South Africa, April, 1908, p. 293.

Grecian Chrome Iron Ore

The following description by the late A. Habets (*Rev. Univ. des Mines et de la Metallurgie*, Feb., 1908), relates to the chromiferous iron ores of Greece. They are not rich ores, rarely containing 50 per cent. of iron, but they are abundant enough to form the basis of substantial mining industries in certain localities where the deposits lend themselves to exploitation.

The chief locality is to the north of Athens, particularly in Boetia and Locrida. Here large masses of serpentine have been injected among white and yellow limestones; the iron ores are associated with the serpentine, being found in veins, sometimes in the serpentine itself, sometimes at the contact of serpentine and limestone, and sometimes in fissures in the latter rock.

The concessions of the Société Hellenique des Mines are situated north of Mt. Ptoon. The principal deposit, over 2 km. long, is in the form of a vein between a roof of yellow limestone and a foot-wall of white limestone. The vein dips 45 deg. to the southwest and its width varies from 12 to 18 m. In another deposit north of the first, the vein reaches a width of 110 m., but includes a limestone horse. This deposit is now in operation. These concessions are connected with the wharves at Larymna, on the Atalanta canal, by a railroad 16.5 km. long.

Two partial analyses of the ore, dried at 110 deg., follow:

	I	II
	per cent.	per cent.
Iron	47.50	49.10
Manganese	0.56	0.05
Chromium	2.19	2.49
Nickel	0.70	0.56
Alumina	12.35	n. det.
Lime	0.99	0.32
Magnesia	1.61	0.70
Silica	6.38	5.39
Titanic oxide	0.60	0.45
Sulphur	0.016	n. det.
Phosphorus	0.03	0.024
Arsenic	0.01	0.029
Copper	0.01	0.017

The output of the Société Hellenique in 1907 was 185,000 tons.

Mining of the deposit is accomplished by a combination of open-pit and milling methods. While the terraced slope of the open pit is advancing along the strike of the orebody, a shaft is sunk beyond the head end of the pit, connecting with a drift coming out at the bottom of the open working. Ore is then shot down this shaft into cars in the drift, forming a funnel-shaped excavation. Owing to the inclination of the vein, part of this work can be carried on in the hanging wall, and a large part of the barren material which must be removed when the open workings reach that point can be thus disposed of. There comes a time when the thickness of rock overburden becomes prohibitive, and then regular underground working has to be adopted.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

D. Z. Ivorton, of the firm of Oglebay, Norton & Co., has sailed for Europe.

W. F. Robertson, of the Robertson Iron and Steel Company, of Cincinnati, has sailed for Europe.

E. H. Gary, chairman of the board of directors of the United States Steel Corporation, is in Europe.

W. L. Kauffman has resigned as general manager of the Youngstown works of the National Tube Company.

James F. McClelland, consulting mining engineer of Palo Alto, Cal., is at Tonopah, Nev., on professional business.

W. R. Strickland has been appointed mechanical engineer at the Detroit plant of the American Radiator Company.

C. W. Landrum has been appointed superintendent of the Wisconsin Zinc Company's properties in southwest Wisconsin.

Wm. J. Quigley, manager of the Chihuahua Mining Company, has returned to Chihuahua, Mexico, after six weeks in California.

James W. Abbott, consulting mining engineer, of Pioche, Nev., passed through New York, on his way home, after spending several weeks in Maine.

Major E. L. Zalinsky, U. S. A., retired, has been made president of the Bureau of Illuminating Engineering, which is a corporation of illuminating engineers, of New York City.

A. Chester Beatty has severed his connection with the Guggenheim Exploration Company as head of its engineering staff, but continues to act as consulting engineer for the Guggenheims.

H. A. Guess, milling superintendent for the Guggenheim interests, has completed the series of metallurgical tests at the Esperanza mill at El Oro, Mexico, and is now at Flat River, Mo.

E. H. Skinner, mining engineer, has resigned from the engineering staff of the Guggenheim Exploration Company and is now with W. B. Thompson, 25 Broad street, New York City.

Frank J. Llewellyn, division contract manager of the American Bridge Company, Chicago, has recently returned from a five months' trip to China, Japan, and other points in the far East.

William A. Pomeroy has left Palo Alto, Cal., to accept the position of general manager of the Lustre Mining and Smelting Company, Santa Maria del Oro, Durango, Mexico, via Parral.

Donald B. Gillies, general manager of the San Toy Mining Company and other Schwab interests in Mexico, recently underwent a successful operation for appendicitis, and is now convalescing at El Paso, Texas.

M. W. Summerhayes recently returned to Nogales, Arizona, from a visit to the property of the Compañia Minera Juarez, near Caborca, Sonora, where he was investigating the present cyaniding and reduction operations, with a view to increasing the capacity, and making changes to improve extraction.

Obituary

Thomas Chalmers, Jr., died July 21, 1908, in Chicago. For many years he was associated, with his brother W. J. Chalmers, with Frazer & Chalmers, which later became the Allis-Chalmers Company, of Milwaukee, Wis. Mr. Chalmers was 51 years old at the time of his death.

Donald Ray Morgan, one of the best known mining men of northern Mexico, died in the town of Iguala, Guerrero, July 25, of smallpox, a disease from which perhaps no part of Mexico is ever entirely free. Mr. Morgan, a native of the State of Massachusetts, came to Mexico about 15 years ago with an engineering corps operating in the southern part of the Republic. But he soon turned his attention to mining and was successively with the American Smelting and Refining Company, the Mexican Metallurgical Company, and the Torreon Metallurgical Company; and it was with the last-named company that he became best known, for to him, more than to any other one man, is due the building up of that company's mining department, of which he was general superintendent for a number of years. About two years ago Mr. Morgan severed his connection with the Torreon Company to take up several promising propositions near Chihuahua and Monterey, for the handling of which he organized the Mexican Mines Syndicate, with offices in both Chihuahua and Monterey. The work seemed to meet with remarkable success; but the panic of last fall found the company with heavy bills on its hands for new machinery and supplies, which it was not able to meet and the properties were taken over by the creditors. Since that time Mr. Morgan had given his attention to the States of Michoacan and Guerrero, with marked success, and it was while attending to affairs in the latter State that he contracted the disease that caused his death after but a short illness. He leaves a wife, who was with him at Iguala. A host of friends and acquaintances throughout Mexico recognized his sterling worth and unremitting energy in the pursuit of his profession.

James Duncan Hague, for many years prominent as a geologist and mining en- [illegible] Stockbridge, Mass., Aug. 4, aged 72 years. [illegible] year 1854 at the Lawrence Scientific [illegible] went to the University at Göttingen, Germany, and to the Royal School of Mines, at Freiberg, Saxony, where he remained from 1856 to 1858. He married Miss Mary Ward Foote at Guilford, Conn., in 1872. Before that, however, he made a long trip of exploration to the South Seas, in 1859-1861, and in 1862-1863 he had a period of service in the United States Navy. For three years, until 1866, he was a manager of copper mines in the Lake Superior region. While there he participated in the discovery and development of the Calumet & Hecla property. Next he was an assistant geologist on the United States Geological Survey, and from 1871 to 1878 he was a consulting mining engineer in California. He was United States commissioner to the Paris Exposition of 1878. In 1879 he settled in New York, though his work took him to many parts of the country, and he passed much of his time in the West, especially in California. His advice as a consulting engineer was widely sought and highly valued. He was president of the North Star Mining Company, of California, and was connected with other companies. At the time of the San Francisco earthquake he represented the New York Chamber of Commerce in the distribution of the relief funds. He was a member of the New York Chamber of Commerce, American Museum of Natural History, Metropolitan Museum of Art, American Geographical Society, American Institute of Mining Engineers, and various other organizations, as well as the Century, City, Metropolitan, Union League, and Downtown clubs. He was author of several books, and often contributed articles to the *Proceedings* of the Institute of Mining Engineers; to this JOURNAL and other periodicals. He leaves one son, also a mining engineer, and two daughters.

Societies and Technical Schools

[illegible]

The secretary announces that, by special arrangement, the *Transactions* of this association and of the American Brass Founders' Association will be sent out together to members of both societies. The paging will be separate and continuous in each case, the index making proper allowance for this when issued at the end of the year. The first instalment consists of the papers read at and contributed for the Toronto convention. These include, besides others of special interest to iron founders, papers on "Chemical Reactions in Foundry Cupola Practice," by Jules de Clercy, Montreal; "Ferro Alloys in the Foundry," by W. M. Saunders, Providence, R. I.; "By-product Coke for the Foundry," by George A. T. Long, Chicago; "Titanium in Cast Iron," by Dr. Richard Moldenke, Watchung, N. J.; "Cupola Thermics," by S. H. Stupakoff, Pittsburg.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Goldfield and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

August 1—On Thursday last the district attorney of Solano county, in company with a committee of supervisors and prominent residents of Benicia, visited the plant of the Selby Smelting Company at Selby, on the opposite side of Carquinez straits from Benicia and met General Manager Braden and Superintendent Englehardt for a conference on the smelter-fume question. They were shown all over the plant and examined the bag-house and the Cottrell apparatus both of which are designed to condense and do away with the smelter smoke nuisance. Subsequently these gentlemen called upon Henry Underhill, president of the company, at the offices in San Francisco, where another discussion of the subject took place. Ultimately the party returned to Benicia for a conference which resulted in a request for the district attorney to have the permanent injunction granted over a year ago, enforced immediately. This closes down the works until the matter of a rehearing is settled, and meantime a large number of men will be thrown out of employment.

It is evident from this action that the people representing Benicia and Solano county were not properly impressed with the fume-arresting devices at the smelter, upon which the Selby company has already expended about $100,000. None of them are, of course, experts in this matter, but consider themselves damaged by the smoke conditions which have existed. The Cottrell device is perfectly satisfactory to the Selby company. The serious illness of Mr. Cottrell has delayed matters to some extent, but he has left the hospital for the country, and will endeavor to return to the Selby works by Monday next. After that it is expected that the smelter will be fully equipped with the Cottrell appliances, patents for which have now been obtained in the United States, and in foreign countries. The Western Precipitation Company, of this city, will handle the introduction of the device in other smelting plants. It seems probable that when its efficiency is proved beyond question arrangements will be made so that work can again proceed on the extensive Guggenheim smelter at Point San Bruno, in the southwestern portion of San Francisco bay, where large sums have already been expended.

Bert Hill and James Hart, the original discoverers of the new camp of Hart in San Bernardino county, got into a controversy with Peters, Johnson and O'Keefe over a lease in the Big Chief mine, one of the big properties of the district. It was finally agreed by all parties concerned to submit the matter to arbitration, three well-known mining men of the district being selected to act as arbitrators. Two out of the three settled on a stated amount as due the lessees. Hill and Hart appealed from this award and went to the courts. Now Judge Orter revokes the order staying judgment for the plaintiffs and said that as all parties had agreed to abide by the decision of their friends and neighbors, a just decision had probably been made.

The Standard Oil Company is continuing its recently adopted policy of purchasing oil lands in this State outright. It has recently acquired the Talara Oil Company's 80 acres in the Midway field of Kern county for a stated price of $100,000. The holding is a lease owned by W. S. Porter and A. Scribner, the land belonging to J. W. Jameson, of Los Angeles. There are four producing wells in the south end of the property yielding light oil which the Standard has been buying under contract. All the territory is proved. It is thought more offers will be made by the Standard for specially desirable holdings.

Both the O'Hara quartz mine near Sonora, Tuolumne county, and the Tightner mine at Alleghany, Sierra county, which have been in wonderful bonanza ore for several months past, not only continue to yield largely, but the output is increasing as depth is attained in both properties. In the lower levels of the Tightner the owner, H. L. Johnson, has found the ore richer in the south winze than it was up above. It is now thought that the rich shoot continues to the lowest level where a tunnel is being run to tap the ledge. Only a portion of the newly discovered deposit has been removed, the shaft being kept filled with water to safeguard the balance until it is desired to remove it. The old Gillis property at Jackass Hill, Tuttletown, long famous as a pocket mine, is also again in bonanza, and is yielding exceedingly rich "picture rock." These are all private properties, worked by their owners, and only two or three men are at work in any of them.

In addition to the regular miners employed by the company, there are 14 crews of tributers at work in the old Champion mine at Nevada City. None of these men are making less than $3 per day, and most of the crews are earning $5, 6 or $7 per day, and one crew gained $11.50 per day. Most of the ore being recovered is from the 800 level upward. The mine was for a long time in litigation and unproductive, and is now under bond. The company owns 25 or 30 claims, most of them at Nevada City.

Goldfield, Nevada

July 28—There have been "things doing" in Goldfield during the past week: the largest production for more than a year; the settlement of litigation which releases two rich producing leases; a strike of ore which extends the known ore zone considerably to the north; almost a boom in the stock market; and a practical solution of the problem of treating the Consolidated concentrates in the company's own plant.

The most important event of the week was the compromise agreement between the Consolidated and the Jumbo Extension, thus ending the apex litigation brought by the former company about the Gold Wedge claim of the Jumbo Extension. This small fraction of very rich ground lies between the Mohawk and the Jumbo and the two leases, the Mohawk Ledge and the Mohawk Jumbo, were stopped from mining pay ore during the dispute. These two leases will now resume, each being given a maximum of 30 days in which to repair the underground workings and put the equipment in shape. The Mohawk Ledge has 221 days to run, and the Mohawk Jumbo has 100. This latter lease had a 10-c. dividend posted when the injunction was granted and its dividend money amounting to $60,000 was tied up. The checks will now be mailed to stockholders of record of October 20, 1907.

By the terms of the compromise agreement the Consolidated waives all damages as regards ore extracted from the Wedge claim to date by the Jumbo Extension and the Jumbo Extension deeds the claim to the Consolidated subject to the leaseholds of the Mohawk Ledge and the Mohawk Jumbo.

Either the Consolidated or the Jumbo Extension may develop the Poleverde claim of the latter company charging a maximum of $10,000 against joint account for development purposes. The net proceeds from any ore which may be found apexing on other consolidated ground, are to be divided equally between the two companies. The title to the ground is to remain in the Jumbo Extension.

The Consolidated company reserves the

right to mine the ores of the Vinegerone claim, the net proceeds of the ore extracted to be equally divided. The title to this claim is to remain undisturbed; the Consolidated owns a one-fourth interest and the Jumbo Extension three-fourths.

Receiver Frank L. Wildes has made his first report on the affairs of the State Bank and Trust Company, which closed its doors last fall. He alleges gross mismanagement, extravagant use of depositors' money, loaning of funds to depositors who did not give "twenty-five cents worth of security" and practical embezzlement by the president and directors. The receiver's statement disagrees with the cashier's statement, showing a discrepancy of over $900,000. The grand jury at Carson has resumed its investigation of the bank's affairs as a result of this report.

Thirty-four sacks of ore worth close to $100,000 were sent to Denver this week under a heavy armed guard to be used as evidence in a high-grade case being tried there. The ore is said to be of the same kind and value as the ore stolen from the Mohawk Mining Company while in transit to Denver under care of the Wells Fargo Express Company. The suit is brought by the Goldfield company against the express company to recover the value of the ore stolen.

Wallace, Idaho

July 31—The purchase of the control of the Panhandle smelter by the Greenough Brothers, thereby making the Snowstorm mine at Mullan an entirely independent concern, the erection of a reduction plant by the Stanley Consolidated Company at Burke, and the settlement of the dispute between the big dividend payers and the commissioners of Shoshone county with regard to assessed values, form the chief features of interest connected with the mining industry of the Cœur d'Alene district during the past week. Under supervision of Manager Titus work on the Panhandle smelter is being rushed to completion. It is expected that the plant will be in full operation within the next 30 days. Most of the ore to be smelted will come from Montana mines and the plant will handle about 250 tons a day. Enough ore has been guaranteed to keep the plant in steady operation.

The Stanley mine at Burke, which has been closed since June, is to be equipped this fall with a reduction plant of a capacity of from 40 to 50 tons a day, and the lease and option on the mill of the New Jersey company, which expired recently, has been given up. The mine will not be started again until its own mill is completed and this, it is expected, will be in about 60 days. The company is now waiting for a settlement of its suits against the Hercules by which it seeks to restrain the latter company from dumping tailings on the patented land of the Stanley company above the millsite.

Butte

July 30—The mines of all the sub-companies of the Amalgamated, with the exception of those of the Boston & Montana, are operating to their full capacity. Of the latter company the Leonard, East Colusa and West Colusa mines are producing approximately two-fifths of their normal output and are shipping to the Washoe smelter at Anaconda, while the Boston & Montana smelter at Great Falls is being repaired. The repairs at the smelter are taking longer than was expected at first and the latest report given out by the company is that no ore will be received before Sept. 1. The line of the Chicago, Milwaukee & Saint Paul railway between Butte and Saint Paul was completed within the past week. It is expected that the completion of the road will give added impetus to the mining industry of Fergus and Meagher counties, inasmuch as the railroad facilities in those counties have heretofore afforded but little opportunity for shipment of ore, while the new road will bring the mines in closer touch with the smelters.

Denver

August 1—The inventors and patentees of the various machines designed to drive tunnels in rock without the use of explosives, are industriously endeavoring to perfect their inventions, and as industriously exploiting them in the Denver papers. The principal ones are the Karns, Sigafoos, Proctor and Bennett. All of them are ingenious, and the result of years of mechanical study and work, and that ultimately one successful tunneling machine will be evolved from the many is more than probable. The most difficult part of the matter is that while some of these machines may, and indeed have, driven short distances at a high rate of speed, their efficiency will never become certain until it has been shown that they are capable of sustained effort for long distances, equal to the unexpected emergencies and occurrences which happen; and last, but not least, that it will be possible to convey the cuttings, or muck, to the surface in the heavy tonnage, and with the rapidity with which it will be produced according to the rate it is asserted these machines will bore. As shown in the article on rock-boring machines in the JOURNAL of Nov. 23, 1907, the automatic mucker must be an integral part of the tunneling machine, and should be shown at work successfully.

The miners who draw wages and steal their employers' ore, have invented for themselves the name of "high-graders," ore thieves being too harsh a term to suit them. In the Federal court here, the jury has returned a verdict in favor of the Mohawk Mining Company, of Goldfield, [illegible] worth of ore stolen from the mine, and [illegible] who bought it from the miners. It does not appear, however, that anyone was punished, but simply that the company got back what had been stolen from it. All this, I fear, will tend to encourage the robbers.

In the Cripple Creek district, it is reported that a cyanide mill will be erected on the Portland mine, to treat the old dumps and the low-grade ore from the mine.

The production of the Cripple Creek camp is given at about $9,000,000 for the seven months ended with July.

Indianapolis

[illegible] pert sent out by the Government to inspect mines and to collect specimens of coal and fossil formations from coal mines spent last week in the Indiana coalfield, most of the time in Sullivan county. He shipped to Washington a number of coal specimens and fossils taken from the 50 mines of that field. Mr. Willard said that Indiana coal mines are better kept and equipped for operation than the coal mines of many other States. Mr. Willard said he had not found many mines as well kept and as nearly properly operated as the mines of Sullivan, Greene and Clay counties. "They are models of soft-coal mines and are the equals of the best mines to be found in the country in method of operation."

"Surface and other indications" Mr. Willard said, "that mean nothing to the farmer or the untrained man indicate that there is a great deal of good coal territory in Indiana that has not yet been touched. This being true the mining business of Indiana is bound to improve."

Toronto

[illegible] trict has been revived by the discovery of placer gold by Professor Willmott, Canadian government geologist, who was examining a number of locations for the owners, residents of Ottawa. The gold was found in a bed of black sand from [illegible] gray sand one inch deep, under 2 ft. of mud. It is said to yield one ounce gold [illegible] claims, covered with muskeg and hitherto supposed to be valueless, is anticipated. The Larder City Gold Mines, Ltd., which owns some claims of this character proposes to work them in the winter after the methods adopted in the Yukon for frozen gravel.

T. H. Crowley, prospector, of Peterborough, Ont., who recently arrived at Port Arthur, reports the discovery of an extensive nickel deposit north of the Grand Trunk Pacific Railway and about 100 miles west of Port Arthur. He brought specimens of nickel and also of silver and free gold secured in the area north of Wabigoon and Sturgeon lakes.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Gila County

Miami—According to J. Parke Channing, this company has now developed on three levels 4,500,000 tons of ore, and it is estimated that there are 2,250,000 tons additional near the ends of the various drifts and crosscuts. The orebody has been opened 1050 ft. in length, 700 ft. in width, and 400 ft. vertically.

Graham County

New York and Arizona Gold and Copper Company—The company is increasing its force of miners as fast as there is room in the workings. The miners in the Lillian and Buzzard tunnels have been working under difficulties, as the hot and rainy weather has made the air very bad. The engine purchased some time ago for the big blower at the mouth of the Lillian tunnel did not give satisfaction and the company has purchased another which will be installed in the next few days. Another very rich ore-chute has been struck much richer than the surface ore. The company will let a contract to sink and raise on this ore-chute. In two months the Lillian will be directly under the Black shaft at a depth of 245 ft. There is a large body of good milling ore on the surface which has been developed considerably. Plans are being made for the erection of reduction works.

Ash Peak Mining Company—This company is working a large force of men. They are down 200 ft. and have found rich ore, mostly gold and silver. The company has been shipping ore from this mine to the smelter at Douglas.

Clifton—This camp now has improved reduction works and has been increasing its shipments of copper. Two new water-jacket furnaces have arrived and are now being installed, one for the Arizona Copper Company and the other for the Detroit Copper Manufacturing Company, whose works are on the Frisco river. About 600 men are working at present in the mines of the district, and within six months the number is expected to be doubled.

Santa Cruz County

Four Metals—The Red Hill adit at this mine, in the Mowry district, now in 515 ft., has cut into the body of sulphide copper ore a distance of 75 ft., without reaching the hanging wall.

Morning Glory—The incline shaft at this copper mine, in the Harshaw district, is down 140 ft. The vein at the depth is a little more than 6 ft. wide.

California

Amador County

Central Eureka—At this mine, Sutter Creek, E. C Voorheis, superintendent, the machinery is being put in running order, and the shaft is being repaired.

Mitchell—This mine at Pine Grove has been bonded to John Crammer, who is unwatering it and putting the 10-stamp mill in order.

Apropos Mining Company—The Hoffman ranch adjoining the Argonaut mine at Jackson, has been deeded to this company.

Calaveras County

Dutch Bar—To this mine in Grapevine district the men have completed the road from the Union Construction Company's road. Heavy machinery will now be hauled to the mine.

Reiner—A new hoist is being placed over the new three-compartment shaft of this mine, and grading is completed for the compressor.

Hamburg—At this mine, near Mokelumne Hill, repairs are being made on the 20-stamp mill and new buildings are being erected under the supervision of G. Steckel.

Bald Hill—This mine has been bonded by Nevada operators, who intend installing new machinery and beginning work shortly.

El Dorado County

Gilbert—Lee Brothers have made a rich strike in this mine 16 miles north of Placerville, and are sacking the ore. There is a small mill on the property.

Kern County

Uncle Sam—J. L. Thompson, of Lancaster, has purchased a half interest in this mine, near Mohave, adjoining the Karma on Soledad hill.

Sidney Group—This group at Johannesburg, recently purchased by D. V. Williams, of Montana, made a satisfactory first clean-up, and new machinery is to be installed.

Mariposa County

Moonlight—This property at Mariposa has been bonded by Wm. Harris and Geo. De Sallier and contracts have been let for a ditch and wagon road. A 10-stamp mill will be erected.

Nevada County

Morydena—This mine, near Grass valley, idle for two years, is being reopened by J. W. Jaquith and E. F. Hilton.

Lecompton—In the unwatering of this mine, the water was lowered 280 ft. in the first nine days of pumping. The mine is under bond to H. S. Abbott; Samuel Colt is the resident superintendent.

Murchie—At this mine, Grass Valley, the bottom of the shaft is 1075 ft. from the surface, and it is being sunk to 1500 ft. There are 50 men on the payroll, and the 20-stamp mill is kept running night and day.

San Bernardino County

Hart—At this new camp local capital is to erect a 10-stamp custom mill, so that owners and leasers may realize on the ore already mined. Water is somewhat scarce.

San Diego County

Dulzura Group—At this new camp several sales of mining properties have recently been made. E. J. Waidan, of San Diego, has purchased the Mason group near the Buckhorn. H. Kruger has bought two claims from E. Paulsell near the Artery Consolidated mines.

Yellow Metal—This mine, at Banner, has been sold to Gibbons Brothers, of Reno, Nevada, who are installing a six-drill compressor plant, and will equip the property with a mill. The mine has been developed to 500 ft. depth.

Sierra County

Miners' Home—This property, at Howland Flat, for some time idle, is running again.

Del Monte—This mine, which yields gold both from quartz and placer, is being put in shape for work by James Mackin. The property now embraces 340 acres. A crosscut is being run to undercut the old workings. The mine adjoins the Oriental on the west.

Siskiyou County

Klondike Mining Company—This mine, nine miles below Hornbrook, J. D. Downing, manager, has its tunnel in 1500 ft. There is a new mill ready as soon as the electric power plant is completed. Power will also be supplied to two other mills in the vicinity.

Indian Girl—This mine near the Klondike, which has been worked as a pocket mine, a hand mortar being used for crushing specimen, is now to be equipped with machinery.

TUOLUMNE COUNTY

Water Lily—This gravel mine on the Stanislaus river, near Reynolds Ferry, has been bonded by Fitzgerald & Lyon to E. F. Johnson and associates, of Grass Valley.

Bagdad-Chase Mining Company—This company, at Soulsbyville, has recently bonded the Ralph mine at that place and is installing machinery to work the property.

Clio—This mine, which was sold for taxes, has been redeemed by the First National Bank of Sonora for Los Angeles men and will soon be actively worked.

Colorado

LAKE COUNTY—LEADVILLE

Dinero Tunnel—The breast of the tunnel, Sugar Loaf district, has reached a distance of 3,700 ft. That the tunnel is nearing its destination is shown by the change in the formation which is gradually getting out of the black lime and entering a mineralized matter of lime and porphyry. In addition the tunnel is making considerable water.

Cleveland—This property, South Evans gulch, is shipping steadily 50 tons daily of high-grade ore from the north and south drifts. The ore is shipped to the Ohio & Colorado smelter at Salida. The immense bodies of low-grade ore in the mine are allowed to stand until the prices of the different metals increase in value. The ore shipped runs from 2½ to 14 oz. gold per ton and is a sulphide. The property belongs to the New Monarch Mining Company; 75 men are employed.

Yak Tunnel—The bore has now passed the Ollie Reed territory in South Evans gulch and is heading for the Resurrection in Big Evans gulch. Recently a fissure vein was caught in the granite, several inches wide, that runs 1 oz. in gold. This is supposed to be a stringer from the veins owned by the New Monarch Mining Company. The tunnel is being driven at the rate of 300 ft. per month.

Little Jonny—The monthly output from this property, Breece hill, is about 7000 tons, and the bulk of it is high-grade ore. At the beginning of the month No. 4 shaft will be closed temporarily for repairs, which will be completed in about three weeks.

Penn—The different lessees on this property, Breece hill, are now in a position to ship daily 225 tons of iron, silicious and sulphide ores.

Starr—The lessees are shipping from the lower levels 30 tons daily of an excellent grade of iron-silver ore. Operations are being carried on at the water level and the bulk of the ore dips down.

Idaho

SHOSHONE COUNTY

Shutz Mining Company—This is a newly organized corporation which will acquire and operate a group of seven claims in an unorganized portion of the Cœur d'Alene adjoining the Bullion and Wonder claims. The property is said to carry a 4-ft. vein of iron ore carrying also lead and silver. An adit has been started which will run 400 ft. to tap the lead at 200 ft. depth.

Bunker Hill & Sullivan—A new concentrator of 1000 tons capacity is now nearing completion, and it is hoped to start the first unit of 500 tons capacity by September 1. The second unit will be constructed as soon as possible. The old concentrator which handles 1100 tons of ore per day will be overhauled and improved. Electric power will be used.

Alice—This property, one of the old locations in the vicinity of Mullan, reports a strike of rich galena in the 500-ft. level. The extent of the discovery has not been made known. The mine has been developed at heavy expense and carries one of the best leads near Mullan.

Mineral Farm—Work on the new tunnel has already progressed 25 ft. The tunnel is being run along the footwall and, as the country is very broken, rapid progress is being made. Electric power is being installed for the drills to be used as soon as the formation becomes firmer. The tunnel is designed to strike the vein at 1300 or 1500 ft. from the portal. A working shaft will then be sunk.

Temple—Galena ore has been encountered in a shaft being sunk on this property to determine the position of the orebody. A crosscut will be driven to tap the ore at greater depth as soon as the position of the ledge is established.

BONNER COUNTY

Idaho Smelting and Refining Company—T. L. Greenough, one of the principal holders of the stock of this company, states that the plant will be ready for ore in 30 days. Work is being rushed with all speed on the buildings and on the installation of machinery.

Blacktail Mining Company—The Blue Bird mine on Lake Pend Oreille has made a carload shipment of ore that netted $5400 in silver and lead. There are two adits, one of which crosscuts two leads. From the lower one 700 ft. of drifting has been done in the first lead. A supply of ore is now ready for the smelter.

Indiana

GREENE COUNTY

Little Giant—This mine near Linton, broke all previous records July 30, when it loaded 45 cars and hoisted 1453 tons of coal. There was a breakdown, which required 15 minutes for repairs.

WARRICK COUNTY

[illegible] Mining Company—This company, with headquarters at Paradise, has incorporated, to do a mining business. The company has ample capital [illegible] L. Bridges, I. M. and S. V. Howes.

Michigan

Keweenaw—The Phoenix stamp mill has gone into commission and will handle the rock from the Medora shaft. This mill has been thoroughly overhauled. It contains but one head with a capacity of about 400 tons daily. The Medora shaft is down 13 levels and has approximately two miles of underground openings. There is a stock pile containing between 50,000 and 60,000 tons of stamp rock taken from the development work. The shaft has been sunk in the lode which dips about 23 deg. from the horizontal. In sending rock to the mill part will come from the stock pile and the remainder from the shaft; in this way a thorough test will be obtained. The rock is exceedingly soft which makes it easy to mine and to mill.

Osceola—No. 2 shaft house of the Tamarack Jr. branch of the Osceola Consolidated was destroyed by fire, as was also the blacksmith and machine shop. The Tamarack Jr. has been idle for the last six years and when in operation it mined the Calumet conglomerate lode. The property also carries the Osceola lode and may, in the future, be again opened on that lode; the conglomerate workings are exhausted.

Rhode Island—The crosscut from the shaft toward the Franklin Jr., is encountering some favorable ground on the Pewabic lode. Developments on this lode at the Franklin Jr., property are encouraging and this lode is also being opened at the north.

Wyandot—A diamond drill has been installed on the lands of this company and a series of holes has been sunk to cut the favorable formations that have been exposed at the north. The company is also driving a crosscut from the shaft at a depth of 700 ft. This crosscut will cut the various lodes at that depth.

Isle Royale—Three shafts are producing and sending about 700 tons of rock daily to the mill. The mine is in fine physical condition especially the openings at the southern extension.

IRON

Chapin—The new Ludington shaft is completed and ore is now being hoisted. The shaft has four compartments and is 10 ft. 4 in. by 23 ft. 1 in. inside dimensions. The total depth is 1522 ft. Steel is used throughout except the sheathing, which is of heavy planks. The shaft is one of the largest in the Lake Superior district, and is surmounted by a modern steel shaft house containing four ore pockets. The Cornish pump, formerly at Chapin D shaft, has been installed at the new opening. The upper cylinder is 50 in. diameter and the lower is 100 in. The stroke is 10 ft. Some of the other dimensions and weights of the pump are: Pumping bob, 50 tons; flywheel, 40 ft. diameter, 1500 tons; crank shaft, 27 in. diameter; pump rods, 7 in. diameter, 1500 ft. long; plunger, 28 in. diameter. The capacity of the pump is 319 gal. per stroke with 10 strokes per min. The guaranteed capacity is 3000 gal. per min. It is the intention of the company to hoist the greater part of the ore through this shaft.

Missouri

JOPLIN—ZINC LEAD DISTRICT

Rex Land—W. H. and O. H. Picher, E. O. Bartlett and B. W. Lyon have started drilling the east side of this tract. This part of the tract has never been systematically drilled.

Picher Lead Company—Stockholders of this company and Cincinnati men have bought the D. D. & C. mine near Rewey, Wis., for $50,000.

WEBB CITY

Yellow Dog—This mine has closed down on account of low ore prices.

GRANBY

Granby—This company has announced that it will inaugurate the same leasing system at Granby as that used in the Joplin district. The Granby company has heretofore aided the miners in prospecting by granting leases on very liberal terms and sharing the expense of prospecting.

Montana

BUTTE DISTRICT

Elm Orlu—The shaft on this claim, the property of W. A. Clark, Jr., situated north of Walkerville on what is known as the Rainbow lode, has reached a depth of 1000 ft., where a station is being cut, preparatory to crosscutting to the vein. The last crosscut to the vein was driven on the 700-ft. level where small bodies of copper ore were opened up.

Butte & Superior—A depth of 1200 ft. has been reached in the shaft and the cutting of a station at that level is nearly completed. From this station a crosscut will be run to the lead. Pumps of large capacity will also be installed on the 1200 station.

Tuolumne—The shaft on this property, which adjoins that of the North Butte, has reached a depth of 1000 ft. The management states that a crosscut, run north from the east drift on the 1000-ft. level, has intersected a vein and disclosed 14 ft. of ore which will average more than 3 per cent., and 6 ft. of ore which will assay 20 per cent. copper. Three 250-h.p. boilers have been ordered. A Nordberg hoist capable of working to a depth of 3000 ft. has also been ordered. Sinking will be resumed shortly and the orebody discovered on the 1000 will be developed at greater depth.

British Butte—Work has been completed on a series of dams which will give a storage capacity of 10,000,000 gal. of water. The water to be stored will be pumped from the mine shaft and will be used in the operation of the gold dredge which is now being constructed.

Pittsburg & Montana—The building for the new 300-ton concentrator has been completed and machinery is now being installed. When finished, the concentrator will enable the company to work its lower-grade ores.

Copper Eagle Mining and Smelting Company—The mine is located north of Walkerville and carries principally silver ores, with some gold. After a shut-down lasting since December, operations were resumed a short time ago. It is reported that the capital needed for the development of the mine has been secured, and that the shaft will be sunk an additional 100 ft. before any shipments are made. Before the shut-down a rich body of ore was discovered on the 250-ft. level and this same lead will be worked at greater depth after the sinking has been completed.

Pilot-Butte—It is reported that the expert sent out by Milwaukee capitalists to examine the property which the company held under lease and bond has reported unfavorably, with the result that the money necessary for the resumption of activities will not be forthcoming. The company expects to lease its hoist and will probably dispose of its other machinery.

Badger State—This is one of the Boston & Montana properties and adjoins the Jessie claim of the North Butte company on the northwest. Sinking has recently been begun.

JEFFERSON COUNTY

Gold Crown Mining Company—Drifting is being done on the 225-ft. level, where it is reported good ore has been encountered. The management states that plans are now being considered for the erection of a concentrator on the property.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Production—Goldfield is rapidly coming back to the condition that prevailed before the late labor trouble and the recent financial depression, as is shown by this week's production, which is the largest for more than a year, and while the figures do not come up to those of 12 and 15 months ago, the settling of apex litigation, thus permitting rich leases to resume shipments and the early completion of the Consolidated mill with the consequent production from the Mohawk, Combination, Jumbo and Red Top mines and the Florence mill with the starting of work on company account, all point to a production before the year ends which will exceed Goldfield's best record heretofore. The production for the week ending July 28 amounted to 2452 tons valued at $313,275. The Kinkead mill treated 25 tons of concentrates experimentally and the Combination treated 595 tons, all from Consolidated ground. The Western Ore Purchasing Company handled from the Engineers lease 451 tons; Mushett Lease 16 tons; Van Riper dump 50 tons; the average valuation being $350 per ton. The Nevada-Goldfield Reduction Company handled from Mohawk Combination Lease 186 tons; Combination Fraction, 676 tons; Baby Florence, 38 tons; Hayes-Oddie, 40 tons; Consolidated Red Top, 25 tons; Daisy, 20; Hayes Frances Mohawk, 30 tons; Mohawk Jumbo, 12 tons; Little Florence dump, 12 tons; Frances-Gold Mountain, 1 ton. The average value of these 1040 tons was about $100.

Consolidated Red Top Lease—This lease operated by the John Donellan Company on the north end of the Red Top claim has, after several months' operations, struck shipping ore. The ore was found in the 150-ft. level and a winze on the dip proved up still better ore than above. The 225-ft. level is being pushed to cut the vein and the same will be done on the 300. This extends the producing zone of Goldfield's inside district to the north and gives considerable impetus to all workers in this part of the camp.

Goldfield Merger—The merger, recently formed, comprising the Velvet, St. Ives, Gold Horn and Potlatch has completed a survey of its properties and is now making preparations to begin a main working shaft, which will be a double compartment and will be sunk 1000 ft. without stopping.

Baby Florence—Lewis H. Rogers, formerly of the Rogers Syndicate, has been given sole charge of the Baby Florence by the directors. J. F. Meikle, formerly superintendent of the Rogers Syndicate lease has been elected manager and superintendent of the Baby under a contract which returns to him one per cent. of the net earnings of the lease and no other compensation.

Mohawk Jumbo—This lease, no longer restrained by injunction, is already retimbering and making extensive preparations for extracting ore. It has been idle since last fall when it shut down for a few days to allow a survey to be made underground. The strike followed immediately and when that was settled the injunction was secured. When the shutdown occurred the daily production was averaging about $9000.

Engineers Lease—This lease, on the Florence, made its first shipment a little more than a month ago and has now declared its first dividend of $90,000. The lease is shipping 75 tons per day. One shipment the past week averaged almost $1500 per ton. The parent company, the Florence Goldfield, received from two leases last week, one of them, the Engineers, the sum of $142,000 for ore shipments.

Kendall—Leases on the Kendall, one of the first producers of the camp, are shipping ore from a depth of 70 ft. which breaks across 2 ft. worth $150 per ton without sorting. No work is being done on company account. The formation near the surface is very much broken and no workings have ever gone deep enough to get into unbroken ground.

Consolidated—The Consolidated authorities deny any rumors that owing to reduced freight charges they will ship their high-grade ore. They say that all their ore, high and low, will be put through the new mill. A recent run of 35 tons valued at $1900 per ton put through their Combination mill proves the scheme feasible. Further their experiments on treating the mill concentrates which proved so satisfactory in the laboratory have been tried on a larger scale, in the Kinkead mill, where 25 tons were treated this week with such gratifying results that the company claims to be independent of railroads from now on.

Diamondfield Black Butte—The Ellsworth-Baumgartner lease which has been at work only 10 weeks has just made its third shipment which averaged $120.10 per ton. The first shipment averaged $220.68 and the second $1002.10 per ton.

Laguna—The Mushett lease has received settlement sheets for a 20-ton shipment which averaged a little above $200 per ton.

Mohawk Combination Lease—A dividend of $7500 has been paid to the owners of this lease, making a total to date of $107,500. One or two more payments will be made as the odds and ends of the lease are cleaned up.

Red Top Fraction—Thanks to the strike on the ground of the Consolidated Red Top lease, the Red Top Fraction has taken a new lease of life and will sink its shaft to the 400-ft. level.

Esmeralda County—Rawhide

The First Exchange bank has opened for business and has prospects for a good future. Another mill has reached camp and will be in operation in two or three weeks. This is the Watt mill with a capacity of 40 tons per day, which is being put up at Cypress Wells down on the flat a couple of miles from town. The 20-stamp mill of the Murray lease is promised to be ready for ore inside of a month. The Swiftwater Bill Gates, which has already worked to great advantage will have its capacity increased.

Grutt Hill Mint—This lease, on the Coalition property has made its first shipment which includes 20 tons of $300 ore and 10 sacks of ore which will average nearly $10 per pound. This high grade comes from a stringer which varies in width from the thickness of a knife blade to nearly an inch and is yellow with free gold. This stringer follows the shaft from 110-ft. to the 150-ft. level. Drifting both ways at this level has begun. A new hoist has been ordered and the shaft will be put to the 300-ft. level with all possible speed.

Queen Mascot—The Jordan lease has, this week, made its first shipment to the Selby smelter. This shipment contains two tons of ore valued at $4000 per ton and several tons valued at $500 per ton. This ore is broken down on canvas underground and carefully sacked. A hoist has been ordered and is expected to be running inside of two weeks when sinking will begin.

Czar Mines [illegible] operating the Wagner-Putnam lease on block No. 4 of the Czar claim, this week shipped 400 sacks of ore amounting to about 15 tons. This ore will, like the previous shipment, net about $100 per ton. A hoist has been ordered for this lease.

Humboldt County—Ros[illegible]

Durango Girl—Smelter returns from the last shipment from the Ford lease gave $181.85 in silver and $5.70 in gold.

Lander County—Austin

The Electric Power and Light Company, of Austin, will utilize the waters of Big creek, 12 miles from Austin, for electric power, which will be furnished to the camps of Skookum and Giveenah, the big Austin mill, and the large hoists to be installed on the Union and Frost shafts.

Nye County—Bullfrog

Keane Wonder—A gold brick worth $8500 was sent in from Keane Wonder to the First National bank, of Rhyolite, this week. The output of the mine for June was $15,200, the mill operating less than half the time.

Montgomery-Shoshone—Nine large bricks weighing approximately 11,000 oz. were shipped the first of the week to the Selby smelter. In addition to this, which represented the June clean-up, about 35 tons of concentrates were shipped. The total produced for the month was close to $70,000.

Beatty—The machinery for the 40-ton custom mill is en route from Denver, and the building is going up rapidly.

Rhyolite—The Homestake-King mill owners, owing to exceedingly favorable underground developments, are talking of increasing the new mill to 60 stamps.

Nye County—Manhattan

Security Reduction Company—This company, owning nine claims near Manhattan, is installing a gasolene engine, and in addition to the 20 stamps now in place is putting in a grinding mill and concentrating tables.

Nye County—Tonopah

Production—Shipments for the week amounted to 4930 tons valued at $127,800, shipping ore averaging $60, and mill ore averaging $25 per ton. The shipments were: Tonopah Extension, 130 tons; Tonopah Mining, 2800 tons; Belmont, 700 tons; Montana Tonopah, 1000 tons; Midway, 100 tons; MacNamara, 150 tons; West End, 50 tons.

[illegible] shut down three days this week to make repairs on the hoisting machinery. The mill lost also one day for repairs.

Belmont—Prospecting on the 1000-ft. level is still going on. The main east crosscut is now about 200 ft. beyond the famous Mizpah fault, no large orebody having yet been found.

MacNamara-West End—The apex fight between the MacNamara and the West End has been settled by compromise, and both stocks have been very strong and active during the present week. Last year the West End proposed a consolidation of the two properties, offering the MacNamara five shares of the Consolidated stock for 14 shares of MacNamara. This the latter company declined to consider.

Tonopah Extension—Experts have arrived to make the independent examination of the company's property which was authorized at the last annual stockholders' meeting in May.

Storey County—Comstock

Ophir—A notice has been posted at the shaft house at Virginia City informing the miners that of all receipts over $50,000 per month, which is about the present income of the mine, 10 per cent. will be set apart and divided among the miners and other employees. The notice frankly informs them that the offer is made as an incentive to increased effort.

White Pine County—Ely

Nevada Consolidated—One unit of the big concentrator is running and the second unit is expected to start this week. One reverberatory furnace is in operation and it will handle all the product from the roasters for some time to come; when it falls behind another furnace will be blown in. The converters have been started this week and blister copper is now being turned out at Ely.

Veteran—This mine, near Ely, has 235 men on the pay roll at present and is increasing its force rapidly. The 300-h.p. hoist has been tested to satisfaction and will henceforth hoist 1100 tons of ore daily.

South Dakota

[illegible]

Blue Belle—The Chicago owners have arranged for the commencement of work. A 200-ft. shaft will be sunk, considerable drift work will be done and a new high-grade orebody developed.

Gold Eagle—The new working tunnel is in 150 ft. and will be continued another

150 ft. A new shaft 200 ft. deep is to be started.

Tinton—The mill is treating 25 tons of ore daily, and as soon as some tests are completed this tonnage will be materially increased. The tin product is to be treated in the plant here and then shipped to Liverpool, England.

J. G. LaSarre—The Chicago owners expect to be able to ship regularly in a few weeks; the ore is now being put in shape, and appears to be sufficient.

Schleihardt—J. A. Blatt and others, of Lead, are making good progress in the development of this Nigger Hill gold property.

Pennington County

Balkan—At the annual meeting the following officers were elected: President, M. Ramonovich; vice-president, John Shanosky; secretary, M. Milokovich, and treasurer, Harry Groth, all of South Chicago. The property at Rochford will be developed this year and a test mill is to be erected.

Golden Metal—Preparations are being made for a resumption. An electric-power plant is to be erected to cost $50,000, and the 20-stamp mill will be refitted and modernized.

Golden Slipper—A new high-grade orebody has been opened up and will be developed.

Klein & Burton—The tunnel is in more than 300 ft., and the vein is expected to be cut daily. The property is situated near Hill City.

Evinvale—New machinery is being placed in the hoist in preparation for the sinking of a new 200-ft. shaft. The property contains wolframite. J. Truax is the owner, and has charge of the work of development.

Wisconsin

Zinc-lead District

Platteville—Good lead ore has been found at a depth of 40 ft. on the Billy Robinson farm, adjoining the Weigle mine on the west. The Empire and Acme companies will resume next week under the management of the Wisconsin Zinc Company; the mines and mills will be operated two shifts per day. The Old Homestead mill is completed and running, the first car of jack assaying close to 50 per cent. zinc. The Forest City will resume work next week. The new pumping plant at the Calemesis, comprising two 16-in. crossheads, is installed and shaft sinking has been resumed. The Washburn will start milling soon.

Cuba City—The Pittsburg and Board of Trade mills are both inclosed and will be finished about Aug. 10. The Erie and the Big Four are pumping and will resume shaft sinking and development work. The Beloit-Elmo has installed a larger pumping outfit for shaft sinking. The Dall and Baxter mines are making big productions, but both are holding their jack for better prices; the Dall has 300 tons of roasted zinc ore and the Baxter has about the same amount of green concentrates. The Dall is making 10,000 lb. of lead per day which more than pays all expenses.

Benton—The Fox company will erect a roasting plant; satisfactory roast tests of their ore are being made at the Enterprise roaster at Platteville. The inclined shaft at the Ollie Bell, owned by the Mineral Point Zinc Company, has just been completed; a 100-ton mill was built on this property last fall, but was not put in operation, awaiting the completion of the incline shaft. Good sheet jack was struck in the Minnie shaft near the Empress. The Good Hope has resumed development work. The Dawson, under new management, is mining and milling again with a limited force. The Pittsburg-Benton, Frontier, Etna, Fox and Vandeventer are each making a big production of jack and considerable lead. The Wiseman, Wilkinson and Only Wonn are making lead exclusively.

Hazel Green—A big deposit of lead ore is being opened up on the Jeffries and Sutherland land, two miles north of Hazel Green. The ore was struck 5 ft. below the surface in a vein 3 ft. wide containing lumps weighing 500 and 600 lb.; two men alone took out 50,000 lb. in two weeks. The new No. 2 mill at the Kennedy will soon be ready for operation. The old mill is running again after a shutdown to overhaul machinery. The mine will be operated two shifts per day as soon as the new mill is completed. The Kennedy and the Mills are shipping their green concentrates, under contract, to the Mineral Point Zinc Company. The Illinois has resumed. The Big Dad is pumping out and will start work again soon.

Canada

British Columbia—Crow's Nest Pass

The coal miners in the Crow's Nest Pass district have suffered severely from forest fires of great extent in that region, which spread widely owing to the dry condition of the woods following a long drought. The mining towns of Fernie and Hosmer were destroyed, while at latest dates Coal Creek and Michel were threatened. So far as known 125 lives were lost, and a number of men are missing. The surface plants at the mines of the Crow's Nest Pass Coal Company at Fernie and Hosmer were totally destroyed, the fire descending upon those towns so rapidly that it was impossible to save anything; and it was there that most of the lives were lost. At latest advices, the fire had extended through a belt 70 miles long and from three to six miles wide; while the fire was still extending eastward. The loss to date is estimated at $8,000,000. The hope of saving the town and coal-mine buildings at Michel was slight.

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending July 25 were as follows: Buffalo, 63,560 lb.; Coniagas, 82,590; Cobalt Central, 37,440; City of Cobalt, 123,650; Drummond, 109,720; LaRose, 298,130; McKinley-Darragh, 283,980; Nipissing, 176,480; O'Brien, 194,000; Right of Way, 57,180; Watt, 60,180; total. 1,486,910 pounds.

Cobalt Central—On the first level 800 ft. of drifting and crosscutting have been done, and 1000 ft. on the second level. Two drifts have been started at the third level. The concentrator is treating 60 tons daily. On the Bailey property adjacent, which is now under lease to the Cobalt Central company, 100 ft. of drifting has been done on the Big Pete vein at the 65-ft. level. The vein averages 9 in. in width and is reported to contain 5000 oz. silver to the ton. An equal amount of drifting has been done on this vein at the 100-ft. level, the character of the vein being about the same. In crosscutting at 65 ft., a new 6-in. vein was struck.

Columbus—This company, which lost its plant in the fire a few weeks ago, is arranging to install a compressor and will shortly resume underground work. Before closing down, the 160-ft. crosscut at the 150-ft. level struck the main vein, which was about 10 ft. wide at that depth. Drifting along this vein will be resumed.

La Rose—The company is exploring the high bluff, separating its property from the O'Brien and Chambers-Ferland, which turns out to contain a network of rich veins. A series of tunnels is being run, in one of which a vein 1½ in. wide was encountered carrying 1047 oz. silver to the ton; the wall rock for a foot on each side also contained silver.

Nipissing—A force of 325 men is employed, 125 doing surface prospecting. In all 30 miles of trenching have so far been done on the property. A fine new vein, struck on Little Silver ridge, has been opened up 300 ft., and averages 6900 oz. of silver to the ton. It is known as No. 96. A tunnel is being driven into the hill to cut it at depth. This vein is crossed at right angles on the top of the ridge by another newly discovered vein, No. 102. The tunnel, driven from Cobalt lake, is now in 1150 ft., and has been connected by a 40-ft. upraise, with the underground workings of vein No. 49 at a depth of 105 feet.

Progress—A small compressor plant will shortly replace that destroyed by the bush fire. The main shaft is down 100 ft., at which level the vein is of calcite, 14 in. wide.

Ontario—South Lorraine Township

Haileybury Silver Company—The main

shaft is down 85 ft., the vein at this point being 10 in. wide of calcite and cobalt with silver showing. Machinery will be installed next winter.

Keeley Location—New camp buildings have been erected and development is being pushed by a force of 35 men. About 10 tons of silver ore has been sacked.

Mexico

Mexico City

The campaign, which was being waged by the press of this city against the proposed mining legislation, has suddenly been stopped, whether "by request," or not, is not stated. Whether the lull is due to the fact that public opinion is now molded, or that there is no further necessity, is not apparent. President Diaz, in an interview with a prominent American is reported to have indicated that he would disapprove the anti-foreign clause of the pending law, which is now in his hands.

Chihuahua

Plata Colorada—Construction on the mill at Parral is still delayed. Much of the tank steel is on the ground as well as other machinery, but construction is at a standstill.

San Rafael—Corrigan, McKinney & Co., former owners of the Concheño mine, have completed the purchase of this mine in the Terrazas district.

Parral Production—The production of the Parral camp for the week ending July 18 amounted to 5970 tons, of which about 3000 tons were shipped to smelters and the balance milled locally.

El Porvenir—Shipments of high-grade ore amounting to about 100 tons weekly are being sent out from this mine in the Parral camp. Nat. P. Wilson is the manager in charge.

American Smelting and Refining Company—A contract has been awarded the Trenton Iron Company for the installation of a two-mile aërial tram from this company's Vieja mine in the Santa Eulalia camp to the town of Santa Eulalia. Branch lines to the Velardeña and Santo Domingo mines are also planned. The smelter at Chihuahua is now receiving ores from the Santa Barbara and other camps in this State.

Hinds Consolidated—This company is marketing ore at the Chihuahua plant of the American Smelting and Refining Company. W. W. Elmer is the general manager of this company's Santa Barbara properties.

Dolores Mines Company—This company, recently shipped through the Banco Minero, Chihuahua, silver bullion of the value of 160,000 pesos. The new hydro-electric power plant is now in commission.

Bismark—The London Mining Company, operating this old mine, situated near Guzman in the northern part of the State, is sending occasional shipments of high-grade ore to the El Paso smelter. R. H. Sutton, is the superintendent.

[illegible]

Production—Shipments of ore and concentrates for the week ending July 25 amounted to $135,000; bullion, $149,000; total for the week, $284,000.

Mineral Belt Railway—A conference was recently held between the officers of the Mexican Milling and Transportation Company and the contractors for its mineral belt railroad; as a result the work is to be pushed to completion at once. At present about 400 men are employed.

Guanajuato Consolidated—This company is reported to be considering the purchase of a slime filter. At present the slime from the 80-stamp mill is treated by decantation, entailing a slight loss in dissolved metal, and in cyanide.

Oaxaca

Oaxaca Smelting and Refining Company—The Oaxaca smelting plant of this company has been bought in at public auction by H. D. Milde, former auditor of the company, for the bondholders at $275,546. There were no other bidders.

Magdalena Smeltery—This plant, which for a time seemed in successful operation by Lloyd R. Hamer and associates, but which is now in the hands of a receiver, has completed the short run made to clean up the ores on hand, and is once more closed down indefinitely.

Oaxaca Iron and Coal Company—This company has denounced about 1500 acres of iron lands near Tlaxiaco, and has a number of experts in various parts of Oaxaca in search of coal and oil.

Sonora

Aguaje—This mine worked by the antiguos for the high-grade silver ore and from which they were driven by the water, is now handled by Eastman and McMillan; good ore is being taken out.

Nacozari Consolidated Copper Company—Ore carrying upward of 1000 oz. silver to the ton has been struck in the workings, but to tap this ledge will necessitate the driving of the main tunnel about 100 ft. farther.

Valdeza Mining Company—This company has installed a small plant on the property near Valdez Pass out of Cos. The ore is free milling gold carrying about $20 per ton. The plant consists of a crusher, a battery of two Nissen stamps and plates, and the estimated capacity is about 15 tons per 24 hours.

Oso Negro—Messrs. Camp, Ish and associates have started shipments of ore from the property. This ore averages about $100 per ton, principally in silver.

Las Chispas—At these mines of the Pedrazzini Gold and Silver Mining Company, the mill is resuming operations after a 40-day shutdown due to lack of water.

Tigra—Two Huntington mills and four Wilfley tables are being added to the concentrator at the mine giving a capacity of about 150 tons daily. Shipments now average about six tons of concentrates and four tons of crude ore per day. Work in the mine is practically confined to development, all ore being the result of such operations.

[illegible] the north half of the new concentrator has been in operation for about 30 days. About 750 tons of ore are being treated per 24 hours. This ore averages about 3¾ per cent. copper, and a net saving of about 82 per cent. has been made thus far. The concentrates carry about 12 per cent. copper.

Creston de Oro—At the new plant of the Dawson Mining Company about 20 tons of ore carrying $12 in gold and 25 oz. silver per ton is being treated daily. The plant consists of a crusher, Lane slow-speed mill, amalgamating plates and a Wilfley table and a saving of about 80 per cent. is made, equally divided between bullion and concentrates.

Vera Cruz

Burning Oilfield—The big gusher in Tampico district is said to be flowing 70,000 bbl. per day and is still burning. An immense drag is being built to use in an attempt to smother the flame. The hole is said to have increased in size from 6 in. to 12 feet.

Africa

[illegible]

Gold output for June was 23,360 oz., being 867 oz. less than in May. For the six months ended June 30 the total was 146,585 oz. bullion in 1907, and 149,619 oz. in 1908; an increase of 3034 oz. The bullion reported this year was equal to $2,905,619, or 140,572 oz. fine gold.

New Zealand

The Mines Department reports the exports of gold for the four months ended April 30 at 144,087 oz. bullion in 1907, and 162,382 oz. in 1908; an increase of 18,295 oz. The bullion reported this year was equal to $3,104,096, or 150,174 oz. fine gold.

South America

[illegible]

Exports of minerals for the full year are officially reported as below, in metric tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of gold bullion were 4548 oz. in 1906, and 3770 oz. in 1907; a decrease of 769 oz. This does not give the full amount of gold shipped, however; only that in the [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 5—The coal trade in the West is quiet for the most part. Here and there a little improvement is reported, but there has been no general forward movement. In some of the large centers there has been a tendency to supply too much coal, with a consequent effect on prices. In the East the bituminous market is dull; though a slight improvement may be reported at a few points, it has been only temporary and local. The anthracite market has been steadier, but this has been due to curtailment of production and smaller supplies in the markets. There is plenty of coal stored to supply any demand that may arise unexpectedly.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 25, in short tons:

	1907.	1908.	Changes.
Anthracite......	3,218,472	2,925,651	D. 292,821
Bituminous.....	21,627,845	18,165,406	D. 3,462,439
Coke............	7,994,094	3,799,751	D. 4,194,333
Total..........	32,840,411	24,890,808	D. 7,949,593

The total decrease this year to date was 24.2 per cent.

Receipts of coal at Lake ports for the five months ended May 31 were as follows, in tons, according to the Department of Commerce and Labor:

	1907.	1908.	Changes.
Anthracite.....	861,676	433,258	D. 428,418
Bituminous....	2,993,519	624,842	D. 2,368,677
Total.........	3,855,195	1,058,100	D. 2,797,095

The total decrease in this period was 72.6 per cent. The receipts of bituminous coal at the upper Lake ports Duluth, Superior and Ashland fell off from 1,233,125 tons in the first five months of 1907 to 96,162 tons in the same period of 1908, a loss of 92.2 per cent.

New York

Anthracite

Aug. 5—Prepared sizes are not moving rapidly except in a few cases. The movement to upper Lake ports has been fairly good, but aside from this not much business has been done. Small steam sizes seem to be in fair demand or rather the production is so curtailed that the supply is being taken readily. Circular prices, which are being cut for prepared sizes, are as follows: Broken, $4.65, egg stove and chestnut, $4.90; pea, $3.25@3.50; buckwheat No. 1 $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

It is constantly reported that conditions in the soft-coal trade are better, but these reports are not backed up by specific cases. Throughout New England factories start up and run for about a week only, to shut down on account of lack of orders. This gives the impression, probably, that conditions are better, whereas the improvement is only temporary. In New York harbor the trade continues at a standstill and good grades of steam coal are offered at $2.45@2.50 with no takers. Fair grades have been offered as low as $2.25, but no interest has been shown in them.

Transportation from mines to tide has not improved. No change is reported in the Coastwise vessel trade and there are still many vessels seeking business. The rates from Philadelphia are as follows: Boston, Salem and Portland, 55c.; Lynn, 60@65c.; Newburyport, Gardiner and Bangor, 70@75c.; Portsmouth, 55@60c.; Saco, 90@$1.; Bath, 65@75c.; to the Sound, 45@50 cents.

Birmingham

Birmingham, Aug. 3—Coal production in Alabama is improving slowly, as imported labor is being placed in the mines. At Wylam, for instance, in the western part of Jefferson county, the production is about 25 cars a day against 105 cars during normal conditions. At Brookside, Blossburg and other places in this county, the production is picking up slowly. The operators assert that there will be no giving in to the unions. There have been few shut-downs because of the strike. The furnace companies, in addition to sending out labor agents, are employing a force of deputies to guard their property and protect the men who are working. The military is on duty in the district and the Governor of the State is near to see that there is no violation of the law.

Coke supplies are falling off; the furnace companies have made arrangements to bring in all the coal and coke they can use from Tennessee and West Virginia.

Chicago

Aug. 3—The harvesting trade continues to give a semblance of activity to the coal market, steam and domestic business continuing very light. Demand is exceptionally good from the West and Northwest, and is increasing. In consequence lump coals are finding improved sale.

Illinois and Indiana lump bring $1.75@2.35, run-of-mine sells for $1.60@1.75, and screenings are in relatively heavy supply at $1.40@1.50.

Hocking is in light but fairly steady demand at $2.90@3.15, the latter being standard circular price. Smokeless is not so plentiful as regards run-of-mine, with lump hard to get and bringing premiums. Run-of-mine smokeless holds steady at $3.30. Youghiogheny is quiet at $3.15 for steam and $3.25 for ¾-in. gas. Anthracite is hardly at all in demand.

Indianapolis

Aug. 3—For the first time in several weeks Crown Hill mine No. 2 in the Clinton field hoisted coal on July 29, giving employment to 300 miners. During the recent strike the company put in electric haulage and this is now in operation. The mine has the record of the second largest output in the Clinton field. The Deering Coal Company, which is undergoing reorganization, has temporarily shut down its Old Oak Hill mine, but to offset this mine No. 7, where work had been stopped for two weeks for repairs, renewed operation. Work in the entire Clinton field has been fair, but miners are looking forward to a material betterment.

Pittsburg

Aug. 4—There is but little change in the coal trade. Prices remain on the basis of $1.15 for mine-run coal at mine. Production is at the rate of 60 per cent., although the mines are running to about 75 per cent. of capacity. Operations are not more than five days a week at most of them. The river mines are running to capacity and stocks are being rapidly accumulated. The rise in the rivers was disappointing, as the water was within a foot of a navigating stage when it subsided and the loaded coal was left in the harbor. There is about 10,000,000 bushels loaded and ready to go out.

Connellsville Coke—The demand for coke is increasing and prices are firmer, but there has been no advance. Furnace coke remains $1.65@1.75, and foundry $2.10@2.25 on contract. For prompt shipment these prices may be shaded. The *Courier*, in its report for the week, gives the production in both fields as follows: Connellsville, 121,349 tons; Lower Connellsville, 67,450; total, 188,799 tons. The shipments were 7155 cars, distributed as follows: To Pittsburg, 2987; to points west of Connellsville, 3709 cars; to points east of Connellsville, 459 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States six months ended June 30, long tons:

	1907.	1908.	Changes.
Anthracite	1,213,354	1,353,060	I. 139,706
Bituminous	4,454,888	3,946,830	D. 508,058
Total coal	5,668,242	5,299,890	D. 368,352
Coke	434,846	323,706	D. 111,140

Exports do not include coal furnished to steamships in foreign trade. Canada took this year 3,992,801 tons of coal, or 75.3 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, six months ended June 30, long tons:

	1907.	1908.	Changes.
Anthracite	13	15,023	I. 15,010
Bituminous	951,433	815,467	D. 135,966
Total coal	951,446	830,490	D. 120,956
Coke	72,873	59,533	D. 13,340

Canada furnished this year 532,625 tons of coal and nearly all the coke; Australia, 240,998 tons of coal. The greater part of the imports are on the Pacific Coast.

Iron Trade Review

New York, Aug. 5—A moderate inquiry for pig iron is reported, with some sales, but prices are not firm, and furnaces are still inclined to make concessions for good orders. Southern producers claim that they are holding prices at $12, Birmingham, for No. 2 foundry, but there is little doubt that iron can be had for 25 or 50c. less.

In finished material the market remains quiet. A few small structural orders have been placed, but on larger contracts negotiations are slow. The only rail orders reported are 7000 tons for the Boston & Maine, and 14,000 tons for the Baltimore & Ohio. Other new business is still light.

United States Steel Corporation—The statement for the quarter ended June 30 is condensed as follows, the net earnings being the balances remaining after paying working expenses, repairs and maintenance, and charges of subsidiary companies:

	1907.	1908.
April	$14,600,838	$ 6,761,680
May	16,056,832	6,021,279
June	14,846,035	7,482,797
Total net for quarter	$45,503,705	$20,265,756
Sinking fund, depreciation and reserve		$ 3,911,766
Charges on U. S. Steel Corp. bonds		7,311,963
Total charges		$11,223,729
Surplus for quarter		$ 9,042,027

Appropriations made were $6,304,919 for dividend of 1¾ per cent on preferred stock, and $2,541,513 for dividend of ½ per cent on common stock; a total of $8,846,432, leaving a balance of $195,595. For the first quarter in 1908 the earnings were $18,229,005, and the surplus was $7865. The unfilled orders on hand June 30, 1908, were 3,313,876 tons, against 3,765,343 tons at the close of the previous quarter.

Baltimore

Aug. 4—Exports from Baltimore for the week included 10,023 lb. [illegible] to Antwerp, and 1,122,351 lb. tin scrap to Rotterdam. There were 6111 tons steel rails sent to Mexico. Imports of iron ore were 5450 tons from Cuba.

Birmingham

Aug. 3—Alabama producers of iron announce that there has been no reduction caused by the strike of the coal miners and that all orders are being promptly filled. There is some business still being transacted and the market is considered firm. Prices are a little firmer, $12 per ton for No. 2 foundry, [illegible] There is a large quantity of iron being consumed in the district by the cast-iron pipe plants and other industries.

The Tennessee Company announces that the four furnaces in blast at Ensley broke a day's record during the past week, producing more than 1500 tons of iron. The other two furnaces at Ensley are undergoing repairs. Some time was lost at the big steel plant at Ensley during the past week, the fuel running light. Steel is being shipped out as quickly as manufactured.

Chicago

Aug. 5—Sales of pig iron continue light, as to both individual orders and aggregate amount. There is a renewal of inquiries for the future, and a few sales run into the first quarter of next year. In general, however, the demand is for only iron to supply needs of the next three months. The size of lots has not run over 100 tons as a rule, larger orders coming only from the exceptional smelter who feels his selling contracts secure. Foundries are running still as closely to the wind as possible.

Southern iron varies considerably, sales being made at $11.50@12 Birmingham ($15.85@16.35 Chicago), and perhaps lower than $11.50. Northern holds at $17@17.50, with the demand fairly steady, though light. Lake Superior charcoal brings $20@20.50, with small sales. These prices are for the last half, early-delivery iron bringing less.

The sale of iron and steel products is very light in nearly all lines, structural materials showing a little activity. Coke is quiet at $[illegible] for the best Connellsville.

Philadelphia

Aug. 5—Large sales for early delivery have been made within a few days of pig iron for cast-iron pipe, of bridge material and rails. These transactions have exerted a favorable influence on the [illegible] market, but not on prices. Orders for 1000 or 500 tons are taking the place of orders for 100 or 200 tons. The sold-up condition of most Southern furnaces is serving to strengthen Eastern pig. Basic pig has sold more freely. No. 2 foundry averages $16; forge about the same.

Steel Billets—Some long-standing negotiations for billets [illegible] in orders for the delivery of material. Billets continue weak in price.

Structural Material—Quite a little lump of new business has shown up during the past few days. Considerable building is to be pushed to completion before cold weather. The material is now being ordered.

Pittsburg

Aug. 4—Outside of a decided slump in pig-iron prices the iron and steel markets are in good shape. More mills were started this week, and the general outlook is better. There is a healthier inquiry for all material. The large interests are booking many orders, but all are for small tonnages, indicating that [illegible] are covering for immediate requirements. In structural material some important contracts are in sight. The largest so far placed calls for [illegible] tons of steel for the new Oliver building. It will be filled by the American Bridge Company. The Republic Iron and Steel Company is still taking small orders which warrant the operation of all of its plants in the North. The Carnegie Steel Company is running its most important works, outside of the Edgar Thomson rail mill, to capacity. Another furnace was put in operation this week, indicating that more than 60 per cent. of its finishing mills are running. The only discouraging feature is the shutting down of over 80 of the hot mills of the American Sheet and Tin Plate Company. The only explanation given is that the hot mills have been breaking records of production and got ahead of the finishing mills. The tinplate output despite the closing of the hot mills shows no decline.

Pig Iron—There is an alarming slump in the prices of the best grades of pig iron, and the only explanation [illegible] that there is a surplus of stock and furnaces are willing to [illegible] to get rid of these stocks. One of the most important deals was the sale of 300 tons of bessemer iron at $15.50, Valley. The Page Woven Wire Fence Company came into the market [illegible] and got the iron at $1[illegible]. Another sale was made at $15.40 at furnace, and it is believed this price can be duplicated for delivery in the third quarter. [illegible] and there is no difficulty in doing $14.40 at furnace. The Standard Sanitary Manufacturing Company came into the market this week for 8000 tons of foundry iron [illegible] 3500 tons of Southern for its Louisville [illegible]

Allegheny works. Malleable bessemer and basic iron remain firm at $15, and gray forge at $14, Valley furnace.

Steel—The steel market continues firm, and no shading of the price of $25, Pittsburg, for bessemer and open-hearth billets is reported. Some good sales were made during the week at the regular prices. Plates remain at 1.60c. and merchant-steel bars at 1.40c.

Sheets—The sheet mills are running to about the same capacity as last week, and prices remain firm. Black sheets are still quoted at 2.50c., and galvanized at 3.55c., for No. 28 gage.

Ferro-manganese—Prices are firm at $46@47, Pittsburg.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Aug. 5.

At all U. S. Ports in June and year

Metal.	Exports.	Imports.	Excess.
Gold			
June 1908..	$ 8,626,718	$ 3,409,885	Exp. $ 5,216,833
" 1907..	23,872,140	2,165,342	" 21,706,798
Year 1908..	53,507,975	26,368,198	" 27,139,777
" 1907..	36,300,732	21,468,647	" 14,832,085
Silver			
June 1908..	4,437,360	3,366,182	Exp. 1,071,178
" 1907..	5,360,599	3,476,546	" 1,884,053
Year 1908..	25,514,545	21,054,332	" 4,460,213
" 1907..	29,219,209	22,395,611	" 6,823,598

Exports of specie from New York, week ending Aug 1: Gold, $200, to Mexico; silver, $981,123, to London and Paris. Imports: Gold, $156,264, from Central and South America; silver, $333,866, from Mexico and Central America.

Specie holdings of the leading banks of the world Aug. 1, are reported, as below, in dollars:

	Gold.	Silver	Total.
Ass'd New York	.. ..	....	$321,313,400
England..... ..	$185,601,945	....	185,601,945
France........ ..	638,402,755	$181,439,395	819,842,150
Germany	204,075,000	84,575,000	288,650,000
Spain..........	78,340,000	134,945,000	213,285,000
Netherlands....	38,518,000	21,230,500	59,748,000
Belgium... . ..	20,223,335	10,111,665	30,335,000
Italy....	183,555,000	22,000,000	205,555,000
Russia	580,170,000	39,725,000	619,895,000
Aust.-Hungary.	235,080,000	67,315,000	302,395,000
Sweden.........	20,145,000	....	20,145,000
Norway.........	8,400,000	....	8,400,000
Switzerland....	19,775,000	....	19,775,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

July-August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
30	4.8690	52¾	24 5/16	3	4.8685	52½	...
31	4.8695	52	24 3/16	4	4.8670	52⅞	24⅜
1	4.8690	52½	24 5/16	5	4.8645	52½	24¼

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has fluctuated between 24 3/16 and 24⅜d. in London, without any special feature. The market still depends on the Indian demand.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 23:

	1907.	1908.	Changes.
India	£7,087,574	£4,467,193	D. £2,620,381
China.	.....	516,400	I. 516,400
Straits.....	544,012	90,510	D. 453,502
Total......	£7,631,586	£5,074,103	D. £2,557,483

Receipts for the week were £218,000 from New York and £5000 from Mexico; total, £223,000. Exports were £2500 to Egypt and £149,000 to India; £151,500 in all.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July-August	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
30	13⅛ @13⅜	13 @13⅛	59¼	30½	4.47½ @4.52½	4.65 @4.70	4.50 @4.55
31	13¼ @13½	13 @13¼	59⅞	30¼	4.47½ @4.52½	4.65 @4.70	4.50 @4.55
1	13¼ @13½	13 @13¼	...	30¼	4.47½ @4.52½	4.65 @4.70	4.50 @4.55
3	13¼ @13½	13⅛ @13⅜		30¾	4.47½ @4.52½	4.70 @4.75	4.55 @4.60
4	13¼ @13½	13⅛ @13⅜	60⅛	30¾	4.47½ @4.52½	4.70 @4.75	4.55 @4.60
5	13⅜ @13⅝	13¼ @13½	61¼	31	4.57½ @4.60	4.72½ @4.77½	4.60 @4.65

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The advances noted recently have continued without a check on any hand. Demand has been active, and the capacity of sellers was severely taxed during the week. Business has been done on a larger scale than at any time since the exciting days of last October. The orders for copper came from all sources, and are evidence of a rapid return to a normal level in the business of the large consuming interests. The market has reflected the heavy transactions by a steady advance in prices, and the close is firm at 13⅜@13⅝c. for Lake; 13¼@13½c. for electrolytic in ingots, cakes and wirebars. Business in casting copper during the week has been done on an average of 12⅝@12⅞, the close being 13⅛ cents.

The London standard market was quick to take notice of the improvement reported from this side, and a heavy speculation ensued, which advanced the prices rapidly, notwithstanding the Monday holiday, and brought the market at the close to £61 7s. 6d. for spot, £62 5s. for three months.

Refined and manufactured sorts we quote: English tough, £63@64; best selected, £63@64; strong sheets, £75@76.

Exports of copper from Baltimore for the week, as reported by our special correspondent, were 1478 long tons.

Manufactured Copper—Sheets, cold-rolled, 17½c.; hot-rolled, 16½c. Wire, 15c. base.

Tin—Notwithstanding the fact that the domestic market did not give any encouragement to the London market so far as buying orders were concerned, the latter kept remarkably steady and closes at £137 12s. 6d. for spot and £138 17s. 6d. for three months.

The domestic market moved within narraw limits and transactions were confined to spot stock only, which is small and well concentrated. Spot tin is, therefore, practically independent of London quotations, and is selling at a considerable premium. Business at the close has been done at around 31 cents.

Lead—There has been a great deal of activity throughout the week, owing to buying on part of both consumers and speculators in anticipation of higher prices. This materialized today in a rapid advance; the close is firm at 4.57½@4.60c. New York.

The London market has been strong and advancing throughout the week, and closes at £13 10s. for Spanish lead and £13 11s. 3d. for English lead.

Spelter—It is reported from the West that the bulk of the stocks which have been a menace to the market for so long have been liquidated, and that it was due to this liquidation, which went on so gradually as to pass unobserved, that the depression in this metal was of such long duration. The advance which took place during the past week is, therefore, quite logical, and as the output of spelter is still away below normal a further advance is looked for. The close is strong and advancing at 4.72½@4.77½c. New York, and 4.60@4.65c. St. Louis.

Spelter has been neglected in the London market, and closes for good ordinaries at £19, and £19 5s. for specials.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—Buyers are entirely indifferent to the market, and prices are nominal. Quotations are unchanged at 8½c. for Cookson's, 8⅜c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—Prices remain unchanged at $22.50 per oz. for hard platinum, $20 for ordinary and $15 for scrap.

Imports and Exports of Metals

Exports and imports of metals in the United States for the six months ended June 30 are reported as follows, in the measures usual in the trade:

	Exports.	Imports.	Balance.	
Copper, long tons	169,399	36,546	Exp.	132,853
Copper, 1907....	83,563	62,287	Exp.	21,276
Tin, long tons....	142	18,393	Imp.	18,251
Tin, 1907	211	20,601	Imp.	20,390
Lead, short tons	37,083	56,351	Imp.	19,268
Lead, 1907......	16,306	37,669	Imp.	21,363
Spelter, sh. tons.	1,813	482	Exp.	1,331
Spelter, 1907....	357	487	Imp.	130
Nickel, lb....	6,489,865	7,631,987	Imp.	1,142,122
Nickel, 1907....	5,239,990	9,489,398	Imp.	4,249,408
Antimony, lb ...	.....	4,156,555	Imp.	4,156,555
Antimony, 1907.	....	4,772,622	Imp.	4,772,622
Platinum lb ...	... .	1,536	Imp.	1,536
Platinum, 1907.	....	3,731	Imp.	3,731
Quicksilver, lb ..	101,284	......	Exp.	101,284
Quicksilver '07	275,386	....	Exp.	275,386
Aluminum, value	$172,307	..	Exp.	$172,307
Aluminum, 1907	181,229	....	Exp.	181,229

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. Zinc ores exported were 10,071 tons in 1907, and 14,091 tons in 1908; zinc dross, 12,994,478 lb. in 1907, and 11,681,222 lb. in 1908. Zinc ores imported this year, 11,721 tons calamine and 8038 tons other ores, 19,759 tons in all; not reported in 1907. Antimony ore imported, 1,697,790 lb. in 1907, and 590,497 lb. in 1908. Exports given in the table above include re-exports of foreign material.

Wisconsin Ore Market

Platteville, Wis., Aug. 1—The base price for 60 per cent. zinc ore this week was $35@36 per ton; no premium price was paid. The best grades of lead ore sold at $58@60 per ton.

Shipments from the district for the week, ended Aug. 1 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	476,410		150,384
Hazel Green	388,600		..
Benton........	369,880	106,610	
Highland.........	313,000	....	
Days Siding....... ...	220,100	.	
Livingston	120,000	.	...
Galena........	63,800	.....	... ..
Harker	45,350	.	
Cuba City....		88,200	66,475
Total..... .	1,997,080	194,810	216,859
Year to Aug. 1	54,225,621	6,385,615	98,014

In addition to the above there was shipped to the electrostatic separator at Platteville, from Galena, 88,000 lb.; from Mineral Point, 137,700 lb.; from Rewey, 63,500 lb.; from Linden, 122,170 lb.; from Benton, 248,390 lb.; from Cuba City, 60,170 lb. Shipped to the Joplin Separator Works at Galena, from Mineral Point, 53,300 lb. Shipped to the Enterprise roaster at Platteville, from Strawbridge, 154,000 lb. zinc ore.

Missouri Ore Market

Joplin, Mo., Aug. 1—The highest settling price of the week was $38 per ton on an assay base ranging from $32 to $35 per ton of 60 per cent. zinc; the average price, all grades, was $30.94, low on account of large sales of silicate and low-grade ore. Zinc ore was sold during the week for next week's delivery as high as $36 base. The highest price for lead ore was $61, medium grades selling at $58@60 per ton; average price, all grades, was $59.52.

Heavy purchases were made, practically all available ore being sold, a large amount for future delivery. Lead was in increased demand.

Following are the shipments of zinc and lead from the district for the week ending Aug. 1:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	2,832,490	633,610	$64,326
Joplin...	1,925,900	231,040	37,368
Galena .	[illegible]	172,290	16,079
Oronogo..	728,190	58,990	14,218
Spurgeon. .	[illegible]	164,210	8,765
Prosperity	215,880	157,020	[illegible]
Miami .	[illegible]	110,770	7,782
Granby . . .	[illegible]	46,200	[illegible]
Duenweg .	370,740	76,410	7,495
Alba-Neck	[illegible]	.	7,155
Quapaw-Baxter .	403,750	6,500	5,844
Aurora .	327,400	.	5,238
Cave Springs	102,650		1,590
Zincite	84,060	3,630	1,452
Sarcoxie	[illegible]		1,205
Carthage.. .	60,640		1,030
Playter......	49,660	3,230	841
Totals	9,488,420	1,663,900	$196,331
31 weeks..............	284,292,770	44,749,570	$6,006,198

Zinc value, the week, $146,807; 31 weeks, $4,786,924

Lead value, the week, 49,524; 31 weeks, 1,219,274

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1907.	1908.	Month.	1907.	1908.
January ...	45.84	[illegible]	January ...	83.58	46.88
February ..	47.11	34.92	February ..	84.58	49.72
March	48.66	34.19	March .	83.75	49.90
April....	48.24	34.08	April..	79.76	52.47
May.... ..	45.98	33.39	May .. .	79.56	56.05
June .. .	44.82	32.07	June .	[illegible]	60.48
July	45.79	31.67	July..	58.18	[illegible]
August.....	43.22		August... .	[illegible]	. .
September.	40.11		September.	53.52	
October ...	39.83	.	October ...	51.40	
November..	35.19	.	November .	43.40	
December..	30.87	.	December .	[illegible]	...
Year .	43.68	...	Year	68.90	......

Chemicals

New York, Aug. 5—The general chemical market is quiet, but prices are firm and concessions are the exception. The stronger tone of the metal market has influenced the market for chemicals derived from metals. The rest of the market is listless and only a small volume of business is being done.

Copper Sulphate—The demand has not increased to any extent, but the cuts in prices, which were evident recently, have now almost disappeared. Quotations remain at $4.05 per 100 lb. for carloads and up to $4.90 for smaller lots.

Exports of copper sulphate from the United States, six months ended June 30, were 5,983,816 lb. in 1907, and 6,574,373 lb. in 1908; an increase of 590,557 lb. this year.

Nitrate of Soda—The market is quiet, but prices are held firm at 2.30c. for spot and 2.25@2.35c. for other positions of 1908.

Sulphur—Imports of sulphur into the United States, six months ended June 30, long tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of sulphur for the six months, 3640 tons in 1907, and 6070 tons in 1908; an increase of 2430 tons.

[illegible] chemicals into the United States, six months ended June 30, in pounds:

	1907.	1908.	Changes.
Bleaching powder	56,991,613	36,642,645	D. 20,348,968
Potash salts......	111,691,297	87,521,800	D. 24,169,497
Soda salts........	10,926,281	5,224,475	D. 5,701,806

Exports of acetate of lime for the six months, 45,224,071 lb. in 1907, and 32,712,357 lb. in 1908; a decrease of 12,511,714 lb. this year.

Phosphates—Exports of phosphates from the United States, six months ended June 30, long tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total..	[illegible]	[illegible]	[illegible]

The chief exports this year were to Great Britain, Germany and France.

Mining Stocks

New York, Aug. 5—The feature of the week was the sensational rise in copper stocks. Amalgamated was strong touching $79 and closing at $78.25. American Smelting, common, was well liked and recorded a high price of $90.50. Utah Copper shared in the advance, touching $40.50 and closing at $40.25. United States Steel, both common and preferred, were heavily dealt in, common closing at $45, and preferred at $109.50 per share.

On the Curb the coppers were active and shared the upward movement of the Exchange. Cumberland-Ely advanced to $9.50 and closed at $9.25; Dominion Copper closed at $2.25; Nevada Consolidated, $15.25; Guggenheim Exploration rose to $184, the high price on this movement. Gold and silver stocks were mostly neglected except Combination Fraction which made a sensational rise, closing at $1.46 per share.

Boston

Aug. 4—Mining shares have continued on their upward course without any undue or dangerous speculation. Set-backs have been slight and then only the result of profit-taking.

Those properties lying within the so-[illegible] terially marketwise. Adventure touched $11; Atlantic, $16 and better; Isle Royale,

$25; La Salle, $15.50; Mass, $7.75; Michigan, $14.25, and Wyandot, $2.62½. Adventure is known to have this lode, and the Mass mining people are believed to be negotiating for the purchase of adjoining property. Allouez is up $3.75 to $38.25, and Centennial $2.50 to $30.75. Copper Range rose $3.25 to $80.50. Franklin, $3 to $14.50. Persistent buying of Butte Coalition has put the stock up $3.25 to $30, and North Butte, $5.12½ to $86.37½, although the latter has reacted moderately.

The Curb has also shown improvement in prices. Since T. W. Lawson has taken hold of this market business has been good. Lake Copper and Miami have been the mining features. These and Utah Apex are likely to be listed on the Exchange shortly. Many of the Curb representatives of Exchange houses have gone into business for themselves under the late ruling of the Stock Exchange.

San Francisco

The mining stock exchanges of this city are following up cases where operators have been swindling the public in various ways. Some men were arrested this week who, it was found, had been removing the cancellation stamp from returned mining stock certificates, and then reissuing the certificates as new stock. The matter was brought to the attention of the Grand Jury and investigation followed, resulting in the arrest of some of the operators. Similar cases are to be pressed with a view to punishing the gang of operators who have been following this and similar practices.

STOCK QUOTATIONS

NEW YORK Aug. 4

Name of Comp.	Clg.
Alaska Mine	½
Amalgamated	79
Anaconda	48½
Balaklala	‡3½
British Col. Cop.	6
Butte & London	....
Butte Coalition	29½
Colonial Silver	.25
Cum. Ely Mining	9½
Davis Daly	2⅛
Dominion Cop.	2⅛
Douglas Copper	4
El Rayo	2 1/16
Florence	3⅛
Foster Cobalt	.44
Furnace Creek	.14
Giroux	3⅞
Gold Hill	½
Goldfield Con.	5 13/16
Granby	105
Greene Gold	⅜
Greene G. & S	¼
Greenw'r & D.Val.	.75
Guanajuato	2
Guggen. Exp.	182
Hanapah	‡.20
McKinley Dar.	1/16
Micmac	2⅞
Mines Co. of Am.	1 7/16
Mitchell Mining	‡½
Mont. Sho.C	1.00
Nev. Utah M. & S	3
Newhouse M. & S	6¼
Nipissing Mines	7⅝
Old Hundred	½
Silver Queen	1.04
Stewart	½
Tennessee Cop'r.	39
Tri-Bullion	1¾
Union Copper	13/16
Utah Apex	4¼
Utah Copper	40¼
Yukon Gold	4¼

BOSTON Aug. 4

Name of Comp.	Clg.
Adventure	8¾
Allouez	38¼
Am. Zinc	28½
Arcadian	4½
Arizona Com	23¼
Atlantic	16
Bingham	.70
Boston Con	14¼
Calumet & Ariz.	128¼
Calumet & Hecla	695
Centennial	30¼
Con. Mercur	‡.45
Copper Range	80
Daly-West	11⅛
Franklin	13¾
Greene-Can.	12½
Isle Royal	23¼
La Salle	15
Mass	7¼
Michigan	14
Mohawk	69
Nevada	15¼
North Butte	84½
Old Colony	.75
Old Dominion	42
Osceola	115½
Parrot	28⅞
Quincy	99
Rhode Island	4¾
Santa Fe	‡1¼
Shannon	16⅛
Superior	23½
Tamarack	74
Trinity	18
United Cop., com.	7¾
U. S. Oil	25
U. S. Smg. & Ref.	42½
U.S.Sm. & Re., pd.	46
Utah Con.	48½
Victoria	6
Winona	6¾
Wolverine	144
Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	24¾
Am. Smelt. & Ref.	91½
Am. Sm. & Ref., pf.	109¼
Bethlehem Steel	20⅞
Colo. Fuel & Iron	33½
Federal M. & S., pf.	85½
Inter. Salt	18½
National Lead	78⅞
National Lead, pf.	104⅞
Pittsburg Coal	12½
Republic I. & S.	21
Republic I. & S., pf.	74½
Sloss-Sheffield	63
Standard Oil	639
U. S. Red. & Ref.	14¼
U. S. Steel	46½
U. S. Steel, pf	111¼
Va. Car. Chem	27¼

BOSTON CURB

Ahmeek	‡84
Black Mt	‡4
East Butte	7¾
Hancock Con	6¾
Keweenaw	8½
Majestic	.77
Raven	1¼
Shawmut	.35
Superior & Pitts.	15
Troy Man	.50

ST. LOUIS Aug. 1

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	03	.02
Center Cr'k	2 00	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78 00	76.00
Cent. Oil	110.00	100.00
Columbia	4.00	3.00
Con. Coal	18.00	16.00
Doe Run	125.00	115 00
Gra. Bimet.	.20	.18
St. Joe.	15.00	12 50

LONDON Aug. 5

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd	0 1 0
Camp Bird	0 13 0
Esperanza	3 0 0
Tomboy	1 3 0
El Oro	1 5 6
Oroville	0 9 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 5.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.24
Best & Belcher	.50
Caledonia	.10
Chollar	.19
Comstock	‡ 26
Con. Cal. & Va.	.86
Crown Point	.30
Exchequer	.17
Gould & Curry	.12
Hale & Norcross	.25
Mexican	87
Ophir	2 30
Overman	.07
Potosi	.12
Savage	.22
Sierra Nevada	.33
Union	.32
Utah	.04
Yellow Jacket	65
TONOPAH STOCKS	
Belmont	.95
Extension	.82
Golden Anchor	.02
Jim Butler	.26
MacNamara	.64
Midway	.45
Montana	1.45
North Star	.08
Tono'h Mine of N.	7.62½
West End Con	.56
GOLDFI'D STOCKS	
Adams	.05
Atlanta	.25
Booth	.37
Columbia Mt	.22
Comb. Frac	1 40
Cracker Jack	.06
Dia'dfield B. B. C.	.18
Goldfield Belmont	.15
Goldfield Daisy	.70
Great Bend	.33
Jumbo Extension	.50
Katherine	...
Kendall	.14
Lone Star	.08
May Queen	.06
Oro	.11
Red Hill	.24
Roanoke	...
Sandstorm	.31

Name of Comp.	Clg.
Silver Pick	.20
St. Ives	.34
Triangle	06
BULLFROG STOCKS	
Bullfrog Mining	03
Bullfrog Nat. B.	.06
Gibraltar	.05
Gold Bar	.04
Homestake King	.35
Montgomery Mt.	.06
Mont. Shoshone C.	.87½
Original Bullfrog	.02
Tramp Cons.	.18
MANHAT'N STOCKS	
Manhattan Cons.	.08
Manhat'n Dexter	.04
Jumping Jack	.03
Stray Dog	.04
MISCELLANEOUS	
Golden Boulder	.08
Bonnie Clare	.07
Lee Gold Grotto	...
Nevada Hills	1.75
Nevada Smelting	.87½
Pittsburgh S. Pk.	1.24
Round Mt. Sphinx	.20

COLO. SPRINGS Aug. 1

Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	‡3⅛
Dante	6¾
Doctor Jack Pot	5
Elkton	58¼
El Paso	34
Findlay	22½
Gold Dollar	‡6
Gold Sovereign	‡3
Isabella	28½
Index	....
Jennie Sample	‡2⅝
Jerry Johnson	‡4
Mary McKinney	‡25
Pharmacist	‡3
Portland	1.00
Un. Gold Mines	3⅞
Vindicator	‡80
Work	‡8½

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	July 17	Aug. 6	$0.02
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Chollar, Nev	July 8	July 30	0.10
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Helvetia, Ariz	....	July 20	0.50
Ingot, Utah	July 17	Aug. 5	0.01
Iowa Copper, Utah	July 13	July 30	0.05
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Lucky Calumet, Ida	July 3	Aug. 13	0.01
Maxfield, Utah	July 18	Aug. 17	0.02
Mexican, Nev	July 17	Aug. 17	0.10
Missoula Copper, Ida	July 25	Aug. 25	0.01
Oro Cobre, Cal	July 16	Aug. 3	0.02
Sierra Nevada	July 14	Aug. 4	0.10
Signet	Aug. 8	Oct. 6	0.01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Wabash, Utah	July 10	Aug. 1	0.10
Wheeler, Utah	July 16	Aug. 6	0.01½

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25 738
February	68.835	56.000	31.852	25 855
March	67.519	55.365	31.325	25 570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	.....	31.637	.....
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
November	58.677	.....	27.164	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13.726	24.825	13 901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58 786
March	25.065	12.704	25.560	12 875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57 842
July	22 130	12.702	21.923	12.933	95.016	57.989
August	18.356	......	19.255	......	79.679	.....
September	15.565	......	16.047	......	68.375	......
October	13.169	......	13.551	......	60 717	......
November	13.391	......	13.870	......	61 226	......
December	13.163	......	13.393	......	60 113	....
Year	20 004	......	20.661	......	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	.....
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32 620	......
May	43.149	30 015	November	30 833	......
June	42.120	28 024	December	27 925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14 250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	......	19.063	.....
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20 563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4 338	23.850	19.031
August	5.701	......	5.551	......	21.969	......
September	5.236	......	5.086	......	21.050	......
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	.....	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

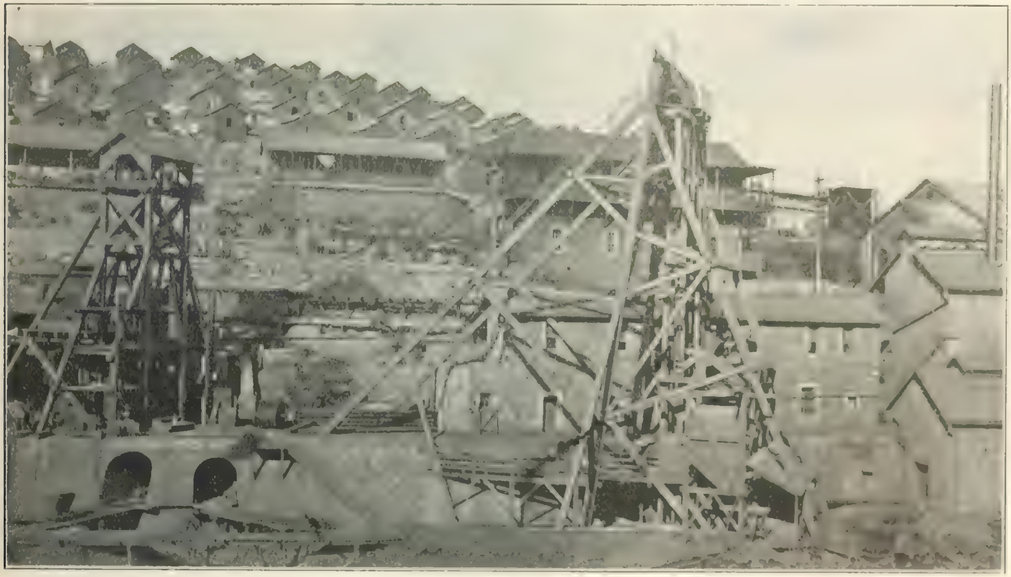
VOL. LXXXVI. NEW YORK, AUGUST 15, 1908. NO. 7

Mines of Penoles Company, Mapimi, Mex.—I

The Ore Occurs in Chimneys and Pipes in Limestone; Some Modern Mining Methods, Including Use of Diamond Drill, Are Employed

BY CLAUDE T. RICE

Mapimi is reached from Bermecillo on the Mexican Central, by a narrow gage railroad, 25 km. long, belonging to the Compañia Minera de Peñoles. The town was founded in 1598 partly on account of the finding of ore near by and partly on account of the magnificent spring for which the town is famous; in fact, for many years Mapimi was one of the main water places on the *camina real* between Mexico City and Chihuahua, but mining is and always has been the chief reason for its existence.



PORTION OF SURFACE EQUIPMENT, OJUELA MINE, [illegible]

Mapimi, in fact, is the oldest mining district in Durango, for the Spaniards discovered the mines in 1598, the first ore being found at the Ojuela mine, near the *boca de mina*, the large hole in the side of the *arroyo* under the suspension bridge shown in one of the accompanying illustrations. Here one can see the old steps that the Mexicans cut in the limestone when they first worked the Ojuela, over 300 years ago; this same chimney of ore is still being mined. For years the Spaniards worked the Ojuela and other mines near-by, smelting the oxidized silver-lead ore, in spite of its high arsenic content, in their adobe furnaces. In fact, some stolen ore is still surreptitiously smelted at Mapimi in such furnaces.

The Spaniards operated the mines with great success until 1821 when the Mexicans obtained possession of them. The Mexicans continued the work until 1884, but from 1867 on, the district was almost abandoned until foreigners entered it (about 1890). Two of the foreign companies "went broke" on the Ojuela, but finally in 1893 the Compañia Minera de Peñoles, which had been working a silver mine a few miles farther west, purchased the Ojuela mine. This company also had a hard time following the orebody, which is very irregular, but at last it found rich ore so that now the Compañia Minera de Peñoles is one of the most prosperous companies in Mexico.

The Bufa de Mapimi, of which the ore zone forms part, rises high above the [illegible] composed of much contorted, massively stratified limestone. [illegible] a northwest-southeast trend, and has been the scene of much fracturing, for along both the east and west sides of the mountain extends the wide shear zone in which the orebodies are found. The western part of this zone is still in a prospecting stage, but the central part has been worked for centuries and in it are all the mines at present producing.

All these mines, with the exception of the San Juan, which is producing 80 to 100 tons per day, belong to the Compañia Minera de Peñoles. Consequently, as the Ojuela mine is the largest and best developed of its properties, I will describe it.

[illegible]

The Ojuela mine is about six miles south of Mapimi, high up on the eastern side of the Bufa de Mapimi. While the Ojuela mine is below the line of cliffs that are so prominent nearer the top of the Bufa, still the side of the mountain near the mine has been cut up so much by deep gulches that the surface equipment had to be erected in a sag of the ridge containing the orebodies, necessitating expensive construction and some novel features in mining engineering.

The mine is connected with the company's smelter at Mapimí, by a 30-in. railroad. The first four miles of this road are level, but between El Cambio, at the base of the mountain, and Ojuela, there is a rise of 1100 ft. in two miles. This necessitated the building of a rack road, for the average grade is over 10 per cent.; however, near the mine, owing to the irregularity of the country, the grade is 14 per cent., while for a considerable distance the grade is 12 per cent. to make up for the 7-per cent. grade near the base of the mountain. The ore is hauled to the smelter in trains of four cars, holding eight tons each, and on the return trip supplies are taken to the mine. In fact, it is this rack road which has made possible the installation of the large machinery, necessary at the mine, without sectionalizing it.

SORTING OXIDIZED ORE, OJUELA MINE

Owing to the deep *arroyo* between the Socavon and the Ojuela shafts, a suspension bridge was necessary to connect the Socavon shaft with the rack road. This suspension bridge is 1100 ft. long and, at its center, 300 ft. above the bottom of the *arroyo*. It was built by the John A. Roebling Company, of Trenton, N. J., in 1899, and was at that time the second longest suspension bridge in the world. As this suspension bridge has a heavy grade from the Socavon end toward the Ojuela end, the ore trains consisting of four cars each are handled on the bridge by means of an 18-h.p. hoisting engine.

Such are some of the novel features above ground, and yet underground there is another suspension bridge, 60 ft. long, which was necessary to bridge an old stope so as to prospect the ground on the other side. This suspension bridge was cheaply constructed from old hoisting cable, anchored to eyebolts, wedged into holes, drilled into the strong limestone forming the walls of the stope. To these main cables, 6x8-in. cross pieces were fastened by small pieces of steel cable, and on these cross pieces the stringers that carry the rails were placed.

The Ore Occurrence

The ore, which is an arsenical silver-lead ore, occurs in a vertical shear zone, 3000 ft. wide, running northwest and southeast through the limestone. A diorite dike occurs near the east boundary, and there is also another near the west boundary, but the shear zone extends beyond these dikes, and ore has been found at some distance to the east of the east dike. Through the shear zone cuts a strong fault called the San Diego fault; this is almost vertical, and has caused considerable displacement of the strata, for to the west the limestone has only a slight dip, while to the east it is highly inclined. This fault was formed prior to the formation of the orebodies and apparently it has had some influence on their location.

SORTING SULPHIDE ORE, OJUELA MINE

As is characteristic of limestone districts, the ore occurs in irregular bodies, many of which outcrop at surface. The orebodies appear to have a tendency to form along northwest-southeast fractures and the pitch is commonly toward the northwest. The orebodies are chimneys, not veins, which suddenly change both in their dip and in their strike. Indeed, in some places the orebodies change their course so suddenly (almost 90 deg.) as to indicate the existence of secondary jointings in the limestone at right angles to the main direction of shearing. In some places the orebodies form large chimneys, in others, small pipes; they either follow or cut across the bedding planes. The irregularity of these deposits is well shown by the Ojuela orebody, one of the largest in the mine.

The Ojuela and San Carlos Orebodies

Down to 25 m. the Ojuela orebody, which is best described as a large chimney, has a pitch of 20 deg. at first N. 30 deg. W., then almost due west; but at 25 m. the chimney becomes almost vertical with a pitch toward the southeast until at a depth of 100 m. the pitch turns N. 15 deg. W., the chimney remaining almost vertical to a depth of 150 m. At that depth the pitch flattens to 45 deg. and is toward the northwest until the depth of 175 m. is reached, where it becomes vertical. At a depth of 250 m. the orebody splits, inclosing a lens of limestone, 30 m. wide. The two parts come together again at 350 m., and continue vertical to a depth of 500 m. At that point the pitch changes to 40 deg. toward the southwest, but at a depth of 550 m. the pitch turns to almost due west, the angle remaining the same, until at a depth of 600 m. the pitch flattens to 15 deg., and is due north. At a depth of 610 m., the pitch changes to N. 70 deg. W., the angle remaining the same until at 620 m. the chimney again becomes vertical and continues so to a depth of 700 m.

An irregularity fully as pronounced is also characteristic of the other large chimneys, such as the San Pedro, the Paloma, and the Santo Domingo orebodies. In the San Carlos orebody, which is composed of several related occurrences, the ore forms in small pipes, from 3 to 8 ft. in size, which have already been developed for a distance of 600 ft.; throughout this distance the small, but irregular, size remains remarkably characteristic of these pipes. In places these pipes, like the larger bodies, cut across the bedding planes, or they may follow the bedding planes, in which case they are approximately parallel either to the strike or to the dip of the limestone. These pipes have a tendency to occur in parallel groups, sometimes entirely separate from one another, but often connected in many places with small pillars of limestone between them. When the pipe is approximately parallel to the strike of the strata, it has a slight pitch toward the northwest.

As has been said, the ore in the Ojuela mine, and also throughout the district, occurs in many different forms, the common characteristics being the irregularity of the pitch and the prevalence of washed walls and water courses in the oxidized, and only the oxidized, portion of the orebodies, indicating the presence of strong circulating currents during the period of oxidation.

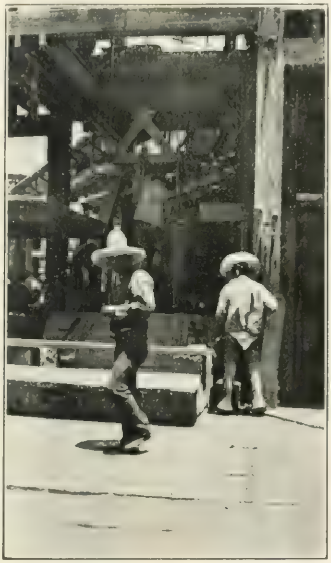
The zone of oxidation is very deep for the change from the oxidized to the sulphide ore does not take place until between the 12th and 13th levels, at a depth of 1700 ft. At this point of change the ore shows secondary enrichment in some places, but at other places there is no sign of such enrichment.

In the upper levels the oxidized ore consists mainly of silver-bearing carbonate in a calcareous gangue heavily stained with iron oxide. This oxidized ore carries 400 grams silver and 4 grams gold per metric ton, 13 to 14 per cent. lead, and 9 per cent. arsenic. The sulphide ore consists mainly of argentiferous galena associated with some sphalerite and considerable arsenopyrite. The sulphide ore assays 500 grams silver and 4 grams gold per metric ton, 11 per cent. zinc, 12 per cent. lead, and 9 per cent. arsenic.

METHOD OF HOISTING

The mine is worked through several vertical shafts, which are close together owing to the fact that some of them were necessary because in depth the former shafts had passed into the orebody. The last, the Tiro Norte, the only one having two compartments, has been sunk to a depth of 2624 ft. to serve as a main working shaft, for it was better to sink this shaft than to tie up the mine while enlarging one of the other shafts. In fact, the hoisting system is not in its final stage, for the main shaft, although 2624 ft. deep, is not used at present below the 1700-ft. level, owing to the fact that as yet it has not been connected with the main orebodies on the lower levels. Consequently several single compartment "counter-shafts" are used for hoisting the ore from those levels up to the 1700-ft. level. These shafts are equipped with drum hoists run by 150-h.p. induction motors, the sheave wheels and the drum being connected by an inclined raise.

Above the 1700-ft. level several shafts are used for hoisting owing to the exigencies of lowering and hoisting, on company time, 1200 men each day. In fact, since in Mexico at least two and a half times as many men are required underground per ton of ore hoisted as in the United States, the hoisting and lowering of the men is an important problem at the large, deep mines.


TRIANGULAR CROSSHEAD USED WITH ROPE GUIDES, OJUELA MINE

The levels from these shafts have been driven at irregular intervals above the 450-m. level, but below that level the interval, 50 m., is regular down to the deepest, the 800-m. level. On the 216-m. level an adit connection has been made with surface so that, with the exception of that for the boilers, no water has to be pumped above the 216-m. level.

The main hoisting shaft is timbered with regularly framed 8x8-in. shaft sets, placed at 5-ft. centers, but posts have been placed in the middle of the end plates and dividers so as to strengthen the guides and to permit splicing at any place along their length. All the other shafts are untimbered, except for an occasional stull placed to hold the air pipe and pump-column, for the limestone is strong and does not air-slack. In fact, the main shaft was timbered not on account of weak ground, but merely so as to hold the guides, for the limestone was so hard that it was cheaper to use shaft sets than to cut hitches and put in stulls to carry the guides.

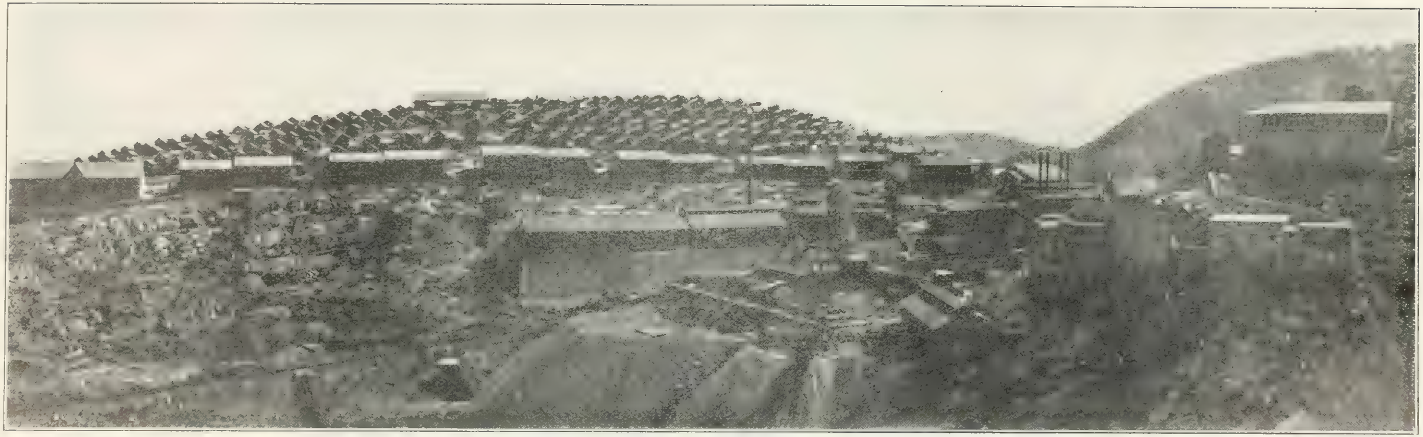
In the main shaft the hoisting is done with reel hoists, 3½x⅜-in. flat cable and self-dumping skips being used. This the Mexicans re-sew so well that their work compares favorably with similar work done in the States. In the untimbered shafts, which have only one compartment, buckets and wire-rope guides are used. These guides are made of four-strand, ⅝-in. wire rope, fastened to eye-bolts in the bottom of the shaft, or, when sinking is being done, fastened to wire ropes stretched between eye-bolts placed in drill holes in the sides of the shaft. The wire-rope guides pass over pulleys in the head-frame and then down to a hand winch by which they are tightened. The bucket, having a capacity of one ton, is hung from a triangular crosshead, made by bolting together two triangular frames of 3x5-in. timber, the angles being strengthened by means of iron plates. The bucket is made with a long bale attached to pins placed below the center of gravity and is kept from dumping by means of links passing over lugs in the top of the bucket. The wire-rope guides pass through babbitted boxes bolted onto the end of the triangle which, of course, is placed with its apex up. Spinning of the bucket is prevented by lashing the ring of the bucket chain to the crosshead.

The buckets run with remarkable smoothness on the guides and probably there is not more than 5 to 6 in. vibration in the center of a guide 1700 ft. long, even during rapid hoisting. With these rope guides hoisting is rapid for I have seen an ordinary trip and return, including the dumping on top and the fastening of the loaded bucket at the bottom, made from the 1700-ft. level in two minutes.

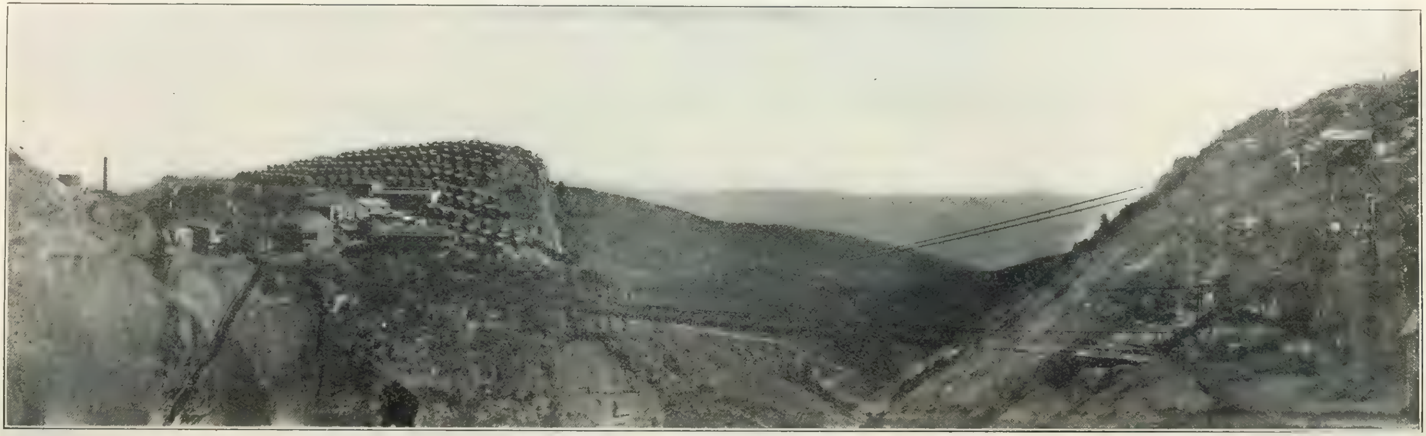
In using this system, provided they are kept tight by means of the winch, the guide ropes work satisfactorily, and surely it is cheaper to put in rope guides than to timber a shaft if buckets are to be used; but, if cages are to be used, the rope guides are not steady enough for fast hoisting.

THE MEXICAN METHOD OF MINING IN THE SMALLER STOPES

The method of stoping in the different orebodies varies considerably owing to differing characteristics in each. In the large bodies regular overhand stoping or underhand stoping is used, but in the irregular orebodies Mexican methods of mining are employed, for it does not pay to drive drifts or crosscuts to get under



THE OJUELA MINE SHOWING THE MEXICAN TOWN ON THE SUMMIT OF THE RIDGE AND RACK ROADS AT BASE OF THE CLIFF



THE SUSPENSION BRIDGE LEADING FROM THE SOCAVON SHAFT TO THE OJUELA SHAFT. THE BLACK SPOT IS WHERE THE OJUELA OREBODY COMES TO SURFACE small orebodies. The Mexican methods were devised during centuries spent in working the irregular deposits in limestone, so characteristic of northern Mexico, or else in following narrow streaks of rich ore in large veins. Consequently, for cheaply working small irregular deposits, provided labor is not expensive, the Mexican method of following the ore and packing it out on the back is hard to improve upon; but, of course, it is not economical in large orebodies, even when the labor is cheap and accustomed to the methods.

The Mexican miner will follow the ore with narrow workings, taking out only the minimum amount of ground when the pay streak is narrow; indeed, he will work in narrow, winding places where an American miner would not work for an instant, and in spite of the necessarily poor ventilation will do a good day's work. From such places the *peon* packs out on his back, the load, weighing between 80 and 100 lb., which he has scooped into a sack by means of a horn or iron scraper, for it is impossible to use a shovel in such workings.

It is on account of the gophering character of much of the early work, which was necessary in order to obtain the rich ore required by the crude metallurgical methods, that the Mexican has developed so many oddities in his mining, such as a desire for a short-handled double jack, and especially an aversion to the shovel, which in some parts of Mexico he is reluctant to overcome. Consequently, the Mexican prefers even in wide places to use a long-handled hoe to fill a small pan, held between his feet, and then to dump the filled pan into the car, rather than to shovel the ore directly into the car. The speed with which he will fill a car in this manner is remarkable, and in a drift the Mexicans are often seen filling two cars at the same time, on the same track, the ore being packed in pans. Frequently on a Fourth of July the Americans put up prizes for a car-loading contest, and it is said that with several *peones* in the contest, each busy with a hoe and pan, such a contest becomes almost as exciting as a double-hand drilling contest.

As the Mexican at Mapimi appears to be able to fill a car as quickly with a pan as with a shovel, and as he is more contented using his own method than the methods of the *gringos*, much of the ore at the mines of the Peñoles company is loaded into cars by the hoe and pan method.

A modified form of the chicken ladder is also used at the Ojuela mine. These are made by nailing cleats, 4 in. thick, onto a 2-in. plank, 8 in. wide. These ladders are light and cheap and, as the Mexicans prefer the chicken ladder to regular ladders, it is in many cases policy to use chicken ladders. Indeed, the common type of the much scorned chicken ladder, made by notching either a round pole, 10 or 12 in. diam., or a 6x8-in. timber, is far preferable to an ordinary ladder in an untimbered raise where the rock must be blasted onto the ladders, for it is hard to break a chicken ladder.

These Mexican methods have been described so that the engineer unfamiliar with Mexico will appreciate the fact that these apparently crude methods devised by the early Mexican miners are well adapted not only to mining small irregular deposits but also for developing the orebodies until they increase sufficiently in size to warrant more expensive methods of development; and so that he will realize that good engineers use such methods in Mexico when circumstances warrant their use.

Overhand and Underhand Stoping in the Larger Orebodies

When the orebodies are large, either overhand or underhand stoping is used; in either case a drift is driven to cut the orebody and raises are put up or winzes sunk from the level above to serve for ventilation and as ore chutes. But in general the underhand method is used, for with it no timbering is required as the walls are strong and do not air-slack. The ore is all mined on the way down and the limestone walls are cleaned of any slabby ground; consequently large stopes can be worked without accident. When the orebody is flat frequently overhand stoping is used, since then no staging is required.

In some of the wide orebodies much ore, formerly too poor to mine, has been left on the walls. In the past this ore was mined by erecting scaffolds along the sides of the stope, from which the miners drilled, but now waste filling is used and chutes are carried up with the filling as the overhand stripping of the walls proceeds. The ore in the stopes is soft and consequently the ore is drilled by hand. The drifts and crosscuts are also driven by hand except that, when speed is desired, machines are used. These drifts and crosscuts are all 2x2 m. in size in order to allow the setting up of diamond drills crossways in them for prospecting the ground to either side. Two 2¼-in. machines, mounted on a cross bar, are used in driving. All mining, drifting and crosscutting is done on contract. The price paid for a 2x2-m. crosscut is 45 pesos per meter; the Mexicans furnish all labor and supplies and deliver the broken rock at the shaft. Frequently with two 2¼-in. machines in the breast these Mexicans will drive, two shifts being worked per day, 50 m. per month in the limestone.

The price paid for mining and delivering the ore to the shaft varies considerably with the nature of the orebody and its distance from the shaft. In large orebodies often only 90 centavos per ton is paid, but in the smaller orebodies, where the ore has to be packed on the back, as much as 3 pesos per ton is paid; the average throughout the mine is about 2 pesos per ton. At these prices the miners make from 2 to 3 pesos per day and that is the scale at which miners on day's pay are paid. The Mexican contractors pay their [illegible]

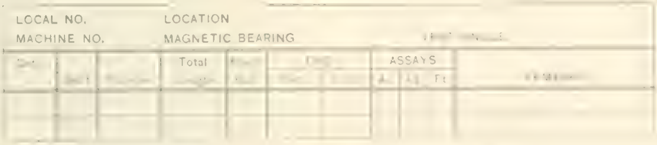
Prospecting with Diamond Drills

Owing to the irregularity of the orebodies the prospecting is done by means of diamond drilling from the different drifts and crosscuts. At present between 5500 and 6000 m. of holes are drilled per month by the 15 diamond drills, four of which are Sullivan type "R" drills and the rest of Swedish make. These latter were originally operated by hand power, but the company has converted them into power drills by adding two friction wheels and a direct-current motor to drive the drills. Most of these Swedish drills are at present fed by hand, but A. Frey, the engineer in charge of the diamond drilling, is perfecting an automatic feed which is doing very good work.

The pumping for the Swedish drills has to be done by means of a hand pump, but this is no disadvantage when using Mexicans on diamond drills, for the man doing the pumping immediately detects any clogging of the drill and warns the operator before the bit is damaged. For this reason the wear on the diamonds is not so great with the Swedish as with the Sullivan drills.

[illegible] a side, was used in blocking out a level for prospecting with diamond drills, but now this method has been abandoned, because it is more expensive than the new method now used, and because it had not been the means of discovering any orebodies which would not have been found by the cheaper method.

In the new method the drifts and crosscuts are not laid out systematically, but are driven to develop known orebodies or to follow the San Diego fault and other fractures. The general direction of the



LOCAL NO.
LOCATION
MACHINE NO.
MAGNETIC BEARING

			Total			ASSAYS		
							Ft	

INDEX CARD FOR F[illegible]

drifts is taken as a base line from which to set up the drills; the position of each set-up is determined by means of a transit and the direction of the hole is marked so that the drill holes will be parallel and at 5-m. centers. The diamond drills are set up by means of plumb bobs hung from the marked stations so as to assure accuracy of alinement and position, the rod is leveled, and holes 60 m. deep are drilled in both directions from each set-up.

The distance drilled each shift, the distance at which any dike or any orebody is cut, the width and the value of the ore (as determined from sludge samples, for little core is obtained when drilling in ore), together with the direction and position of the hole, are kept on cards which are filed in a card index (see accompanying cut). From this data the drill holes are plotted on special maps reserved entirely for diamond-drill work and on which only the principal workings are indicated so as to permit orientation.

The cores, which vary between ¾ and 5/16 in. diameter, are not kept, as the limestone is all of the same general character. Practically all holes are drilled horizontally and parallel to the others drilled from the same drift, but at the end of a drift the holes are drilled in different directions with an angle of 10 to 20 deg. between them so that they form a horizontal fan 60 m. in radius, prospecting the country beyond.

The footage drilled per shift varies considerably from day to day and also with the machine used. The drills equipped with the Frey automatic feed drills an average of 13 m. per shift; the Sullivan type "R" machine drills 10 m., while the hand-fed Swedish machines average between 6 and 7 m. The drilling is done on contract for 40 centavos per meter. This makes the cost of drilling about 1.35 pesos per meter including the cost of labor, power, diamond loss, repairs, and superintendence. All diamond-drill men are Mexicans, except the engineer in charge and the diamond setter.

PUMPING, PRODUCTION AND POWER

All the pumping is done by electric pumps, most of which are run by induction motors, but a few direct-current pumps are still in use. The station pumps of Jeanesville type have a capacity of 400 gal. per minute, and are run by 150-h.p. induction motors; two of these are pumping from the 500-m. to the 217-m. level and two from the 800-m. to the 500-m. level. On the 215-m. level the water flows to surface through an adit connection. In order to lower these heavy pumps a worm-driven Denver Engineering Works heavy-duty machinery hoist was used, which did the work admirably. A Sulzer centrifugal pump having a capacity of 700 gal. per minute against a head of 1000 ft. has been ordered and will be installed as soon as it arrives. On the 217-m. level small electric-driven triplex pumps are installed to pump the boiler water, and the water used for washing, etc., to the surface.

At surface the large sizes of the low-grade oxidized ore is sledged and hand-picked, while all the sulphide ore which will not pass through a 2-in. opening is closely hand-picked. But as the company owns its own smelter, which is near-by, this sorting is not extensive.

At present the mine is producing 500 tons of ore per day, about 100 tons of which is sulphide ore, and approximately 1200 men work underground. At the mine all employees except superintendent, assistant master mechanic, electrician, head diamond setter, master mechanic and assistant master mechanic, electrician, head pumpman, head carpenter, foremen and cashier, are Mexicans.

All electric power is generated at the smelter and transmitted at 6600 volts (alternating) to the mine where it is transformed to 440 volts for use in driving the underground pumps and motors. Some of the current is changed by a motor-generator set to direct-current at 250 volts for use in electric lighting and for running direct-current hoists, pumps and diamond drills. The mine is equipped with two electric-driven Ingersoll-Rand compressors having 2000 cu.ft. per minute capacity. At the mine only sufficient steam is generated to run the surface hoists, for all other machinery is run by electric power.

New Apparatus for Electrolytic Determination of Metals

F. C. Frary (*Journ.* Amer. Chem. Soc., XXIX, pp. 1592-1596) describes two forms of apparatus for the rapid determination of metals by electrolysis without the use of rotating electrodes.

The first form of apparatus consists of a solenoid of about 500 turns of 1.5 mm. Brown & Sharpe No. 14 insulated copper wire, wound on a copper cylinder, 6 cm. in diameter and 11 cm. high, flanged at either end with sheet iron. Within the copper cylinder at its lower end is a hollow iron cylinder, 4 cm. high. The solenoid is surrounded and protected by an iron mantle, 2 mm. thick, which presents a short path for the magnetic circuit on the outside of the coil. This arrangement concentrates the entire magnetic force of the solenoid in that portion of its core above the inner iron cylinder.

The beaker used in the analysis is set within the solenoid, supported by the inner iron cylinder and should have a capacity of from 125 to 150 c.c. The cathode may be of platinum foil, or platinum, copper, silver or nickel gauze, and should fit the beaker rather closely, while the anode may be a plain spiral.

The solenoid and the electrolytic cell are usually connected in series. The resistance of the coil is about one ohm, and a current of 5 amperes may be employed for a long time without danger of overheating; indeed, the heat imparted to the electrolyte is often an advantage. In case the heating of the electrolyte is a disadvantage, a smaller beaker may be used and jacketed with a coil of lead pipe through which water flows. If a higher current is wanted, it is a simple matter to arrange separate circuits for the solenoid and the electrolytic cell.

When the apparatus is in use, the lines of force pass down through the electrolyte cutting the lines of electrical current passing from the anode to the cathode. Every infinitesimal strip of electrolyte between the electrodes acts as if it were a wire carrying a current, and being cut at right angles by the lines of force immediately moves in a direction perpendicular to the lines of force. In this manner a circulation of the electrolyte within the beaker is set up, the speed of rotation of which is governed by the strength of the current in the solenoid and that passing through the cell.

THE APPARATUS WITH MERCURY CATHODE

The second form of apparatus was devised for use with a mercury cathode where the current lines are vertical. The beaker for this form has its bottom projected upward so that in cross section it has the form of a ring. The beaker is made of Jena glass and has three platinum points fused in the bottom, projecting into the mercury within. It rests upon, and forms contact with, an insulated copper plate on top of the solenoid, and is connected with the source of current. Projecting up within the space in the bottom of the beaker is an iron pole from the solenoid, while the pole from the other end of the solenoid is brought up to form a ring around the outside of the beaker. The lines of magnetic force are thus concentrated in this ring-shaped section of the beaker and being at right angles to the direction of the current, circulation is established. The beaker is 5 cm. in diameter and 10 cm. high and has a capacity of 200 c.c., which gives sufficient room for any boiling or frothing that may take place. The solenoid coil has 500 turns of No. 16 Brown & Sharpe insulated copper wire wound on an iron core 1.6 cm. in diameter. With a current of 3.4 amperes, and with the solenoid and cell connected in series, the speed of rotation of the electrolyte was about 100 r.p.m.

These forms of apparatus seem especially excellent, for they offer a means of rapid electrolytic analysis that is free from the objections to apparatus where rotation of the electrolyte is obtained by mechanical means.

A reduction of oxygen in air from 20.93 per cent. (the normal amount) to 17 per cent. will extinguish lights, but for a short time will not affect men appreciably.

The Cost of Silver-Lead Smelting

A Study of the American Smelting and Refining Company, Which Is Estimated to Have Made a Profit of $2 per Ton of Ore Smelted

BY WALTER RENTON INGALLS

The relation between miners and smelters, in so far as concerns the purchase by the latter of the ores produced by the former, is a matter of general and absorbing interest. The conditions under which silver-lead ore is smelted have been described and discussed elaborately in several standard treatises, and in many articles in the industrial periodicals, but either because these analyses are too technical or because of inability to deduce generalizations from a mass of data pertaining to various particulars, there is a general demand for information as to the cost of smelting silver-lead ore in the United States; the cost of refining the base bullion; the percentages of silver and lead extracted; and finally, the first cost of the plant. In the absence of such information, it is a common belief that the smelters charge more for the treatment of ore than they ought to; in other words, that they make a greater profit out of the miners than is fair to the latter. The present article is an attempt to deduce from the official reports of the American Smelting and Refining Company, by all means the most important smelter of silver-lead ore in the United States, some general conclusions as to its treatment of the mining industry; and also as to its own standing as one of the great industrial enterprises of the United States in which many thousands of persons are interested as stockholders. Two other parties of interest are the management which conducts the affairs of the company and the consumers of metals, particularly lead, who purchase their supplies from it. The most important portions of this article are derived from the official reports of the American Smelting and Refining Company and the United States Smelting, Refining and Mining Company, which are public property and open to the analysis of anyone who cares to undertake it. The technical data incorporated in the article are well known to members of the profession who are engaged in the smelting industry.

THE AVERAGE COST OF SMELTING

No data respecting the average cost of smelting and refining in the United States have ever been published, and it would be next to impossible to obtain it. The costs range rather widely among the various plants, depending upon the size and nature of the plant; the cost of labor, fuel, fluxes, and material; the character of the ores smelted, etc. Thus, nine plants during the same period of six months, a few years ago, showed costs of smelting, referring to the blast-furnace operation only, per ton of charge (ore and flux) which ranged from $2.50 to $4.80. This appears in the following table:

COST PER TON OF CHARGE
(Ore and Flux)

Works	Amount	Works	Amount
A	$3.418	F	$3.429
B	2.625	G	3.929
C	3.260	H	4.039
D	3.331	I	4.781
E	3.754		
		Average	$3.607

Consequently, it must be borne in mind that what I shall go on to say is simply in the nature of broad generalization, and does not apply to any specific case. For the same reason allowances must be made for what may appear to be inaccuracies by comparison with specific cases.

In the treatment of the argentiferous ores of the West, different conditions enter into the consideration. In the working of those ores, the present practice is to roast only those which are low in lead, and charge raw into the blast furnace the rich galena. The cost of roasting is about $2 to $2.50 per ton of ore roasted. The cost of smelting a ton of charge in a large modern plant, under favorable conditions, is about $2.50, of which about 84c. is for coke and $1.66 for labor, power and supplies. The expense of administration amounts to about 16c. additional. Consequently, the total cost per ton of charge (ore and flux) is about $2.66. If the ore amounts to 80 per cent. of the charge, which corresponds to the ordinarily good practice, the cost per ton of ore is about $3.33.

In the case of a sulphide ore something more has to be added for the roasting, whether the latter be done in a special furnace, or in the blast furnace. If the galena be charged raw into the blast furnace, a certain portion of its sulphur is burned off, but another portion reappears in the form of matte, which must be roasted in a special furnace. Smelters reckon roughly that it costs about 25c. per unit to get rid of sulphur in whatever way that be done. An average of the work of many large smelting plants shows that for every ton of charge smelted in the blast furnace, about 0.4 ton of material (ore and matte) must be roasted. The cost of roasting ranges from $2 to $2.50 per ton. Taking the lower figure, in view of economies which [illegible] process, we may figure that on the average 80c. is to be added to the cost of smelting, making the total cost per ton of ore about $4.12. Figuring on the same basis of 80 per cent. of ore in the charge, the average for the nine works previously mentioned would be $3.607 ÷ 0.80 = $4.50, approximately. I shall adopt the latter figure.

INTEREST CHARGES, AMORTIZATION, ETC.

However, there are other things which enter into the reckoning of the smelter. His works, capable of smelting 1000 tons of ore per day, or roughly 330,000 tons per annum, have cost in round figures nearly $1,000,000, or about $3 per ton of annual capacity. Reckoning amortization at 10 per cent. per annum, and interest on the investment at 6 per cent., the smelter must add 48c. per ton of ore smelted on account of these fixed charges. Moreover, the smelter is bound to carry a large stock of ore on hand, upward of a month's supply being required for ordinary safety and the necessity of making up beds of the proper mixture. Assuming that the works which is treating 330,000 tons of ore per annum has always 30,000 tons on hand, and that the average value of the ore is $30 per ton, the interest charge on each ton of ore smelted is upward of 15c. A month's delay in realizing on the products adds 15c. more.[1] This makes a total of $5.28 up to this point, namely, the production of base bullion. The smelter has recovered about 95 per cent. of the lead and 97 per cent. of the silver in the original ore. He has paid the miner for only 90 per cent. of the lead and 95 per cent. of the silver, wherefore he has a certain leeway on these metals, as he may have also on gold for which he has paid the miner only 95 per cent., but recovers 100 per cent.[2] Also he obtains an advantage from a few by-products, which do not amount to much per ton of ore, but are considerable in the aggregate.

---

[1] [illegible]

[2] [illegible] drawing it rather tightly upon the smelter. [illegible] cent., which the lead suffers in refining the [illegible] lead in the ore does not obtain any great margin on this item, nor does he on the purchase of the silver. The smelter does not really recover 100 per cent. of the gold, although he may apparently do so, and even more, because of the cumulative effect of [illegible] the ore settlements, which give the smelter more to start with than his books show.

Copper

Besides the gold, silver and lead of the ore there is a certain amount of copper, modern practice demanding the presence of 0.5 to 1 per cent. in the charge in order to insure a clean slag. This copper goes partly into the slag, and partly into the base bullion (from which it is recovered during the refining process), but chiefly it is obtained in the form of matte, which is concentrated up to about 40 per cent. copper and then is despatched to Omaha, where it is converted to blister copper. The converting of this leady matte is more costly than the treatment of ordinary copper matte, and indeed throughout the lead smelting process copper is subject to high losses, especially in the slag of the first smelting, which follows from the common metallurgical principle that losses are quantitatively constant (or nearly so) and proportionately variable. Consequently in the treatment of an ore so low in copper as 0.5 to 1 per cent. the percentage of loss is large. It may be generalized, perhaps, as 30 per cent. It is for this reason that the smelter makes so large a deduction from the copper in the ore (1.3 units off from the wet assay) and pays for it at 3@7c. less than the price of refined copper at New York. Of course the reader will understand that the deduction of 1.3 units pertains to ores that contain sufficient copper to deserve payment, and that those ores when mixed with many others that contain no copper give an average furnace charge with 0.5 to 1 per cent. copper. It may be explained also that all of the copper does not finally appear as refined metal, a fairly large quantity being obtained and marketed as bluestone. However, in the generalization which I am attempting it is impossible to go far into these details.

I. A. S. AND R. CO. COMPARATIVE STATEMENT OF ASSETS.

Year.	1903	1904	1905	1906	1907
Property account	$86,845,671	$86,845,671	$86,845,671	$86,845,671	$86,845,671
Investment account	1,028,598	1,680,306	*3,982,576	*4,179,915	*3,810,595
Metal stock (Au. Ag. Pb. Cu.)	18,010,687	17,032,300	16,418,543	19,415,200	18,251,587
Material, fuel, flux.	1,107,253	1,224,688	1,118,902	1,114,893	1,317,544
Cash	2,339,154	4,047,423	4,636,649	4,757,929	6,706,984
Total assets	$109,331,362	$110,830,387	$113,002,340	$116,313,607	$116,932,381

*Does not include 177,510 shares of the common stock, American Smelters Securities Company, par value $17,751,000.

Freight and Refining

The products of the smelteries are base bullion and lead-copper matte. The latter goes to Omaha for converting and the blister copper thence is passed on to Perth Amboy for refining. The base bullion goes to Denver, Omaha, Chicago and Perth Amboy. As in the case of smelting there are differences among these works as to the cost of refining and other conditions, but inasmuch as the prices for lead and copper are based on the market at New York it is best to confine attention to the refining and handling of base bullion at that center.

The freight rate on base bullion from Salt Lake City to New York is $10.80 per ton; from Denver and Pueblo to New York it is $6.40 per ton. The cost of refining is $6@$6.50.[1] Other costs are lighterage, $0.625; selling, $0.40; miscellaneous, $0.325. This gives a total of $7.60 exclusive of freight. The cost of a lead refinery is about $6.66 per ton of annual capacity, on which amortization at 10 per cent. and interest at 6 per cent. come to $1.07, making the total cost of refining, lighterage, selling, etc., about $8.67. Consequently the charges on a ton of ore smelted at Salt Lake and yielding 10 per cent. of lead are as follows:

Smelting	$5 28
Freight on bullion	1 08
Refining, etc.	0.87
Total	$7 23

In addition to the above total, $7.23, the reports of the American Smelting and Refining Company indicate a general expense amounting to 25@40c. per ton of ore smelted, the smaller figure being achieved in the more recent years. Consequently we may put the total cost of smelting and refining at about $7.50 per ton of ore.

In custom-refining it is the practice to pay the smelter, i. e., the seller of the base bullion, for the gold at $20 per oz.; for the silver at the New York price less 1c. per oz. (this is 98 per cent. when silver is worth 50c. per oz.); and for the lead at 98 per cent. of the New York price. The actual extraction of lead is 99 per cent. The loss of silver is so small that it may be disregarded for present purposes.

Neglecting the freight and refining charges on copper, and some minor incidentals, it may be assumed that the total cost of smelting a ton of average ore is about $7.50; that the extraction of gold is 100 per cent.; of silver 97 per cent.; and of lead, 0.95 × 0.99 = 0.94 per cent.

II. A. S AND R. CO. COMPARATIVE STATEMENT OF INCOME ACCOUNT.

Year.	1902	1903	1904	1905	1906	1907
1. Earnings	$7,038,682	$9,403,711	$9,425,443	$10,506,683	$11,665,886	$13,250,058
2. Repairs	791,306	770,854	818,141	878,648	828,582	976,535
3. General expense	1,385,757	1,056,786	701,729	729,224	675,945	763,854
4. Net earnings . .	4,861,619	7,576,786	7,905,573	8,898,811	10,161,358	11,509,669
Employees' fund			91,254	216,816	449,204	540,420
6. Improvements.	1,300,000	655,683	597,582	425,289	938,100	1,054,996
7. Metal account .		1,500,000	500,000	637,795	Nil.	Nil.
8. Net income . . .	3,561,619	5,421,103	6,716,737	7,618,912	8,774,055	9,914,253
9. Dividends	3,500,000	3,500,000	4,750,000	6,000,000	6,750,000	7,000,000
10. Surplus for year	61,619	1,921,103	1,966,737	1,618,912	2,024,055	2,914,253
11. Total surplus	2,951,968	4,873,071	6,839,808	8,458,720	10,482,775	13,397,028

The American Smelting and Refining Company

The reports of the American Smelting and Refining Company throw but little light upon the subject of the cost of smelting. Its statement of assets, gross earnings, profits, etc., for a series of six years, is given in the accompanying tables. Before proceeding to discuss these figures, it is important to make certain explanations. In each year the figures are for the fiscal period ending April 30, wherefore the major part of the period pertains to the preceding calendar year. The item that I have entered as "Repairs" is given in the reports of the company as "Ordinary Repairs and Betterments." What I have called "General Expense" includes all of the general expenses of administration, together with interest and taxes. "Net Earnings," so called by the company, are evidently not properly designated, being merely the operating profit. The true profit, or actual net earnings, appears later in what the company calls "Net Income." Under "Improvements" I have entered what the company calls "Appropriation for Extraordinary Improvements and New Construction." From the uniformity of this account, I judge that it represents chiefly the new construction undertaken to replace worn out or antiquated plant; in other words, it is in this way that the company makes good the depreciation of its property, which otherwise would have to appear in an amortization account. Thus the plant at El Paso has been practically rebuilt, and extraordinarily extensive improvements and additions have been made at Leadville, Omaha, Perth Amboy and other works during recent years. In Utah the Murray smelter, an entirely new plant, has been built. Obviously the actual net earnings do not appear until after all of these charges have been deducted. As to the sufficiency of the allowance for amortization made in this way I shall have something to say further on.

---

[1] At Chicago the cost is only $4 and under favorable conditions lead refining should be done at that figure.

At no time has the Smelting Company made any statement of its production of metals or amount of ore smelted. The nearest that it has come to communicating this important information was in the report for the fiscal year ended April 30, 1903, wherein it is stated that the volume of business transacted during the year is reflected in the following figures. Metal content of ore purchased: gold, 1,025,132 oz.; silver, 62,389,438 oz.; lead, 492,960,350 lb.; copper, 47,919,666 lb. Fuel consumption: coal, 544,790 tons; coke, 433,431 tons; fuel oil, 3,523,904 gal. Freight traffic: total tonnage moved, 4,434,484.

Tonnage of Ore Smelted

These data enable us to arrive approximately at the amount of ore purchased, and we may assume that the amount smelted was approximately the same. It is a fair assumption that the ores were purchased in substantially the proportions required to make a suitable smelting mixture, and that the lead content was in the neighborhood of 10 per cent. of the total ore. The purchase of 246,480 tons of lead would therefore imply 2,464,800 tons of ore. Some of the copper purchased was included with the lead charge, but some was smelted separately. As to this particular I can do no more than surmise that 100,000 tons of copper ore may have been smelted separately, and that the total amount of ore smelted by the company in this year was about 2,564,800 tons. It will appear that this estimate is probably not far out of the way. In 1901 the American plants of the company alone were smelting at the rate of about 2,000,000 tons of ore per annum, and from that time onward business increased. In the fiscal year ending April 30, 1903, the total movement of freight is given as 4,434,484 tons. Deducting 991,221 tons for fuel (allowing 13,000 tons for the oil) and 270,439 tons of lead and copper, we have left 3,172,824 tons for ore and limestone, of which the latter would normally be about one-sixth, deducting which there remains 2,644,018 tons for ore. There is some traffic in matte and other products from one works to another, but making allowance for such duplications and overestimates it seems not unreasonable to assume 2,500,000 tons of ore smelted. On this basis, namely 2,500,000 tons, it appears that the total actual profit to the company in the year ending April 30, 1903, was a little less than $2.20 per ton of ore. Inasmuch as this is determined by making the tonnage the divisor of the whole profit of the company and it is not to be doubted that even in 1902-03 the company was making handsome returns from its mercantile and investment accounts, I believe it is reasonable to assume that its profit in smelting, properly considered, at that time may have been about $2 per ton.

Average Grade of the Ore

The figures given for the fiscal year ending April 30, 1903, also convey [illegible] all information respecting the average metal contents of the ore smelted in the United States and Mexico. Proceeding still on the assumption that the total tonnage was 2,500,000, the average [illegible] .41 oz. gold, 24.95 oz. silver, 197.4 lb. lead, and 19.17 lb. copper. The substantial accuracy of this deduction is confirmed by the report of the Census for 1904. (The Census confusingly designates the year as 1905, because its investigation was made at that time, but the investigation related to 1904.) According to the Census, the amount of argentiferous ore treated in 1904 was 2,271,724 tons, which yielded an average of 0.42 oz. gold, 16.53 oz. silver, 198 lb. lead, and 22.72 lb. copper. It is to be remarked that the figures of the Census relate only to ore smelted in the United States, while my previous figures have included the ore smelted both in the United States and in Mexico. Moreover, the latter figures are for contents of the ore purchased, while the Census figures are for yield of the ore. However, the agreement is sufficiently close to confirm the belief that my estimate is a close approximation.

Another interesting deduction may be made from the statistics of the Smelting Company for the year ending April 30, 1903. During that period, the average price for silver was 50¼c. per oz.; of copper, 12.452c. per lb.; of lead, 4.147c. per lb. Henry M. Adkinson, in an article in the JOURNAL of May 16, 1908, discussed the terms of a series of ore contracts made by a certain mining company, and computing the full metallic contents of the ore at the New York prices and comparing the total per ton with the amount received from the smelters showed that the portion of the value deducted by the smelters ranged from 25 to 54 per cent. The smelter's portion in five contracts out of seven ranged from 48 to 54 per cent., and the low figure of 25 per cent. was experienced only on the last contract, which was made comparatively recently with a competitor of the American Smelting and Refining Company. Mr. Adkinson's figures conveyed the impression that a great deal larger part of the value of the ore bought by the smelters remained in their pockets than is really the case. Of course, as a matter of fact, the smelter does not secure 100 per cent. of the metals, a more or less quantity being lost in the processes of smelting and refining, while of the value actually realized large portions are absorbed by the cost of smelting, refining and selling, and by freight charges. Computing ore of the average grade shown for the year ending April 30, 1903, on the basis of 100 per cent. of the metal contents at the average New York prices for silver, lead and copper, and $20.56 per oz. for gold (which is what the United States Smelting, Refining and Mining Company realized for [illegible] it appears that the maximum gross value of this [illegible] as follows:

0.41 oz. gold [illegible]	[illegible]
24.95 oz. silver [illegible]	[illegible]
197.3 lb. lead @ 4.147c.	[illegible]
19.17 lb. copper @ 12.4[illegible]	[illegible]
Total	[illegible]

Having already shown that the average profit per ton of ore smelted in that period was probably about $2 the actual net profit to the smelter on the basis that Mr. Adkinson figured was a little more than 6¼ per cent. of the ore value.

The Subsequent Increase in Profits

It is impossible to follow analytically the subsequent history of the company in any way that has a very sound foundation. The reports show a marvellous increase in the profits, which were $5,421,103 in 1902-03 and $9,914,253 in 1906-07. During this period of four years the amount of ore smelted by the company increased greatly, but there is no reason to surmise that it increased in the same ratio as the profits; indeed, there is sufficient evidence to warrant me in saying positively that it did not, and that if the tonnage of ore smelted in each year were made the divisor of the net profits reported the quotients would be steadily increasing. However, any such proceeding would be quite misleading in its results, because during this period the company underwent great expansion and derived greatly increased profits from sources that are not properly referable to the direct smelting operations. These will be discussed further on. The company avers that it has not increased treatment charges, and there is much evidence in support of that assertion. Its Colorado schedules are openly declared. From certain data that I happen to have, I find the following:

Cripple Creek ore: The rates vary according to the grade of the ore, but it is sufficient to compare the rates on ore containing 1 oz. gold. In 1897, before the Trust was in existence, this ore fetched $19 for the gold, less $10 for freight and treatment; in 1908, its value is $20, less $6 for freight and treatment. Ore containing 2 oz. of gold netted $28 in 1897 and $32 in 1908.

Clear Creek-Gilpin lead ore: The rates vary according to the percentage of lead. Comparing the rates on ore containing 25 to 30 per cent. lead. In 1897, gold was paid for at $19.50 per oz., silver at 95 per cent. of the New York quotation, and lead 35c. per unit ([illegible] basis), less $5 treatment charge. In 1908 the terms for gold and silver are the same, but the lead realizes 49c. per unit ($4 basis) and the treatment charge is $3 on neutral basis; on the "flat schedule" the treatment charge is $5; the neutral schedule is used when it figures better for the shipper.

Leadville carbonate ore: 1897. Gold, $19 per oz.; silver, 95 per cent.; lead, $4 basis. Ore containing 25-30 per cent. lead, 43c. per unit; $1 treatment. Leadville delivery. 1903. Same rates as in 1897. (This ore has always been in great demand and the smelter's margin was early narrowed down to the irreducible minimum.)

In the report of the Smelting Company for the year ending April 30, 1906, Daniel Guggenheim, the president, states that "the increase in the earnings of the company have not been due to increase in treatment charges made to miners, but on the contrary such charges have been in many instances decreased. It is the policy of the directors to decrease treatment charges to miners and thus to encourage production wherever the same can be done, and at the same time leave a reasonable assurance of profit to the company. The increase in earnings has come in the past and must come in the future from economies in operating expenses, and an increase in the volume of business due to the encouraging of production in territory tributary to works already established and to the opening up of new territory."

There is considerable evidence that in this respect the company has practiced what it has preached, and there is no good reason to doubt the assertion of the officers of the Smelting Company that they have given the producers of ore the benefit of a large part of the administrative and metallurgical economies that they have effected, and that the charges for treatment have been reduced, considering the general average. It stands out clearly in the reports of the company that its main policy is to swell its earnings by increasing the volume of its business, and in the line of that policy it is essential to stimulate the production of ore.

Policy of the American Smelting and Refining Company

The reports of the American Smelting and Refining Company make certain general statements which are instructive in connection with this study of the present position of the company and its relation to the mining industry. Memoranda of these statements are made in the following paragraphs:

April 30, 1903. The policy of the directors has been to centralize operations at the most advantageous points, thus reducing administration expenses and obtaining more economical work. It has been found advisable during the last two years to close down a number of plants, some of which are held in reserve, while others of small capacity, or of unfavorable situation, have been dismantled. At the end of the year there were in operation smelting plants with a capacity of 3,720,000 tons per annum; refining plants with a capacity of 340,000 tons of lead bullion and 36,000 tons of copper bullion per annum. Held in reserve were smelting plants with a capacity of 650,000 tons per annum, and refining plants with a capacity of 125,000 tons of lead bullion per annum.

April 30, 1904. At most of the plants the cost of operation has been reduced by means of the extraordinary improvements instituted. Some of the surplus earnings of the company have been invested in the stock of lead manufacturing companies. The American Smelters Steamship Company was organized to conduct the traffic of the Smelting Company between Perth Amboy and Mexico and South America. The stock of the Steamship Company is entirely owned by the Smelting Company. The rate of freight charged has been the lowest made by any of the established lines, but the Steamship Company showed a profit of $93,005 during the year.

April 30, 1905. The increase in the investment account of $2,302,270 is due to the purchase of 25,000 shares of Series B, preferred stock, of the American Smelters Securities Company. The directors considered it more advisable to invest part of the cash surplus in a 5-per cent. security, guaranteed by its own earnings, than to have the money remain on deposit in a trust company at a low rate of interest. The smelting company also acquired 177,510 shares of the common stock of the American Smelters Securities Company of the par value of $17,751,000, the value of which is not shown in the investment account. The policy of the directors is to make long time contracts for the product of all important mines tributary to the plants of the company and large tonnages have been placed under contract for periods extending from 10 to 25 years. The exclusive right to the use of the Huntington-Heberlein patents in the United States has been acquired; also the right to use them at the works of the company in Mexico. As soon as these improvements have been instituted and the various works, the construction of which has been authorized, are in operation, the earnings of the company will be materially enhanced. In making the distribution among the employees, according to the profit-sharing plan, the directors state their belief that the encouragement given to the employees by this distribution of earnings has had no small influence in bringing about the very satisfactory condition of prosperity enjoyed by the company during the year.

April 30, 1906. The increase in the earnings has been due both to an enlarged business and efficient and careful management. The valuation on the books of the company of silver, lead and copper in ores is so much below the present market value that the directors have deemed a further credit to metal account unnecessary this year. The increase in the value of metal stock during the year, amounting to $3,000,000, is due to the enlarged capacity of the works of the company, and the development of mineral resources tributary to the plants of the company.

The amount of gold refined during the year amounted to over $50,000,000. While the mines of the American Smelting and Refining Company have been purchased and operated mainly for their value in assuring a steady supply of certain classes of ores for the smelters of the company, yet these mines have been profitable directly from their operations and they now constitute a very valuable asset of the company. It has been the policy of the directors to use the profits of this investment to liquidate the original cost of purchase and the continuing cost of development. Early in the present fiscal year these outlays for purchase and development will have been entirely covered by the profits of the department, and the directors expect to carry the profits of the mining department to the credit of profit and loss, beginning with the fiscal year ending April 30, 1907. The company has not included in its financial statement earnings from the following sources: 1. Use of Huntington-Heberlein patents. 2. Mining properties of the company. 3. Stock of the American Smelters Securities Company. 4. Stock of the United States Zinc Company. 5. Stock of the United Lead Company. However, subsequent to April 30, 1906, the directors effected a sale of a portion of the stock of the United Lead Company and therefore the profit accruing from this sale will be carried into the accounts for the fiscal year ending April 30, 1907.

April 30, 1907. The profit of the mining department has been used during the year to liquidate completely the entire cost of purchase and the continuing cost of development of the mines of the company.

Explanation of Increasing Profits

Reverting now to the subject of the increasing profit shown by the reports of the Smelting Company, it is important to consider a variety of conditions. It is well known that it is much more economical to smelt on a copper basis than on a lead basis. The difference in favor of the former is fully $1 per ton of ore. Consequently, the more copper ore to be smelted, the more the profit, and the increasing net earnings of the Smelting Company are doubtless due to some extent to the increased amount of ore smelted on the copper basis. It is also well known that the margin on ore purchased in Mexico is much greater than on American ores, and a large part of the profit of the Smelting Company is derived from its Mexican business, which has been rapidly increasing. The lowest margin, probably, is realized by the smelteries in Colorado, which buy and treat in the neighborhood of 1,000,000 tons per annum and operate rather uniformly at that rate. A few years ago, the profit in smelting in Colorado was only about $1 per ton, and probably it is no larger at the present time. The increase in the earnings of the Smelting Company has also been promoted without doubt by its profit-sharing system, which was designed to increase efficiency and has had that effect. The company has benefited from economies in administration, as is clearly shown by the decreasing amount to the account of general expense. Furthermore, it has derived great advantage from the introduction of metallurgical improvements, such as the Huntington Heberlein process, and the concentration of operations at the most economical plants.

Metal Stock Account

Finally, we come to the question of metal stock account, wherein the purchaser of ores may lose or make a great deal through fluctuation in the value of the metals. In the long run such fluctuations are expected to balance, and temporary gains or losses are commonly charged to an account representing quotational profit or loss.

In a long upward trend of prices, a buyer of ores may realize a great profit; and similarly in a sharp decline, he may suffer immense losses. From 1901 to the end of 1907 the general trend of the metal markets was upward, as is shown in the accompanying table of the prices of copper, lead and silver. It is not quite clear from its official report how the American Smelting and Refining Company adjusts its metal account, but undoubtedly the greatest factor in the increase in net income up to April 30, 1907, has been the appreciation in the value of metals on its hands, just as since June, 1907, its net income has suffered severely from the decline.

AVERAGE PRICES OF METALS.
(AT NEW YORK)

Year.	Silver, Per Oz.	Lead, Per Lb.	Copper, (a) Per Lb.
1902....	52.16c.	4.069c.	11.626c.
1903.....	53.57	4.237	13.235
1904..	57.22	4.309	12.823
1905......	60.35	4.707	15.590
1906....	66.79	5.657	19.278
1907......	65.33	5.325	20.004

(a) Electrolytic

The company carries in its statement of assets an item of "metal stock" ranging from $10,418,543 to $10,415,200, which represents its valuation of ores and metals on hand. The nature of its business requires that large quantities of ore and crude metal be in stock at all times. It appears from the data deduced in this article that the stock necessarily carried is from 20 to 25 per cent of the annual turnover, in other words the ore and its products are in process of treatment and in transportation for 2½ to 3 months. It has been the practice of the company to write off from its earnings in certain years a varying amount for "metal account" to offset a possible depreciation in the stock on hand, but since 1905 no such allowance has been made.

Control of the Markets

The administration of the American Smelting and Refining Company has gradually passed through a process of enlightenment in respect to its subserviency to the natural law of supply and demand. Several years ago it had a notion that it could exercise some control upon the price of silver and in 1902 it made contracts with ore producers, stipulating that silver was to be paid for at the rate of 95 per cent of the New York price, but if the price should exceed 60c. per oz., one third of the excess over 60c. per oz. was to be deducted from the price of silver used in settlement under the contracts. This was to be the smelter's commission for elevating the price. It was soon learned that the company was upon dangerous ground in attempting to manipulate the price of silver, and the attempt was abandoned in favor of the policy of selling each day the same amount of silver that is taken in, the sales being made at whatever is the market price. This put the company in a sound position in so far as the business in silver was concerned, and by virtue of contracts, an equally sound position was achieved with respect to the copper business. With respect to the lead market, however, the company continued the attempt to control the price, and was successful therein so long as the market was a generally rising one, but when the prolonged decline began in 1907, it was found that the control could no longer be maintained, and the company was obliged to recede from its position in this market.

Nevertheless, the control over the price of lead which was exercised by the Smelting Company from 1902 to 1907 was without doubt largely contributory to the increase in the net earnings shown by its reports for those years. Distinctly, this did not come out of the pockets of the ore producers, but on the contrary came out of the pockets of an entirely different class of persons. The effect of the American Smelting and Refining Company upon the lead market, so long as it had control thereof, was to elevate the price for that metal above the level that would, in all probability, have represented the market under natural conditions; this is said with full [illegible] of the moderation of the company in re[illegible] will further in 1902 when it [illegible] had the [illegible] of the [illegible] of the Smelting Company in [illegible] a lead [illegible] has be[illegible] contracts with [illegible] of the producers [illegible] of Mexico [illegible] lead [illegible] to the United States, providing that the producers be paid for the lead content at [illegible] of the market price for lead [illegible], but in the event that the price be higher than 4[illegible], payment is made to the producer of only one-half of the excess, the advantage of the other half going to the smelting company. Since 1902 the annual average price for lead has been steadily in excess of 4c. per lb. The bill for the premium over what might have been the natural price has been paid by the consumer; the ore producer has participated in the profit. Moreover, the American Smelting and Refining Company, along with the other smelters and refiners, has derived a certain advantage from the "exempt" lead obtained from Mexico and Canada, purchased on the basis of the London price, which is always much lower than the New York price. The foreign lead ore and base bullion are brought into the United States for smelting and refining in bond, but according to Treasury rulings, allowance is made for loss [illegible] per cent of the metal in the process, the actual loss being much less than that; [illegible] considerable quantity of foreign lead, purchased at a low price, [illegible] free of duty. There is a variety of such conditions which have assisted the smelters.

The Adverse Conditions of 1907

It is well recognized that a sound opinion as to the status of any company cannot be based upon its showing for a single year; it is necessary to analyze the results for a series of years. In the case of the American Smelting and Refining Company we have official statements for a long series of years, but even so it is impossible to arrive at final conclu[illegible]er, because the years heretofore have been generally prosperous ones. We must await the showing of one or two years of less favorable conditions. There is every reason to anticipate that the report of this company for the year ending April 30, 1908, will be of decidedly different [illegible] the fact that conditions did not become serious until the last quarter of the cal[illegible]

---

[1] We may roughly estimate the amount of this profit in the aggregate to all of the re[illegible] The average price of lead at New [illegible] don prices.

the United States Smelting, Refining and Mining Company for its fiscal year 1907, which corresponds with the calendar year, gives an inkling of what may be expected. This company (which is the chief competitor of the American Smelting and Refining Company) out of a gross production of $18,408,655, realized a gross profit of $1,827,590.99, which was diminished by $120,009.25 for depreciation and reserve funds, $166,317.58 for administrative and legal expenses, and $733,255.09 for writing down the book value of metals unsold at end of the year, including metals in process and in ore stocks, to the market value at Dec. 31, 1907. Deducting these items, the actual net profit for the year was $807,999.07.

The United States Smelting, Refining and Mining Company in 1907 produced 38,518,378 lb. of copper, 53,617,324 lb. of lead, 6,739,269 oz. of silver, and 235,822 oz. of gold. This company makes reports which are far superior to those of the American Smelting and Refining Company with respect to taking its stockholders into the confidence of the management; indeed its reports are far more frank than those of the generality of public companies, but it fails to communicate the information required for a technical analysis. However, it is stated that the United States Smelting Company, one of its constituents, handled 659,306 tons of charge in 1907, which may be estimated as representing upward of 527,445 tons of ore (estimating 80 per cent. of the charge). The Mammoth Copper Mining Company, another of its constituents, produced, and doubtless smelted, 201,123 tons of ore. We may assume, consequently, that the company smelted at least 728,568 tons of ore. On this basis the net profit, namely $807,999, was only $1.10 per ton of ore (which does not include any of the profit derived by the subsidiary refining company). However, this profit represents not only what the company achieved in smelting, but also what it realized from mining, inasmuch as by far the larger part of the ore smelted was derived from mines owned by itself, their output being 406,748 tons, besides which its subsidiary, the Richmond Eureka Mining Company, produced 32,467 tons, leaving only 289,353 tons for outside custom ores. If we disregard the loss through depreciation of metals, the net earnings of the company were about $2.10 per ton of ore smelted, which is surprisingly small in view of the large tonnage of ore produced by its two rich mines, viz.: the Centennial-Eureka and the Mammoth.

The Division of Ore Value

Now let us see what division is made of the value of an ore assaying 0.41 oz. gold, 24.95 oz. silver, 197.3 lb. lead and 19.17 lb. copper, which was the composite of all the ore bought by the American Smelting and Refining Company in 1902-03. The smelter and refiner probably realize from this ore approximately as follows:

Gold, 0.41 oz. gold @ $20.56	$ 8.43
Silver, 24.95 oz. × 0.97 @ 50¼ c.	12.16
Lead, 197.3 lb. × 0.94 @ 4.147 c.	7.69
Copper, 19.17 lb. × 0.7 @ 12.45 c.	1.67
Total	$29.95

The expenses from the time of receipt of the ore at the smelting works to the sale of the refined metals are approximately as follows:

1. Smelting, 1 ton @ $4.50	$4.50
2. Converting, 40 lb. copper matte @ 0.7c	0.28
3. Freight on 190 lb. lead bullion @ 0.43c	0.82
4. Freight on 13½ lb. copper bullion @ 0.5c	0.07
5. Refining 190 lb. lead bullion @ 0.38c	0.72
6. Refining 13½ lb. copper bullion @ 0.7c.	0.09
7. General expense	0.40
8. Amortization	0.25
9. Tie-up of metals	0.30
10. Metal account	0.30
Total	$7.73

1. As previously computed. 3. The rate of 0.43c. is the mean of the rates from Salt Lake and Pueblo; this assumption is necessarily arbitrary. 4. In this case also the assumption of freight rate is necessarily arbitrary. It is intended to cover all freight charges on copper from the time of leaving the first smelter. Copper matte goes to Omaha from East Helena, Salt Lake, Denver, Pueblo, and elsewhere—even from Perth Amboy and the copper bullion thence goes to Perth Amboy. Probably the assumption of 0.5c. per lb. to cover all of this movement is too low. 7, 8. These figures are deduced from the reports of the American Smelting and Refining Company; the allowance for amortization appears to be too low. 9. As previously computed. 10. This appears to be the average allowance that has been made by the American Smelting and Refining Company, as insurance against depreciation of metals on its hands.

Inasmuch as the smelter is supposed to realize a profit of $2 per ton of ore, the total deduction for its account must be $7.73 + $2 = $9.73, and from the value of the ore, $29.95, there is left $29.95 — $9.73 = $20.22 to pay for the ore and the freight upon it to the smelting works.

Now let us see how that would figure out to the producer. We may assume a settlement on the lines of the following:

Gold, 0.41 oz. @ $19.50	$ 8.00
Silver, 24.95 oz. × 0.95 × 50¼ c.	11.91
Lead, 197.3 lb. @ 2 c.	3.95
Copper, 19.17 lb. @ 5.45 c.	1.04
Total	$24.90
Less treatment	4.68
Net value to producer	$20.22

This corresponds to an ore contract reading "Gold to be paid for at $19.50 per oz.; silver at 95 per cent. of the New York quotation; lead at 40c. per unit; copper at the New York quotation, less 7c. per lb.; treatment charge, $4.68 per ton; neutral basis; delivery at smelter's works." This has a familiar sound, except that so small a percentage of copper is not always paid for, but it must be remembered that I am here figuring on a composite ore, the copper of which is obtained chiefly in special classes of a higher average than the average of all ores smelted. Many producers in 1902-03 received less favorable terms than those reckoned above; others more favorable. The reasons for the difference have been well explained by Mr. Grabill in an article in the Journal of July 11, 1908; also in numerous other articles and books, including my "Lead and Zinc in the United States," pp. 46-47. But the general average in 1902-03 must have been approximately as here calculated, else the profit reported by the American Smelting and Refining Company would have been otherwise than as stated.

Of course the ore producer does not receive so much because the freight on the ore from mine to smelter has still to be paid. Unfortunately there is no means to determine what was the general average of freight charges. It ranged from the $1 per ton from Bingham to Murray, to the $8 per ton from the Cœur d'Alene to Denver, and upward for transportation from more remote points, and particularly transportation in Mexico. I hazard the guess (and it is nothing but a guess) that the average freight on 2,500,000 tons of ore smelted in 1902-03 was $5 per ton. On that assumption the average yield of the ore was $15.22 at the mines. However, this is purely speculation. Still there can be no question that the railways' share of the business is a large one.

Conclusions

After a consideration of the data presented herein, it is impossible to escape the conclusion that the great increase in the net earnings of the American Smelting and Refining Company from year to year, is to be attributed to:

1. Enlargement in the volume of business.

2. Institution of economies (a) in administration; (b) through centralization of operations; (c) through metallurgical improvements; (d) through increase in operative efficiency.

3. Appreciation in the value of metals, due partly to natural causes and partly to manipulations by the company. The profits on exempt lead, and on contracts with the producers of lead ore, whereby the value in excess of a certain price per pound is divided between the producer and the Smelting Company, must contribute largely to the treasury of the company. Since the middle of 1907, the depreciation in the value of metals has offset some of the gain previously realized.

4. Increase in the amount of ore smelted on the copper basis, which is more profitable than the lead basis.

5. Increase in earnings of subsidiary companies, such as the Steamship Company.

6. Earnings from investments of surplus, e. g., the preferred stock of the American Smelters Securities Company.

7. Profits from investments, e. g., the sale of a portion of its holding of the stock of the United Lead Company, carried into earnings for the year ending April 30, 1907.

Looking at the American Smelting and Refining Company from the standpoint of the investor, the showing made by its official reports is impressive. While paying large dividends upon its preferred and common stock, it has accumulated an immense surplus, part of which is carried in cash and part is invested in enterprises that are certain to be profitable, such as the American Smelters Securities Company, although the Smelting Company does not yet give itself credit for its large holding of the common stock of the Securities Company. Similarly, there are other interests which do not appear in the income account of the Smelting Company, it being the policy of the company to bring these enterprises to maturity before incorporating their yield in the income account. Thus, the Smelting Company has extensive mining interests, which have been profitable, but their returns have so far been used to cancel the amount invested in them. Apparently it will be only a short time before the net yield of many of these enterprises will figure in the income account of the Smelting Company. The last statement of the latter was indeed like that of the man who is reluctant to believe that he is rich.

The position of the Smelting Company being so strong in these respects, and the surplus which it carries being so large, the company may easily be forgiven for not writing off anything for amortization of its plants. As I have previously pointed out, the outlay made on account of extraordinary improvements is of the nature of an amortization account, but the amount expended so far in this way is of doubtful sufficiency. The smelteries and refineries now owned by the company must be worth in the neighborhood of $15,000,000, i. e., it would cost that amount to replace them. The average amount expended for extraordinary improvements during the five years ending with April 30, 1907, has been a little less than $750,000 per annum, which is only 5 per cent. of the physical value of the plants. Perhaps the actual net income of the company ought not to be figured quite so large as it does; however, as I have previously remarked, the surplus of the company is amply sufficient to take care of any deficiency in this respect.

Elmore Oil Process Patent Decision

In February, 1907, the British Ore Concentration Syndicate, Ltd., and A. S. Elmore began suit in London against Minerals Separation, Ltd., an English company, claiming among other things, "an injunction restraining the defendants, their servants, agents and workpeople from importing into, selling, offering for sale, supplying and using in this realm ores or mineral substances treated by any or [illegible] the processes described and claimed respectively in the Specifications of Letters Patent numbered 21,948 of 1898 and 6519 of 1901 of which the plaintiffs are the registered legal owners."

The case was heard by Justice Neville who pronounced judgment on July 18, 1908, in favor of the defendants. The judge made the following statements: "It seems to me, therefore, that on giving what seems to me a perfectly fair construction of Elmore's specification, that is, that the essence of his invention is the making use of the known law of selection of oil with a view to obtain the carrying up of the particles by the oil to the surface, is a different thing from making use of the same law for the purpose of greasing the particles in a way which does not affect their specific gravity, and then making what I think is an ingenious use of the law of surface tension by agitation and enabling the particles to be carried up by the operation of air bells.

"I come, therefore, to the conclusion that with regard to the 1898 patent there has been no infringement by what the defendants have been doing.

"I think, therefore, in that case, whether you take it that the patent is confined to the 1898 patent or whether you take it generally, the defendants have not infringed a patent which has no validity, and consequently no relief can be granted against them. I think, therefore, that the action fails, and must be dismissed with costs."

Minor Mineral Products of North Carolina

By Joseph Hyde Pratt*

There continues to be a large demand for the quality of talc such as is found in Swain county, North Carolina, and which is now produced only by the North Carolina Talc and Mining Company, of Hewitts. This is an exceptional quality of talc, and the deposits cannot supply the demand. The State has been pretty well prospected for similar deposits, but thus far none have been located, although large deposits of other qualities of talc, suitable for grinding, and for the manufacture of soapstone tubs, etc., are known. During 1907 the quantity of talc produced was somewhat in excess of that of the previous year and amounted to 4085 tons, valued at $74,347. This was obtained by seven producers in Alleghany, Jackson, Moore and Swain counties. Five quarries that were formerly producers of this mineral made no production in 1907.

Where formerly practically all of the talc mined in North Carolina was shipped out of the State, there is now a certain amount of the ground talc utilized by the Talcum Puff Company, of Asheville, N. C., which is a manufacturer of talcum powders. It produces its own talc in Swain county, and on account of its pure quality they are able to put on the market an exceptional quality of talcum powder.

The barytes industry in North Carolina is not a large one, although the quality of the barytes produced is equal to any. It is hard and compact and usually very free from iron stains. Its hardness and compactness make it a little more difficult to grind than the softer barytes. During 1907 there were 5785 tons of crude barytes produced from Madison and Gaston counties. This was valued at the mine at $18,855, an average of $3.25 per ton. A considerable portion of the barytes mined in Gaston county is ground where produced, but the balance is shipped out of the State in the crude condition.

The production of graphite in North Carolina has always been small and has never amounted to more than a few hundred tons per year. Its use has been for foundry facings and it is of rather inferior quality. During 1907 no graphite was shipped.

---

*State geologist, Chapel Hill, N. C.

Note.—The statistics relating to talc and soapstone and barytes were collected by the U. S. Geological Survey in coöperation with the State Survey.

Prize for Best Collection of Minerals from Ontario

A prize of $100 in cash is offered by J. B. Tyrrell, mining engineer, of Toronto, for the best collection of minerals gathered in the Province of Ontario during the year 1908 by anyone not employed as a collector by a public institution or dealer in minerals. The collection must contain at least 30 mineral species, and it is suggested that where convenient the size of the specimens should be 2x3 in. Each specimen must be labeled with the exact locality from which it was obtained, and the date on which it was found. No specimen will be considered unless it is so labeled.

A typewritten list of the specimens, with names of minerals and localities, in triplicate, together with a declaration stating that they were personally collected by the signer of such declaration, in the Province of Ontario in 1908, at the localities stated, with the post-office address of the collector, must accompany each collection.

The collections must be addressed. "Examiners, Tyrrell Prize, Government Assay Office, Belleville, Ont.," and must be sent, *prepaid*, to the Government Assay Office, Belleville, Ontario, on or before Dec. 1, 1908, where they will be opened and examined jointly by Professor Nicol, of the School of Mining, Kingston, and Doctor Walker, of Toronto University. If requested the collections will be re[illegible]

Duluth Steel Plant and Belt Railway

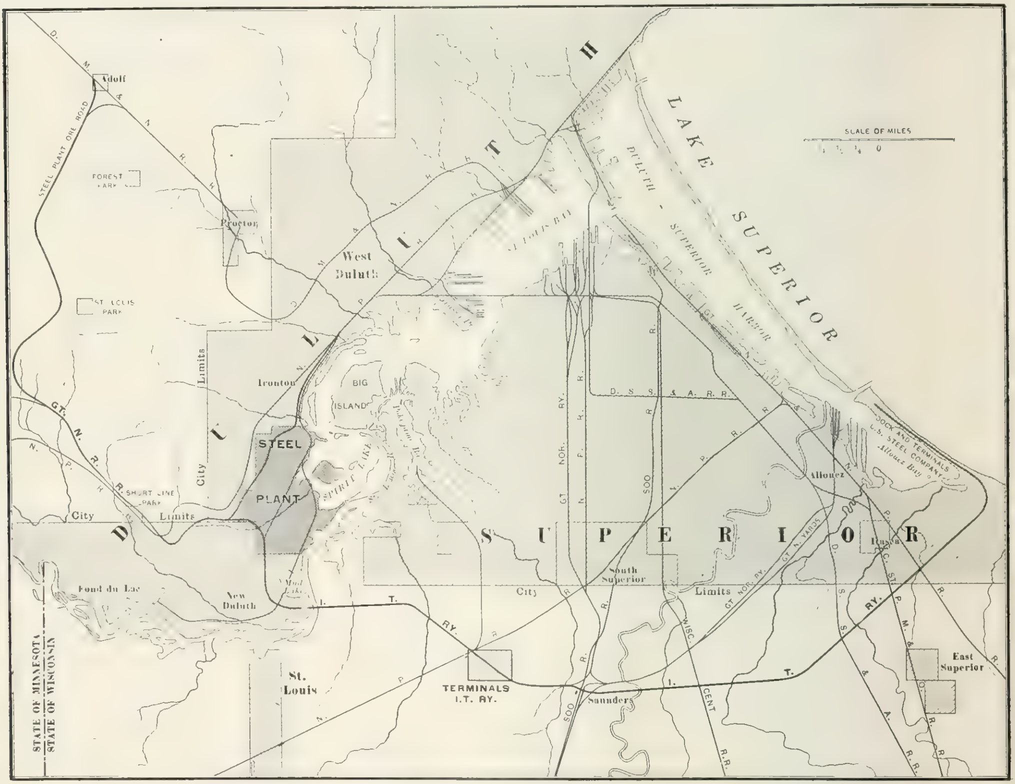
By Dwight E. Woodbridge

In connection with its proposed steel works at the head of Lake Superior the U. S. Steel Corporation has planned a belt railway line for the Duluth and Superior terminal system that will not only give it access to every railway that now enters, or will in future enter, the region, but will provide ample room for any manufacturers that may wish to avail themselves of the raw-steel products to be rolled at its works.

Three railway incorporations have been made, which cover the situation. Combined, these will leave the line of the Duluth, Missabe & Northern, which is the steel corporation's road from the Mesabi range to Duluth, at the village of Adolph, and will follow an old and abandoned grade built by the Duluth & Winnipeg to the site of the proposed works; it will cross the St. Louis river into Wisconsin, run back of the city of Superior, crossing every road to the head of the lakes but two or three that come in on the Minnesota side, and will swing around to the base of Wisconsin point, running up that stretch of land to its end.

There will be about 30 miles of road, and a large double-deck swing bridge across the upper part of the harbor. Congress has already authorized this bridge. The road will not only be a great convenience to the steel company, relieving it of all danger of delay from congested traffic in city terminals, which is a constantly growing evil, but will enable it to assist other roads, at profit to itself, in handling their transfer and terminal freights. The construction of this road has begun and will be pushed to completion, as it is hoped to have it running this year.

Operations on the Minnesota Steel Company's works so far have been merely preliminary, but it is expected that before the close of the summer activity will be more marked. So far the steel corporation has not definitely decided as to the extent of the Minnesota Steel Company's operations, but the original plans have already been found too small, and the works will probably be of fair size.



MAP OF DULUTH AND ENVIRONMENTS, SHOWING POSITION OF NEW STEEL PLANT AND ROUTE OF BELT RAILWAY

The Detection and Identification of Manganese and Chromium

Professor Karslake[1] recommends the following method for the detection of manganese and chromium in the same solution. To the cold dilute nitric or sulphuric-acid solution of the substance to be tested add 1 or 2 c.c. silver nitrate solution of ordinary concentration, then a relatively large amount (2 to 5 grams) of solid potassium persulphate, and then carefully heat the whole until the evolution of oxygen, due to decomposition of the persulphate, is practically over. This converts the manganese into permanganic acid and the chromium into chromic acid. The permanganate color shows itself first and usually obscures the chromate color. In order to detect the chromium, shake cool solution with one-fourth to one-third its volume of ether and add peroxide of hydrogen in excess. This will convert the chromic acid to perchromic acid. The method may be easily and rapidly performed in an ordinary test tube.

---

[1] *Journ.* Am. Chem. Soc., May, 1908, p. 905.

New Mining and Milling Practice on the Rand

Recent Improvements in Efficiency and Reduced Cost Have Put Criticism Based on Conditions of Two Years Ago Entirely out of Date

BY EUSTACE M. WESTON*

A period of severe adversity has done the mining industry on the Rand nothing but good. Costs have been so reduced that quite another aspect has been given to almost every mining enterprise in this field, and signs are not wanting to show that the inflow of capital, necessary to develop and work the ground many square miles in extent now lying idle, is to be resumed. Several idle mines, such as the Aurora West and the Bantjes, are resuming work or are about to resume work.

The lesson of the period of stress has, however, been a severe one. A selection of most of the mining and finance companies showed in the end of 1904 a valuation, according to the market, of £270,000,000. The valuation the market placed on these same companies in December, 1907, was £116,000,000. This is notwithstanding the progress made by the industry as shown in the accompanying table:

PROGRESS OF RAND MINES, 1904-1907.

Year.	Stamps at Work.	Tons Ore Milled.	Value Output.	Working Profits.	Dividends
1904	4795	80,022,736	£15,453,312	£5,800,000	£3,821,846
1905	6521	11,160,422	19,991,658	6,700,000	4,898,970
1906	7527	13,571,554	23,615,400	8,500,000	5,580,97
1907	8245	15,523,229	26,421,837	10,000,000	7,007,41

Costs per ton milled have been coming down slightly since 1905; but it was only in the latter end of 1907 and the beginning of 1908 that the most marked reductions have been shown. The cost per ton milled in 1905 was 23s. 10d.; in 1906, 22s. 3d.; and in 1907, 21s. 2d. The profit per ton in 1906 was 12s. 5d., and in 1907 12s. 10d. per ton milled. Compare these figures with those for the first four months of the present year as shown in another table.

IMPROVEMENT DURING FOUR MONTHS OF 1908.

	Value Per Ton Milled. Shillings.	Cost Per Ton Milled. s.	d.	Working Profit. s.	d.
January...	31.91	19	5	12	7
February	32 43	19	5	13	1
March. . .	31 57	18	8	13	3
April . .	32 05	18	6	13	7

Compare now market valuations and dividends declared between the years 1906 and 1907.

Dividends declared by mines having an estimated average life of 26 66 years in 1906 .	£5,565,972
Market valuation	56,305,227
Amount required per annum to redeem this market valuation capital in 12½ years at 3 per cent.........	3,728,363
Full dividend .	1,837,609
Per cent. on market value yielded by shares .	3 26

These are practically the figures given by a number of representative engineers before a government commission on the mining industry. The figures for 1907 are as follows:

Dividends 1907	£6,962,113
Market valuation	58,100,000
Amount required per annum to redeem market valuation in 12½ years at 3 per cent	3,971,200
Full dividend....................	2,991,213
Per cent. on market value.........	5.10

The method of averaging the life of all the mines allows of errors, if it is sought to press the comparison too far; and, of course, the case of each individual mine requires separate consideration, but this table shows that great progress has been made.

More Available Orebodies

The result is perhaps better than it seems, when viewed in the light of results of 1908, because this great reduction of costs has lengthened the life of many of the mines. In many mines the reserves of ore blocked out and before classed as non payable now becomes available. Reefs also, such as the main reef in many mines standing almost untouched will now be mined.

It was recently estimated that in the more central portion of the Rand alone there were 80,000,000 tons of ore averaging about 16s. per ton in value awaiting a lowering of costs to be available, and this lowering of costs has now arrived and its effects will be shown in the returns for 1908. Both on the far east and far west Rand there are known areas containing low-grade reefs of other series than the main reef that will, under present conditions, pay to work, the Kimberly reef and the so called Battery reef being examples. With the yield and profit mounting every month as shown by the following table for four months of this year, these properties must attract attention:

	Yield.	Working Profit.
January	£2,294,632	£878,244
February	2,212,936	872,229
March	2,350,865	950,155
April	2,308,050	953,839

In January of this year 8410 stamps and 71 tube mills were at work; in April, 8450 stamps and 73 tube mills. About 15.75 per cent. of rock hoisted is sorted out.

Results at Some Rand Mines

The following list shows the costs at some of the mines. These costs include [illegible] ment and administration expenses.

[illegible] mine; development finished, reefs wide; opening old stopes, removing pillars, etc.; 120 stamps; 14s. 2d. per ton milled; much machine stoping.

[illegible]—Development nearly finished; 135 stamps; 14s. 7d. per ton milled; much machine stoping.

Knights Deep—A [illegible] deep mine; reefs far too large; much machine stoping; development costs about 31s. per ton; 200 stamps; costs 16s. 4d. per ton milled

New Goch—Outcrop mine; reefs small, much faulted; stoping almost entirely by hand labor; a difficult mine to work; costs per ton milled, including about 3s. per ton for development, 16s. 11d.; stamps, 120.

Robinson—The premier mine on the Rand outcrop; large reefs; development costs only a few pence per ton; 210 stamps; cost per ton milled 12s. 10 pence.

Robinson Central Deep—A [illegible] deep level; large reefs; 155 stamps; cost per ton, 14s.; large proportion rock broken by machines.

Robinson Deep—Workings from 2000 to 3000 ft. depth; costs per ton milled 16s. 11 pence.

Roodepoort United Main Reef—Outcrop; reef principally worked only a few inches thick; ground very heavy requiring about 2s. per ton for timber; 110 stamps.

Simmer & Jack—Outcrop and deep level shafts; reefs large; development costs normal; 320 stamps, largest single battery on Rand; costs per ton 13s. 11 pence.

Van Ryn—Outcrop mine; reefs small; most rock broken by hand; development costs 3s. per ton; stamps 160; cost 18s. 11d. per ton milled; most of these mines have tube mills besides the stamps.

Some of the mines with higher costs are:

[illegible]—Stamps, 120; worked by resueing; costs 30s. 2 pence.

New Railfontein—Stamps, 120; working an erratic and narrow reef series north of the main reef; 25s. 1 d., costs per ton milled.

Main Reef West—Stamps, [illegible]; similar to Windsor; costs 25s. 11 pence.

Jumpers—Old mine; nearly exhausted; working old ground by resueing; 70 stamps; costs 32s. 2 pence.

[illegible]—Stamps, [illegible]; similar to Roodepoort United Main Reef, but a deep mine; costs 28 shillings.

---

*Brakpan, Transvaal

Some of these costs compare favorably with those of any other field and remove the reproach of inefficiency brought against the miners and superintendents of the Rand.

How the Economy was Effected

How have these economies been brought about? Stores have been bought more carefully, many of the group having now a central laboratory to test materials supplied. Stores have been used more carefully as their consumption has been checked. On some mines the oil bill alone has been diminished £50 to £100 per month.

Greater efficiency has been gained from those in charge. Several of the groups have done away with the cumbersome and useless system of having a general manager and a huge central office staff supposedly to check the work of the mine managers. A consulting engineer is employed to give advice, and a central drawing office with designers and a chief mechanical engineer meet all other needs; while a managing director can do all other work in the control of the policy of the mines. Though cost keeping is still run to ridiculous extremes on some mines, as on one mine where stores were divided over 1700 accounts; yet, on the whole, the system is now used sanely, and gives the required information with less labor.

New inventions and appliances in ore treatment have also reduced costs. Mills have been enlarged and tube mills installed enabling a greater tonnage to be put through with the same administrative cost. Further reduction of surface cost is looked for in the more extended employment of large central works for supplying electrical power to numerous mines. Explosives have improved in quality, and shortly a reduction of 8 to 10 per cent. in prices is expected owing to greater competition. The present cost of best blasting gelatine is about 52s. 6d. or $12.6 per ton.

Underground the recent strike gave the management a chance to find out what men could really do in stoping and development, and to ask something approaching this from them. In development work alone prices have been reduced from 5s. to 10s. per foot, and the men in some cases earn as much as they did before. Stoping costs with machines have also been reduced.

Native Laborers Plentiful

Everywhere the proportion of both white and native labor has been reduced per ton mined and greater efficiency has been gained. The native is coming to work in large numbers owing to the failure of the diamond industry and the cessation of public works in South Africa due to the depression. The Chinese, working on contract, have shown what can be done in shoveling and drilling single jack and this work is now being asked of the native, and wages for natives have been reduced. In many mines the native now has to clean down the broken rock to the bottom of his stope before starting drilling. He is required to shovel for two hours and then to drill 42 in. instead of 36 in. as formerly. Contract prices for tramming have been cut down all around, though on some mines the tramming contractor still makes £200 to £300 per month.

Air Pressure and Drill Steel

Mine managers and engineers on the Rand have at last begun to wake up to the losses of efficiency of air machinery underground. Much remains to be done; but things are not now as bad as they were two or three years ago. Long ago I protested against the idea of running rock drills with 40 to 50 lb. pressure and called for tests showing the loss of pressure due to defective and small pipe lines. At last these matters are receiving attention, and in some mines by increasing the size of air mains pressures have been raised 10 or 15 lb., and the tons broken per shift raised correspondingly.

An eminent American engineer was recently employed to report on Rand costs and he apparently overlooked this vital matter entirely, merely remarking that the air pressures on the Rand were from 70 to 80 lb. He does not seem to have inquired what they were at the machines themselves. Had he done so he could have laid his finger on one of the chief causes of inefficiency.

The supply of sharp drill steel was at one time scandalously bad on nearly all the mines and even now is often bad enough. On one large mine where machines are supposed to put in from four to six holes per shift an average of only about 26 sharp drills were supplied per double shift over a period of a year. This means, of course, either that the drills had to be used twice, which in hard ground cannot pay, or that the number of holes expected were not put in. Electric sharpening furnaces are now being tried with success, it is said, underground on some of the mines and may help to solve this problem.

Small Stope Drill

These are among some of the chief causes of the recent reduction of costs. The small stope drill has not yet arrived to displace hand labor. The Gordon drill has not in practice shown an efficiency anything like approaching that shown in the recent trials. An average of four to five holes per shift has been with difficulty maintained in actual work. Progress has, however, been made, and the Gordon drill will doubtless be improved. The Murphy drill is said to be showing good results on the Robinson mine. The conditions for the competition for the £4000 prize offered by the government for the stope drill weighing under 100 lb. that during six months with two machines working will put in the most holes for the lowest costs are now published and should attract competition from all over the world.

Assay of Lead

The chromate-oxalate method is recommended by A. H. Low[1] as the best for technical work. The best results are obtained when the determination is carried out as follows: Treat 0.5 gram of ore in a 6-oz. flask by the usual methods to obtain the washed lead sulphate on a 9-cm. filter. Dissolve the lead sulphate on the filter with a jet of hot sodium-acetate solution contained in a wash bottle, receiving the filtrate in the original flask. Prepare the solvent by diluting a cold saturated solution of commercial sodium acetate with an equal bulk of water and adding 40 c.c. of 80-per cent. glacial acetic acid per liter. Agitate the extract in the flask and heat if necessary to redissolve any separated precipitate. Add 10 c.c. of a 5-per cent. solution of commercial potassium dichromate, and boil gently for a few minutes to render the precipitate basic, when it is easily filtered. The change is shown by its becoming reddish yellow in color. Filter while hot, wash out the flask with hot water and wash the precipitate once. Wash off the lead chromate with a jet of hot oxalic-acid solution, using from 25 to 40 c.c. Heat nearly to boiling in a wash bottle, add grain alcohol to the mixture in the flask and boil until the chromic acid is reduced and the lead is converted to oxalate. Remove from the heat, add 30 c.c. of cold water and cool thoroughly in cold water. When cold filter and wash the precipitate thoroughly. Place 5 c.c. of strong sulphuric acid in the flask and dilute with a little cold water and add about 125 c.c. hot water. Add the filter and precipitate and titrate with standard potassium permanganate solution. The solution used for iron determinations will serve. Theoretically, the oxalic acid value of the permanganate solution multiplied by 1.642 will give the lead value, but owing to slight losses as sulphate, oxalate, etc., the factor 1.669 will give best results. On this basis, for 0.5 gram of ore taken for assay, the solution should contain 1.5185 grams of potassium permanganate per liter so that 1 c.c. may equal 1 per cent. lead.

Tom Johnson (*Journ.* Chem., Met. and Min. Soc. of South Africa) states that he has used ⅞-in. ground steel for hand steel, instead of ⅞-in. octagonal steel, with good results. As the ground steel weighs less than the octagonal steel, more drills per ton are obtained, the drills are lighter for the men to carry, and holes are started more easily. The drills were tapered down to a small head and the head end tempered.

---

[1] *Journ.* Am. Chem. Soc., April, 1908, p. 587.

The San Rafael Mill at Pachuca

By Mark R. Lamb[*]

The San Rafael 60-stamp mill at Pachuca, Mexico, which is being built under the supervision of Edmundo Girault, the general manager for the company, is rapidly nearing completion. Several new features are combined in this mill but nothing has been employed which has not been tried out thoroughly.

Forty stamps of the battery have been moved from a former concentrating mill, and with these wooden mortar blocks are used. The other two batteries are new and heavy, and are set on strong concrete foundations, as will be the additional forty stamps to be built as soon as the present plant is in operation.

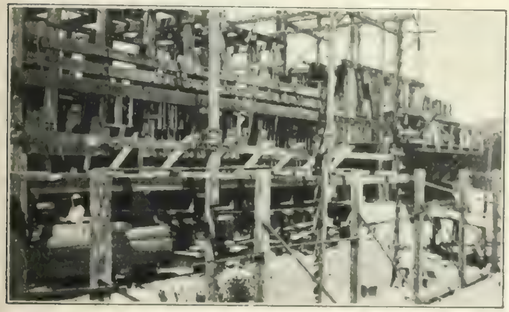
It was intended to include concentrators in the scheme of operation but the results attained by J. B Empson by thorough agitation in Brown tanks show this to be unnecessary. The crushing will be done in cyanide solution, and as planned now the coarse pulp from the battery will, after classification, go direct to tube mills, and the slime to slime settlers. Space and fall has been provided for concentration should a variation in ore or conditions require this additional step. The tube mills are of Krupp make and are three in number.

Classification before and after the tube mills will be by means of a newly designed scraping classifier, consisting of an inclined flight of scrapers running slowly over sprocket wheels dragging the sand from a slightly inclined settling box.

The finished product from the tube mills will be conducted to three continuous settling tanks of the Dorr type in which a scraper slowly revolves and drags the settled slime to the central discharge. The thick material from these settlers will go to 10 Brown tanks, where the solution will be brought to treatment strength and the pulp strongly agitated. Mr. Empson believes that a large excess of air is necessary for good extractions on silver ores and has provided a compressor having a capacity of 1400 cu.ft. per minute for these tanks. He draws his conclusions from results of extended experiments on Pachuca and Guanajuato ores.

GENERAL VIEW, NEW MILL AT SAN RAFAEL

BROWN AIR AGITATION TANKS



STAMP BATTERIES, SAN RAFAEL MILL

BATTERY AND TUBE MILLS, SAN RAFAEL MILL

As his plant will treat 200 tons per day only part of the tall tanks, perhaps half, will be in agitation at one time; consequently ample air capacity and tank capacity are provided.

After the agitation in the Brown tanks is completed, the pulp is sent to settling and storage tanks where as much of the treatment solution as possible is decanted before the pulp is sent to the Moore filter. The filter will be in two complete units, each having a capacity of 150 tons per day.

The entire cyanide plant as well as the mill will be run by electric power so that few men will be needed. The battery will require the usual complement of men, but the tube mills require little attention; the settlers discharge automatically, one man per shift will attend to the Brown tanks, and only one man is required for the Moore filter. Mr. Girault is inclined to employ a large factor of safety in tank capacity, machinery strength and motive power. He says that although people who know may design the plant, after all, the *peon* must run it and things must be proportioned accordingly.

The ore from the mine treated at this mill will average about one kilogram silver per ton. Besides the mine ore, a large reserve of milling ore is provided in the form of an unsorted waste dump.

Though all of us who are interested in the silver industry are hoping that the price of silver will go up, there is no certainty of it and its production must be brought to a manufacturing basis. With such a plant as the one just described and with ore of the indicated grade, silver can be produced for 35c. per oz. Still, with silver at the present price of 53c. it should be taken at not to exceed 45c. in estimating the value of mines.

Agitation and filtration have reached a fine point; stamps are not equaled for crushing down to a mesh sufficiently fine for tube milling, consequently the weakest link in the chain is the tube mill with its high power cost and high first cost. The Brown, or El Oro, liner has reduced lining cost to a very reasonable figure, and the employment of mine ore to largely replace the expensive pebble for grinders has decreased running and maintenance costs. With a little more improvement in tube-mill design, our metallurgy will be nearly on a parity, considered as a manufacturing industry, with rolling mills.

---

[*] Milling and cyanide engineer, Guanajuato, Mexico.

Cupellation of Silver

C. H. Fulton, assisted by O. A. Anderson, I. E. Goodner and I. D. Ossa (*West. Chem. and Met.*, IV, pp. 31-54) has made an extensive investigation of the actual temperatures of cupellation and certain other interesting phenomena in the cupellation of silver. The loss of silver and gold in cupellation by absorption and volatilization, as is well known, is a function of the temperature and increases rapidly with it. The proper temperature for cupellation is one at which feathers of litharge form on the cupel and the object of this investigation was to ascertain this temperature. Previous workers in this line have determined the temperature in various parts of the muffle during cupellation and at points in close proximity to the cupelling lead button. The main objection to such measurements as showing the temperature of the lead button, is that the heat evolved by the oxidation of the lead raises the temperature of the lead button very much above the temperature of the surrounding atmosphere. The authors, therefore, aimed to obtain the actual temperature of the lead button as well as of the surrounding atmosphere and of a similar empty cupel placed in close proximity to the one holding the lead button.

It was first attempted to obtain the temperature of the lead button by inserting in it the protected end of a thermo-couple. This method proved impracticable as the fused quartz tube first used was eaten through in a very short time, while the iron tube next used was soon surrounded by a heavy scoria of iron oxide and soon ate through. The successful solution of the problem was to insert the couple in the cupel in such a manner as to be in contact with the lead from below.

The cupels were contained in a 3.5-in. section of iron pipe, 2.5 in. long, in the side of which was inserted a 0.5-in. iron pipe closed at the end within the larger pipe. The closed end, after the pipe had been shrunk in place, was dipped into asphaltum paint, thinly covered with finely powdered chromite, heated gently until the paint thickened, dipped again in the paint, sprinkled with chromite and heated. This operation was repeated until a coating approximately 0.0625 in. thick was obtained. The cylinder was then carefully packed with moist bone ash, leaving a section of the iron tube, having an area of approximately 0.0625 sq.in., exposed at the bottom of the hollow. After a careful drying the cupels were ready for use.

The temperatures were measured with a platinum, platinum-rhodium couple and a Siemen's and Halske galvanometer. The couple and galvanometer were carefully standardized both before and during the work and at no time showed more than the allowable error within the limit of observation. A temperature curve was constructed in reference to the galvanometer readings and used in the determinations of temperatures from the readings observed. In the work, two cupels were placed side by side in the muffle, one serving as a blank and the other for the cupellation. The junctions of the platinum and the platinum-rhodium wires with the copper leads were made by brass binding screws and each junction placed in a test tube filled with distilled water. The four test tubes were placed in a graphite crucible and packed with ice so that the temperature of the junctions approximated during the experiments. By means of a two-way switch either couple could be connected with the galvanometer.

In the first experiment one of the couples was placed beside the cupel without being enclosed in a blank. After the button uncovered its temperature rose very rapidly and soon exceeded the temperature of the muffle. As the muffle cooled, the temperature of the button dropped but at a much less rate and showing at one time a temperature 145 deg. C. above that of the muffle. The lead froze at 802 deg. C. while the temperature of the muffle was 675 deg. C.

The next series of experiments in which blanks were run showed that the opening and freezing temperatures are near each other and ranged from 778 to 850 deg. C. in the cases observed. It was noted that in all cases as soon as the button uncovers there is a sharp rise in the temperature of the cupel, whether the muffle temperature rises or not, being from 20 deg. to 150 deg. C. above the muffle temperature according to the rate of oxidation, i.e., the air supply. Therefore, since the losses are dependent on the temperature, the regulation of the air supply is as important as the regulation of the muffle temperature.

The uncovering temperature being much below the melting point of litharge, it is evident that volatilization of the litharge takes place below the melting point and is a function of both the area exposed and the temperature. Furthermore, the ordinary lead button from a crucible assay has adhering to it small amounts of silicious slag, and the bone ash at times contains small quantities of silica. The formation temperatures of the lead silicates are so low that only a small amount of silica present will materially lower the opening temperature.

The temperature for uncovering is, therefore, dependent on: (1) The presence of silica in a condition to combine with lead; (2) the vaporization of solid litharge, the rate of vaporization depending upon the temperature and the relation of area exposed to volume present, for a button with a thick covering will not open at as low a temperature as one with a thin covering; (3) the presence of foreign metals in the lead, such as copper, iron, etc., which raise the uncovering temperature.

Apparently cupellation can be carried on below the melting point of litharge. The particles of litharge that form on the surface of the button, though solid, are pasty and capable of being absorbed by the cupel, but the authors suggest the possibility that the surface of the cupelling lead may be at a higher temperature than the thermo-couple at the bottom indicates.

Feathers of litharge form on the cupel walls when the walls are cooler than the cupelling lead and below or near the uncovering temperature, but they will not form above 820 deg. C. The formation of these feathers is the best available guide to the temperature of cupellation, and the actual temperature is usually from 840 deg. to 900 deg. C., although a higher temperature with a strong current of air impinging on the cupel might still yield feather litharge.

The authors next investigated the temperature changes occurring at the finishing point of a cupellation containing silver. That there is a marked evolution of heat at the finishing point was plainly demonstrated, the latent heat evolved raising the metal nearly to the freezing point of silver.

The authors summarize their work as follows: (1) In the case of the lead buttons, not containing any appreciable amount of copper or iron, etc., i.e., pure, that a muffle temperature of at least 800 deg. C., and, better, one of 850 deg., is necessary to "uncover" or start cupellation; (2) that this temperature may be lowered to about 770 deg. C., during the oxidation of the greater part of the lead; (3) that toward the end of the cupellation, or the "finishing," in case of silver, it must again be raised to about 830 deg. C., in order to get a pure silver button; (4) that the actual temperature of the cupelling lead is always appreciably higher than the muffle temperature; (5) that the actual finishing temperature of the cupellation cannot safely be carried below about 910 deg. C.; (6) that the greatest observed surfusion of silver was 77 deg. C., and that this is probably very near the maximum; (7) that silver beads finishing with surfusion are free from lead; (8) that "feathers" or crystals of sublimed litharge on the cupel are an indication of the proper cupellation temperature, provided the air draft is not excessive.

Power Systems of the Mines of the Joplin District

Of the Three Types in Use the Gas Engine Plant Shows the Greatest Economy, the First Cost Being Slightly Less Than for Steam

BY D. F. BOARDMAN

There are few mining districts that afford as wide a range in the selection of power plants as the Southwest Missouri lead and zinc mining district. The systems employed include: (1) steam, derived from gas-fired boilers with oil burners as an auxiliary; (2) steam, derived from coal-fired boilers; (3) gas engines, direct-acting and belt transmission; and (4) electrical current. The relative cost of installation and operation, the richness and estimated life of the property, and the reliability of the plant, are the chief determining factors in making a choice.

The mines of this district may be divided into two classes according to the nature of the deposit, whether pocket or in sheet formation. The pockets may vary in size from that of a bushel basket to the dimensions of a convention hall. These pockets were the richest and first mines worked, but are so uncertain that the kind of power employed is of minor importance.

The blanket or sheet-ground mines are more continuous and offer greater inducements for the study of economy in power production. In the district north of Webb City where mining conditions are similar, there are new mills representing all the types of power production, steam, gas, and electric current. Here the operator can practically figure in advance the number of tons of ore that he will mine per acre, the estimated tons of jack, the yearly returns on the investment, and the length of the life of the mine. Care in the selection of an economical power plant is, therefore, decidedly worth while.

A fair basis for a comparison of the steam, gas-engine and electric systems would be the costs per horse-power hour. It is on this basis that electrical power is sold;[*] but reliable and accurate data for steam and gas-engine plants are not to be had. Gas engines are of recent introduction, and the steam operators rarely trouble themselves with complete boiler and engine tests. In a group of the sheet-ground mines north of Webb City all of the conditions are practically the same. The cost of mining per ton of ore ranges not far from $1; hence for mines of like capacity a fair basis of comparison is the cost of power per ton of ore extracted. This is the basis adopted in this article and will be employed in studying the economy of the different systems. Nothing but the actual cost of power will be taken into consideration; although it may seem unfair, the cost of oil, waste, packing, repairs to engines, [illegible] compressors, will be eliminated. These costs vary largely with the efficiency of the management, and in a year's run are insignificant as compared with a total of the power bill.

Electric Current

The Spring River Power Company is the chief source of electrical power for the district. The water-power generating plant at Lowell, Kansas, has a capacity of 3000 kw., supplemented by a 2000-kw. steam plant. The company supplies a three-phase 25-cycle curent, at 33,000 volts, stepped down at the mines to 2300 volts, the pressure generally supplied to all the motors of more than 50 h.p. capacity.

The advantages claimed for electric power are the efficient division of power into large and small units, the absence of waste when not in use, no loss in transmission, overload capacity of motors, general convenience, and special economy in pumping.

The Yellow Dog mine on the Underwriters land has the largest and most complete example of electric power installation of the mining plants in the district. The hoisting is done from two incline shafts by two 40-h.p. motors, driving an endless chain of iron elevator buckets. For each of the two 500-ton units of the mill there are: a 100-h.p. motor for the line shaft, a 40-h.p. motor for each centrifugal pump, and a 30-h.p. motor to drive the sand jig and tailings elevators in each end of the mill, a total of 170 h.p. Three 200-h.p. motors are used to drive three 1200-cu.ft. Ingersoll compressors. There is also a 5-h.p. motor for driving the deep well pump, a 30-h.p. motor on the sludge mill, and a 30-h.p. motor on the centrifugal mine pump, recently installed. A total of 1085-h.p. is supplied at a rate of 0.89c. per horse-power hour, the monthly bill for handling approximately 26,000 tons of ore being $2600. The power cost is approximately [illegible] per ton of ore. In this calculation the work of nine machine drills breaking ore for the Marigold mine is included in the cost to offset the pumping done by the steam plant of the Marigold for the Yellow Dog. About 1c. per ton is charged against pumping in the power bill. The electric service has been entirely satisfactory.

Another example of electric power installation is found at the Eleven O'clock mine at Prosperity. The mill is driven by a 75-h.p. motor and handles about 150 tons of ore per shift. A 75-h.p. motor drives [illegible] operates a direct-connected three-stage turbine pump underground. Hoisting is done by a 15-h.p. variable-speed motor geared to a Sampson hoist. The total amount of material handled by this mill in seven months amounted to 28,055 tons, or about 400 buckets daily. The total power required for air for five drills, for pumping one-third of the time, and for ventilation, milling and hoisting, amounted to 275,853 horse-power hours, or approximately 10 horse-power hours per ton handled, at a cost little less than 10½c. per ton of ore. The total cost of maintenance of the electrical equipment of the plant did not exceed $15 for 16 months of continuous operation. No electrician was employed, the blacksmith starting the motors, and attending to the oiling.

[illegible]

A most interesting example of a double power installation (electricity and steam) to do the same work, was furnished some months ago at the Nymo mine, at Webb City. The water in the shaft amounted to 450 gal. per min., which had to be raised against a 220-ft. head. During the month of April, 1907, practically no work was done in the shaft, the steam and electrical pumps alternating in holding the water down. A 10-in. triplex Deane pump driven by a 75-h.p. motor handled the water for 13 days for a total cost of $79.09. At 1c. per horse-power hour the average charge was $6.08 per 24 hours. A compound steam pump with an unprotected steam line handled the same amount of water at an average cost of $13.59 per 24 hours for six days during the same month. This shows an economy for the electric pump of more than two to one as compared with steam.

Steam Plant

One of the first and most successful exponents of modern steam power installations in the district, is that of the American [illegible] at the company's sheet-ground mines at Prosperity. The first plant erected in 1905 was of smaller capacity than that required by the three mills subsequently built, but the Corliss engine and condensing [illegible] economy that larger plants along the same line were constructed.

The large central power plant at the [illegible] for air, light and pumping at all four mines.

---

[*] Mining engineer, Joplin, Mo.

The mill engines at the different plants are 18x36-in. Bates-Corliss, and develop from 125 to 150 h.p., the power developed depending on the tonnage handled. A 2400-ft. Imperial-Rand, and a Laidlaw-Dunn-Gordon air compressor of the same size furnish the air. A 75-kw. generator supplies power for the various motors, for lighting above and below ground. Snow condensers are used at about 23 in. vacuum. Two Snow pumps installed underground handle about 600 gal. of water per minute. Six 150-h.p. high-pressure Erie boilers, gas fired, with an auxiliary oil-burning system, supply the steam.

The compressor at this plant is a compound and condensing machine; when running alone without other demands on the boilers it showed a consumption of 38 cu.ft. of gas per horse-power hour, or a cost of 0.38c. per horse-power hour with gas at 10c. per 1000 cu.ft. The plant as a whole shows according to the company's statements a cost of 0.49c. per horse-power hour. The average of the non-condensing plants where only the hoist and mill engines are run, is 0.75c. per horse-power hour, the approximate cost of power per ton being 5.4c. as compared with 10c. per ton for electric power at the two mills described.

Another very economical steam plant is that installed at the Providence mine. The power plant is modeled on plans very similar to those of the American plant. It employs the condensing system throughout with the exception of the 8x8-in. hoist, and the 5-in. pump which has a compound steam end. The daily capacity of the mill is 350 tons and the cost for gas is $20.40. The cost of power per ton of ore is 5.8c. as compared with 10c. per ton for electric power. During June, July and August, 1907, 27,337 tons of ore were handled, the total expense for gas being $1607.70. Air for two machines employed upon ontside work, is included in this estimate which raises the cost above the true figure. The cost of power for pumping at 1c. per ton is included in the total given as 5.8c. per ton of ore.

Slide-valve Engines

The Red Dog and Bull Dog are adjoining mines, and represent the common type of steam-power plant in the district, as does the Dinger mine. The engines are all of the ordinary slide-valve type. They are run without the aid of condensers, and the feed water is heated in wooden tanks. The steam hoists and pumps are similar to those of the Providence. At the Bull Dog mine the power cost is naturally higher for the work done, it being a new mine, and being crowded for working room in opening up. The cost of power per ton is 10.5c. The Dinger is an older mine and with exceptionally favored facilities for getting ore, and hence the cost of fuel per ton is lower than normal, being 6.4c. per ton of ore.

The Red Dog mine offers a most favorable subject for comparison. It operates on the same run of ore as the Yellow Dog and the Providence, and has slightly less water to handle than the latter mine. Its daily tonnage is 300 against the 350 tons of the Providence and the method of mining, mill construction, and total work done, are all practically the same. The cost of power at the Red Dog is 7.6c. per ton, against 5.8c. per ton at the Providence, which shows a saving of 20 per cent. in favor of the type of steam plant employed at that mine.

The Majestic mine represents one of the oldest types of steam plant and mill handling sheet-ground. Its high cost is due partly to its poorer equipment in engines, neglect of boilers, as well as the natural increased cost due to reduced tonnage, and the scale-producing mine water used in the boilers. The cost of power is 10c. per ton, about the same as that of the electrically equipped mill of the Eleven O'Clock of the same capacity.

Oil at 2⅓c. per gal., when used as an auxiliary to gas under boilers to do the same work, costs about 50 per cent. more than gas. Comparatively few mining plants use coal in preference to gas. The Federal mine at Aurora, handling about 160 tons per day, employing four machine drills and handling about 250 gal. per min., and firing three boilers of an aggregate capacity of 220 h.p., showed an average cost for fuel of 10.5 cents. This plant corresponds closely in capacity and type to the Majestic, which has gas-fired boilers, and the Eleven O'Clock, which has an electric plant, all showing approximately the same cost for power, 10.5c. per ton.

With slack at $1.40 or mine-run at $2 per ton, coal costs about the same as gas at 10c. per 1000 cu.ft., but the general inconvenience of handling, the dirt, and the extra labor connected with each firing account for the popularity of gas, even when the cost may be less favorable.

Gas Engines

The Little Princess mine is a representative of gas-engine power plant. Its position near the Providence and Red Dog, and its nearly equal capacity, and similar mining, milling and hoisting conditions, make it a most proper subject for comparison. The mill handles about 350 tons per day or at the rate of 20 tons per hour. It is driven by a tandem Snow gas engine of 110 rated h.p. The belt-driven Ingersoll compressor of 1000 ft. capacity, carries nearly the equivalent of 10 drills, the blacksmith shop being also supplied with air. A 100-h.p. boiler, gas-fired, supplies the steam for three 8x8-in. hoists, the light plant and what little pumping is necessary.

The gas under the boilers, required to do this work, is supplied at a cost of $4.25 per day. The mill gas engine, developing at least 85 h.p., consumes about $2.75 worth of gas in 17 hours. Power to drive 10 air drills costs $2.50 per day of eight hours, or 25c. per day for each drill. The average cost per working day handling 350 tons is below $10, or 28c. per ton. Adding one cent per ton for the cost of pumping, not included in the duties of the Princess power plant, we have a power cost of 3.8c. per ton against 5.8c. per ton for steam, and 10c. per ton for the electrical plant. An estimate of the first cost of a 300-ton plant is given in an accompanying table.

FIRST COST OF POWER PLANT FOR A 300-TON MILL.

Gas Engine Plant:	
Gas engine for mill (brake load, 125 h.p.; rated 150 h.p.)	$3200
Clutch for same	85
Gas engine for compressor (load 150 h.p.)	4500
Belt-driven air compressor (2 stage, 900 ft. per min.)	2750
Belt for compressor	250
Boiler (100 h.p., installed)	1000
Feed pump	90
Circulation water pump, fittings, covering, etc	500
Mine pump, capacity 500 gal., 220 head, with column pipe, etc	950
Three 8x8-in. Sampson geared hoists	750
Setting of gas engine plant	200
Light generator, 10 kw	300
Total	$14,575
Steam Plant	
Two 150-H.P. high-pressure boilers	$2800
Feed-water pumps	180
Heater	200
Condenser	200
Semi-Corliss mill engine	1200
Air compressor, 900 ft., compound air and Corliss compound steam	4100
Two 8x8-in. Sampson geared hoists	750
Light generator, 10 kw	300
Mine pump, capacity 500 gal., 220 ft. head	700
Column pipe and exhaust line	250
Steam, water and exhaust lines	750
Asbestos covering	250
Deep well plant	2500
Extra buildings for boilers	600
Setting of engines	125
Total	$14,905
Electric Plant:	
Mill motor, 125 h.p	$1500
Clutch	85
Compressor motor, 125 h.p.	1800
Belt	250
Compound air compressor, belt-driven	2750
Three 30-h.p. geared hoists	1125
Motor for mine pump, 75 h.p., 220 volts	1750
Centrifugal pump, 500 gal., 220 ft	850
Switch board	350
Wiring, lights, etc	750
Setting of motors	75
Transformer for hoist, pump and lights	800
Total	$12,085

Comparison of Costs

The cost of a gas-engine power plant is estimated at $14,575. This sum would furnish the necessary 100-h.p. boiler, three 8x8-in. geared hoists connected with the boiler, a mine pump of a capacity of 500 gal. against a 220-ft. head, an electric light plant, a standard belt-driven air compressor of 900 ft. capacity, a gas engine for the mill with a brake load of 125 h.p., one for the compressor of 150 h.p., and the whole plant set up in running order, the gas engines to be of a reliable make of neither the least nor the most expensive type on the market.

The cost of a steam plant of the best type to do the same work is estimated at $14,905. This includes two 150-h.p. high-pressure boilers, feed-water heater, condensers, pumps, semi-Corliss mill engine, Corliss air compressor and units for the production of the power for hoisting, lighting and pumping. It includes the cost of steam-pipe covering, extra buildings required by the presence of boilers, and a deep well which is now considered essential in the district for boiler water.. The estimate is given in an accompanying table. The cost of a steam plant of the common type, i.e., one with slide-valve non-condensing engines, open-box feed-water heater, without the light plant, but of the same capacity, and all the essential points enumerated would be about $2000 less, or $12,900.

COMPARISON OF COSTS AND ECONOMY OF THREE TYPES.

	Electric.	Steam.	Steam.	Gas Engine With Steam Auxiliary.
First cost of installation	$12,085	$12,900	$14,905	$14,575
Cost of power per ton of rock	0.10	0.075	0.056	0.038
Revised cost of power per ton of rock	0.10	0.085	0.066	0.048
Cost of power per year, 300 days, 300 tons.	9,000	7,650	5,850	4,320
Saving by use of gas engine plant	4,680	3,330	1,530	

The cost per ton of rock is increased one cent per ton in the case of steam and gas engine plants by the necessity of having a day engineer in attendance. An electrical plant under intelligent management requires no engineer. An engineer's wage, $3 per day, would increase the cost one cent per ton for a 300-ton plant.

Reliability of the Gas Engine

The reliability in continuous service for steam and electric service is about the same. The majority of the users of gas engines, after their preliminary trouble due to inexperience, receive satisfactory service. The chief causes of gas-engine difficulties have been: (1) in the insufficient reserve horse-power usually installed, a gas engine being able to carry only a small overload; (2) too small and poorly built foundations, a gas engine apparently calling for two to three times the weight of a steam-engine foundation. When the engineer learns that a gas engine is bound to go, if it receives its spark and the correct mixture of air and gas, his troubles are as few as those of a steam engineer; but a gas engine does call for intelligent care in spite of all claims to the contrary. The Little Princess mine is here given not as an example of a smooth-running gas-engine plant, but it was selected because its operation could easily be compared with neighboring steam and electrical plants operated under similar conditions.

The employment of gas engines of an aggregate capacity of more than 5000 h.p. in the district by more than 100 owners of mills, foundries, laundries, and light plants, is pretty fair proof that a large number of engineers consider the gas engine a reliable prime mover. The economy of gas engines as compared with electric motors and steam engines is particularly apparent in small individual units.

In large steam plants of the best type, running wholly compound and condensing, with gas at 10c. per 1000 cu.ft. or coal at $2 per ton, shows a surprisingly close approach in expense to a gas-engine plant with gas at 25c. per 1000 cu.ft. The steam plant as now usually installed, with its medley of single-acting and compound, condensing and non-condensing engines, competing with a gas-engine plant of the type used at the Little Princess shows a cost of 5.6c. per ton against 3.8c. per ton of rock, or an economy of approximately 33 per cent. in favor of the gas engines.

If the work of lighting, hoisting, and pumping makes up more than 33 per cent. of the total, it would be advisable to figure on a larger or double-compressor installation, cutting off the steam boiler altogether, and to do this very un-economical work by means of gas engines as prime movers, returning the air used to the intake of the compressor, and realizing a nearly maximum attainable efficiency.

Cost of Lead Mining and Smelting in Spain

Special Correspondence

The report of the Linares Lead Mining Company, Ltd., for the year ending June 30, 1907, gives some interesting information as to the cost of producing lead in Spain. The general characteristics of that company's operations are as follows: Working on a small scale; careful selective mining; hand-dressing to a high-grade product; smelting in reverberatory furnaces. The country is granite, the veins are narrow, exceedingly pockety, and are badly dislocated. A large amount of exploratory work has to be done and reserves are rapidly consumed. The company has two mines, the Pozo Ancho and Los Quinientos; the latter has much the poorer ore and its operating expense is augmented by the necessity for pumping. Operations at the two mines are therefore described separately.

Pozo Ancho Mine

The shaft of this mine is 1718 ft. deep. During the year under review, 4654 ft. of development, of which levels constituted the larger part, was done at a cost of $8.41 per ft. Where the pay streak was found at all, it ranged from ½ to 2 tons of mineral to the square fathom of lode. Machine drills were used for drifting; stoping was done by hand. Ore reserves at the end of the year included 3150 tons unbroken and 370 tons broken and lying on the stulls. During the year, 6576 sq.m. of lode were stoped, at an average cost of $4 per sq.m. These stopes, including the ore secured during drifting, yielded 27,848 tons of ore, the mining of which cost $3.82 per ton, equivalent to $37.32 per ton of finished product.

The 27,848 tons of ore were treated on the dressing floor at a cost of 47c. per ton, and yielded 2571 tons of first-class and 274 tons of second-class ore, the cost thus being eqivalent to $4.60 per ton of clean ore. The crude ore yielded 10.21 per cent. of clean ore, or 1 ton for each 9.8 tons of crude. The total cost was thus $41.92 per ton of clean ore.

Los Quinientos Mine

The shaft of this mine is 1670 ft. deep. During the year 2783 ft. of development, of which levels and crosscuts constituted the larger part, was done at a cost of $10.90 per ft. The pay streak in this mine did not carry anywhere more than 1 ton of mineral to the square fathom. Reserves at the end of the year included 747 tons unbroken and 172 ton of broken ore.

In the year, 5907 sq.m. of lode were stoped, at an average cost of $4.47 per sq.m. The stopes yielded 21,550 tons of crude ore, costing $4.19 per ton, equivalent to $67.21 per ton of clean ore.

The 21,550 tons of crude ore were treated on the dressing floor at a cost of 37c. per ton, and yielded 1234 tons of first-class and 72 tons of second-class ore, the cost thus being equivalent to $5.92 per ton of clean ore. The crude yielded 6.06 per cent. of clean ore, or 1 ton to each 16.5 tons of crude. The total cost was thus $73.13 per ton of clean ore.

Smelting

The larger part of the ore is smelted in a reverberatory furnace, with coal for fuel; the rest of it is calcined and then smelted in a blast furnace together with slags and fume obtained from the reverberatory furnace, and dross from the desilverizing pots.

The amount of ore treated in the reverberatory was 5389 tons, averaging 77.12 per cent. lead. The recovery amounted to 3485 tons of pure lead, a recovery of 83.84 per cent. of the lead in the ore. The slags and fumes from the operation contained 443 tons of lead which, added to the metal recovery, accounts for 94.50 per cent. of the lead in the ore. The coal consumption was [illegible] tons, [illegible] [illegible] $2.53 per ton of ore smelted.

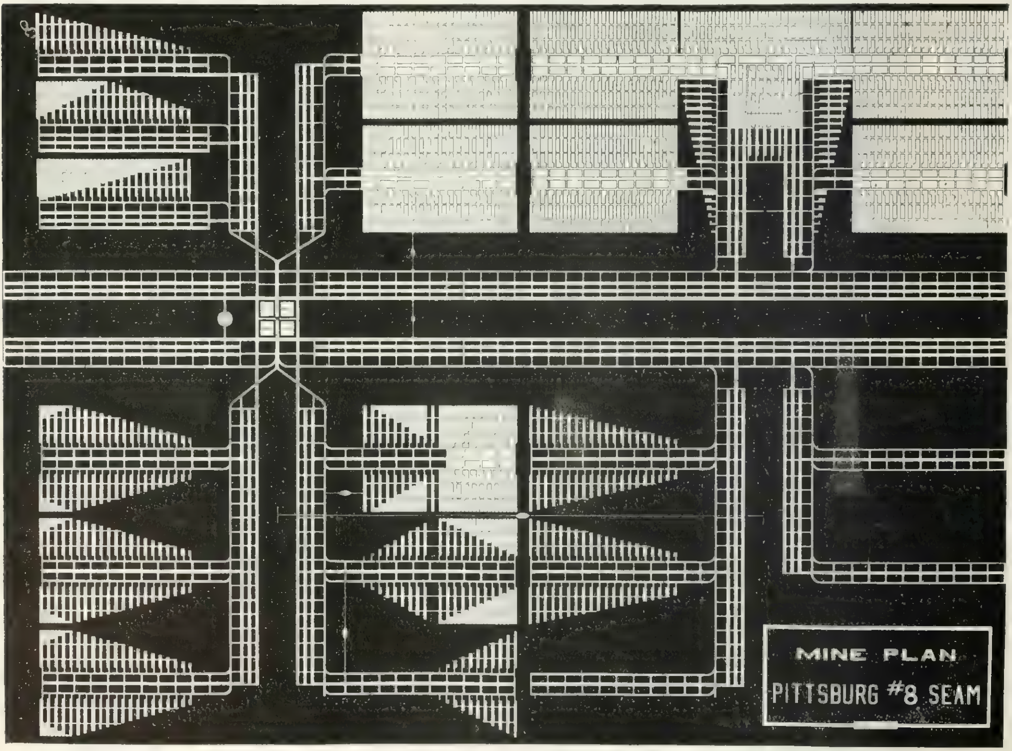
The amount of ore calcined was 499 tons. The blast-furnace yield comprised 257 tons from the calcined ore, 525 tons from slags and fumes, and 31 tons from dross slags. The total weight of lead treated in the desilverizing pots was 4370 tons, which yielded 488 tons of concentrated or R. R. lead, 3392 tons of reduced, or F. O. lead, 425 tons of refined or D. lead, the remainder being lost or contained in dross.

Suggested Mining Method for Pittsburg Seam

A New Plan for Mining the Pittsburg No. 8 Bed by Which Greater Safety May Be Attained and Losses of Coal Reduced 30 Per Cent.

BY R. Y. WILLIAMS*

The present method of mining the Pittsburg No. 8 seam in Belmont and Jefferson counties, Ohio, and in the Panhandle district of West Virginia is both wasteful of the coal and uneconomical. The seam lies practically flat under a normal cover of approximately 225 ft.; the bed averages 5 ft. 6 in. in thickness. The analysis of the coal shows the following:



GENERAL SYSTEM OF DEVELOPMENT FOR THE PITTSBURG SEAM IN EASTERN OHIO AND NORTHERN WEST VIRGINIA

Moisture.	00 93	per cent
Volatile matter	39 46	per cent.
Fixed carbon	51.35	per cent.
Ash	8 26	per cent.
	100.00	per cent.
Sulphur	3.86	per cent
Phosphorus	0 0067	per cent.
B.t.u	13,949	

The following figures show the total tonnage in bituminous coal in Belmont and Jefferson counties, Ohio, and also the annual increase in percentage:

Years	Tonnage.	Percentage.
1900	2,455,870	152.3
1901	2,829,163	176.0
1902	3,810,757	237.1
1903	5,205,060	323.3
1904	5,588,472	347.1
1905	7,209,645	448.6
1906	7,465,571	464.6
1907	11,003,845	684 8

A section of the Pittsburg seam and adjoining strata is as follows:

Limestone	20 ft. to 40 ft.
Shale	5 ft. to 6 ft.
Roof coal	12 in. to 18 in.
Soapstone	1 in. to 10 in.
Pittsburg coal	62 in. to 68 in.
Fireclay	1 ft. to 3 ft.
Limestone	Bottom.

The mining plan generally adopted throughout this region drives two parallel main entries on the butts of the coal through the center of the property, and from these main headings, two parallel face entries are driven at 2000-ft. intervals; one of the latter entries is used for haulage and the other for air. These entries are 8 ft. wide and are laid off on 40-ft. centers. At each 500-ft. interval along the face entries, a pair of butt or work headings lead off both to the right and to the left, usually at 90 deg. to the main entries. From each work heading, 20 to 30 rooms are driven on the face of the coal. These rooms are spaced on 32-ft. centers, are 24 ft. wide, 225 ft. deep and have the roadway up the center. Under these conditions, with the room pillars only 8 ft. through, no attempt is, or could be, made to do any stumping in this coal.

GREAT LOSSES OF COAL

Obviously, this system is wasteful of

---

*Mining engineer, Moundsville, West Virginia the coal, and the operator who chooses to work his property in this way lets it be known that his aim is to extract but 56 per cent. of the total tonnage he owns. This method is so crude, however, that the element of luck is never strong enough to prevent the heaves and squeezes which this system invites. I venture the assertion from my own observation that not more than 40 per cent. of this coal is being mined per acre. This is a direct loss to the resources of the United States.

The United Mine Workers of America, as well as the operators, are responsible for this state of affairs. The Union lays down the rule that all rooms shall be 24 ft. wide, and that heading yardage shall be paid where the mine boss orders a room driven less than 24 ft. This has been the custom for years, and no concerted action on the part of the operators has ever been made in order to bring about an improvement in the mining conditions. When the question is asked as to why pillars are not robbed, the reply is to the effect that the Pittsburg No. 8 seam cannot be stumped.

I have been in close touch with the mining conditions in this part of the country, having been superintendent of a mine typical of this section where I had an excellent opportunity to study all the details of the working of the system, including squeezes and the conditions resulting therefrom. I submit, therefore, the following method which I believe to be peculiarly adaptable to the locality in question. The accompanying illustration illustrates the method.

A Proposed System of Working

The main features differentiating this new plan of working the coal from the old scheme are: (a) the increasing of the room pillars from 8 ft. to 22 ft. and the decreasing of the room widths from 24 ft. to 18 ft., also placing the roadway on one rib; (b) the leaving of heavy chain pillars both to protect the main haulageways from the action of the heavy limestone above the coal, and to prevent the oxidation of the coal left in the pillars; (c) the introduction of six room air courses between the main entries, and from one to three room air courses between each pair of butt headings, to make possible an excellent and inexpensive system of return air; (d) the splitting up of the intake air and the return of the vitiated air in a manner that will reduce to a minimum the chance for the ignition of firedamp mixtures.

The details of this plan may be tabulated as follows:

Face entry interval	2,610 ft.
Butt heading interval	600 ft.
Main entry pillars	200 ft.
Butt heading pillars	30 ft.
Room pillars	22 ft.
Room centers	40 ft.
Crosscut centers	80 ft.
Width of rooms and room air courses	18 ft.
Length of rooms	225 ft.
Length of room necks	21 ft.
Width of headings and crosscuts	8 ft.

No passways are indicated on the drawing as their location depends on the particular system of haulage used, and on roof and gradient conditions.

A Large Percentage of Coal Obtained

In studying this new method, the first fact noticeable is that almost all the coal is obtainable. We will assume, however, that the actual mining wins but 90 per cent. As the old system recovers only 40 per cent. of the seam, the new plan effects a saving of 50 per cent., or exactly one-half the property. Where coal is valued at $150 per acre, and assuming a coal proposition controlling 1000 acres, the proposed plan of working the seam will eventually mean a saving of $75,000. These figures applied to the "cost per ton" basis shows a saving of $0.01875, or nearly 2c. per ton.

The second advantage which this system offers is the reduction in the cost of yardage, both per ton of coal produced and per acre developed. Let us assume a body of coal measuring 2610 ft. on the butts and 3200 ft. on the face.

(a) Mining on the old plan, we have the following:

Main entries	3,200 yd.
Main entry crosscuts	800 yd.
Butt headings	9,720 yd.
Butt heading crosscuts	2,100 yd.
Room necks	5,796 yd.
Room crosscuts	4,224 yd.
Development headings	1,740 yd.
Development heading crosscuts	440 yd.
Total yardage	28,320 yd.

Theoretical area of coal removed:

Wide work (24 ft.)	4,053,888 sq.ft.
Narrow work (8 ft.)	679,680 sq.ft.
Total	4,733,568 sq.ft.
Total area in block	8,352,000 sq.ft.
Theoretical percentage removed	56 per cent.
Actual area of coal removed	3,340,800 sq.ft.
Actual percentage removed	40 per cent.

The following conditions obtain:

Pick yardage	$1.66
Machine yardage	0.52
Thickness of seam	66 in.

One ton of coal in solid equals 30 cu.ft.

In the area considered, the following will be true:

Total tonnage	1,531,200 tons.
Tonnage theoretically possible	857,472 tons.
Tonnage actually gained, 40 per cent	612,480 tons.
Yardage, total cost by pickwork	$47,011.20
Yardage, total cost by machine-work	14,726.40
Yardage, theoretical cost per ton, pickwork	0.055
Yardage, theoretical cost per ton machine work	0.017
Yardage, actual cost per ton pickwork	0.077
Yardage, actual cost per ton machine-work	0.024

(b) By the new method here suggested, we note the following figures:

Main entries	2,000 yd.
Main entry crosscuts	2,193 yd.
Butt headings	6,787 yd.
Butt heading crosscuts	2,640 yd.
Room necks	[illegible] yd.
Room crosscuts	[illegible] yd.
Development headings	870 yd.
Development heading crosscuts	924 yd.
Total yardage	23,494 yd.

With conditions as to yardage costs, area, etc., the same as above, we find the following to be true:

Total tonnage	1,531,200 tons.
Tonnage actually mined (90 per cent.)	[illegible]
Yardage, total cost by pickwork	$39,000.04
Yardage, total cost by machine-work	[illegible]
Yardage, actual cost per ton pickwork	[illegible]
Yardage, actual cost per ton machine work	0.0088

A comparison of the two methods with respect to yardage shows the following:

	Old	New	Saving
Yardage, cost per ton, pick	0.077	0.0283	0.0487
Yardage, cost per ton, machine	0.024	0.0088	0.0152
Yardage, cost per 1,000 tons, pick	77.00	28.30	48.70
Yardage, cost per 1,000 tons, machine	24.00	8.80	15.20

It is also important to note from the above considerations that the cost of the total yardage required by the proposed plan is $40 per acre less than under the old system.

Speed of Development

Quick returns for money invested are required of all systems of coal mining; but the business of producing coal should by this time be well enough understood to prevent the demands of the investors from ruining the mine by "hogging the coal" at the foot of the shaft.

The system here presented, as compared with the method usually adopted, offers an advantage in the matter of getting up a quick tonnage by its plan of driving 20 four-room air courses comparatively near the shaft, and yet so located that the removal of the coal in these rooms cannot possibly impair the solidarity of the shaft pillars. Moreover, this wide work will materially lower the cost of the coal in this early development stage when as is customary, most of the coal is won from narrow workings.

In the matter of ventilation, the proposed method has many points of advantage. If we assume the mine in question to be dusty, gaseous and ventilated by a fan working as an exhaust, the first noticeable feature is that each work entry is ventilated by a fresh split of air, (a condition that will eventually be required by law). In the second place, firedamp mixtures of gas and dust, which are generated mostly at the working faces, are at once removed from places where they are an element of danger and deposited in the return air courses. Furthermore, by increasing the area of the return air courses, the velocity of the return air is greatly diminished; this means an enormous decrease in the power on the air according to the formula

[illegible]

Where u equals power on the air.

[illegible]

[illegible]

r equals velocity of the air.

It is not claimed that this system will reduce the item of ventilation cost, but it is maintained that with the same horsepower on the fan, the efficiency of the ventilation will be more than doubled.

MAINTENANCE AND TIMBERING

Maintenance and timbering in a mine operated along the lines suggested in the accompanying drawing are relatively simple and inexpensive when compared with the old methods. It is an evident fact that the cost of maintenance of tracks, mining machine equipment, etc., for any mine will be materially lowered if a system be introduced which will raise the percentage of coal obtained from 40 to 90 per cent. In addition, the expensive deadwork required to keep narrow air courses clean is entirely eliminated. Where a fall occurs in narrow workings, the passageway is choked, while in a wide air course falls may take place and continue even to the limestone above the coal without seriously impairing the ventilation.

Under the old regime, from 200 to 300 props were required per room. These props are worth from 6 to 12c. at the mine; therefore, the 200 posts required in one room at 10c. each will cost $20, or about 2c. per ton, not including the cost of delivering the posts to the working faces. Moreover, these posts are not recovered. Under the new scheme, if the conditions are similar, 100 posts will work the room and rob the pillar, and most of these props are recoverable. Under this latter arrangement, steel posts could be used to good advantage, and should reduce the cost of timbering to less than ¼c. per ton.

Another advantage that this plan offers lies in the possibility of rapidly, cheaply and completely sealing off any portion of the mine should dangerous gases or water collect in old workings. Situations often arise in old mines where an opportunity of this kind would be worth hundreds of dollars.

The plan of isolating the various sections of the mine in the manner this system suggests, makes it appear impossible for an explosion to occur in any one division of the workings and wreck the whole mine, as would be the case were all the entries and rooms directly connected. If this method will thus reduce the area contributing to an explosion, and will thereby limit the explosive violence to the division in which the ignition occurs, the advantage accruing from the adoption of the plan is incalculable.

In recapitulating the above benefits to be derived from the use of the proposed system, the following "cost per ton" summary shows the saving in working costs:

Saving in original property cost	1.875c. per ton.
Saving in yardage in pick mines	4.870c. per ton
Saving in yardage in machine mines	1.520c. per ton
Saving in maintenance and timbering	4.000c. per ton
Total saving in pick mines.....	10.745c. per ton.
Total saving in machine mines .	7.395c. per ton.

The following summary shows as marked advantages as the above, but advantages cannot be readily reduced to the "cost per ton" basis:

1. Increased ventilating efficiency
2. Reasonable speed of early development
3. Protected main haulageways.
4. Reduced likelihood of explosions.
5. Limited area for spread of explosions.
6. Easily sealed abandoned workings.

The Pittsburg No. 8 seam is now valued at $150 per acre. It may confidently be predicted that these figures will soar higher when the proposed improvements in the navigation of the Ohio shall have been consummated and the Panama canal completed. Considerations of this character, when combined with the statements of Prof. I. C. White relative to the wasting of our natural resources, should awaken in the operators of this region an earnest desire for a mining system that will yield a larger return per acre.

Notes on Recent Mine Disasters

By James Ashworth*

The disaster at the Darr mine on Dec. 19 last, whereby 233 valuable lives were sacrificed, following so quickly after the Monongah mine explosion, which caused the loss of nearly 400 lives only 13 days previously, cannot have failed to cause a feeling of nervousness throughout the coalfields of the United States. Not only are such great accidents naturally calculated to cause a feeling of apprehension, but they also cause every thinking owner and manager to look around and consider the condition of their immediate properties.

That blasting is the greatest factor of danger and uncertainty is most distinctly indicated by the Monongah explosion, if it is not so certainly indicated in that occurring at Darr. At Monongah, only blasting powder was used, but at Darr, dynamite was also employed. Whatever explosive was in use in either mine, it is perfectly clear that explosives were applied with an amount of recklessness which is simply appalling. In the majority of cases the shot holes were drilled on the solid, and, therefore, it was totally impossible for these shots to clear themselves to the foot of the hole. This sort of blasting is of no advantage to either the workmen or the owners, as the percentage of run-of-mine is largely increased, and the product of the shot is less speedily loaded with the shovel than it would be if handled in blocks; furthermore, a mine car will not carry so large a weight of run-of-mine as it will of blocks, and though this may seem a small matter at first sight, yet when looked at through the figures of a whole day's output, the total may be greatly affected. One of the reports on Monongah suggested that the weight of powder in each shot should be reduced, and that the coal should be blasted down in two benches; there is little doubt but that if the coal were broken down twice, the advantage would be marked, as the coal dislodged by the roof shots would be in a large marketable condition, and the tonnage of coal secured per pound of explosive would be increased.

The coal may not in all cases be thick enough to make it worth while to shoot it down in two lifts, but if not, the holes may be multiplied and a shot fired in each corner of a room, after which a center shot will bring down the remainder in fine condition. The writer has in mind a mine where dangerous conditions were frequently encountered through placing two heavy shots in the wall of coal, but when these were multiplied into three shots, all fired separately, the dangerous conditions were immediately disposed of, and better results were obtained.

More thorough supervision is insisted on by all the inspectors of mines, and this again is a point of the greatest value to the safety of the mine; but under no conditions whatever should a fire boss or shot firer be allowed to fire a hole which he has not examined before it is charged, for if the workman is permitted to charge the hole, and simply leave it ready for the shotman to light, the latter can only give the minimum of protection to either himself, the mine, or the rest of the miners.

WATERING

Next comes the question of watering, which in the majority of cases is, and always will be, of a more or less perfunctory character. Mining men often forget that coal dust is not an easy article to dampen, and that to properly "water," only a small working place takes much more water than can be applied in practice. In one case it was suggested that the weight of water used should be equal to half that of the dust, but this method of reasoning is not practical, nor would it be effectual, and, therefore, something more than that is required.

METHODS TENDING TO GREATER SAFETY

I would suggest that a wet blanket, or other suitable material be hung up, not necessarily the whole hight of the coal but particularly close to the roof, and at such a distance from the shot that it could not be torn to rags by the dismembered coal. Every hole should be bored by a twist drill, as the screwed cut, left inside the shot hole by these drills is of the greatest assistance in holding the stemming, which ought to be of a non-inflammable nature. The use of electricity for shot firing would probably facilitate the work of the shotmen, and be of considerable advantage in gaseous mines. There is, however, another point which if taken into account in the laying out of the mine, would have the most important influence on the general safety, viz., the longwall method of working coal instead of the pillar-and-stall or stoop-and-room. There are many varieties of longwall, and if one system does not suit the conditions, some slight modification will certainly do so.

---

*Mining engineer, Edgecroft, Rushton, Macclesfield, England.

A longwall mine is more easily ventilated than one on the stoop-and-room principle, and the weight of the roof comes into use just where it is required, that is to say, on the coal face, where it will in many cases bring down the coal when properly undercut without the use of powder. Furthermore, the roof weight instead of crushing the coal pillars settles down on the pack walls. Many miners have the strongest objection to the use of high explosives because the latter do not bring down the coal in as good condition as black powder, but even this difficulty is of easy solution if a special powder known in England as Bobbinite is used. This powder has a similar appearance to blasting powder, but the flame if such it can be called, is of an entirely different character. It is fired with ordinary fuse and does not require a detonator; therefore, it does not introduce this most serious objection to the use of high explosives. Detonators are apt to get dropped in the workings, and in cases of misfires to cause accidents both within the mine and outside it.

Blasting In Mines

Still another serious danger from blasting in mines is called by some observers, "detonation," and by others as "percussion" or concussion. On no previous occasion has this phenomenon of coal-mine explosions been so clearly demonstrated as in the Monongah mine, where various experts distinctly showed that the disaster was extended throughout Nos. 6 and 8 mines by this agency. Therefore, any explosive which requires a detonator, also introduces a danger factor into the mine which did not exist before, and this is of the greatest importance in any mine producing firedamp, for without the addition of firedamp, detonation would not be possible. Detonation also affects the safety of a mine where watering or spraying is depended on as one of the factors of safety, because no watering can influence a detonating vibration, and if it does it will assist in carrying it out more effectually.

The Effect of Detonation

A demonstration of detonation was recently in evidence at the Urpeth explosion, in the county Durham, England, where two shots of a high explosive were fired in a heading, the one after the other; neither blew out and there was no visible explanation why an explosion had been caused; it was, however, known that there was some gas in the air when the first shot was fired, and it was surmised that this shot released more gas. Both shots were fired electrically, and I believe that the second shot detonated the gas in that part of the mine and killed all the men who were at work there. The Udston explosion in Scotland and the Universal explosion in South Wales, were instances of the effects of "percussion" or in the latter case of "detonation," there being simultaneous explosions in widely separated parts of the mines, at practically the same instant of time. In the case of Monongah, there is no public report of the doctors on the state of the bodies, or of the cause of death, but I have been informed that most of the bodies were badly mutilated by the direct effects of the explosion, or by the enormous pressure (percussion), which in the majority of cases pressed the ribs inward and in other cases, disembowelled the bodies. This latter would result from the after effects, when the gases created by the explosion cooled down, and condensation then caused what is generally described as backlash, or that period when air rushes into the mine at enormous velocity to fill the void caused by cooling and condensation.

Whether the Darr mine disaster was caused by a blown out or over-powdered shot, or whether it was caused by the ignition of firedamp through the recklessness of men who only wished to save a couple of cars of coal from being buried by a fall of roof, and for this purpose passed a danger board with a naked light, does not matter much, but it demonstrates the fact that where more than one place can be confidently pointed out as the initial point of an explosion, that either percussive or detonative, or other simultaneous effects have been factors in the disaster.

Believing, therefore, that either percussion or detonation have been clearly demonstrated in the cases of two recent explosions, I will consider what is the best remedy. A few years ago the division of mines into separate ventilation districts and the subdivision of these districts into separate panels, would have been a perfectly certain guard and security against any such effects, but the accidents at Monongah and Darr, without including any others, make it clear that these precautions, admirable though they be, are insufficient, and we are forced back to the very first principles of mining, which are, that an adequate volume of air must be provided to render innocuous all firedamp given off by the mine, and that we must not be satisfied by providing just a fixed number of cubic feet of air per man and animal, but that the volume of air provided shall efficiently sweep the working faces of the mine; that regulations for the safety of the mines and miners shall be carried out with greater strictness, and discipline maintained; that safety lamps of the best construction giving not less than one standard sperm candle-light be used in all mines where firedamp is continuously given off, that the use of electrical wires "overhead" on the roadways shall be carefully considered, and although it was not shown by the evidence given at either Monongah or Darr that electricity had any part in extending or initiating either explosion, yet where the products of an explosion are being forced through a mine at a high velocity, it is conceivable that the wires may be broken down, and an arc caused by the short-circuiting of the current, thus igniting a mixture of air and carbon monoxide which otherwise might have passed to the outside of the mine without ignition.

Coal dust is stated to be the important factor in both the explosions referred to, and the chain coal cutters are the producers of excessive quantities of dust; however, the experiments made by Mr. Jones, of the Westmoreland Coal Company, Irwin, Penn., demonstrated that the chain machines made far less dust when at work than did the punchers or hand mining; if, however, the comparison is made in the very fine dust only, then the chain made a little more dust than hand mining, but far less than the puncher, and, therefore, if a chain machine were worked at an equal speed to hand mining, doubtless the machine would make the least dust. We live in an age of hustle, and, therefore, if large outputs of coal are to be made and mines developed with vigor, it is perfectly certain that machinery will have to be applied wherever it is possible to apply it, and, therefore, dust will be a troublesome factor to the end of the chapter, and its presence must be to some extent tolerated while its production may be restricted by improved methods of mining; for instance, by working the coal cutters on a separate shift, and periodical removals of dust. The most dangerous dust is that which for a certain period after it is freshly produced from the coal, floats away in the air current, supported by the gas which is occluded within its minute body, and which apparently makes it so greasy that water will not adhere to it, and consequently, the watering and spraying of a mine exercises no influence on this class of dust, but only on the heavier particles which take a minor part in colliery explosions and mainly assist in the production of carbon monoxide by the effect of heat on their surfaces.

If close attention is given to the provision of an ample ventilating current, the restriction of blasting, and the use of the best safety lamps, it will be found that these are better remedies for colliery explosions than attempts to control the demon of coal dust by watering or spraying.

Too strong a ventilation dries the air and increases the danger of explosions. The best ventilated mine is sometimes the most perilous. This was proved by the Courrieres disaster, the Courrieres mine being one of the best ventilated [illegible]

Colliery Notes

Great Britain has one mine inspector to every 22,000 persons employed.

An authority on hoisting states that the best composition for dressing winding ropes is plumbago or graphite mixed with vaseline, linseed oil, palm or other vegetable oil.

Tests made by the Transvaal Commission showed that there is often a difference of from 3 to 16 per cent. between the aggregate strength of the wires of a hoisting rope and the breaking load of the rope.

Every 10 deg. rise in temperature of feed water may be taken as effecting a 1-per cent. saving in fuel, and as the carbonates are driven off at 200 deg. F., the saving in fuel due to heating with exhaust steam is important.

More than 100 tons of coal are being taken from the Susquehanna river daily in the vicinity of Espy, Penn. Five dredges are being operated at that point. Many families in that section secure their winter's coal from the river.

During the year 1907 the Maxwell mine of the Lehigh & Wilkes Barre Coal Company produced 310,845 tons of coal with only one fatal accident. The Hollenback colliery of the same company produced 296,188 tons, and had but one fatal accident.

In order to reduce friction and avoid accidents on a main-rope haulage system, vertical pulleys and rollers set on end should be used to take the rope around curves; if the curve is sharp, guiding boards inside the curve will help to keep the trip on the road.

The following ingredients make a good rope lubricant; tar, oil, mica, and axle grease. The tar and oil should be absolutely free from acid of any kind. This lubricant resists water successfully, thoroughly penetrates the wires and fills the cable, giving it a solid appearance.

When preparing anthracite coal in a breaker the waste made by the rolls may be increased as much as 5 per cent. of the whole output by over-feeding the coal to the rolls. The size of the rolls also influences the amount of waste made. Large rolls are generally preferred by most superintendents.

The air space inside a mine motor should be reduced to a minimum, so that the cubical capacity and consequently the volume of explosive mixture that can collect in the motor will be as small as possible. If possible, all motors should be blown through once a day with compressed air to prevent the stopping of the openings by coal dust.

Tests have shown that the tension on single belts is nearly 45 lb. per in. of width, and from 60 to 80 lb. per in. on heavier belts. On a 10-in. double belt, therefore, the tension is equal to 700 lb. The loss of power, a large part of which is due to tight belting, is, in some plants, as high as 70 per cent. The slacker belts are run, the more power they will transmit.

The mining regulations of the Transvaal demand that a portion of a rope not shorter than half the circumference of the shaft head sheave, and cut off when recapping, be sent to the Government Mechanical Laboratory for testing. Not more than six months must elapse between successive recappings of round rope, and three months in the case of flat ropes.

Pulsometers work best and give the greatest efficiency when the hight to which the water is to be raised is between 30 and 50 ft. They are best adapted for the drainage of dip workings, or for use in sinking shafts. They also give satisfactory results when gritty water has to be dealt with. Difficulty is often experienced from the ball valve getting worn flat and sticking.

Even when electric motors are entirely inclosed and so-called explosion-proof, every possible care must be taken; this means frequent overhauling, frequent cleaning and a competent and intelligent attendant. An inclosed motor is likely to draw in gas and air, especially if the bearings become worn; this is due to the partial vacuum in the motor case when the machine cools down after use.

The wear of a rope increases as the speed. Double the speed and you double the amount of wear. The load may, however, in most cases be increased without any harm being done. It is better to increase the load than the speed. These points should be borne in mind when considering the comparative merits of main, tail and endless rope haulage; they are also especially applicable to hoisting from deep shafts.

Insulating oil should be pure, unmixed, mineral oil obtained from fractional distillation from petroleum and not treated chemically in any way. It must contain no trace of either acid or alkali, and all moisture should be eliminated by heating carefully at about 268 deg. F. before using. For transformers, the oil should be fairly light in color and as fluid as possible; switch oil may be more viscous and darker. Cheap oil, which is apt to be more or less gritty, should never be used.

If possible, conduct all electric wires for mine lighting or machine operation through entries not used by men or beasts. Electric-haulage roads should never be used for traveling ways as the trolley wires used to supply the power to the locomotives cannot be insulated. At points where it is absolutely necessary for men to cross an electric-haulage road prominent danger signals should be set up. In gassy mines electric wiring should not be allowed beyond the main intake airway.

Whenever a fire occurs in a mine, it should be completely isolated by stoppings constructed at least 33 ft from the nearest point of the fire. These stoppings should be built of brick or stone, or should be made of logs, one on top of the other, a double row 4 ft. apart, reaching from the floor to the roof. The logs should be let into the floor and the roof at least a foot and the ends into the sides of the pillars 18 in. The space between the two rows should be packed tightly with sand, ashes or clay. If brick or stone walls are used, they should be thick enough to resist the pressure of the superincumbent strata.

When a seam of coal is to be worked by the longwall system, the planes of cleat greatly influence the quality of the output. When "working on the face" the coal is easily won, but the face is bad to keep open. When "working on the rise," the roof has a tendency to fall away from the face, and to lie against the face when working to the dip. When "working on the end" the coal is hard to mine, but the roof at the face can be kept up better, although the coal is often crushed by the roof pressure. If the output is to be marketed as steam coal, this crushing of the coal is a serious drawback, but when the coal is intended for making coke, it is economical to have the face advancing on the end of the cleat.

In low seams of coal, the blasting of top and bottom rock to provide space for getting the cars up to the working face is avoided at some plants by the following method: A branch road is made to keep the cars off the heading road. Then use small, flat-wheeled cars for each chamber, so that they can be run on the bottom rock and thus do away with the use of tracks in the rooms. Keep the regular mine car on the branch and fill it from the small chamber cars, which should be equipped with a hook on one end of the haulage rope and a grip on the other end; this system is then operated as a gravity plane by the use of a prop, located at the chamber face, and fitted out with a pulley block for the rope to run on.

The Midland District Miners' Fatal Accident Relief Society of England is a splendid example of what organized thrift can do and what miners may accomplish for themselves if more effort is put into saving and less into demands for State and Federal aid. The membership of this society is nearly 40,000, and the amount standing to the credit of the benefit fund, the whole of which is available for the widows and orphans of members who lose their lives in the mines,, is approximately $300,000. The dues are 2c. per week per member, the benefits comprise annuities of 60c. a week, until the child is 13 years of age; funeral expenses are also paid. During its existence, the society has provided for 428 widows and 938 children at a cost of $330,000, besides paying $33,200 in funeral allowances and legacies to widows and other relatives of deceased members.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas.   Robert McKean, Sec.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* The Engineering and Mining Journal.

Our circulation for July, 1908, *was* 44,500 copies.

August 1	12,000
August 8	9,500
August 15	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
Transvaal Gold Mining ... 335
The Alabama Coal Miners' Strike ... 335
The National Conservation Commission ... 336
The Prospector and His Motor Car ... 336
Signs of Improvements ... 336
*Mines of Penoles Company, Mapimi, Mex. I. *Claude T. Rice* 309
New Apparatus for Electrolytic Determination of Metals ... 314
The Cost of Silver-Lead Smelting. *Walter Renton Ingalls* 315
Elmore Ore Process Patent Decision ... 321
Minor Mineral Products of North Carolina. *Joseph Hyde Pratt* 321
Prize for Best Collection of Minerals from Ontario ... 321
*Duluth Steel Plant and Belt Railway. *Dwight E. Woodbridge* 322
The Detection and Identification of Manganese and Chromium ... 322
New Mining and Milling Practice on the Rand *Eustace M. Weston* 323
Assay of Lead ... 324
*The San Rafael Mill at Pachuca *Mark R. Lamb* 325
Cupellation of Silver ... 326
Power Systems of the Mines of the Joplin District *D. E. Boardman* 327
Cost of Lead Mining and Smelting in Spain. *Special Correspondence* 329
*Suggested Mining Method for Pittsburg Seam ... *R. Y. Williams* 330
Notes on Recent Mine Disasters. *James Ashworth* 332
Colliery Notes ... 334
Correspondence:
Safety of Coal Mines ... *Mel. Butler* 337
Ore Sampling by Machine. *E. P. Mathewson* 338
Over-Balance Weight for Single Drum Hoist ... *Richard Roelofs* 338
The National Conservation Commission ... 339
Gold in Borneo ... 339
Mount Morgan Gold Mining Company, Ltd. 339
South African Mining Notes. *Special Correspondence* 340
*The Q. & C. Electric Pull Switch for Mine Signaling ... 340
Sampling in West Australia ... 340
New Publications ... 341
Personals, Obituaries, Societies and Technical Schools ... 342
Special Correspondence ... 343
Mining News ... 345
Markets, etc ... 351
*Illustrated.

Transvaal Gold Mining

Gold production in the Transvaal made a record in July, the total reported by cable being 584,455 oz. fine gold—or $12,080,685—which is 929 oz. more than was reported for last December, though the total for that month was swelled by the inclusion of a considerable quantity of gold reserved in previous months. For the seven months ended July 31 the total output was $82,357,796, indicating that the total for 1908 will be not far from $140,000,000, or far in advance of the other great gold-producing countries.

A year ago it was thought possible that the Transvaal had approached its probable maximum output, and there were not wanting prophets who predicted that a gradual decline would soon begin. That the decline will come some time is, of course, inevitable; but at present the time seems distant. There are, indeed, recent signs of a probable increase in production. Among these are the extension of the eastern limit of the Witwatersrand area, as mentioned in our pages last week. The main cause of the gain in production this year, however, seems to be the working of much low-grade ore, which has hitherto been sorted out or left in the stopes untouched. This has been made possible by the reduction in working costs, which has been a prominent feature of recent practice in the Transvaal. Whether this reduction can be carried much further is uncertain, though mine and mill managers are concentrating their attention on this special point, and much may be done when so many able and experienced men unite in the effort. There is a possible doubt on the point whether the working of so much low-grade ore will increase dividends; but there is no doubt that it is a factor in the increase of production.

The withdrawal of Chinese labor from the Transvaal mines, concerning which such gloomy predictions were made a year or two ago, has had no perceptible effect on production. Over two-thirds of the 40,000 Chinese laborers at one time employed have been sent home. Their places, however, have been readily filled by negroes, the supply of Kafir labor having been, for various reasons, more abundant than for several years past.

The Transvaal has some difficult economic problems to work out in the next few years; but it does not seem probable that in that time they will be complicated by any serious fall in the gold production.

The Alabama Coal Miners' Strike

The murderous attack on a train carrying strike-breaking miners near Birmingham is the first notable case of violence which has marked the present strike in the Alabama coal mines. Indeed it is the first instance of such an outbreak in the State which we can now recall. It indicates a change in mining conditions in that State, and the introduction of a new element.

For a number of years the coal mines of Alabama were operated on a sliding scale based on the price of pig iron, in the manufacture of which a large part of the output was used. About four years ago the United Mine Workers, having succeeded in unionizing a considerable number of the miners, declared a strike. The large iron companies, which operate the greater part of the mines, refused to accede to the demands of the strikers, and continued to operate their mines under the old scale. The companies were successful at that time, partly because they brought in a number of men from the outside; partly because the negro miners were hard to hold permanently to any organization, and partly because the companies were secure in the possession of a considerable reserve force in the shape of convicts, hired from the State under the Alabama penal system, who, of course, had no option in the matter. Since that time the mines of the iron companies have been operated on a non-union basis. Most of the commercial coal companies mining coal for sale, however, made terms with the union, and have since been operated with union men. The agreements of these companies expired July 1 and most of them decided to make a reduction in the mining scale. The union had previously been active in organizing all the miners it could reach, and refused to accept the proposed reduction of 10c. per ton in the mining scale, offering as a compromise a decrease of 2½c. only. This was rejected, and a strike was ordered.

The result was that nearly all the commercial mine operators decided to join the iron companies and work their mines on the open-shop plan. Although the number of strikers who joined in the movement planned by the union was larger than had been anticipated, nearly all the mines have continued in operation, and the production has been large enough to supply current demand. As requirements have been recently increasing, with an increase in iron output, it became necessary to bring in a number of men from outside the State, and it was a party of these men who suffered in the recent outbreak.

In the strike of three or four years ago very little violence was reported. That it has occurred now is due to the presence of a new element, consisting of the foreigners who were then brought in to take the place of the striking men, and who are leaders in the new strike. The negro miners are hardly prepared for open warfare, unless they have white leaders, and these seem to have come forward. The State, however, has taken active measures to suppress violence promptly.

The struggle in Alabama is to decide whether the union shall continue to exist. At present the advantage seems to be with the operators, largely for the reasons given for the failure of the former strike. By murder the strikers have put themselves at a disadvantage, and the operators have shown themselves ready to take the opportunity.

The National Conservation Commission

The National Conservation Commission, in its commendable search for information as to the extent of our natural resources, is sending out a schedule of questions for which it requests answers. A large part of these relate to forests, agricultural resources, etc.; those of interest to mining men are published on another page of this issue. We understand that the answers to these questions are to be used only in figuring up the aggregates which the commission desires to obtain approximately.

Some of these questions cover points to which answers will be exceedingly difficult to obtain. This is especially the case with those referring to the quantity of mineral resources unmined and the probable future supply. In the case of coal deposits and of some iron deposits approximations can be reached in many cases; but with other mineral deposits—which include metallic ores—we do not see how any reliable estimates can be obtained. In many cases mine owners and operators would be relieved if they had the information for themselves, though they might not be always willing to give it to others. Comparatively few, even of the larger mines, have ore reserves blocked out or ascertained for a long period ahead. The probable life and future production of a great majority of metal mines are questions which future work must decide; they can be answered for a very few years only, under the best conditions. "The probable duration of the supply of each important mineral," which the commission seeks to ascertain, must be, at best, founded on estimates which are merely guesses at the truth—and in many cases very wide guesses.

The schedule of the commission contains, however, a number of questions which ought to bring valuable information and expressions of opinion. The proper collation and presentation of the answers, or their substance, should result in publications of value to the public.

The Prospector and His Motor Car

The automobile has made a place for itself in the mining industry. In Nevada the uses to which the gasolene-driven car has been put are endless, and it is only a question of time when some enterprising manufacturer will put upon the market a machine especially designed for the rough work of the prospector and miner. At present one sees luxuriously upholstered cars, built for pleasure touring on well made and well kept roads, loaded with tools and supplies, doing the work of the burro and the pack mule.

The advantages of a means of transportation that consumes nothing but gasoline and a little lubricating oil in a desert country is obvious. Pack-trains are slow at best, and prospecting is not the leisurely business it once was. The news of a new strike now travels rapidly, and against the man with a swift motor car to carry him to the new camp the old-time prospector with his burros has no chance whatever. All the desirable locations will have been staked out while the pack-train is still crawling across the desert miles away.

A prospector who recently covered 6000 miles during a six months' trip in Nevada predicts that the automobile will supplant all other means of transportation in certain sections of mining country, in spite of the difficulties to be overcome. Difficult mountain grades and wastes of sand are not insurmountable obstacles. High power seems to be indispensable, not so much for the speed which it makes possible, but to negotiate the steep grades and heavy sand. Much of the driving across the plains must be done at low speed, because all the power available is necessary to plough through the sand.

In rough country the machine is preceded by a man on foot who gives timely warning of approaching mule teams on the narrow roads. Automobiling in search of likely prospects is not touring for pleasure, but it is far less fatiguing than tramping the desert with animals. The prospector steps out of his car at the end of his journey fresh and fit for work.

So common is the motor car in certain mining districts of Nevada that travelers frequently find it easier to get gasolene than to get water either for drinking purposes or for cooling the motor.

Signs of Improvement

The present activity on the Stock Exchange and the gradual gains in prices of the important metals may be taken as signs of the passing of the depression of the past year; just as the break in stocks and the fall in metals preceded the panic of last October. Stock Exchange advances may savor of manipulation, and of the work of certain interests; but, after all, Wall Street has a certain foresight, the correctness of which has often been proved by events. Of course, the tendency is always to go too far and too fast, and to discount the future at too high a rate, but this does not disprove the accuracy of the general direction. The steady advance in metals is evidence of an increasing demand, which is based on solid improvement and confidence in the future.

THE GARFIELD SMELTING Works appears still to be having more or less trouble, due chiefly to the draft system. A single chimney may satisfactorily serve a large plant of this character, as for example the Washoe works, but it is neither theoretically nor practically the best arrangement. In this respect the Steptoe smelter, with a chimney for each department, presents a more logical design. In zinc-smelting practice there is a chimney for each pair of furnaces.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Safety of Coal Mines

With reference to safety in coal mines, there are four important things to be considered: (1) Examination for miners; (2) apprenticeship for miners; (3) clearance letter, or service letter for all underground men; (4) improvement in the camp living conditions.

A law providing for and governing the examination of miners should be national so as to be uniform in all States and Territories, and to be carried out without partiality and injustice. It should provide for a sufficient number of capable men on each State examining board to do the work thoroughly and conveniently. Three men should be on each board, and examinations held at suitable times in each camp, or some city easily accessible to the men to be examined.

I would recommend a fee of $5 for the examination so as to prevent any "railroading," and deter persons that feel doubtful about being competent from taking the examination until they are fully prepared; also to make the examining board as near self-supporting as possible.

The examinations should be conducted in a manner that will not only determine what the applicant knows, but will do some educational work at the same time. In addition to the practical things a miner should know, there should be some questions of a theoretical nature, so as to induce reading on the part of the men.

The men now working as miners should be required to pass a practical examination; and while these cannot at first be made as severe as they should eventually be, they should be rigorous enough to eliminate the incompetent. The State laws should be made more nearly uniform, and prepared to fully cover the duties of superintendent, pit-boss, fire-boss, engineers, miners, etc., and of the operator. No one objects to laws if all are compelled to comply; heavy penalties should be provided for violations. The requirements for certificates should be: (1) Age, 21; (2) American citizen—the foreign element feel more amenable to our laws when naturalized; (3) Ability to read and write English. This is of the utmost importance in order that the men may be able to read notices and instructions, and understand what is told them.

Apprenticeship for Miners

It is more important that coal miners be competent and careful men than in any other class of work, as in no other occupation are the lives of so many fellow workers dependent upon the acts of each individual. Nearly all States require underground coal-mine foremen and fire-bosses to pass an examination before being allowed to serve in such capacities. This is good so far as it goes, but it does not reach the proper men. Practically all the accidents and explosions are caused by the miners, and these are the men that need educating to make coal mining a safe and attractive work.

Some people think it only requires a strong back and a few months' experience to become a good miner, while in fact it is a life study. Coal miners are among the best paid workmen, and they deserve the dignity bestowed on the other classes. Our production is materially increasing, and there will be work for several generations of miners yet to come.

Where there are two "miners" in a place, all instructions must be necessarily given to both, and unless they have been partners for a long time and one is naturally the leader, neither feels like starting first to comply. Again, being equally responsidle, they are each prone to let the other look out for himself.

Under the "miner and laborer" system, the foreman will issue his instructions to one man, the miner, and he will be held responsible for the compliance. Again, the miner will naturally look out for the laborer and prevent him from committing any foolish acts. It will be to the advantage of the miner to get as much work as possible out of the laborer; this will cause him to teach the green man to work to advantage and learn. If the miner is not considerate and steady, he will not be able to keep a laborer, and if the laborer is not steady and willing, he will be justly forced out of the ranks, as he will not be able to get a miner to take him.

There are many capable and safe miners today who have been forced out of the mine on account of being crippled or too old to perform the necessary physical labor. Under this system, his life of usefulness will be greatly lengthened if he could use his "head" and the laborer would perform the heavier part of the work. There are also many men who are averse to going underground, because they are compelled to work with anybody, regardless of personal habits and inability to do his share of the work. A good man does not want a partner that is repulsive to him and one that shirks, and yet wants half on pay day. There are many clean, strong and level-headed young men who would be glad of a chance to learn to be miners if they could go in with a man whom they felt sure would protect them. This system will enable the competent miner to make better money and serve to make each man rely on his individual efforts. The apprenticeship should consist of not less than two years' service, not necessarily at one mine.

A Clearance Letter

The "clearance-letter" system in vogue on all railroads has proved to be a benefit to all concerned. It is a check to the employee and prevents many rash acts. It also enables the employer to learn the man's past record. This will tend to keep a steadier class of men, and when an applicant for work as a miner, having a certificate, applies to the foreman, the latter knows that the man has passed as competent, and from his service letters he will know the applicant's record. There should be a severe penalty for any person issuing a false or misleading service letter. No foreman need hesitate to hire a man who has been previously discharged for some rash act, providing nothing else is against him. The fact that he knows the man's faults enables him to know what to watch for.

The unreliable or unsafe man has no rights that are entitled to consideration, but the other class has a right to demand protection, and to accomplish this end a broad view (eliminating selfishness and personal fears of any possible injustice as an individual) must be taken. Any system is susceptible of some occasional abuses.

Improvement in Camp Living Conditions

The living conditions in coal camps are anything but pleasant. Some of the newer towns are designed to present an attractive appearance outside, and the houses built to avoid sameness, but what improvement has been made on the inside? Not a single closet in the house, no pantry, single floors, so that the children playing on the floor always have colds. The windows and doors let in all kinds of wind and dust, and seldom is there running water in the house. It is a rare thing to even find a kitchen floor level. Workers of the family are compelled to wash in the kitchen, because there is no suitable wash-house. All these things tend to make the wife's work unnecessarily hard.

In the employment problem you will solve nine-tenths of the question by making the home conditions such as will make the wife contented. The large factories and mills have discovered this, and have made a notable improvement not only in the working conditions, but in the home conditions. The home conditions are more important than any other.

Increasing wages is an endless chain. The living conditions must be such as will develop the young into useful men and women. If the houses, etc., are built for the worst class, that is the kind of labor the company will get, and conditions will continue to grow worse.

The company stores should be made an inducement for people to live in the camps. Schools should be the best. I do not approve of having a saloon in the camp; however, as there is no use trying to keep liquor from confirmed drinkers, the saloon should be just a bar, no chairs and no room to loaf, no credit extended and no treating; the company to own the saloon, and all the profits go to the betterment of camp life.

Healthy people must have amusement, for if no healthy amusement is provided they will seek other forms. There should be a suitable hall for shows and dancing, a reading room, pool room and gymnasium, and the company should provide for suitable shows, etc., nothing free, but a small charge to make up the deficiency, if any. A baseball nine does wonders toward producing camp loyalty. Some camps are practically run just for the profit made from the store and saloon.

The above, I firmly believe, will greatly increase the safety of coal mining, increase the standard of individual workmanship, and in every way produce a healthier, happier and better class of citizens. As for mechanical safety appliances, the mines are generally well equipped, and something must now be done to reach the individual worker to make the mines safer.

Mel. Butler,
Superindentent Big Six
Coal Company.
Palmer, Wash., Aug. 1, 1908.

Ore Sampling by Machine

In the article on sampling, by John A. Church, in the Journal of July 18, it appears to me that the author has not investigated conditions at *modern* sampling works, either custom or private, in the Rocky mountain region of the United States. For many years very efficient sampling machines have been in use in the district referred to.

The matter of the separation of the fine and coarse particles in transit through the mill, during the sampling operation, is taken care of satisfactorily in all modern mills by reducing the lengths of the spouts between cutting devices and by using shaking feed for the crushers and rolls throughout the sampling mill.

Again, the cutting machines most in use are time cutting machines, i.e., they are so proportioned and speeded as to take the whole of the stream of ore, for a given interval of time, every so often.

These various improvements correct any errors that might arise from the separation of the fine and coarse particles in transit through the mill.

I have found that there is sampling done at the present time that is almost as accurate as the best assaying. The accompanying table shows, (1) a comparison of sampling plants, under the columns *A* and *B*; and (2) a comparison of assayer's work in portions of columns *B* and *C*. The sampling machines represented by the columns *A* and *B* were both of the same type and had all the improvements referred to. The ore, in 50-ton lots, was put through one sampler and then through the other. In the comparison of assayer's work on the "golds" there is relatively a great percentage of difference, but this is due to the very small quantities of gold in the ore.

A COMPARISON OF SAMPLING.

Lot Numbers.		Per Cent. Copper.			Oz. Silver.			Oz. Gold.		
A	B & C	A	B	C	A	B	C	A	B	C
2463	547	5.10	4.91	4 80	1.90	1 80	1 90	0.020	0 026	0.015
2464	548	3.42	3 82	3.70	1 50	1.70	1.80	0.018	0.026	0.010
2465	549	3 75	3 69	3.71	1.30	1 30	1.40	0 015	0.015	0.007
2466	550	6.13	6.03	5.86	2 10	2 00	2.20	0.015	0.022	0.015
2490	554	4 42	4.22	4 07	1.40	1.40	1.50	0.012	0.020	0.007
2491	552	4.02	4.57	4.48	1.30	1 40	1.60	0.012	0 015	0 007
6231	5730	4 08	4.03	4.01	1 70	1 60	1.40	0.02	0 02	0.025
	118	3 54	3.38		1.30	1 30		0.007	0.007	
2118	38	7.03	6 95		6.9	7 8		0.015	0.012	
2119	37	7.44	7.01		6.6	6 9		0 015	0.015	
2121	40	9.15	9 32		10 7	10.10		0.022	0 03	
2122	45	15.11	14.48		53 20	53 20		0.010	0.010	
2124	46	6 91	5.98		18 6	17.70		0.010	0.012	
Total of assays		80 10	78 39	30 63	108.50	108 20	11.80	0.191	0 230	0 086
Mean		6 16	6 03	4.38	8 35	8 32	0.169	0 015	0.018	0.012
Difference			0.13			0 03		0.003		
Per cent. difference		2.11			0 36				16.67	

COMPARISON OF ASSAYERS.

		Per Cent. Copper.			Oz. Silver.			Oz. Gold.		
Total of assays			31 27	30 63		11 20	11 80		0.144	0.086
Mean			4 47	4 38		1 60	1 69		0.0206	0.0123
Difference				0 09		0.09				0.0083
Per cent. difference			2 01				5 33		40.29	0.0083

E. P. Mathewson.
Anaconda, Mont., July 28, 1908.

Over-Balance Weight for Single-Drum Hoist

In the Journal of Aug. 1, I note the comment of J. J. Smith on an article by S. A. Worcester in the Journal of May 2. Mr. Smith deplores the fact that Mr. Worcester suggests a patent, for the latter states in his article, "that the management decided to install the overbalance weight, my invention, on which patent is now pending."

Mr. Smith is right. The idea is old and has been used many times at many different places. The Cresson mine at Cripple Creek was the first mine in that great district to use a counterweight. It has been in use over two years without any hang-up and, with deference to Mr. Worcester and his excellent work, it is made from a design that has less liability to hang up, as the bearing surface is the entire length of the frame, as in a cage; or briefly, the shoes on the counterweight frame are arranged as on a cage or skip. Incidentally I might add that when this counterweight was installed at the Cresson, as well as at the present time, a skip was in use.

As a matter of fact, the use of the counterweight on the Cresson attracted the notice of the owners of the Findley mine and was the direct cause of the employment of Mr. Worcester to design one for the Findley. So the Cresson antedates the Findley, and further many counterweights antedate the Cresson. The only differences in counterweights in in the design, or possibly in the casting. Mr. Collins, now with the Montana-Tonopah, used a counterweight at the Combination mine, Goldfield, Nevada, when he was superintendent there. So it is obvious that Mr. Smith is right and that the idea is old and unpatentable.

The advantages of the use of a counterweight are well and skilfully stated by Mr. Worcester.

Richard Roelofs,
Supt. Cresson Mine.
Cripple Creek, Colo., Aug. 5, 1908.

Dry walling (G. Preumont, *Min. Journ.*, June 20, 1908) is called *poteo* in Peru and Bolivia and is much used. The dry walls are quite similar to those built in Mexico, as in both countries the system was introduced by the Spaniards. In forming the arch for lining a drift, stones cut to fit are used; these stones are cut in quarries, generally from a dacite or a diorite, and are sold to the mines in large quantities. At Corocoro these cut stones for the arch cost from 2 to 4d. each. The cost of dry walling a drift with the wage of the men at 7s. 6d. per day is from 24 to 35s. per foot.

The National Conservation Commission

The outcome of the recent conference on the conservation of national resources has been the appointment of the National Conservation Commission, of which Gifford Pinchot is chairman and Thomas R. Shipp secretary, both with headquarters at Washington. The first business of the commission is to collect information; and to that end it has now, through its executive committee, presented a schedule of inquiries for the inventory of natural resources. The schedule is the combined result of careful study by the chiefs of bureau concerned and by the executive committee. Criticism and suggestion regarding it are invited. The compilation of material is going forward rapidly, under the supervision of Henry Gannett, who reports substantial progress since the last bulletin was issued.

Under Section A, Public Land Laws, the questions submitted possess interest for prospectors, locators and owners of mineral lands, the title to which is derived from the United States. These questions are as follows:

1. What have been the policies and results of our public-land system?

2. What specific changes are necessary in the public-land laws to promote the best permanent use of the land?

3. Preparation of a code of public land laws.

4. Is the tendency toward larger or smaller individual holdings generally? In any region? (*a*) Farm lands. (*b*) Timber lands. (*c*) Mineral lands.

5. What are the causes for this tendency?

In Section G—Minerals—the questions to which the committee seeks to obtain answers are as follows:

1. Approximate quantity of our mineral resources: (*a*) Mineral fuels (coal, lignite, oil, gas). (*b*) Iron ores. (*c*) Other ores and minerals.

2. Approximate production and use: (*a*) Annual production and consumption, and total production to date, of each important mineral. (*b*) Rate of increase of production. (*c*) Influence of re-use of metals on production.

3. Probable duration of the supply of each important mineral.

4. Nature and extent of waste in the mining extraction, and use of mineral products.

5. Methods of preventing or lessening this waste.

6. How can the duration of mineral resources be extended by: (*a*) Complete utilization of by-products. (*b*) Prevention of waste in mining and extraction. (*c*) Increasing efficiency in use. (*d*) Discovery and development of substitutes for materials and methods now in use.

7. Deterioration and loss of metals and other mineral substances through destructive agencies: (*a*) Extent of such deterioration and loss. (*b*) Nature of such action and methods of preventing it.

Under miscellaneous information the committee asks for answers to questions under the head of Life and Property, the first being of special interest to mine operators, and the second of more general application, as follows:

1. Conservation of life and property in mining: (*a*) Nature and extent of loss of life in mining. (*b*) Nature and extent of property losses in mining. (*c*) Causes and probable prevention of mine accidents, mine fires, etc.

2. Conservation of life and property through prevention of surface fires: (*a*) Nature and extent of the loss of life from fires. (*b*) Nature and extent of the loss of property from fires. (c) Total cost of fire losses, fire insurance, systems of fighting fires, water systems for same, etc. (*d*) Possible prevention of such fires through: (1) The investigation of fire-resisting properties of materials. (2) The investigation of fire-proofing systems. (3) Changes in building materials and systems.

Gold in Borneo

The total known production of gold in Sarawak, North Borneo, from the beginning of 1898 to the end of 1907, was 308,629 oz. fine, or $6,379,361. The production for the 10 years, by years, was as follows, in ounces of fine gold:

1898	1,889	1903	40,329
1899	12,499	1904	41,341
1900	20,871	1905	44,299
1901	32,220	1906	39,186
1902	34,256	1907	41,751

The return for 1907 shows an increase of 2565 oz. over 1906, though it was 2548 oz. below 1905, the year of greatest production. The whole of this gold was produced by the two mines in Upper Sarawak belonging to the Borneo Company, Ltd., which has its offices in London. The Chinese do a very limited amount of gold washing in different places, but the government keeps no record of the output. At the best it is insignificant, and cannot amount to more than 100 oz. a year.

At the two mines mentioned about 18,000 tons of ore are handled each month. There is no free gold, and all the material is cyanided direct. The ore consists of metamorphosed and brecciated shales, but the bulk of the gold is obtained by cyaniding the clays, which are decomposition products of the shales. This is done at one mill by treatment in lumps in very shallow vats—2 ft. deep—and at the other mill by puddling the clays, fine grinding the ore and sands and filter pressing. A large installation of Ridgway's vacuum filters is now being put in.

Borneo is one of the countries which have not been thoroughly prospected, and it is not improbable that other gold deposits may be found in time.

Mount Morgan Gold Mining Company, Ltd.

The 23d annual report of the Mount Morgan Gold Mining Company, Ltd., is for the year ended May 31, 1908. In this year the total receipts from all sources were £911,724, of which £359,838 was from gold won from mundic and oxidized ore, £532,854 from blister copper, £17,617 from copper precipitate, and £1415 from sundry receipts. Against this is an expenditure of £648,360, which includes £65,856 paid to the Queensland government, £326,590 for wages, £255,914 for miscellaneous expenses, and £48,956 written off against plant and machinery account.

The total ores mined and treated amounted to 405,601 tons, which necessitated the removal of 287,834 tons of waste rock. There were 38,037 tons of iron ore, and 89,086 tons of limestone used for fluxes. The metals produced in the fiscal year were 153,092 oz. gold valued at £650,288, and 5561 tons of copper, valued at £278,000. Of the three classes of ore mined the oxidized ore comprised 123,469 tons; sulphide gold ore, 117,770 tons; and auriferous copper ore, 155,714 tons; total, 396,953 tons. The oxidized ore has shown a yearly depreciation in its gold content, and it is believed that mining this ore will have to be abandoned.

The total amount of sinking and driving was 4852 ft., of which 3326 ft. was driving. The overburden removed from the open-cut was 273,000 tons, which enabled the extraction of 154,000 tons of payable ore.

At the reduction works the average grade of all ore treated was 7.06 dwt., of which the ore treated at the Mundic plant averaged 10.89 dwt., and at the West plant, 3.40 dwt. The cost per ton at the Mundic works was 14s. 2.61d., and at the West, 10s. 7.93d., against 13s. 3.21d. and 10s. 6.36d., respectively in the previous year.

The electrolytic copper refinery at Port Kembla, N. S. W., in which the company is interested, is expected to be completed in December, 1908, at which time the company will treat its blister copper instead of shipping it to America for refining.

The contract for the erection of the first cyanamide plant to be built in North America has just been let (*Amer. Fertilizer*, June, 1908). The plant will be built on the Canadian side of Niagara Falls and will have an initial capacity for making 7500 tons of this artificial fertilizer.

At the Corocoro copper mines, Corocoro, Bolivia, inclined winzes with steps cut in their sides are used to connect the levels, which are 22 m. apart. Some of the mines are from 700 to 900 ft. deep and the men enter and leave them through these winzes.

South African Mining Notes

SPECIAL CORRESPONDENCE

In view of the recent decision of the Robinson company to erect an extra 50 stamps to treat the large tonnage of Main Reef lying intact below Leader stopes in the greater part of the mine, importance attaches to the reference to Main Reef possibilities contained in the annual report of the Robinson Deep. The superintending engineer states that stoping on certain areas of the Main Reef, which were included in the previous year's ore reserves, has shown that this reef is of erratic value and patchy in character. Although part of this ore will undoubtedly be worked at a profit, it has been thought best to exclude it from the forecast of ore reserves.

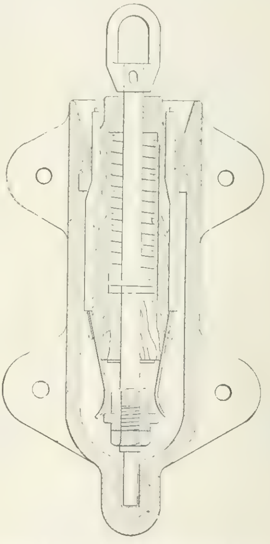
The dissolution of the North Witwatersrand Gold Mines, Ltd., floated in 1904 to exploit the several reefs underlying the Main Reef series to the west of Johannesburg, has come about in what has appeared the natural order of things to many. Financial difficulties are ostensibly the cause of the company's collapse, but a more significant factor has been the failure of development results to justify further big capital expenditures. The auriferous deposits of the Lower Witwatersrand formation, quartz veins, conglomerates and sandstones, have long been known to contain rich patches and were exploited even before the discovery of the Main Reef; but it is now proved almost conclusively that there is little hope of establishing another Rietfontein upon these precarious Northern series.

The Budget speech of the Transvaal treasurer, McHull, was remarkable for the expression of ministerial good feeling toward the administrators of the gold mining industry. Mr. Hull has personally been one of the most unsparing critics of the mining houses, and his remarks are thus doubly gratifying, when he declares that recent results have reflected the "greatest credit upon all who are associated with the management of the mines. I am assured and I believe that a further reduction in working costs is not only possible, but probable, and that we are within measureable distance of the time when the orebody known as Main Reef will become a workable and payable proposition. The government will render every aid which is possible to bring about this desirable result."

The Q & C Electric Pull Switch for Mine Signaling

The slowness of the bell-rope system of signaling when rapid hoisting is being done has caused the development of electric signaling, and the bell rope at the larger mines has become merely a subsidiary system to be used in case of accident to the other systems, and for signaling from the cage itself. At first, simple push buttons were used, but the numerous troubles arising from their use in wet shafts has resulted in several more elaborate, but more satisfactory, electric signaling devices being placed on the market. Some of these devices depend upon the making and breaking of an electric-lighting circuit, others on the ringing of an electric bell.

The Q & C pull switch, made to operate on a bell circuit, is one of these newer water-tight switches which is being used in several of the mining camps of the West. It consists of a make-and-break piece, the copper disk in which is pulled against the contacts by the signal cord when the signal is given. A spiral spring breaks the circuit quickly, rendering the signal sharp and distinct. The electric wires enter at the bottom, and the whole is so inclosed in an iron box that it is thoroughly protected from water and dampness. The insulation is either wood, rubber, or vulcanized fiber. This switch can be used with a battery current, or a circuit from the lighting system.


SECTION OF THE Q & C ELECTRIC PULL SWITCH

The switch is bolted at the different levels to the side of the shaft post, facing the station and high enough so that the pull rope will be out of the way of timbers which are being loaded from the cage.

This signaling device is used at Butte, Mont., and at Bisbee, Ariz., as well as elsewhere in the West, and appears to give entire satisfaction. It is made by the Quincy, Manchester, Sargeant Company, Old Colony building, Chicago, Illinois.

Sampling in West Australia

In West Australia sampling at the mines is very close and careful, according to E. Davenport Cleland (*Journ.* Chamber Mines, W. A., May, 1908). The drillings from drill holes, section samples from the sides and roof, and grab samples taken from the broken ore while mucking it out are used in determining the value of ore being mined or developed. In drifting, the drillings from the dry holes are assayed in samples representing 2-ft. sections along the vein. As soon as a round of holes is blasted and cleaned out, the fresh face is sampled and then the sides of the drift in sections of 2 or 3 ft., at right angles to the dip of the lode. Finally a grab sample of the broken ore is taken as it is loaded into the cars. In order to prospect for parallel veins, 5-ft. holes are drilled, at intervals of 10 or 15 ft. along the drift, into the wall or walls of the vein. The drillings from these holes are sampled in 3-ft. sections.

Crosscuts in ore are sampled in 3-ft. sections along their length, and both the drillings and the muck are sampled as in the case of drifts in ore. In the case of crosscuts in country rock, two samples, one on each side of the crosscut, are taken for each round of holes blasted. When ore is found the sections are carefully resampled. The drillings from one of the holes in the face are also assayed. Before abandoning a crosscut a hole from 10 to 15 ft. long is drilled in the face, and the drillings assayed in 3-ft. sections.

The faces of raises are sampled in 30-in. sections after every round blasted. In winzes, samples are taken along the ends as close to the bottom as possible, for there is too much danger of salting the sample with fines if the bottom of the winze is sampled. In both raises and winzes, holes are drilled into the sides at stated intervals and the drillings sampled in 2-ft. sections.

In stopes, while work is in progress, the faces are sampled in 3-ft. sections across their entire width. Holes 6 ft. deep are also bored into the sides, at 15-ft. intervals along the stope. In case any ore is disclosed the payable width is stripped off and the face sampled.

The position of all samples, together with the value and width of the ore, is recorded and ore reserves are computed when developed on three sides. The vein is divided into blocks 100 ft. in length along the vein, and the value and tonnage of ore in each block is calculated separately.

A writer on the copper and brass industries states that scrap copper wire of high conductivity makes excellent metal; and if it is pressed together in small bundles the loss in melting is slight. Scrap telephone wire is not so good for brass making because it often contains silicon.

New Publications

Annales de la Societe Geologique de Belgique. Vol. XXXV, Part I. Pp. 33, illustrated. 6½x10 in.; paper. Liege, Belgium, 1908: H. Vaillant-Carmanne.

Poor's Manual of Railroads, 1908 Forty-first Annual Number. Pp. 2074. 6x9 in.; cloth, $10. New York, 1908: Poor's Railroad Manual Company.

The fact that the present issue is the forty-first in yearly series is, perhaps, the best comment that is needed. "Poor's Manual" has long had an established reputation as an authentic source of information on railroads and railroad securities, which has made it indispensable for all who require such information. The introduction gives a summary of railroad operations and results which is nowhere else to be found in condensed form. Its figures are generally accepted as authoritative. The present volume bears all the marks of careful compilation and accurate statement which have marked its predecessors.

Colliery Explosions and Rescue Appliances. By W. Galloway. Pp. 120; illustrated, 7x10 in.; paper. London, 1908: Gresham Publishing Company.

The book is a valuable addition to the author's work entitled, "Practical Coal Mining." The question of barometric pressure as an agent in causing gas explosions in mines is dealt with in detail. Methods of detecting firedamp, and a discussion of the various safety lamps are included. The chapter devoted to blasting is thoroughly practical, and contains an excellent description of modern methods of testing explosives. The most popular and interesting discussion is that relating to coal dust. The volume is the author's best contribution to the subject of colliery explosions, and is the most modern work yet produced along this line.

The Labor History of the Cripple Creek District; a Study in Industrial Evolution. By Benjamin McKie Rastall. Bulletin No. 198, University of Wisconsin. Pp. 166; illustrated. 6x9 in.; paper, 50c. Madison, Wis., 1908.

This is an interesting account of the series of labor troubles which was the most bloody and in all respects the most disgraceful in the recent mining history of the United States. No good citizen can review it in the pages of this book without a feeling of shame that such things were. When in the strike of 1894 the State of Colorado through its force of deputy-sheriffs recognized the belligerency of the strikers, under arms, to the extent of arranging with them an exchange of prisoners there was a sacrifice of dignity that bore terrible fruit in the more serious strike of 1903-04. Mr. Rastall tells the history of both the strikes with an unusual minuteness of detail; much more, we think, than there is any good reason for doing. As a history, which is well-told and is as entertaining as a romance, his work is a great success. As a sociological study of the labor conditions which permitted these strikes and the part of the Western Federation of Miners it is decidedly weak. We must say, however, that Mr. Rastall's work impresses us as being done in a remarkably impartial manner, and we have no doubt that it will find unqualified acceptance as an accurate statement of facts, from which subsequent students of the labor question will be able to deduce their own conclusions.

Peat and Lignite: Their Manufacture and Uses in Europe. By E. Nystrom. Canada Department of Mines. Pp. 247, illustrated. 6¼x9½ in.; paper Ottawa, Canada, 1908.

This publication embodies the results of an exhaustive investigation, undertaken under the direction of Dr. Eugene Haanel, Canadian director of mines, into the peat industry of Sweden, Norway, Finland, Denmark, Germany, Holland and Ireland to ascertain how far the methods, processes and machinery, in use in Europe for the exploitation of the peat deposits, are suitable to Canadian conditions. Canada possesses extensive and widely distributed areas of peat bogs, the total extent of which is 37,000 square miles, according to a statement of Dr. R. Chalmers, of the Canadian Geological Survey, based largely on estimates so far as the West is concerned.

The exhaustion of the forests and the increasing value of wood for other than fuel purposes has made the problem of fuel supply one of increasing importance, and has directed attention to the undeveloped peat resources and several attempts have been made to manufacture peat fuel; but in most cases financial failure has been the result. As the author points out, the industry in those European countries where it is now firmly established had to pass through a similar phase at the outset. The methods at present used for peat-fuel manufacture depend upon air-drying, the question of economically removing the water from the peat being the main problem. The industry abroad is largely carried on in connection with drainage works with the object of rendering the land, which is practically valueless in its original state, fit for cultivation. In the more thickly populated sections of Canada the increased value of the land when drained would be a substantial factor. A detailed account of the assistance afforded by European governments is given.

The opening chapters of the report deal with the occurrence, classification, composition and calorific values of peat and its various economic uses. Analyses of the Canadian product indicate that it compares favorably with many of the European peats, the percentage of combustible matter ranging from 66.80 per cent. for the Brockville, Ont., peat, to 81.64 per cent. for that of Ste. Thérèse, Russell county, Ont. The most important feature of the work is the detailed description of the processes and plants employed in the manufacture of air-dried peat fuel in the countries visited. There are copious details of cost of plants and of production. The manufacture of peat and lignite briquets is also fully dealt with. A point which is strongly emphasized is that the method and machinery employed must be suited to the nature of the bog to be worked and to local conditions.

In Canada, at least in the southern parts of the central provinces conditions are quite as favorable for the manufacture of peat fuel as in Europe. While the method of adding water to the peat in the pulping and mixing machine can be recommended where suitable drying fields can be obtained, or where only a small production is required, in the majority of cases the employment of peat machines is regarded as preferable. Where bogs are comparatively free from roots, trunks and stumps, the employment of mechanical excavators is a great advantage, the machinery and method invented and used by O. Strenge at Elisabethfehn, Oldenberg, Germany, being probably one of the best. In cases when roots and stumps are present the advantage of mechanical excavators is doubtful and the most suitable machinery and methods are those invented by A. Anrep, of Sweden.

Mr. Nystrom does not speak encouragingly concerning the manufacture of peat briquets, which has not, so far as can be judged, proved a lucrative undertaking in Europe. The increased fuel value does not cover the extra expense of artificial drying and briquetting. The wet-carbonizing process by Doctor Ekenberg of London., Eng., however, is promising and is attracting some attention. Lignite briquetting, on the other hand, has proved satisfactory and attained large proportions in Germany, and the author considers that part of the lignites in Manitoba and Saskatchewan would prove suitable for treatment by these methods.

Among other branches of the industry which might be found remunerative in Canada, the report refers to peat powder, peat coke and peat gas for power purposes. With power plants erected at the bogs the bulkiness of peat fuel would be less of a drawback, and as the peat employed in gas producers can be used with about 40 to 45 per cent. of moisture, the drying conditions would be of less importance. The manufacture of moss litter for bedding and packing purposes is a growing industry in Europe and peat mull is also used with satisfactory results as packing material. The use of peat for the manufacture of textiles, paper and alcohol is regarded as being too experimental to warrant recommending enterprises of this character.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of of their movements and appointments.

G. C. Kaufman, of New York, is in Mexico on professional business.

R. H. Toll, of Denver, Colo., is examining mines in southwestern Colorado.

S. F. Shaw, of Chicago, is engaged in examining some mines near Jimenez, Chihuahua, Mexico.

Mark B. Kerr has opened an office in the Mills building, San Francisco, as general consulting engineer.

W. H. Paul, formerly of Colorado, is now manager of the Dolores Mines Company, Dolores, Chihuahua, Mexico.

Joseph William Teale has been admitted as a partner in the firm of Bainbridge, Seymour & Co., Salisbury House, London.

S. W. Mudd was in Salt Lake, Utah, recently, after having made an examination of the Ray copper mines in Arizona.

Francis J. Peck, of the firm of Francis J. Peck & Co., Cleveland, Ohio, is examining property in Canada for eastern capitalists.

W. E. Defty has left Mexico and is now making mine examinations at Breckenridge, Colo., and in the Leadville district.

R. McCluskey, of Georgetown, Colo., has gone to Alamagordo, N. M., to assume the management of a copper property.

Fred Hoar, superintendent of the Lake Superior & Arizona mine of Arizona, is a visitor at the Lake Superior district for a short time.

C. W. Purington, who is at present in the Ochotsk district of East Siberia, is expected to return to San Francisco in November.

George Crerar has been appointed treasurer and general manager of the Beryl Mining Company, of Baja California, Mexico.

J. P. Miller has been appointed assistant general superintendent of the properties of the Ellsworth Collieries Company, at Ellsworth, Penn.

R. S. Weitzell has been appointed general superintendent of the Sunday Creek Company's Hocking mines, with headquarters at Athens, Ohio.

Silas W. Eccles, vice-president of the American Smelting and Refining Company, was in Salt Lake, Utah, last week, on his return from Alaska.

W. P. Dunham, of Los Angeles, Cal., is in Chihuahua, Mexico, on his way to Pinos Altos, in which section he is carrying on extensive operations.

John A. Traylor, of the John A. Traylor Engineering Company, Denver, Colo., has been spending a few weeks in the State of Chihuahua, Mexico.

H. Forbes Julian, cyanide expert with Chas. Butters & Co., Ltd., has been in Mexico City for several days on his way to Salvador, Central America.

J. E. Spurr has been making an examination of the West End mine, at Tonopah, Nev., for the owners, with a view to planning future development work.

Percy A. Babb is in Jalisco, Mexico, for the Mexico Mines-Prospects Development Company. His company will shortly build a mill and cyanide plant in Oaxaca.

William Mungall has resigned as superintendent of Ellsworth Nos. 3 and 4 mines at Ellsworth, Penn., to accept the position of general manager of the Fife Coal Company, of Scotland.

D. W. Shanks, general manager of the Compañia Minera de Rio de Plata, has returned to Chihuahua, Mexico, and will shortly leave for Los Angeles, Cal., to be absent several weeks.

W. J. Mitchell, superintendent of mines for the American Smelting and Refining Company, at Santa Eulalia, Chihuahua, Mexico, has returned to the mines after six weeks in California.

John H. Kirby, president of the Kirby Development Company, has been in Mexico City with Fred E. Erwin, of New York, who is reporting on the properties of the company in the State of Jalisco.

S. Herbert Coxe has been appointed professor of mining in the Royal School of Mines, London, and has, therefore, severed his connection with the firm of Bainbridge, Seymour & Co., mining engineers.

E. H. Coxe, superintendent of coal mines of the Tennessee Coal, Iron and Railroad Company, was slightly wounded Aug. 9, in an attack made by strikers at Blocton, Ala., on a train carrying non union miners.

Benjamin Magnus, general manager of the Electrolytic Refining and Smelting Company, of Australia, is erecting a large plant at Port Kembla, New South Wales, and has his present address at that place. He expects to have two 100-ton refining furnaces ready by December.

On July 22 a large number of leading members of the British Iron Trade Association assembled in London to do honor to James Stephen Jeans, the occasion being his retirement, owing to ill health, from the position of secretary, to which he was appointed in 1877.

The partnership existing between Charles J. Bandmann and W. J. Adams, as mining engineers, has been dissolved by mutual consent. C. J. Bandmann retains the offices in the Monadnock building, San Francisco, and will settle the accounts of the firm. W. J. Adams has established his office at No. 237 Sansom street, San Francisco.

F. G. Clapp, for seven years with the United States Geological Survey, engaged in investigations and preparation of reports on coal, oil, gas and artesian waters, has resigned from the service, in order to engage in expert practice of geology and allied branches of engineering. A partnership has been formed with A. W. Bee, Jr., and office opened in Pittsburg.

Obituary

Cyrus W. Merrell died in Cleveland, O., July 22, 1908, of pneumonia. Mr. Merrell was associated for 26 years with Oglebay, Norton & Co., of Cleveland, and was secretary of the Commonwealth Iron Company, the Montreal Mining Company, the Bristol Mining Company and the Castile Mining Company.

Charles Gordon Zug, vice-president and general manager of the Zug Iron and Steel Company, of Pittsburg, died at his summer home in Flushing, N. Y., Aug. 10, aged 36 years. He was born in Pittsburg, graduated from the Western University of Pennsylvania, and had been long connected with the company, which was established by his father.

The many friends of Charles F. Shelby, for many years connected with the smelting industry in the United States, at Denver, Aguas Calientes, Mex., and Globe, Ariz., and at present superintendent of the reduction division of the Cananea Consolidated Copper Company, Cananea, Mex., will hear with regret that he arrived in New York, Aug. 7, on a sad mission. He came to take charge of the body of his wife, who died at Far Rockaway on Aug. 3. Mr. Shelby left the same day with the body on a special train for Omaha, where the interment will be made. Mrs. Shelby had been ill since last November, and recently it was found that she was suffering from internal carcinoma and that the disease had progressed too far to be cured. Mrs. Shelby leaves no children. The funeral services were held in St. Patrick's Cathedral, New York.

Societies and Technical Schools

American Chemical Society—As recently noted in our columns, the New Haven meeting of this society was marked by the organization of the Division of Industrial Chemists and Chemical Engineers. Arthur D. Little, of Boston, was elected chairman of the division and vice-president of the society, and indicated in his address the broad field awaiting development by the new organization. The division will include a large proportion of the membership of the society and especially those engineering chemists whose work is directly concerned with industrial development and progress. The division will begin the publication at an early day of the *Journal of Industrial and Engineering Chemistry,* for which a strong board of editors was elected.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Goldfield, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 5—On Monday of this week the board of supervisors of Solano county ordered that all permits heretofore extended to the Selby Smelting and Lead Company to operate its plant be revoked, and that the plant be entirely shut down in obedience to the injunction. They seemed to think that sufficient time had been allowed to test the fume-arresting appliances and were not convinced that the company was acting in good faith in delaying final proof of the efficiency of the apparatus. Meantime the Home Protective Association, composed mainly of residents of Burlingame, San Mateo county, is again active against the establishment of the new Guggenheim smelter at Point San Bruno. The people of South San Francisco are about to incorporate their town, within the limits of which is the smelter site. The Burlingame citizens think this is a move to take the jurisdiction of the smelter site from the county supervisors, into that of the council of South San Francisco, the latter place being in favor of having the smelter built. The San Mateo supervisors have adopted an ordinance so restrictive that it is virtually prohibitive as to operating smelters.

The superintendent of one of the gold mines in the mountain region who employs 50 miners steadily, states that there have been more applications at the mine this summer for work than has been the case in two years previous. Numerous good miners from other parts of the State and from other States sought employment. Numbers of men who went to the new camps in Nevada have returned.

A hearing has been held at Quincy, Plumas county, wherein the government is contesting the right of N. I. Golden and E. V. Darby to certain mineral claims in the Massak section east of Quincy, for which they recently made application for patent. The government officials filed a protest against the issuance of patent, claiming that the ground is not more valuable for mineral than for other purposes. The testimony is to be forwarded to the Land Department at Washington.

The Tom Head copper mines lie 30 miles west of Red Bluff, Tehama county, and while they have never yet become productive, some extensive development work has been done upon them and the deposits are supposed to be very large. They are owned by the California-Massachusetts Copper Mines Company. Now the recently organized Chicago Copper Refining Company will lease the property.

Goldfield, Nevada

August 5—All leasing records, not excepting the world-famous Hayes-Monnette, which gave Goldfield its first fame, are being broken by the Engineers Lease on the Florence ground. It is only mining 50 to 75 tons of ore per day, but that averages nearly $600 per ton.

The State bullion-tax agent is making a tour of the State in an effort to round up all the producing mines, very few of which make the proper legal returns.

The experiments at the Kinkead mill in this city by the Consolidated have proved so completely successful that a new plant is being designed as an adjunct to the new 600-ton mill now in the course of erection. The new process, which is the subject of letters patent, is briefly a sulphuric-acid treatment of the sulphide concentrates converting into soluble sulphates the deterent sulphur compounds. The concentrates are then de-acidized and washed in filter presses, and the resulting residue is cyanided.

Salt Lake City

August 7—The ore and bullion settlements reported by Salt Lake banks last week aggregated $405,000 and $1,456,500 for the month of July.

During July there was produced from Utah smelting plants between 8,000,000 and 8,500,000 lb. of copper.

Dividends have been declared by the May Day and Uncle Sam Consolidated companies, operating in the Tintic district, for August payment. The former, 1½c. per share, or $12,000; the latter, 4c. per share, or $20,000.

Not later than August 15, the United States Smelting, Refining and Mining Company will have its new converter roaster plant in operation at Bingham Junction, when the treatment of sulphide lead-silver ores will begin. Since the resumption of smelting operations at the United States plant about a month ago, only oxide ore has been received owing to the incomplete condition of the converter roasters. The smelter management asserts that with the devices installed and in use at the present time it will be absolutely impossible to [illegible] growing vegetation. It was only upon a guarantee of this kind that Judge Marshall consented to a modification of the decree of injunction which caused practically every smelting plant to cease the treatment of ores in the Salt Lake valley last December and January. The United States Company has started [illegible] centrating mill, which is located near the smelter, on ore from its lead properties in Bingham. The plant has capacity for the treatment of 300 tons per day.

Among the important events of the past week has been the resumption at the properties of the Ohio Copper Company in Bingham, following closely upon the announcement that the bonds authorized by the board of directors had been underwritten by an eastern syndicate. Until recently F. Augustus Heinze has been a controlling factor in this enterprise, but he is said to have relinquished a large stock interest to others who have come to his assistance. It will probably take until about Jan. 1 to place the property in condition to produce upon a large scale. The concentrating mill building, completed early in the year, will be immediately equipped to treat 2000 tons of ore per day and plans have been made to double this capacity. The Mascotte adit, possession of which was obtained from the Bingham Consolidated Company, will be pushed ahead about 300 ft. further to a point where a raise will be made to connect with the bottom of the main working shaft. The face of the adit is in a good grade of milling ore. An electrically equipped railway, which is to become the property of the Bingham Central Railroad Company, organized recently, will be operated through the Mascotte adit and it is figured that the cost of transporting the ore to the mill at Lark will not exceed 15c. per ton. The amount of Ohio bonds authorized was $2,000,000.

Butte

[illegible] ally recovering from the severe setback which it received during the past winter when the price of copper declined and a general shut-down followed. Each week brings with it a resumption of operations in some one of the smaller properties in the district. At the Leonard mine of the Boston & Montana company two Nordberg quintuplex pumps have been installed on the 1200-ft. level. Each pump has a [illegible] the construction of ore bins. A station is being cut at the 800-ft. level and a [illegible] Tramway mine of the Red Metal com- [illegible] started. Operations have also been re- [illegible] Milwaukee company.

Denver

Aug. 7—As reported by the mills and smelters, the Cripple Creek district produced gold to the value of $1,345,031 in July.

Lessees on the Fluorine mine of Cripple Creek are preparing a shipment, the first for some time past from this old-time producer, which is located on what is regarded as the northern limit of the producing area of this district.

Phenomenally rich ore is reported to have been struck in the Trilby mine between the sixth and seventh levels. The ore occurs as an 18-in. streak of sylvanite in a 30-ft. vein.

Geo. A. Pettibone, of Western Federation of Miners notoriety, died from cancer Aug. 3, in Denver.

From Leadville comes the report that on Sept. 1, the Little Jonny, now called the Ibex, will resume operations after a month's shut-down for repairs and installations of new machinery on No. 4 shaft. The property is being worked under the leasing system.

Work has begun on the Koehler Tunnel in the property of the same name, a part of the San Antonio group of mines, near Ouray. This tunnel is designed to develop at depth the copper orebodies encountered at higher levels.

In the Telluride district all the larger mills, including the Smuggler, Tomboy, Liberty Bell and Alta, are running at full capacity, and it is reported that more men are now employed in the district than for many years past.

The mines of the Durango district are being actively worked, particularly in the vicinity of the May Day and Idaho. Most of the properties now operating are being worked by lessees.

A great deal of excitement has been caused during the past two or three days in Glenwood Springs and vicinity by the report of a rich gold strike on Elk creek, about six miles from New Castle, an important coal-mining town of the Western slope.

Birmingham, Ala.

Aug. 10—The first serious case of violence in the present strike of coal miners occurred near Blocton, on the Birmingham Mineral road, very early on the morning of Aug. 9, when a party of strikers fired on a train, killing three men and wounding 11 others. The killed included the conductor of the train, a deputy sheriff and a non-union miner. Among the wounded were three officers of the company, several deputy sheriffs and six miners. The train was a special, carrying non-union men to the Blocton mines under guard of soldiers and deputies. On the outskirts of the town the engineer suddenly saw a log across the track, and at once a fusilade was fired into the train. The engineer did not stop, but let the cowcatcher throw the log from the track and put on full speed. Where the attack was made was in a cut, the ground being on a level with the lowest part of the windows. The assailants on the rocks above poured down a fire directly into the windows and at the engineer. Practically every window in the train was broken, and shots struck all parts of the engine and cab. The train proceeded to Blocton, and the dead and injured were returned to Birmingham.

Troops were at once sent to the spot, and later some 30 men were arrested, charged with taking part in the attack. While many of these men were negroes, it is believed that they were led by some of the foreigners who were brought to Alabama three years ago, at the time of the former strike, and who are now themselves among the strikers.

This murderous outbreak will be the cause of an increase in the use of forcible measures to prevent trouble, and will result in an advantage to the companies, which are trying to break up the union in Alabama.

Toronto

August 8—A decision has been rendered by Judge Russell, of Halifax, N. S., confirming the title of the Dominion Coal Company to extensive submarine coal areas off Point Aconi, Cape Breton. Some months ago the Dominion Iron and Steel Company secured from Mr. Burchell, of Halifax, options on coal areas in the same locality, but lying farther out. The Coal company's areas lie between these lands and the shore and interfere with the direct working of the Burchell areas. An action was brought to set aside the leases of the Dominion Coal Company, Burchell and the Steel company contending that the areas were improperly designated. The result of the litigation seems to render the property unavailable for operation by the Steel company unless by arrangement with the Coal company.

The negotiations for the purchase of the New Campbellton coal mines at Cape Breton which have been under way for some time were closed this week by B. F. Pearson for Messrs. Harmsworth, English publishers. The lands include four or five square miles of coal which will be used in the purchasers' pulp and paper mills at Grand Rapids, Newfoundland.

London

Aug. 1—A reconstruction scheme for Strattons' Independence, Ltd., is announced. The old company sells its property and assets to a new company with a nominal capital of £125,000 in 1,000,000 shares of 2s. 6d. each, which will be issued to the shareholders of the old company at the rate of one new for one old share. The new shares are credited with 1s. 6d. paid, leaving a liability of 1s. per share. The new scheme will, therefore, bring in £50,000, if all the shares are taken up. A scheme to provide further funds by the issue of debentures was insufficiently subscribed. In June, 1907, money was raised to erect a mill according to the designs of Philip Argall. This mill has now been erected, but the cost has exceeded the estimates by some £10,000, and it is owing to this that a reconstruction of the company has become necessary. The new mill will treat the ore on the dumps and the reserves of low-grade ore available in the mine. It is reported that during the current year the mine has about paid its way. During the month of June of this year the profit was $2140. The chairman announces that profits of £30,000 per year may reasonably be expected, and probably much more, especially if the improved outlook in the mine continues.

The directors of the Ashanti Goldfields Corporation announce that their scheme for obtaining further funds in order to increase the milling plant has fallen through, as they could not get the consent of the debenture holders to the proposals. Additional plant is, however, to be provided, although on a smaller scale than at first contemplated. A filter-press plant for treating slimes is to be put up in connection with the present stamp mill.

The Tanganyika Concessions have now completed arrangements for connecting their principal mines with the coast by railway. A line is to be constructed from Lobito bay to the Ruwe mine, a distance of 1020 miles. The Benguella Railway Company is to build the line eastward from Lobito bay for a distance of 620 miles, and the Lower Congo Railway Company is to work westward from the Ruwe mine to make the connection over the remaining 400 miles. Another railway from the south is projected from Mabaya on the Rhodesian frontier to the Star of the Congo mine, to be built by the Katanga Railway Company. This line is eventually to pass through the copper belt to the Ruwe mine. The section from Broken Hill to the Congo frontier at Mabaya is to be constructed by the Rhodesian Railways Company.

These agreements, if carried out, will mean the opening of a large part of the African continent which is at present little known to white men. The country through which the new railways run will be first explored, but there will not be wanting explorers and hunters, who will take advantage of this fresh move into Central Africa. With an advanced base, they will pass still further into the heart of the dark continent. A short time ago it was somewhat of a feat for a traveler to visit the great lakes or the Victoria Falls. Now such journeys are made every day, owing to railway and steamboat facilities, by the ordinary tourists. The railways are to open a country for which great things have been claimed as regards mineral wealth; and it will be interesting to see whether there has been exaggeration or not.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

TALLADEGA COUNTY

Alabama Marble Company—This company has been organized to open a quarry on a large scale, near Sylacauga. The marble is said to be of fine quality. John S. Sewell, of Sylacauga, is president of the company.

California

BUTTE COUNTY

Old Glory—This gravel mine near Oroville, formerly owned by the Sunset Mining Company, is being pumped out and reopened by representatives of the Eastern stockholders.

CALAVERAS COUNTY

California—Work has been commenced on this mine near North Branch, F. H. Horswill, superintendent, and a new air-compressing plant for drills is being put in. The tunnel will tap the blue lead running from San Andreas and Mokelumne Hill through Central Hill.

Gwin Mine Development Company—Owing to failure of water supply at this extensive property, D. McClure, superintendent, the working force of miners has been materially reduced. Good milling ore has been found in the 2400 level.

Stockton Ridge Consolidated Mining Company—The Hexter tunnel, driven by this company, is now in 1900 ft. and has less than 300 ft. to go to reach the gravel channel.

EL DORADO COUNTY

Cedar Valley Gold Mining Company—This company, H. H. Hicks, superintendent, which recently purchased the Hume property, is opening the Old Lady mine.

FRESNO COUNTY

Arkansas—This mine at Trimmer has completed its first mill run with satisfactory results.

INYO COUNTY

Kruger Group—The principal property at the camp of Kruger, owned by Thompson, Griggs & Moody, is now under bond to Southern California capitalists. There are 15 claims in the group and some ore found is of a high grade.

Skidoo—The new cyanide plant at the mill of this company, Skidoo, has been completed and put in operation, The 10 stamps are kept busy on good ore.

KERN COUNTY

Golden—For this property in Amalie district, J. B. Ferris of Caliente has purchased a 20-ton Lane mill, and water will be piped in from Caliente creek.

LOS ANGELES COUNTY

Gold Spike Development Company—This company at Acton, E. Brough, superintendent, is about to run a tunnel 1000 ft. long to develop the old Red Rover mine. There is a mill on the property which has been idle for some time.

MARIPOSA COUNTY

North Fork—There is a renewal of mining activity in this district 14 miles east of Coulterville. Harris & Sellier, of Groveland, Tuolumne county, owning several mines at North Fork, have bonded the Moonlight mines from Wagner & Stolder, and are building 1½ miles of ditch. A 10-stamp mill is to be erected.

NEVADA COUNTY

Delhi—This mine at Columbia Hill has been compelled to suspend operations owing to shortage of water.

Oustomah—Hayes Brothers, of San Jose, Cal., have thrown up the bond on this mine at Nevada City which they have had for a year; John T. Morgan, the owner, will now work it.

Washington—This company, owning the Giant King and other claims in Washington district, is about to erect a 20-stamp mill and put in a power plant. Three large compressors for machine drills are to be purchased.

PLACER COUNTY

Breece & Wheeler—The old ditch, [illegible] miles long, on this drift mine is being cleaned out and repaired. It has not been used since hydraulic mining was prohibited years ago. The water will be used for hydraulicking at the Paragon, a permit having been granted.

SAN DIEGO COUNTY

Julian—At this old camp the Owens mine is again being worked as is the Hubbard, and for the latter new machinery is on the way. Bailey Brothers are working several of their claims at Banner in the San Felipe cañon. A reduction plant is being built.

SAN BERNARDINO COUNTY

Alvord—K. E. Ash has leased this mine, 23 miles from Daggett, and has set men at work developing.

Orange Blossom Extension—The new mill of this company at Amboy has been started up, and plans for an enlargement have already been made.

SHASTA COUNTY

Nevada—J. F. Cowdery has applied to the California Débris Commission for a permit to mine by hydraulic process at this mine near St. Louis.

Uncle Sam—Maxwell, Bauer & Myers, leasing this mine at Kennett, have taken 15 tons of high-grade ore from a rich shoot and have shipped it to the Tacoma smelter.

SIERRA COUNTY

South Fork—The force at this drift mine, Forest City, F. W. Kuhfeld, superintendent, has been doubled. The old tunnel 2400 ft. long has been extended half a mile, but has not yet reached the old Bald Mountain channel.

Tightner—A crosscut tunnel for drainage and exploration is being run into the ridge and is calculated to cut the Tightner ledge at 700 ft. depth.

SISKIYOU COUNTY

Gardner & Weed—Lack of sufficient water has caused this hydraulic mine at Greenview to close down for the season.

Siskiyou Gold Mining Company—This property at Hawkinsville is to be equipped with new machinery.

Murray & Coggins—At this mine, Callahan, H. H. Cloud & Co., are installing a cyanide plant.

Morrison—The owner of this mine at Quartz Valley, J. M. Morrison, has brought a new five-stamp mill.

TRINITY COUNTY

[illegible] company has leased the Mountain Boomer mine at Denny to [illegible] for two years with an option for purchase.

TUOLUMNE COUNTY

[illegible] company, near Tuttletown, is operating the Arbona mine, which has been placed in charge of A. Trittenback.

O'Hara—This mine at Sonora has been closed for a time. The last weekly cleanup was $20,780. The mine has been yielding phenomenally rich ore.

[illegible]

[illegible] Company—This company, J. J. Cusick, manager, has installed an expensive plant on the Eagle mine at Indiana Hill, near Brownsville, and is about to build a sawmill and install an electric-lighting plant.

compressor and drills, etc. It is the intention to enlarge the mill to 100 stamps.

Colorado

Lake County—Leadville

Belvidere Group—Some time ago the shaft on the Belvidere, Horseshoe district, was sunk to a depth of 85 ft. where a good body of ore was encountered. Lou R. Johnston and associates decided that the most economical way to open the property was by tunnel, and recently a contract was let to drive a tunnel from the foot of the hill 500 ft.; 100 ft. have already been driven, and at the breast two distinct veins were caught running at right angles to the tunnel. One vein is 5 ft. wide and the other 2 ft., the veins being separated by only a thin streak of talc.

Dinero Tunnel—According to surveys only 100 ft. remain to be driven before the Dinero veins are cut. As the veins dip to the west, it is more than likely that the tunnel will have to go another 30 ft. The breast is now heavily mineralized and a heavy flow of water is pouring out of the loose ground.

Helena—At this mine, Iowa gulch, the shaft is now down 625 ft., with 165 ft. still to be sunk. The bottom of the shaft is in mineralized matter. The new pump installed at the 500-ft. level handles the water with ease. When the station was being cut at this point a vein of lead ore was opened and several carloads have been shipped.

Lackawanna Gulch—During the week several experts have visited this section, to the south of the Leadville district. A tunnel has been driven a short distance on the Miller vein and samples give good returns in gold. Lou. R. Johnston and associates have an option on the Miller group, and also control the Theodolite and Robinson groups.

Little Jonny—No. 4 shaft on this property, Breece hill, was closed down Aug. 1 to permit necessary repairs which will take a month. The shaft will be retimbered, and new guides put in for the cage.

Sunday Tunnel—The old Garibaldi tunnel, at the head of California gulch, has been cleaned out, retimbered, repaired and straightened for a distance of 1300 ft., and a large station cut out at 1100 ft. to accommodate the electrical machinery to be used in driving the tunnel to its destination, the Sunday vein on Ball mountain. The machinery, including air compressors, machine drills and motors, is now being installed. At 1200 ft. connections have been made with the old Whiteside shaft, which will give the desired ventilation. Manager M. A. Nicholson expects to reach the Sunday vein by the first of next year. The deepest shaft on the Sunday is 450 ft., and the tunnel will cut it about 450 ft. deeper.

Tiger—On this mine at the head of Iowa gulch, the lessees have been driving a tunnel on the original vein and taking out some fair-grade ore. Recently a cross-vein was caught that is 2 ft. wide and carries silver, gold and lead.

San Juan County

Congress—This mine, near the Ouray county line, has been unwatered, all levels cleaned out and retimbered and drifts are being driven ahead on the four levels of the mine in search of new orebodies. J. B. Ross is the general manager of this company, and N. E. Rumery is superintendent of the mine. Recently, at a depth of 300 ft., an orebody was struck, which appears to be a chimney of considerable size, this ore carrying copper and gold.

San Antonio—This mine, in the Red Mountain district, is now shipping 10 cars of high-grade ore weekly.

Teller County—Cripple Creek

On Aug. 1 the new drainage tunnel was in 2873 ft. Only 203 ft. advance was made in July, owing to the hardness of the rock.

Cresson—The July shipments were about 2000 tons, nearly all from the big ore-shoot on the 700-ft. level. Development is in progress on several levels.

Henry Adney—A new vein, 30 in. wide, is reported opened on the 500-ft. level.

Stratton's Independence—A test run is being made at the new mill. It is on ore from the 100-ft. level, which is expected to run about $15 to the ton.

Taylor & Brunton Sampler—It is reported that this sampling mill has been bought by George E. Copeland and associates. The purchase price could not be ascertained. The sampler, which is situated about half a mile northeast of Goldfield, was built by F. M. Taylor and D. W. Brunton, now of Denver, in 1901, and was put into active operation in April of the following year. It has been operated successfully ever since. Since 1903 Mr. Copeland has been manager of the plant, and as a part owner he will continue in that capacity. The new owners take possession immediately. They have organized as the Copeland Sampling Company.

Vindicator—This mine shipped about 2000 tons of high-grade ore in July. Work is going on in all the levels from 400 to 1200 ft., and the shaft is being sunk 100 ft. below the 1200-ft. level.

Florida

Hillsboro County

Coronet Phosphate Company—This company has let a contract to C. G. Memminger, of Lakeland, for the machinery necessary to develop its phosphate lands near Plant City.

Indiana

Warrick County

The Cole Drilling Company has discovered four veins of coal on the farm of J. M. Miller in this county. The drill has penetrated 464 ft., and has passed through three veins of coal of excellent quality. The first vein, at a depth of 30 ft., is nearly 3 ft. thick; another at 140 ft. is almost 6 ft. thick, and a third at 332 ft. is 6 ft. thick. All three veins have an excellent roof of hard limestone and slate on top of the coal. The drillers think a fourth vein will be struck at a depth of 600 ft. Already plans are being made to develop the territory.

Hercules Coal Mining Company—This company, at Evansville, has incorporated with a capital stock of $100,000. The company proposes to operate coal mines. The directors are C. C. Thomas, M. A. Thomas and P. T. Ashley.

Michigan

Copper

North Lake—The North Lake Mining Company has been organized to operate the lands adjoining the Lake property on the north and east. The tract contains 1120 acres and is traversed by the Lake and other lodes for a distance of nearly 7000 ft. The company is capitalized at 100,000 shares, par value $25. As soon as all the details of the organization are completed the company will begin diamond-drill explorations; a complete cross section of the tract will be obtained and the formations will be opened on an extensive scale.

Lake—The shaft on this property continues in the same rich formation that has characterized it from surface. The south drift from the first level continues and is breasted in good ground; it is planned to drive a crosscut from this drift and thus determine the width of the lode. The company is trenching extensively and the ledge is being exposed for a considerable distance. Diamond-drill operations are to be resumed and all the virgin ground of the tract will receive careful attention.

Elm River—The new exploratory shaft has reached the ledge after passing through about 40 ft. of overburden. This shaft is going down vertically on the site of a drill hole which was put down several years ago, the core of which contained a good showing of copper, but at that time no importance was attached to it; it will now be thoroughly investigated. It is planned to put this shaft down between 400 and 500 ft. and then crosscut to the east; in this manner the several lodes crossing this tract will be exposed and their value ascertained.

Mass—This company has rigged a diamond drill at the fifth level of "A" shaft and will explore the territory supposed to be crossed by the lodes recently discovered by the Adventure. The Mass is also carrying on surface drilling in proximity to the Calico lode.

Calumet & Hecla—This company is building an addition to its foundry; the company has been doing practically all of its own casting for some time and the present plant is inadequate to meet its requirements. A new drill-sharpening plant has gone into commission and is working satisfactorily.

IRON

Penn Iron Mining Company—The Brier Hill shaft of this Menominee range company is being lined with concrete. The shaft is 800 ft. deep and 170 ft. has been lined. The opening was originally 6x8 ft., but this is being changed to a cylindrical shaft about 15 ft. in diameter. The enlargement is made in 60-ft. sections and these are lined when completed.

Missouri

ZINC-LEAD DISTRICT

Delta—This company has just completed a 100-ton mill on its lease on the McGowan land at Spring City. One shaft is in ore at 150 ft., and is producing [illegible] tons of lead ore a week.

Florence—This company has a new producer in its 40-acre lease northeast of Joplin. Four shafts are in ore and the company has a 70-ton mill working to full capacity.

Grade Brothers—This company has completed its 100-ton mill on the Massey land, near Granby, and has begun producing.

Granby—This company is drilling on its land northwest of the Royal Blue lease.

I Know—C. M. Sheldon is drilling on this lease, which is just south of the strike made by D. M. Sayer on the Granby lease.

Lucky May—This company has been incorporated with a capital stock of $50,000. The stockholders are C. Frank Taylor, Mercer Arnold, Blanche Forsythe and Ray Bond, of Joplin, Winifred Blake, of Carthage.

Ravenswood—This company has been incorporated with a capital stock of $100,000 to operate in the Reeds-Sarcoxie district. The stockholders are Edward E. Gore, of Chicago; C. A. Blair, H. W. Blair and E. B. Clark, of Carthage.

United Zinc—Rich, shallow lead ore has been struck on this company's land east of Aurora. Seven shafts are going down as a result of the strike.

West Mining Company—This company, of Joplin, has incorporated with a capital stock of $60,000. The stockholders are H. E. West, of Independence, Kan.; Jamot Brown, of Carthage, and H. E. Hayler, C. U. Porter and R. H. Barratt, of Joplin.

[illegible]—This company has struck lead at 40 ft. in an old shaft on the Martin & Haines 40-acre tract. This is another tract added to the mining land of that district.

Montana

BUTTE DISTRICT

Butte & London—At the local offices of the company it is stated that negotiations are now under way for re-financing the company, preparatory to the resumption of operations, and that work may be begun within the next 30 days. At the time work was stopped a number of months ago the shaft had attained a depth of 1100 ft. At this depth crosscuts were run which encountered several veins carrying copper; the ore, however, was not of commercial value.

Davis-Daly—It is stated that the financial difficulties of the company may culminate in a complete reorganization of the corporation, which will carry with it an assessment of $2 per share on the capital stock and thus furnish the means for continuing development work. At the Colorado shaft sinking is in progress.

Ticon—The property, owned by James A. Murray, is situated northwest of the North Butte company's Speculator claim. Work has been resumed under the direction of Alfred Frank, the manager of the Davis-Daly Estates Copper Company, and it is stated that operations will be extensive. The Ticon has been closed down for several years.

Lexington—A rich strike of copper ore is reported on the 800-ft. level. This mine is the principal holding of the La France Copper Company.

DEER LODGE COUNTY

Cable Consolidated Mining Company—Operations were recently resumed at the Cable mine, 20 miles west of Anaconda. For the present the work will be confined almost entirely to prospecting on the tunnel level. For many years the mine has been a famous gold producer. It has been worked intermittently for the past 20 years.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Production—The figures for the three months ending July 30, show that Goldfield is producing at the rate of nearly $10,000,000 yearly. At present both the Consolidated and the Florence are doing no company work pending the completion of their mills. These two mills have a combined capacity of 750 tons and will probably output together about $10,000,000 per year. The actual figures for 13 weeks are 27,559 tons with a value of $2,204,176. The past week's production was 1772 tons valued at $221,050. The Kinkead mill [illegible] concentrates. The Combination mill treated 595 tons of Consolidated ores. The Western Ore Purchasing Company handled from the Engineers lease 272 tons; Van Riper 100 tons. The Nevada Goldfield Reduction Company treated from the Combination Fraction 457 tons; Mohawk dump, 52 tons; Engineers Lease, 123 tons; Consolidated Red Top, 12 tons; Mohawk Jumbo, 6 tons; Black Butte, 60 tons; Mohawk Combination, 35 tons; Oddie dump, 40 tons.

Great Bend—The new shaft is being sunk 5 ft. per day by three shifts and has attained a depth of 175 feet.

[illegible] on the C. O. D. has passed into new hands and work will be resumed. The shaft is down 300 ft. and the property is equipped with a fine plant of machinery.

Kewanas—The sale of the property is officially denied.

[illegible] bucking so that the development work is going slowly. Crosscutting on the 200-ft. level to catch the ledge and sinking a winze from the 150 on the oreshoot are in progress.

Third Chance—The company has disposed of a block of stock for the purpose of raising funds to resume operations. The double-compartment shaft is down 340 ft. and there is 300 ft. of lateral work. This lease is in a good location with the Atlanta on the south, C. O. D. and Gold Bar on the north and side lining the Combination.

Goldfield American—This company, which has a shaft 200 ft. deep on the eastern edge of the inside district, will resume operations.

Empire—Another lease has been let and the work of sinking a shaft has been started. The Williams lease will also resume operations as soon as a hoist is installed.

Engineers Lease—This lease on the Florence is keeping up its record. The first shipment was made on June 17 and about two cars of high-grade ore are being shipped every day. The oreshoot has been proved for a distance of 60 ft. in the upraise from the 300-ft. level. The high-grade portion of the vein is about 3 ft. wide and it only is being broken. The second dividend of $90,000 was paid this week, making $180,000 paid as a result of six weeks' work, and there is enough money in the treasury to pay another one.

Red Top Consolidated—The low-grade ore in this lease has changed to high-grade, and shipments will begin at once. The rich shoot was encountered about 40 ft. south of the Booth end line and is striking toward this property. The Booth company is confident of picking up the same shoot.

Zinn Florence—With confidence that any lease on the Florence ground will produce high-grade ore, this company is pushing lateral work on the 120-ft. level and sinking for the 400-ft. level in the shaft.

[illegible]

mine. The oreshoot has been stoped for a distance of 40 ft. to the east on the 50-ft. level of the winze below the No. 3 tunnel, and its end has not yet been reached. Work on the main working tunnel will be rushed and a compressor and air drills will be installed for this purpose.

Great Western—The west drift on the 100-ft. level is being pushed to connect with the leasers' shaft. On the 200-ft. level the east drift is now in 160 ft. with ore all the way; at 100 ft. from the shaft the orebody was 16 ft. wide. The west drift on the 200-ft. level is in 150 ft., almost the entire distance in ore of a good milling grade. This makes the shoot on the 200-ft. level continuous for 300 ft. Returns from the first carload of ore shipped to Salt Lake give $161.30 per ton.

Esmeralda County—Rawhide

Another mill is under way for the Rawhide district. It is located on the banks of the Walker river near Schurz, and will have an initial capacity of 60 tons per day. The foundations for the stamps, engines, etc., are practically completed, and the machinery is en route. In addition to the reduction plant the owners will erect a sampler. The railway grade is now completed to within a few miles of the town and it is expected to be finished in two weeks. Local officials of the road state that trains will be running into Rawhide by October 1.

Rawhide Victor—This company is installing a hoisting equipment on its Hooligan Hill property, and will continue sinking the shaft from its present 125-ft. level.

Grutt Hill Mint—This lease on the Coalition property will install a 25-h.p. hoist and the shaft will be put down another 100 feet.

Anderson & Gundecker Placer—This enterprise is progressing favorably. The shaft is down 70 ft., and the last sample gave returns of $19 per yard. Water for sluicing will be secured from the Rawhide Water and Reduction Company, which will be furnishing water for both milling and domestic purposes during the present month.

Nevada Humboldt Electric Power and Light Company—This company has been incorporated to supply power to all the camps of the district. Power will be derived from Clear creek, which will furnish 1500 h.p. at the lowest stage of the stream.

Kindergarten Mill—In consequence of its success in reducing low-grade ores, the high-grade ore running from $30 to $200 per ton is now run through the 10-stamp mill in Seven Troughs cañon. The plant is making an even better saving on the high-grade ores than on the low; the tailings average $4 and less.

Lincoln County

Groom—Goldfield men have bought the old mine and have shipped hoisting and pumping machinery to begin active operations. High-grade lead-silver ore was shipped to Caliente 30 years ago, but water in the shaft stopped operations.

Nye County—Bethlehem

Cornforth—On this property an air compressor and a 50-h.p. gasolene engine have been installed, and the tunnel is being driven rapidly to get under the apex of the hill, where it is expected to tap the orebody.

Neversweat—This mine is working a big force of men and is sinking a winze 150 ft. deep on the vein.

Horseshoe Mill—This mill, which has recently been remodeled for the purpose of handling the ores on the dump, has been started up. It is the intention to increase the capacity by the addition of 20 stamps.

Nye County—Bullfrog

Diamond Queen—The original lease is again in ore which runs up in the shipping class. Sinking on the new find is progressing and from this work more than 100 sacks of ore per shift are secured.

Groshong—This lease at Telluride, east of Beatty, is preparing a shipment to Salt Lake. A test shipment to the smelter has already been made and the sorting of the ores on the dump will be gaged by the smelter returns. When the new Beatty mill is completed the Groshong ore will be concentrated there.

Capricorn—Returns on the first shipment show nearly $200 per ton. Two shoots of high-grade have been opened and a new shaft is being sunk.

Sixty-Six Lease—This lease on the National Bank ground has made arrangements to make a shipment to the Shoshone mill. The gold contents will be settled for at $20 per oz. and the same extraction that is being made on Shoshone ores is guaranteed.

Homestake—The mill is crushing about 100 tons per day with its 25 stamps.

Pioneer—The mill for the plant has arrived, and the plant will be in commission in about two weeks.

Rhyolite—The miners of the entire district have voted to accept the Tonopah wage scale to become effective August 8.

Nye County—Johnnie

Johnnie Consolidated—The first step toward the reorganization of the company has been taken by the election of A. D. Myers, of Goldfield, as president. He will shut down the property pending the reorganization. The last brick from the mill was worth about $3100.

Nye County—Manhattan

Manhattan Consolidated—A settlement has been reached by which the various litigants against the application of patents sought by the company have withdrawn their suits and the company is beginning the prospecting and developing of its property.

Nye County—Tonopah

Production—Production for the week amounted to 6065 tons valued at $156,175 as follows: Tonopah Extension, 130 tons; Tonopah Mining, 3500 tons; Belmont, 850 tons; Montana Tonopah, 1100 tons; Midway, 100 tons; North Star, 80 tons.

Nye County—Round Mountain

Great Western—Hydraulicking on the slope of Round mountain is developing very satisfactory results from rather odd conditions. The soil now washed is not more than 1 to 1½ ft. deep to bedrock, but what there is of it is very rich. After the hydraulicking, men are set to work on the bedrock with brooms and a clean sweep is made. The result of the last clean-up for three days on this shallow ground was 250 oz. The bedrock, which is left exposed, is literally fretted with a network of small seams and gashes filled with white talc.

Storey County—Comstock

The Comstock, during the last week in July, produced $30,000, which is the record for 20 years. The output was as follows: Ophir, $16,274; Consolidated Virginia, $5229; Yellow Jacket, $8050; Silver Hill, $708. The Consolidated Virginia has not added anything to the world's supply of precious metals previously for 20 years. Mr. Sturgis and his following will reopen several abandoned workings and it is predicted that Virginia City and the Comstock are entering on a new era.

Comstock Tunnel—At various points in the tunnel and its branches, timbers and tracks are being repaired. The electric locomotive has been sent down to Ward shaft and assembled and made ready for work.

Ward Shaft Association—The new surface steam hoist at the Ward shaft has been started. It has a rated capacity of 2500 h.p. and is the largest on the Comstock.

Sutro Tunnel—A man and four mules died of heat in the Sutro tunnel 8000 ft. in from the mouth during the past week.

White Pine County—Ely

Copper Bond Copper Company—This company have begun sinking on Copper Bond No. 9 and will not do any lateral work until the 200-ft. level is reached, where the mineralized zone as located by the churn drills begins.

Giroux Consolidated—Sinking the Alpha shaft from the 1100-ft. to the 1200 ft. level is progressing. The new smelter is nearly ready to blow in.

Stuart—The Cocomongo stamp mill that is being erected at Cherry creek by the Stuart Gold Mines Holding Company will be ready to run soon. The work has been much delayed by the lack of competent workmen.

North Carolina

ORANGE COUNTY

A discovery of gold is reported near Oaks, by Whitman & Little, who have been prospecting on a tract of 400 acres, on which they have an option.

MONTGOMERY COUNTY

Iola Gold Mining Company—The United States Circuit Court at Asheville has appointed Charles T. Westcott, of Baltimore, and Thomas J. Jerome, of Salisbury, N. C., receivers for this company. There are $46,000 bonds outstanding, and a floating debt of about $30.000. The receivers are directed to continue operations at the mine. It is probable that the company will be reorganized

Oklahoma

OTTAWA COUNTY

Ore has been struck at Narcissa, south of Miami, and three drills are at work. This is virgin territory and south of any ore yet found.

South Dakota

CUSTER COUNTY

Old Charley—The Ruberta Mining Company is about to resume work on this property and is remodeling the 10-stamp mill, with cyanide and roasting additions. Ore will be treated by fall.

LAWRENCE COUNTY

American Flag—The mill has been reconstructed, and fitted with a Dorr classifier and new slimes plant. The present capacity is 200 tons per day.

Gilt Edge Maid—This company has made a long lease of some water-rights which were involved in litigation, which is ended by the new agreement

Gold Queen—A large orebody is being opened up in the tunnel, which is now 40 ft. in. The grade appears to be better than in the older workings

Mogul—Production has been curtailed in this mine, owing to the burning of the Horseshoe hoist. A new hoist is now being erected at the mine

Connie May Morris—Work will be resumed on the property by the Nebraska Mining Company, and a diamond drill has been started on an incline into the hill to determine the size of the orebody.

Golden Reward—The annual meeting of the company resulted in the election of the old board of directors as follows: F. H. Harriman, August Belmont, O. H. Hahn, Harris Franklin, C. C. Tegethoff, Robert W. Goelet, George G. DeWitt, Henry W. De Forest and W. B. Devereaux. All except Franklin, whose home is in Chicago, are from New York. The company will reopen the Las Animas mine for shipments.

[illegible] orebody [illegible] is being developed. It contains free gold.

Hercules—This company is preparing to commence work on a 100-ton mill to treat a body of shale ore being developed in one of the shafts. This ore runs from $4 to $12 per ton in gold. The richer ore is now being sacked and shipped outside.

Mogul—The old Hardscrabble mine in the Terry district will be reopened, and shipment made to the mill at Pluma. The Lucile is also to become a producer again after some idleness.

Roenna—The tunnel is now in 185 ft., and some good ore has been encountered. The ore runs from 80c. to $5 per ton gold. Ohio capital owns the property, which consists of 300 acres in the Tinton district.

Texas

[illegible] COUNTY

A large tract of coal land has been sold to J. H. Adams, of Kansas City, Mo., who intends to begin development work at once.

Utah

CARBON COUNTY

Consolidated Fuel Company—This company intends to begin shortly the construction of 18 miles of railroad to connect its mines at Miller Creek with the main line of the Denver & Rio Grande railroad.

JUAB COUNTY

Godiva—Development work is progressing steadily in this property, which was recently revived by the reorganization of the company. The shaft is being sunk to the 1300 level, the depth being about 950 ft. at present.

SALT LAKE COUNTY

Mt. Aetna—This property, which is located in Bingham, has been bonded to a strong Boston syndicate, which will organize a new company and undertake its development. The group consists of about a dozen claims, five of which are patented.

Silver King—This property, at Alta, is on a shipping basis. It was recently purchased by interests largely identified with the Columbus Consolidated company.

[illegible] statement was issued, Aug. 1, the substance of which is as follows: The new Garfield plant was started up late in June, 1907. The capacity of this plant is 6000 tons per day, and is comprised in 12 complete sections of 500 tons each. The first two sections were started in regular operation July 1; the third and fourth sections July 15; the fifth section, Aug. 17; the sixth, Sept. 1; the seventh, Nov. 2; the eighth, Dec. 18, 1907; the ninth, March 20, 1908; the 10th, May 1. The 11th section is in operation Aug. 1, and the 12th, probably 60 days thereafter. For the quarter ending June 30, the gross production of copper amounted to 11,568,390 lb. The average cost for the quarter was 8.16c. per lb. on the net copper resulting after allowing smelter deductions. Total gain for quarter, $403,694. The earnings for the quarter are based on 12½c. copper for April and May, and on 12¾c. copper for June, although the copper sold during this period brought prices slightly in excess of the average of these figures. At the present time the company has no finished copper on hand unsold. The directors expect a gradual improvement in results and profits as steam-shovel operations progress. Up to the present time it has been impossible to avoid mining and milling a considerable amount of surface oxidized material owing to the conditions surrounding mining and stripping operations. The production for the 12 months ending June 30 shows an increase for each quarter as follows: First quarter, July, 5,305,368 lb.; second quarter, 7,716,712; third quarter, 8,527,939; fourth quarter, 11,568,390; total, 33,118,409 lb. During the quarter just ended 34 per cent. of the ore came from underground mining, by the caving system, and 66 per cent. from steam-shovel operations. The company will have, on Oct. 1, approximately $2,000,000 available for working capital and the commencement of the payment of dividends.

SUMMIT COUNTY

Park City Ore Shipments—Last week shipments amounted to 1856 tons, the mines contributing and amounts being: Daly Judge, [illegible]; Silver King Coalition, 858; Daly-West, 500; miscellaneous, 12 tons.

Boulder Basin—This property, near Park City, has been bonded to a Salt Lake syndicate, for $30,000 consideration.

West Virginia

FAYETTE COUNTY

MacAlpin Coal Company—This company has been organized by James M. Laing, of Charleston, and others, to open a coal mine on a tract recently bought near Thurmond.

[illegible] COUNTY

[illegible] Company—This company is preparing to open a mine on its coal land near Avondale. L. B. Tussing, Columbus, O., is president.

[illegible] COUNTY

George's Creek Coal and Iron Company—This company has arranged to sink an additional shaft near its present mine at Farmington. J. J. Alexander, Equitable building, Baltimore, is president.

Canada

[illegible]

The forest fires in the Kootenay region still continue, but their course has turned away from the mining section and passed into a country which is almost uninhabited. Account is being taken of the damage done, but is still incomplete. The towns of Michel and Coal Creek, with the mines there, were saved, though badly damaged. The Crow's Nest Pass Coal Company has taken prompt steps to replace the surface plant destroyed at Fernie. Material for a steel tipple, larger than the one destroyed, has been ordered in Cleveland, Ohio; and other machinery has been ordered, so that the mines may be in operation as soon as possible.

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending Aug. 1 were as follows: City of Cobalt, 42,210 lb.; Drummond, 63,300; La Rose, 285,040; Nipissing, 120,600; Nancy Helen, 40,000; Right of Way, 121,100; Silver Leaf, 61,410; Trethewey, 170,250; Watts, 54,630. Total, 1,022,330 pounds.

Cobalt Central—A vein 8 in. wide, carrying about 5000 oz. silver to the ton, has been struck on the second level of the property leased by this company.

Drummond—Eight drills and 75 men are at work under the direction of Superintendent Brigstock. Four shafts on the 40 acres near Kerr lake have been sunk to the respective depths of 20, 35, 100 and 135 ft. and 1700 ft. of underground development has been done. Six veins have been encountered on the property.

Ontario—Temagami Reserve

Van Nostrand Township—In the course of assessment work on a group of claims held by a Toronto syndicate, a number of veins varying from 3 to 15 in. in width and carrying iron carbonates and silver have been found. From one vein 4 in. wide a number of small silver nuggets were taken.

Ontario—Port Arthur District

Beaver—A carload of ore was shipped last week for treatment in American refineries. A concentration mill is being installed and is expected to be completed this month.

Ontario—Sturgeon Lake District

Fawcett and Bouillon—Five gold claims, belonging to prospectors named Fawcett and Bouillon, have been purchased by W. F. Brunnea, acting on behalf of Paul A. Fuse, St. Louis, and D. Jenkower, New York, for $25,000. The property was held on option for some time and development operations gave a good showing of gold.

Nova Scotia

Dominion Iron and Steel Company—For the first five days of July the furnaces were idle. The output for the remainder of the month amounted to 22,080 tons of steel, which included 16,405 tons of rails, and 2503 tons of rods in addition to blooms and billets.

Mexico

Chihuahua

American Smelting and Refining Company—A third furnace is being made ready for blowing in at this company's new smeltery near Chihuahua, and the installation of two additional furnaces is also planned. The plant has been in successful operation for several weeks, and increased ore receipts insure uninterrupted operations.

Parral Shipments—The production of the Parral camp for the week ending July 25 amounted to 7550 tons, of which 3970 tons were treated at local milling plants and the remainder sent to outside smelters. Among recent new shippers is the San Jose.

Veta Colorada—It is reported that as a result of the late visit of large stockholders to this company's properties in the Parral camp the work of completing the 500-ton cyanide plant may be resumed at an early date.

Sierra Plata—This company is contemplating the the early installation of hoisting and pumping machinery of large capacity at its property in the Minas Nuevas camp out from Parrel. R. H. Allen is the manager in charge.

Uruachic—Renewed mining and prospecting activity are noted in this section reached from Creel. The present operative properties include the San Mateo, San Martin, San José, Santa Rosa, Almalinda, Santa Marguerita and Mexican Mines Syndicate. Development work is in progress at the San Mateo and plans are under way for the erection of a matting plant; the San Martin is already equipped with [illegible] hoisting, concentrating and smelting works, all of which may be put in operation shortly; at the San José a 10-stamp mill is in commission; the Mexican Mines Syndicate has plans for the operation of a custom smeltery near the town of Uruachic; the Almalinda is new property of promise under development. With the extension of the Orient railway line to Los Tascotes this camp can be reached in one day's travel.

Greene Gold-Silver Company—This company has suspended operations at its Matulera mine near Ocampo. It is given out that this action is necessitated by the pending merger of this property with that of the old Belen Gold Mining Company's holdings in the same district. The Sierra Land and Lumber Company, another Greene enterprise, has also suspended lumbering operations at its immense Madera sawmill plant. Considerable interest is manifested as to whether Colonel Greene, who lately went to Japan for his health, will be able to secure from the Federal Government an extension of his mining concession over the 3,000,000-acre tract in the western part of this State; this concession is said to expire in December of this year.

Florencia—Shipments of ore are now sent out from this mine in the Santa Eulalia camp. The owning operators are S. G. Burns and R. J. de Morambert. The superintendent is W. W. Mitchell.

Dos Abril—This company, operating in the Dolores section, lately made a successful trial run of its amalgamation plant, and will shortly inaugurate continuous milling operations. A 30-horse-power steam hoisting plant is now en route to the mine, and on its installation deeper developments will be prosecuted. It is also likely that a concentrating equipment will be added during the next 12 months. This is a Cleveland, Ohio, company. C. Riddle is directing the mining operations.

Santa Eulalia-Union—Considerable ore of mining grade is reported opened up at a depth of about 350 ft. in this company's property in the Santa Eulalia camp. W. Henderson is in charge.

Swastika—Lead-silver ores are being developed at this company's mines in the San Pedro district in the northern part of the State, along the line of the Sierra Madre & Pacific. The properties include the Viernes Santos, El Campo and San Andres denouncements adjoining the old Congreso mine of the Candelaria Mining Company.

Africa

Rhodesia

Gold production in June is reported at 53,426 oz., an increase of 238 oz. over May. For the six months ended June 30 the total was 304,509 oz., or $6,294,201. For the corresponding period in 1907 the total was 292,775 oz., but the reports last year were made in ounces of bullion, while since Jan. 1 last the companies have reported fine gold.

Transvaal

Gold production in the Transvaal in July is reported at 584,455 oz. fine, which is 9482 oz. more than in May, and exceeds by 929 oz. the report for December last, which has been heretofore the record for a single month. For the seven months ended July 31 the total was 3,671,443 oz. fine in 1907, and 3,984,412 oz.—or $82,357,796—in 1908; an increase of 312,969 oz., or 8.5 per cent., this year.

South America

British Guiana

Gold exports for the six months ended June 30 were 34,849 oz. bullion in 1907, and 31,343 oz. in 1908; a decrease of 3506 oz. The bullion reported this year was equal to $554,169, or 26,811 oz. fine gold. Diamond exports this year were 1565 carats of $10,842 value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 12—The coal trade in the West is again showing some signs of improvement in demand. Mines are running on better time in some districts, and shipments have been larger. There seems to be rather more call for steam coal. The improvement is gradual, but operators find encouragement.

The Lake coal trade has been rather disappointing. Up to Aug. 1 the coal passing through the Sault Ste. Marie canals was 1,555,000 tons less than last year; and there has been also a decrease in shipments to Lake Michigan points.

The Seaboard bituminous trade continues dull, with light demand and low prices. The coastwise shipments are still light, though the season is advancing.

Anthracite trade is not active. The July shipments were the smallest of the year, showing a decrease of 1,127,528 tons from last year. Notwithstanding this fall, the supplies seem to be abundant.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Aug. 1, in short tons:

	1907.	1908.	Changes
Anthracite	3,302,392	3,022,542	D. [illegible]
Bituminous	22,410,402	18,827,072	D. 3,583,330
Coke	8,291,428	3,930,328	D. 4,361,100
Total	34,004,222	25,779,942	D. 8,224,280

Total decrease this year to date was 24.2 per cent.

Coastwise shipments of coal from Atlantic ports for the five months ended May 31, long tons:

	Anthracite	Bitum.	Total	Per ct.
New York	6,826,362	4,077,112	10,903,474	64.5
Philadelphia	965,725	1,836,264	2,801,989	16.6
Baltimore	111,421	1,493,242	1,604,663	9.5
Newp't News	....	981,678	981,678	5.8
Norfolk	....	551,892	551,892	3.3
Total	7,903,508	[illegible]	16,843,696	100.0
Total, 1907	8,235,248	9,431,641	17,666,889	

New York includes all the New York harbor shipping ports. The total decrease this year was 823,693 tons, or 4.7 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, five months ended May 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	8,135,249	1,059,969	9,195,218
Buff., Roch. & Pitts.	2,226,987	157,110	2,384,097
Penn. lines N. Y. C.	[illegible]	[illegible]	2,641,171
Pitts. & L. Erie	2,422,111	1,038,610	3,460,721
Norfolk & Western	3,865,903	752,754	4,618,657
Total	[illegible]	3,036,297	[illegible]
Total, 1907	[illegible]	6,032,026	[illegible]

In addition the Baltimore & Ohio carried 461,484 tons anthracite in 1907, and 340,283 in 1908; decrease, [illegible]

[illegible] Traffic Association, five months ended May 31, short tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
L. Erie, Alliance & Wh.	504,556	385,129	D. 119,427
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

[illegible] per cent.

Coal receipts at St. Louis, five months ended May 31, were 3,107,946 short tons in 1907, and 2,674,383 in 1908; decrease, 433,563 tons.

Shipments of anthracite from Buffalo by Lake for the season to Aug. 1 were 1,739,915 tons. The larger shipments were 599,825 tons to Chicago; 408,235 to Duluth and Superior; 307,550 to Milwaukee.

Anthracite coal shipments in July were 4,541,506 long tons, a decrease of 1,127,518 tons from July, 1907. For the seven months ended July 31 the shipments were, in long tons:

	1907.	1908.	Changes.
Reading	[illegible]	[illegible]	D. [illegible]
Lehigh Valley	6,585,105	6,325,815	D. 259,290
N. J. Central	[illegible]	[illegible]	D. [illegible]
Lackawanna	5,982,905	5,925,177	D. 57,728
Del. & Hudson	[illegible]	[illegible]	D. [illegible]
Pennsylvania	[illegible]	[illegible]	D. [illegible]
Erie	[illegible]	[illegible]	I. [illegible]
N. Y., Ont. & West.	[illegible]	[illegible]	I. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

The total decrease for the eight months was 3.6 per cent. Two companies—the Erie and the New York, Ontario & Western [illegible] decreases, the largest proportional loss being on the Philadelphia & Reading, and the smallest on the Delaware, Lackawanna & Western.

Coal passing through the Sault Ste. Marie canals for the season to Aug. 1 was, in short tons:

	1907.	1908.	Changes.
Anthracite	[illegible]	643,633	I. 11,298
Bituminous	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

[illegible]

New York

[illegible]

Aug. 12—There is no life in the hard-coal market either for prepared or small steam sizes. The slight activity which [illegible] 20c. per ton. Quotations by the large dealers are as follows: Broken, $4.65; egg, stove and chestnut, $4.90; pea, $3.25@3.50; [illegible] 1.50; all f.o.b. New York harbor.

[illegible]

The soft-coal trade is spotty, and Im-[illegible] tain consumers are taking coal, but consumption is not general; in the far East a [illegible] the low freight rates, but so far the bulk of the requirements has not been contracted for.

In New York harbor the market is at a standstill, and prices are lower than ever. Fair grades of Somerset coal are being offered at $2.25, and good Clearfield coal fetches $2.35. A peculiar feature of the situation is that for the first time in months there is a slight car shortage on at least two roads. It is believed that this condition may have been brought about [illegible] ulating demand. In the Coastwise vessel trade small vessels are scarce except in New York harbor. Freight rates are firmer and are as follows for large vessels from Philadelphia: To Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Newburyport, Gardiner and Bangor, 70@75c.; Portsmouth, 55@60c.; Saco, 90@$1; [illegible]

Birmingham

[illegible] shows a little improvement, as new labor is being brought in to take up the work left by the union and other miners on strike. The military force in the mining district has been increased by the bringing in of a regiment more of troops from the [illegible] diate needs of the furnace companies are being supplied now, together with what [illegible] Tennessee and Virginia. The operators [illegible] declare their intentions of operating mines on the open-shop plan. They will listen to no suggestions of arbitration, saying there is nothing to arbitrate. The union miners say they have funds and mean to [illegible] There have been some disorders, and some bushwhacking has been perpetrated.

Chicago

August 11—Harvesting trade continues active in the coal market; otherwise the business is dull. The demand from the West and Northwest increases and is for high-grade coals, threshers having apparently learned by experience the futility of buying low-grade fuel. Some country dealers are stocking up also on domestic supplies.

Illinois and Indiana coals, the chief supply and demand outside of contracts, are the same as last week—$1.75@2.25 for lump, $1.60@1.75 for run-of-mine and $1.35@1.50 for screenings. The demand for lump increases and the demand for fine coals decreases relatively with the growing consumption in the harvesting trade. Steam needs are increasing slowly and the domestic consumers are laying in more coal for the winter.

Of Eastern coals Hocking continues the steadiest, with the best coal holding well up to $3.15, but other prices ranging 10@25c. lower. Youghiogheny is in light supply and demand outside of contracts but brings steadily $3.15 for gas and $3.25 for ¾-in. steam. Smokeless lump is still scarce and run-of-mine brings $3.05@3.30; much low-grade smokeless being on the market. Anthracite is ragged, some country dealers finding good sale, but most inclined not to purchase until actual needs bring quick sales to consumers.

Indianapolis

Aug. 10—Officials in charge of traffic in this State speak cheerfully of the outlook for a heavy fall traffic. They say the worst has been passed, and from now on there will be an increased movement in coal. The railroads are preparing to handle this traffic promptly, and the records of the mines during the past week indicate that it is being offered. The Little Giant mine, near Linton, the Crown Hill No. 2, the Deering mines, near Clinton, and other mines in the State operated full time.

Pittsburg

Aug. 11—Production of coal at the railroad mines in the Pittsburg district shows no gain and is estimated to be at the rate of about 60 per cent. of the capacity of the mines. The independent mines seem to be doing better than the leading producer. Prices continue firm on the basis of $1.15 for mine-run coal at mine. The river mines have slowed up considerably, owing to the heavy accumulation of stock in the pools and in the harbor. The estimated amount ready to go out as soon as the rivers become navigable is 20,000,000 bush. Two rises have been expected within the past two weeks, but fell short by about one foot.

Connellsville Coke—Some fairly large sales have been made during the past week at unusually low prices. One producer, who had fully 500 cars of furnace coke, was compelled to dispose of it yesterday and the price accepted was $1.40. This, however, did not make the market, although other sales have been made at nearly that price for spot shipment. The large interests will not quote less than $1.65 for furnace coke and most of them will not take less than $1.75 either for spot or on contract. The H. C. Frick Coke Company continues to increase its capacity, but its product goes entirely to plants of the United States Steel Corporation. Foundry coke is in good demand and while prices are not particularly strong it is impossible to do less than $2.10 on contract. The *Courier* in its weekly summary gives the production in both of the Connellsville regions at 189,423 tons. The shipments for the week amounted to 7371 cars as follows: To Pittsburg, 3134; to points west of Connellsville, 3720; to points east of Connellsville, 517 cars.

Foreign Coal Trade

Imports and exports of fuel in Germany, six months ended June 30, metric tons:

Imports	1907	1908	Changes	
Coal	5,780,078	5,559,354	D.	220,724
Brown coal	4,341,279	5,432,288	I.	91,009
Total coal	10,121,357	9,991,642	D.	129,715
Coke	242,753	258,576	I.	15,823
Briquets	83,765	94,133	I.	10,368
Exports:				
Coal	9,585,270	9,838,175	I.	252,905
Brown coal	9,836	13,328	I.	3,492
Total coal	9,595,106	9,851,503	I.	256,397
Coke	1,803,503	1,812,642	I.	9,139
Briquets	577,370	802,463	I.	225,093

Coke exports this year included 8847 tons to the United States. Imports of peat fuel this year, 6040 tons; exports, 10,386 tons.

French Coal Output—Production of coal in the two chief districts of France, half-year ended June 30, metric tons:

	1907.	1908.	Changes.	
Nord	3,372,547	3,412,323	I.	39,776
Pas-de-Calais	8,548,921	8,932,823	I.	393,902
Total	11,921,468	12,345,146	I.	423,678

The coke made was 900,823 tons, a decrease of 63,038 tons; briquets made, 640,073 tons, an increase of 64,139 tons.

Iron Trade Review

New York, Aug. 12—No notable changes have occurred in the market, though there is some increase in business claimed. In pig iron there have been more inquiries reported, but prices are still unsettled, and shading to secure orders does not seem ended yet. Most of the inquiries are for foundry iron, though some basic is called for.

The only activity in finished material is in structural steel, and that is only moderate. New building projects are coming forward more freely, and there is a good deal of negotiating. The prices offered by some construction companies indicate that they expect to get the steel at less than present quoted prices. Some small orders for steel rails are reported, including 10,000 tons for the Chesapeake & Ohio, and 28,000 tons for the Cananea, Yaqui & Pacific in Mexico.

Pig Iron Production—The reports of the furnaces on Aug. 1 show 161 anthracite and coke stacks in blast, having a total weekly capacity of 284,600 tons; an increase of 20,100 tons over July 1. Taking the *Iron Age* estimates for July, with an allowance for the charcoal furnaces, the production for that month was 1,235,000 tons. Added to the American Association report for the first half-year, this gives a total for the seven months ended July 31 of 8,153,004 tons of pig iron.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region in July were 4,364,283 long tons. For the season to Aug. 1 the *Marine Review*, of Cleveland, gives the shipments by ports as follows:

	1907.	1908.	Changes.	
Escanaba	2,812,879	754,293	D.	2,058,586
Marquette	1,349,805	345,789	D.	1,004,016
Ashland	1,707,107	592,939	D.	1,114,168
Superior	3,081,664	1,111,887	D.	1,969,777
Duluth	5,151,365	2,819,934	D.	2,331,431
Two Harbors	3,431,921	1,610,439	D.	1,821,482
Total	17,534,741	7,235,281	D.	10,299,460

No change in the situation is probable. The mines are not prepared to rush shipments nor are receiving docks in condition to take care of a large flow of ore. Contract vessels are taking care of all the ore that is offered, wild boats finding no charters.

Baltimore

Aug. 10—Exports for the week included 1,103,969 lb. tin scrap to Rotterdam; 1571 tons steel billets to Liverpool; 5207 tons steel rails to Tampico, Mexico. Imports included 6250 tons manganese ore from India.

Birmingham

Aug. 10—Alabama pig-iron manufacturers are again enjoying a steady demand, and prices have taken on some strength. The lowest quotation now is $12 per ton, No. 2 foundry, with $12.50 a popular price. The sales are aggregating well. The Alabama Consolidated Coal and Iron Company will be making iron from another furnace in the next day or two. Three other furnaces in the district will shortly be started up. Inquiry for iron is coming from all directions. The last week in July was a lively one and the first week of August has been satisfactory. Stocks on hand are moving out, and the home consumption is healthy. The Sloss-Sheffield company will this week start up Lady Ensley furnace at Florence.

Cast-iron pipe plants in the Birmingham district are working on full time, and all pits are employed. The steel plant at Ensley is busy.

Chicago

August 11—Except for an occasional large lot, buying of pig iron continues to be in small quantities and for immediate needs. Yet the condition of the market, according to leading sellers, is improving. The size of lots is slowly increasing and the disposition of the melter is to buy more slowly, it is true, but surely. Several transactions concern lots of 500 to 1000 tons, and one notable transaction of the last week has been for 15,000 tons. The interest of melters in contract requirements for the first half of next year is growing also; inquiries are notably larger in number and aggregate tonnage.

On Southern iron the price has not been seriously cut below the $12 Birmingham ($16.35 Chicago) adhered to by most representatives of Southern furnaces. Some lots have been placed at $11.50 but they have been under conditions favorable to the seller. The tendency of prices seems to be slightly upward. Lots are running 100 to 500 tons. Northern iron is steady, contract requirements absorbing nearly all the product and odd lots being available at $17@17.50 on last-half deliveries. Charcoal iron brings about $20.50, with sales light.

Iron and steel products are improving somewhat, bars, light railroad supplies and structural materials showing improvement. Coke is stationary at $4.00 for the best Connellsville, and other cokes proportionate.

Philadelphia

Aug. 12—More inquiry for pig iron is reported, with some sales of foundry and basic. There is not yet apparent much disposition to buy far ahead, most orders being for immediate or early delivery. Cast iron pipe foundries are still in the market, but other interests are coming forward slowly. Prices are still weak and rather irregular, but No. 2X foundry may be quoted around $16.25, gray forge at $15, and basic $15 or a little over.

Steel Billets—No change is reported, but some transactions, noted as pending last week, have been closed.

Bars—Store trade shows a little improvement, but no large business is reported.

Plates—Business in plates has been quiet, but some work from steel car builders is expected.

Sheets—Sheets are about the same with a better store and retail trade.

Scrap—Dealers are taking to the woods, as buyers are not willing to pay prices while the railroads and other large sellers are not ready to come down. Prices are nominal in the absence of actual sales.

Pittsburg

August 11—Pig iron prices continue to go down, but the steel market shows some improvement. It is slight, however, and the boom expected to develop before this [illegible] to have been sidetracked. Representatives of the large steel interests who had predicted nearly normal conditions before Sept. 1 are hedging, and say now that normal conditions in the iron and steel trade will not materialize before Jan. 1. Orders are coming in satisfactorily, but consumers continue to buy only for immediate requirements. The Republic Iron and Steel Company, which operated its Bessemer plant at Youngstown for three weeks, was forced to close it Aug. 8. As orders have come in since the closing, it expects to start it again Aug. 15. All of the iron plants of the company are running to from 60 to 70 per cent. of capacity. The Carnegie Steel Company is still operating its big Homestead and Duquesne works in this district and the Ohio works at Youngstown to capacity, but all of its other plants that are in operation are running on slow time. The Edgar Thomson rail plant, containing three mills, is not operating to more than 30 per cent. of capacity and this business is on small new orders and on specifications on old contracts. The American Sheet and Tin Plate Company is reducing its tinplate capacity to such an extent that the excuse that the hot mills are getting ahead of the finishing mills is not accepted. An investigation shows that the season is about ended and the demand for tinplate has declined. At the opening of the week the company was only operating 138 of its 242 tinplate mills. The sheet mills, however, are doing rather better than last week.

Pig Iron—The pig-iron trade is the stumbling block in the general market. There is an inquiry in for 4000 tons of malleable and bessemer iron for a contract to be placed by a railroad. It is evenly divided, but the tonnage is not large, as the deliveries are to extend over about eight months. The Oliver Iron and Steel Company came into the market for 3000 tons of gray forge and 1000 tons of standard bessemer several days ago. The contract has not been placed, as the company refuses to pay more than $13.75 for the forge and $15 for the bessemer. The forge price is regarded as fair, as sales at $14 have been made frequently. The $15 rate for bessemer is below cost, as the lowest previous sale was astonishing, being at $[illegible], Valley furnace. While standard bessemer is low, foundry and basic continue high [illegible] at $[illegible] Valley furnace. There has been a time in the iron trade when foundry iron has sold above bessemer, but this was unusual. A local representative of a big Southern iron producer today reported a sale for fourth quarter delivery at $12.50, Birmingham. This would indicate that the Southern makers are well [illegible]

Steel—There is no shading of prices on either bessemer or open-hearth billets, $25 Pittsburg being quoted for early delivery, but in some instances a higher price has been asked for shipments in the last quarter. Sheet-bars remain at $27.50, delivered, plates at 1.60c. and steel bars at 1.40c.

Sheets—There has been a pronounced increase in the sheet trade and prices are firm at 2.50c. for black and 3.55c. for galvanized, No. 28 gage.

Ferro-Manganese—The price for prompt shipment is being shaded, but for late delivery, $47 is the lowest. For August $45.50 can be done.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for June, and the six months ended June 30, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1907.	1908.	Changes.
June	$17,226,259	$11,[illegible]	D. [illegible]
Six months	[illegible]	[illegible]	D. [illegible]

Decrease for the six months, 13.7 per cent. Leading items of export for the six months, in long tons:

	1907.	1908.	Changes.
Pig iron	[illegible]	[illegible]	D. [illegible]
Billets, ingots & blooms	[illegible]	[illegible]	I. [illegible]
Bars	[illegible]	26,72[illegible]	D. [illegible]
Rails	143,059	[illegible]	D. [illegible]
Sheets and plates	67,136	47,599	D. 19,537
Structural steel	[illegible]	[illegible]	D. [illegible]
Wire	[illegible]	[illegible]	D. [illegible]
Nails and spikes	29,513	20,453	D. 9,060

Decreases are shown in all items except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, from the United States for June and the six months ended June 30, are valued as follows:

	1907.	1908.	Changes.
June	[illegible]	[illegible]	D. [illegible]
Six months	[illegible]	[illegible]	D. [illegible]

Decrease for the six months, 52.6 per cent. Leading items of import for the six months, in long tons:

	1907.	1908.	Changes.
Pig iron	[illegible]	[illegible]	D. [illegible]
Scrap	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Bars	[illegible]	[illegible]	D. [illegible]
Wire-rods	9,043	5,538	D. 3,505
Tin plates	[illegible]	[illegible]	I. [illegible]

The only increase shown here was that in tinplates. The largest decrease was in pig iron.

Iron Ore Movement—Exports and imports of iron ore in the United States for the six months ended June 30 are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports	47,629	59,676	I. 12,047
Imports	[illegible]	[illegible]	D. [illegible]

Imports of manganese ore for the six months, 95,859 tons in 1907, and 105,232 tons in 1908; increase, 9373 tons.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Aug. 12.

At all U. S. Ports in June and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
June 1908..	$ 8,626,718	$ 3,409,885	Exp. $ 5,216,833
" 1907..	23,872,140	2,165,342	" 21,706,798
Year 1908..	53,507,975	26,368,198	" 27,139,777
" 1907..	36,300,732	21,468,647	" 14,832,085
Silver:			
June 1908..	4,437,360	3,366,182	Exp. 1,071,178
" 1907..	5,360,599	3,476,546	" 1,884,053
Year 1908..	25,514,545	21,054,332	" 4,460,213
" 1907..	29,219,209	22,395,611	" 6,823,598

Exports of specie from New York, week ending Aug. 8: Gold, $6825, to the West Indies; silver, $969,341, chiefly to London. Imports: Gold, $406,809, chiefly from Cuba and Central America; silver $75,687, chiefly from Mexico.

Specie holdings of the leading banks of the world, Aug. 8, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$322,791,700
England..... ..	$180,287,180	.. . .	180,287,180
France....... ..	642,442,880	$181,365,940	823,808,820
Germany.......	188,675,000	78,195,000	266,870,000
Spain..........	78,375,000	135.450,000	213,825,000
Netherlands....	38,520,000	21,294,000	59,814,000
Belgium........	20,013,335	10,006,665	30,020,000
Italy...........	183,555,000	22,000,000	205,555,000
Russia	580,170,000	39,725,000	619,895,000
Aust.-Hungary.	235,070,000	66,680,000	301,750,000
Sweden.........	20,145,000	....	20,145,000
Norway..... ...	8,680,000	....	8,680,000
Switzerland....	20,855,000	....	20,855,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

The Treasury Department estimates the amount and kinds of money in the United States Aug. 1 as follows:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 195,752,744	$ 615,788,276
Gold certificates.........	34,485,260	784,273,609
Silver dollars....	4,118,848	75,185,134
Silver certificates	9,363,038	474,690,962
Subsidiary silver	24,222,619	122,782,736
Treasury notes of 1890 ..	13,211	4,889,789
U. S. notes	5,645,634	341,035,382
Nat. bank notes..	64,772,332	627,316,659
Total.....	$338,373,716	$3,045,962,547

Circulation per capita, $34.77. Total amount in circulation Aug. 1 was $505,258 more than on July 1, and $264,638,987 more than on Aug. 1 last year.

Silver Market

SILVER AND STERLING EXCHANGE.

August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
6	4.8650	52	24 1/16	10	4.8660	52	24
7	4.8660	52	24 1/16	11	4.8650	51⅝	23 11/16
8	4.8660	52	24 1/16	12	4.8660	51¾	23⅞

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver opened this week at 24 3/16d. in London, but with a weak tendency owing to the fact that the Indian bazaars were the only bidders for silver, and offerings were larger than the demand. This induced Indian sales for bear account, and broke the price to 23 13/16d. on Aug. 11. The market closes firm at 23⅞d. today.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 30:

	1907.	1908.	Changes.
India... ...	£7,224,414	£4,997,493	D. £2,226,921
China.......	......	516.400	I. 516,400
Straits......	544.012	90,510	D. 453.502
Total......	£7.768,426	£5.604,403	D. £2,164,023

Receipts for the week were £4000 from the West Indies and £131,000 from New York; £135,000 in all. Exports were £530,000, to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

August.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
6	13 @13	13⅛ @13¼	60⅞	30¾	4.57 @4.62	4.72½ @4.77½	4.60 @4.65
7	13½ @13¾	13⅜ @13⅝	61	30¾	4.57½ @4.62	4.72½ @4.77	4.60 @4.65
8	13½ @13¾	13⅜ @13⅝	...	30¼	4.57½ @4.62	4.72½ @4.77	4.60 @4.65
10	13¾ @14	13½ @13¾	61⅞	30¾	4.57½ @4.62½	4.70 @4.75	4.55 @4.60
11	13¾ @14	13½ @13¾	61¼	30¾	4.57½ @4.62	4.70 @4.75	4.55 @4.60
12	13¾ @14	13½ @13¾	60¼	30⅝	4.57½ @4.62	4.70 @4.75	4.55 @4.60

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—For the first part of the week under review, that is for Aug. 6 and 7, business was very active and sales continued large. On Aug. 8 there was a decline, and on Aug. 10 sales fell off to a small figure, and very little business has been done since, either with domestic users or for export. In well informed circles, the impression prevails that the pace has been somewhat fast, although it is recognized that the present level of prices cannot by any means be considered high. The most urgent demand appears to be satisfied for the time being and the volume of the transactions has shrunk materially. In the absence of business the last two days, there has been no material change in prices. The market closes slightly easier at 13¾@14c. for Lake; 13½@13¾ for electrolytic in ingots, cakes or wirebars. The average at which casting copper has sold during the week is at 13¼@13½ cents.

A large quantity of copper has been sold during the recent activity, both for domestic use and export, for deliveries running up to the end of October. The quantity is variously estimated at 60,000,000 to 75,000,000 lb. Exports for the next two months will be large.

After touching £62 for spot and £63 for three months, a great deal of speculative realization was encountered in the London standard market, which brought about a rapid decline at the close, quotations being cabled at £60 5s. for spot and £61 for three months.

Refined and manufactured sorts we quote: English tough, £64@65; best selected, £64@65; strong sheets, £76@77.

Exports of copper from New York and Philadelphia for the week were 5251 long tons. Our special correspondent gives exports from Baltimore at 1156 long tons of copper.

Manufactured Copper—There has been a general advance. Sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15¼c. base.

Tin—The market moved within narrow limits and is inclined to sag at the close, which is cabled at 137 10s. for spot and £137 15s. for three months.

The demand from this side, which might have had a stimulating influence on prices abroad, was entirely absent. In the home market, the demand from consumers leaves much to be desired. Tinplate and solder manufacturers will now probably remain out of the market for some time to come, as their season is practically at an end. The premium for spot material, which has become more plentiful, is decreasing, and it can be bought at 30⅝ cents.

Visible stocks of tin Aug. 1 were, in long tons:

	In Store.	Afloat.	Total.
London......................	6,307	4,296	10,603
Holland......	1,936	183	2,119
U. S., exc. Pacific ports....	1,390	1,850	3,240
Total...............	9,633	6,329	15,962

The total shows an increase over July 1 of 1807 tons.

The tin output of the Federated Malay States for June is reported at 3827 long tons; for the six months ended June 30 at 24,442 tons, an increase of 1088 tons over last year.

Lead—A fair amount of business is doing from day to day at 4.57½@4.62½c. New York.

The London market, after advancing to £13 15s. for Spanish lead, is easier at the close, quotations being cabled at £13 10s. for Spanish lead and £13 11s. 3d. for English lead.

Spelter—Business has been of small proportions. First hands being well sold out are not pressing spelter for sale; however, there have been some quantities in second hands which have been thrown on the market and which have brought about a decline to 4.70@4.75c. New York, and 4.55@4.60c. St. Louis.

Advices from abroad about the spelter market are most encouraging, and under a large business, prices at the close advanced to £19 15s. for good ordinaries and £20 for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—Some quiet buying of standard brands for forward delivery has developed. Quotations are 8⅜c. for Cookson's, 8¼c. for Hallett's, and 7⅞@8c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Occasional offers of foreign metal are reported.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is lower, at £17 17s. 6d. per flask, with 1s. 3d. less quoted by second hands.

Platinum—Prices remain unchanged at $22.50 per oz. for hard platinum, $20 for ordinary and $15 for scrap.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, six months ended June 30, figures in long tons, except quicksilver, which is in pounds.

	Imports.	Exports.	Excess.	
Copper	82,066	31,511	Imp.	50,556
Copper, 1907	55,672	37,970	Imp.	17,702
Tin	22,915	21,034	Imp.	1,881
Tin, 1907	21,348	19,132	Imp.	2,216
Lead	117,512	27,793	Imp.	89,719
Lead, 1907	95,235	25,807	Imp.	69,428
Spelter	53,969	3,810	Imp.	50,159
Spelter, 1907	55,324	2,549	Imp.	52,775
Quicksilver, lb.	2,944,722	849,945	Imp.	2,094,777
Quicksilver, '07	2,803,946	1,131,722	Imp.	1,672,224

Copper totals include metallic contents of ore and matte. Tin ore imports, not given above, 10,610 tons in 1907, and 13,087 in 1908. Imports of iron and copper pyrites, 410,082 tons in 1907, and 435,521 in 1908. Of the imports this year the United States furnished 3314 tons copper matte, 35,892 tons fine copper and 20,201 tons lead. Exports include re-exports of foreign material.

Wisconsin Ore Market

Platteville, Wis., Aug. 8—The base price for 60 per cent. zinc ore this week was $36 per ton; two cars are reported sold on a higher base, but no premium figure is reported. For 80 per cent. lead ore $60 was paid. Some of the accumulated stock of zinc ore held for better prices was sold this week, but not shipped.

The shipments, week ended Aug. 8, were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland	555,150	....	
Platteville	88,770		88,000
Hazel Green	203,300		....
Benton	149,860	84,070	
Livingston	100,000		
Cuba City		154,240	
Strawbridge		54,000	
Total	[illegible]	292,310	88,000
Year to Aug. 8	[illegible]	[illegible]	[illegible]

Mineral Point, Linden and Harker failed to report; will be reported next week. In addition to the above there was shipped to the electrostatic separator from Benton, 313,340 lb.; from Elmo, 57,630 lb.; from Rewey, 52,200 lb. Shipped to the Joplin Separator Works, at Galena, from Hazel Green, 79,000 lb.; from Benton, 79,000 lb. Shipped to the Enterprise roaster at Platteville, from Strawbridge, 154,000 lb. zinc ore.

Missouri Ore Market

Joplin, Mo., Aug. 8—The highest price for zinc ore was $39, the base price $35@36 per ton of 60 per cent. zinc, silicate ore from $9 to $20, and the average, all grades, was $32.12 per ton. The highest price offering for lead ore was $63.50 for next week's delivery, with settlements for this week's delivery averaging $60.66, medium grades selling at $60@61 per ton.

Considerable zinc ore that had been accumulating from two to six weeks was shipped out this week, while in some quarters the present week's production was purchased and held for next week's shipment; thus the shipment shows only an increase of 978 tons, lowering the reserve stock approximately 800 tons, and leaving over 6000 tons in the bins, according to estimates made by a representative of the producers.

The highest price for zinc a year ago was $49, the assay base $44@46 per ton of 60 per cent. zinc. Lead was $64.50, with medium grades at $58@62 per ton.

Following are the shipments from the district for the week ending Aug. 8:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,131,420	[illegible]	$78,842
Joplin	2,611,260	213,400	50,898
Alba-Neck	675,530		11,821
Galena	633,310	[illegible]	11,768
Prosperity	[illegible]	[illegible]	11,104
Oronogo	[illegible]		9,957
Miami	[illegible]	56,600	8,543
Duenweg	[illegible]	[illegible]	8,115
Badger	[illegible]	44,460	[illegible]
Carthage	[illegible]		[illegible]
Spurgeon	272,590	[illegible]	6,183
Granby	307,510	[illegible]	4,910
Aurora	386,990	9,440	4,485
Carl Junction	164,220	1,170	2,827
Sarcoxie	143,160		2,433
Zincite	[illegible]		2,422
Ash Grove		[illegible]	[illegible]
Cave Springs	62,080		[illegible]
Totals	[illegible]	[illegible]	[illegible]
32 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week, [illegible]; 32 weeks, [illegible]
Lead value, the week, 47,697; 32 weeks, [illegible]

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	[illegible]	[illegible]	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	[illegible]	[illegible]
April	48.24	34.08	April	[illegible]	[illegible]
May	45.98	33.39	May	[illegible]	[illegible]
June	44.82	32.07	June	[illegible]	[illegible]
July	45.79	31.67	July	58.18	59.90
August	[illegible]	......	August	[illegible]	......
September	40.11	......	September	[illegible]	......
October	[illegible]	......	October	[illegible]	......
November	[illegible]	......	November	[illegible]	......
December	30.87	......	December	[illegible]	......
Year	[illegible]		Year	[illegible]	

Chemicals

New York, Aug. 12—The general market is unchanged, but along certain lines, such as heavy chemicals and acids, a better tone prevails, and some business has been done for future delivery.

Copper Sulphate—The strength in the copper-metal market has had its effect upon this by-product. Prices are firm at $4.65 per 100 lb. for carloads, and up to $4.90 for smaller lots.

[illegible] Wisner, New York, report the position of nitrate in the United States Aug. 1 as follows, in long tons:

	1907.	1908.	Changes.	
Stocks Jan. 1	[illegible]	[illegible]	[illegible]	[illegible]
Imports, 7 months	163,745	142,450	D.	21,295
Total Supplies	176,795	148,350	D.	28,445
Deliveries, 7 months	[illegible]	[illegible]	[illegible]	[illegible]
Stocks Aug. 1	[illegible]	[illegible]	[illegible]	[illegible]
Afloat for U. S.	110,000	[illegible]	[illegible]	[illegible]

Quantities afloat include all cargoes due to arrive by Nov. 15 at United States ports.

[illegible] report the exports of Florida phosphate rock through the port of Savannah in July: Great Britain, 537 tons; Germany and Holland, 3554; total, 4091 tons.

Mining Stocks

[illegible] has been the rule during the past week, with only very slight reactions, which hardly interrupted the upward course of quotations. The amount of business has [illegible]

Amalgamated Copper touched $85.50; American Smelting common, $110; Utah Copper, $46.50; United States Steel, $48 [illegible] vances.

On the curb market also there was great activity and many advances, with occasional reactions. Nevada Consolidated passed $17, and Cumberland-Ely, $10.50. Butte Coalition sold over $28, and Miami above $10. Some stocks which have hardly [illegible]

Today showed a sharp reaction in the

copper stocks, both in prices and in the amount of trading. Apparently this is only a temporary lull in the advance.

Boston

Aug. 11—The mining-share market continues broad and active, with just enough reaction in prices at times to solidify it. At present the market is in a reactionary period. Prices, as compared with a week ago, are higher in cases and lower in others. The high-grade stocks show little or no change. It is estimated that there has already been an appreciation in some 30 copper-mining shares since the low of 1907 of almost $285,000,000.

Amalgamated touched $83.25, but reacted to $80.87½ today. Butte Coalition, from high at $30, is off to $27.12½. Copper Range has been an active feature. Touching $81.50, it has reacted to $79.50, a small net loss for the week. North Butte reached $86, and is off to $83.50. Trinity, under Lawson patronage, made a $7 spurt, touching $25, from which it reacted to $19.50. United Copper, on speculative buying, rose $6.25 to $14. Centennial recorded a $3.50 rise to $33.50. Adventure touched $9.50; Mass, $8; U. S. Smelting, $44.62½; Superior Copper, $25.75, and Utah Copper rose from $40 to $46.25.

A new flotation is that of the North Lake Mining Company, 100,000 shares, at $8 per share. Subscriptions are being received here as well as in Michigan. It is located north of the Lake property, and is said to have the Lake lode for a considerable distance.

STOCK QUOTATIONS

NEW YORK Aug 11		BOSTON Aug. 11	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine		Adventure	8⅞
Amalgamated	80½	Allouez	38¼
Anaconda	48¾	Am. Zinc	28¾
Balaklala	2	Arcadian	4¾
British Col. Cop.	7½	Arizona Com	22¼
Butte & London	...	Atlantic	14¾
Butte Coalition	27⅛	Bingham	.75
Colonial Silver	.25	Boston Con	14
Cum. Ely Mining	9⅜	Calumet & Ariz	127¼
Davis Daly	3½	Calumet & Hecla	690
Dominion Cop.	2½	Centennial	32½
Douglas Copper	4¼	Con Mercur	.45
El Rayo	3 1/16	Copper Range	79½
Florence	3 7/16	Daly-West	‡11
Foster Cobalt	44	Franklin	13
Furnace Creek	26	Greene—Can.	12
Giroux	4¼	Isle Royal	22½
Gold Hill	⅜	La Salle	14½
Goldfield Con.	6 9/16	Mass	7½
Granby	‡105	Michigan	13½
Greene Gold	⅝	Mohawk	‡68¾
Greene G. & S	.25	Nevada	15⅞
Greenw'r & D.Val.	75	North Butte	83½
Guanajuato	2½	Old Colony	.80
Guggen. Exp.	178	Old Dominion	41
Hanapah	‡ 20	Osceola	116
McKinley Dar.		Parrot	28¾
Micmac	3	Quincy	96
Mines Co. of Am.	1 1/16	Rhode Island	4½
Mitchell Mining	1½	Santa Fe	2
Mont. Sho. C	1 1/16	Shannon	15⅞
Nev. Utah M. & S	4	Superior	24
Newhouse M. & S	6	Tamarack	75
Nipissing Mines	7¼	Trinity	20
Old Hundred	½	United Cop., com.	12
Silver Queen	1.05	U S Oil	26½
Stewart	1	U. S. Smg. & Ref.	44
Tennessee Cop'r.	39¼	U.S.Sm. & Re., pd.	45¼
Tri Bullion	2	Utah Con	48½
Union Copper	1 1/16	Victoria	6
Utah Apex	4¼	Winona	7
Utah Copper	44½	Wolverine	145
Yukon Gold	5 7/16	Wyandotte	2¼

*Ex Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	25¼
Am. Smelt. & Ref.	89
Am. Sm. & Ref., pf.	109
Bethlehem Steel	22
Colo. Fuel & Iron	35¼
Federal M. & S., pf	87
Inter. Salt	18½
National Lead	86¼
National Lead, pf.	‡104
Pittsburg Coal	12¼
Republic I. & S.	24½
Republic I. & S., pf.	80½
Sloss-Sheffield	63½
Standard Oil	647
U. S. Red. & Ref.	‡15¼
U. S. Steel	46¾
U. S. Steel, pf	109¼
Va. Car. Chem.	29½

BOSTON CURB	
Ahmeek	‡84
Black Mt.	‡3¼
East Butte	8½
Hancock Con.	‡6¼
Keweenaw	7½
Majestic	.78
Raven	1 1/16
Shawmut	.34
Superior & Pitts.	14¼
Troy Man.	‡.45

ST. LOUIS Aug. 8

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	05	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	5.00	4.00
Con. Coal	20.00	17.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	13.00

LONDON Aug. 12

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 3
Esperanza	3 9 0
Tomboy	1 2 6
El Oro	1 6 3
Oroville	0 9 4

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 12.
Furnished by Weir Bros & Co, New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.20
Belcher	.20	St. Ives	.32
Best & Belcher	.25	Triangle	06
Caledonia	.13	BULLFROG STOCKS	
Chollar	.17	Bullfrog Mining	.03
Comstock	‡.26	Bullfrog Nat. B	.05
Con. Cal. & Va.	.78	Gibraltar	.06
Crown Point	.28	Gold Bar	.04
Exchequer	.25	Homestake King	.34
Gould & Curry	.14	Montgomery Mt.	.08
Hale & Norcross	.24	Mont. Shoshone C.	1.00
Mexican	.76	Original Bullfrog	.02
Ophir	2.10	Tramp Cons	.18
Overman	.08	MANHAT'N STOCKS	
Potosi	.08	Manhattan Cons.	.08
Savage	.24	Manhat'n Dexter	.04
Sierra Nevada	.29	Jumping Jack	.02
Union	.27	Stray Dog	.03
Utah	.04	MISCELLANEOUS	
Yellow Jacket	.56	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	1.18	Lee Gold Grotto	...
Extension	.88	Nevada Hills	1.87½
Golden Anchor	.02	Nevada Smelting	1.00
Jim Butler	.28	Pittsburgh S. Pk.	1.06
MacNamara	.62	Round Mt. Sphinx	20
Midway	.42		
Montana	1.50		
North Star	.10		
Tono'h Mine of N.	7.62½		
West End Con.	.55		
GOLDF'D STOCKS			
Adams	04		
Atlanta	26		
Booth	41		
Columbia Mt.	25		
Comb. Frac	1 37		
Cracker Jack	07		
Dia'dfield B. B. C.	.17		
Goldfield Belmont	.15		
Goldfield Daisy	.76		
Great Bend	.35		
Jumbo Extension	.74		
Katherine	...		
Kendall	.15		
Lone Star	.10		
May Queen	.03		
Ore	.15		
Red Hill	21		
Roanoke	...		
Sandstorm	.32		

COLO. SPRINGS Aug. 8

Name of Comp.	Clg.
Acacia	‡6¼
Black Bell	....
C C Con.	3¼
Dante	‡6¼
Doctor Jack Pot	‡5
Elkton	59
El Paso	35
Findlay	21
Gold Dollar	‡6
Gold Sovereign	3
Isabella	28½
Index	....
Jennie Sample	‡2⅝
Jerry Johnson	‡4
Mary McKinney	‡25
Pharmacist	‡3
Portland	1 00
Un. Gold Mines	3⅞
Vindicator	85
Work	8¼

Assessments

Company	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	July 17	Aug. 6	$0.02
Caledonia, Nev.	Aug 12	Sept 2	0.05
Chollar, Nev.	July 8	July 30	0.10
Exchequer, Nev.	Aug 11	Sept. 1	0.05
Helvetia, Ariz	....	July 20	0.50
Ingot, Utah	July 17	Aug. 5	0.01
Iowa Copper, Utah	July 13	July 30	0.05
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Lucky Calumet, Ida	July 3	Aug. 13	0.01
Maxfield, Utah	July 18	Aug. 17	0.02
Mexican, Nev.	July 17	Aug 17	0.10
Missoula Copper, Ida.	July 25	Aug 25	0.01
Oro Cobre, Cal.	July 16	Aug 3	0.02
Sierra Nevada	July 14	Aug. 4	0.10
Signet	Aug. 8	Oct 6	0.01
Talisman, Utah	Aug 1	Aug. 18	0.02
Tomahawk, Nev.	July 10	Aug. 12	0.01
Wabash, Utah	July 10	Aug. 1	0.10
Wheeler, Utah	July 16	Aug 6	0 01½

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	......	31.637	......
September	67.792	......	31.313	......
October	62.435	......	28.863	......
November	58.677	......	27.154	......
December	54.565	.....	25.362	.....
Year	65.327	......	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13 901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12 875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	......	19.255	......	79.679	....
September	15.565	......	16.047	......	68.375	....
October	13.169	......	13.551	......	60.717	....
November	13.391	......	13.870	......	61.226	....
December	13.163	......	13.393	......	60 113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	......
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28 024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19 828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	......	19.063	......
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	.....
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6 732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6 837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	......	5.551	......	21 969	......
September	5.236	......	5.086	......	21.050	......
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, AUGUST 22, 1908. NO. 8.

The Hematite Mines of Cumberland, England

In Mining the Large Orebodies the Caving System Is Employed with Varying Methods for Removing the Pillars and Supporting the Ground

BY LUCIUS W. MAYER[*]

The county of Cumberland lies on the northwest coast of England, with the counties Dumfries and Roxburgh, in Scotland, to the north, and the Irish sea to the west. In the southwestern part near the sea are the Cambrian mountains. Cumberland produces great quantities of coal and iron, its iron ore being known for its richness and low phosphorus content. The ore is a hard anhydrous peroxide of iron yielding at times almost the theoretical proportion of metallic iron although the average is nearer 50 per cent. The kidney form of hematite is very common. Less prevalent is a material called "pencil ore," which brings as much as £100 per ton and is used for ornamental purposes.

SHAFTS NOS. 5 AND 6, HODBARROW MINE. CAVED GROUND IN THE FOREGROUND

The orebodies of Cumberland appear in every conceivable form. They occur in vein-like formations, in the form of beds, and more often, in irregular masses. The region is much faulted, a majority of the faults running in a northwest-southeast direction. Blue limestone and conglomerate are usually found as a roof over the ore and the floor is commonly slate. Wherever the blue-lime belts are encountered it is well to look for iron, and where the lime horizons are absent, search usually reveals nothing.

It is in the faults that the ore has been given opportunity to deposit. The strongest faults lie in the direction noted, but the general system is crossed by innumerable minor faults. The orebodies are sometimes found in narrow veins, similar to fissure veins in appearance, pinching to nothing in places. In the bed-like deposits, a very consistent thickness is sometimes maintained over large areas. The ore brings about 17s. per ton on the basis of 50 per cent. iron.

METHODS OF MINING

Cumberland is essentially a caving-system country, and no miners are more skilful in conducting the work and the necessary timbering operations than the men of this district. Wherever the caving system is in use the Cumberland miner stands to the fore. He is especially in evidence in the Lake Superior district and in Utah, where the caving system is in use.

Most of the ores in the Lake Superior region are softer than the softest ores [illegible] on the Menominee range have I seen ores which compare in hardness with those in Cumberland. In the Lake Superior district the caving system is used mostly on soft ores. The Cumberland ores are rather tough, thus differing from the porphyry copper ores of Utah and Nevada, where the caving system has been successfully operated.

---

[*] Mining engineer, 193 Pearl street, New York.

SURFACE SUBSIDENCE, PARKSIDE MINE, CUMBERLAND

There is no very marked tendency in the ironfields of Cumberland to depart from old methods of underground work. For example, there is but one inclined shaft in the district, even though there are several deposits generally admitted to be adapted to this method of operation. This does not speak well for the initiative of the Englishman. However, the ability of the men to handle fallen ground in caving areas, makes up for provincialism in other directions.

The Cornish pump is used very generally in Cumberland; in fact, as far as I know, there are no other steam pumps employed underground in the county and few in the whole of Great Britain. The use of the direct-acting steam pumps underground is not at all favored. The opinion prevails that conveying steam underground and handling the exhaust, is no better than a nuisance, and that it is a far less favorable arrangement than the more expensive Cornish pump, and its cumbersome parts.

The air drill, it appears, has not been given a fair trial in this region. The men, although they possess considerable skill in the handling of mechanical devices, prefer to use the hand drill and jack, even in the very hardest ores. It is quite true that in some places the ore is much fractured with many vug-holes and irregularities which interfere with the efficient use of an air drill, but this condition is not so common as to bar the power drill entirely.

PARKSIDE MINE

The Parkside mine is situated at Frizzlington, near Whitehaven, the center of the iron-mining country on the west Cumberland coast. The mine is one of the pioneer hematite producers of the district, but the ore zones are at present pretty well depleted.

SEA BARRIERS, HODBARROW MINE, CUMBERLAND

The orebody originally worked had the form of a huge wedge, as shown in section in the accompanying sketch. This body of ore dipped at a rate of one to four. The roof was sandstone and limestone, while the floor was underlaid with slate, sometimes replaced by limestone. The sandstone strata above the ore are extremely hard; but I found it hard to believe a statement that continual drilling for 18 months had only advanced a 5-in. hole 180 ft. The condition of the ground above the area from which this orebody was worked is shown in an accompanying illustration. The mine in this section is impassable, but the general method of working was as follows:

A vertical shaft was sunk outside the deposit. At 540 ft. a crosscut was driven to the ore and continued as a drift to the hanging wall. From this cross-drift, were extended lateral drifts, at 30-ft. intervals, parallel to the strike, and from these laterals, cross-drifts were cut at similar intervals, thus blocking out the ground on this level in 30-ft. squares, by 10x10-ft. drifts. At 600 ft. in the shaft, a second crosscut was driven, and similarly extended across the orebody. Similarly, from the 600-ft. level, a crosscut was started, and the work of blocking carried out as in the other level.

From the point where the crosscut intersected the orebody, a rise was started on the footwall, which, in these Cumberland deposits, is fairly regular. This rise was extended half-way to the upper level when a sub-level was started, which would be about 30 ft. higher than the level below. The bords on this level were cut the same size as on the main hoisting levels; in fact, all the work was similar on the sub-level, the only difference being that sub-levels are not directly connected to the shaft.

In blocking out it is endeavored to have the drifts in symmetry, one below the other. The work having advanced sufficiently from the various levels as regards blocking out, rises are started from the upper level to the top of the orebody, the different levels being connected by rises, to afford air circulation. By successive slicing, the ore is brought down above the drifts. The overburden is kept separate from the ore by means of timber acting as a mat for the waste to rest upon. Simultaneously, at other points, underhand stoping may be in process of execution in drifts, until eventually the interval between the levels has been either raised, or lowered, and finally pillars 30 ft. square are formed, which extend from the hanging to the footwall.

These operations extended over a long period, and no attempt was made to remove the pillars from the mine until the entire area had been blocked out in the manner described. When it became desirable to remove the pillars and recover the ore in them it was realized that surface derangement would ensue, and that it did ensue is shown in one of the accompanying illustrations.

The method said to have been used for the removal of pillars suggests great possibilities. Going up the rise, the pillars were under-cut, and every effort was made to bring them down without attempting to remove the rock. After a shot was fired all loose ground was barred down, the roof about the pillar being constantly tested. Finally the pillar became so weak that it would crush and crumble. The men did not leave the place until it was certain that a cave was imminent. A cave finally occurring, the men waited until the ground settled, barring down loose pieces of rock by standing on the fallen ground. As this work progressed the cave became more extensive, until finally the entire country subsided.

The ground having settled means were immediately taken to recover the ore in the pillars which had caved. This ground was pierced by means of forespiling, and it is stated that these timbered drifts were driven at comparatively low cost, and were readily maintained in the broken ground.

As a result of general caving, severe contortion of the surface resulted, which not alone affected the ground immediately above the pillars but also drove the shafts out of alinement and damaged the surface plant. A common sight in this vicinity is a chimney which, having taken a tilting position due to subsidence, has been straightened up by inserting wedge-shaped bricks on one side in the base, the lower portion of the chimney making a distinct angle with the upper portion.

The areas worked today in the Parkside mine are mostly narrow veins, a few feet thick, in general steeply inclined. Wherever these bodies widen sufficiently, the usual custom is to raise in the ore, block out pillars 24 to 45 ft. long and 18 to 30 ft. wide, and then top-slice these pillars in a manner to be described later.

Creator Moor Mines

The mines of Lord Leconfield, at Creator Moor, in Cumberland, were worked as early as the 17th century. The hematite orebodies averaged about 75 ft. in thickness, dipping from 20 to 45 deg. Above the ore is a coarse sandstone, called "whirlestone," which in turn is covered by 40 to 50 ft. of clay. The footwall of the orebody is limestone.

As the ground stands today, the conditions are similar to those which obtained at Parkside, in Frizzlington, before the pillars were caved. There is simply a succession of pillars, which, in this case, are sometimes 70 ft. square, and in hight approximate the maximum of 75 to 80 feet. There is no timber to be seen in this section of the mine. The pillars stand vertical and follow the rise and fall of the floor. The rooms between the pillars are about 10 ft. wide. It is possible to climb over a great area in the stopes between the pillars. Where the floor undulates to a steep pitch, light chains are fixed above, so that it is quite possible to climb from the lower level of the mine to the top by following the footwall. The method of working used was similar to that at Parkside, i.e., by sub-levels and blocking out of the area, involving the final cutting out of the middlings, thus exposing four free sides of the pillar which extended from foot to hanging wall.

FORESPILING THROUGH FALLEN GROUND

A Problem of Robbing without Disturbing the Surface

The problem of robbing these pillars presents requirements different from those at Parkside, for at Creator Moor it is imperative that the surface area be maintained. From the standpoint of caving, I venture to say, there would be no hesitancy in attacking the pillars, but this method is prohibited. Over certain sections of the mine, where the pillars happened to be no higher than 25 ft., surface restrictions were not important. In these places the pillars were caved, and the ore recovered. The method followed was to side-lane the pillar and bring down all roof rock. When the span between the reduced pillar and its neighbor became too great, and the roof became treacherous, the latter was shot down, the men standing on the broken rock to further test the roof, and work on the upper part of the pillar. When the fall was high, and the broken rock did not present sufficient elevation, ladders were used.

In working with the drill on ladders the miners use an interesting little scheme. A plank about 5 ft. long, is held under one of the rungs of the ladder, and two loops of a light chain are passed under the plank and around the rails of the ladder in such a manner that the plank is wedged at one end, the other end extending out as a cantilever. The plank serves as a platform from which the miners single-jack at the desired elevation.

In working this ground if the roof caved before the removal of pillar material had been completed the ore was recovered by forespiling through the broken ground. On approaching the stump of a pillar a second branch drive was sometimes started to expedite the removal of the portion left standing. The aim in the first attack is to cave the pillar, and in forespiling, to draw off the ore in the timbered drift shelter, until the waste rock makes its appearance. In forespiling a part of a pillar may be encountered in a comparatively solid condition. In this case mining will be carried on in the ordinary way with a solid face at the head of the drift. When the pillar is a large one, several roads may be driven about it, and through it, until little or no ore of value is left in the area.

The matter-of-fact way in which the miners go about these operations indicates the security which they feel in the work. They are at home in caved or caving ground; it is the ground which hangs and does not submit to control that causes anxiety and calls forth their utmost efforts to induce a fall in the desired way.

Various means of removing the tall pillars standing in the mine without incurring surface subsidence have been considered. A scheme recently outlined involves the filling of the mine with sand flushed in with water, and to pump out the water in the manner employed in Upper Silesia. In my opinion the Creator Moor company has a far more difficult problem than those generally encountered in Germany, and there are certain complications on account of the dip which increase the difficulty.

Keeping in mind the inclined stope, and the pillars standing vertical, it is apparent that the roof span between supports will be great on the removal of the pillar.

During my visit 29-ft. lengths of 5-in. steel pipes, ½ in. metal, were being hung in a 6-in. bore hole, and a complete pipe line was in process of erection in the mine

The sand is to be hauled by a road traction engine in wagons a distance of one mile from the sand bank. The wagons are of the bottom dump type, and of four tons capacity.

ULLCOAT MINE

The Ullcoat mine is situated at Ullcoat, near Whitehaven. The ore worked is generally a very hard hematite. A conglomerate roof makes its appearance more frequently here than at the other mines visited. The ore is a replacement in limestone, and the floor is a Silurian slate: the coarse conglomerate of the roof is sometimes displaced by limestone or slate. Vug-holes are frequently encountered in the formation; they vary in size, from a few inches, to caves nearly large enough for a man to enter. These vug-holes are often filled with a fine quality of pure plastic clay which is readily extracted and is put to good use.

There is the greatest irregularity in the physical condition of the rock, and this, with its hardness, has discouraged the company from giving air drills a fair trial. The drilling is all done with hammer and steel, and it is not surprising to learn that at times the hammermen are doing well when accomplishing a 2-ft. hole in eight hours' work; 8 ft. per shift is near the average. Noble powder containing 85 per cent. nitroglycerin is used in the hard ores, with a No. 6 cap and rubber-covered fuse.

There are three rectangular shafts on the property, this form being rather common in Cumberland. It is the intention to rob the pillars eventually, and the policy now being carried out in mining keeps this idea in view. It is evident that the company realizes the importance of leaving large pillars, rather than making the mistake of doing the robbing work on small pillars.

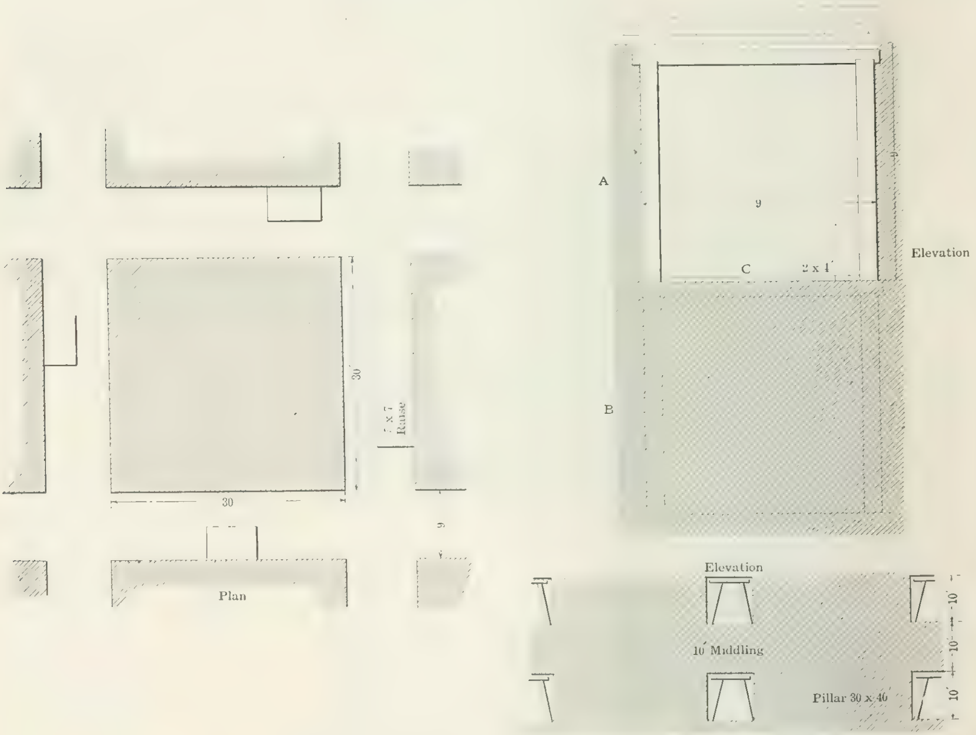
The two main shafts are 50 and 80 fathoms deep, respectively, the latter having three levels.

The peculiarity of a great many seams in this district is the nature of the outcropping materials. As the surface is approached, a very soft, loose material is encountered, which has the appearance of thoroughly wetted mortar. This condition led to a serious inrush not long ago, when the work of robbing the upper pillars was begun. The workings were filled with the soft clayey material, and great difficulty was encountered in reopening the area. A district subject to such inrushes is now bulkheaded so as to confine the incoming material to small areas.

In one seam, which averaged about 6½ ft. in thickness and had a dip of one in three, the ground was thoroughly blocked out in the upper levels by pillars 30 ft. wide and 40 ft. long. The rises, or bords, between the pillars are 10 to 12 ft. wide. Robbing has been begun in this orebody. In other parts of the mine, work is largely confined to blocking out pillars and, I am told, the large profits of this company are derived wholly from development work, which thus far has been the feature of the operations, particularly in the thick deposits.

TIMBER USED IN REMOVING PILLARS

The method of working after a number of pillars have been blocked out along the lines indicated is briefly as follows: The pillars nearest the outcrop are attacked first. Starting at the top of the rise of the uppermost pillar, a lane is cut about 8 to 9 ft. below the top of the pillar. As the driving of this lane is advanced, timbers are set under the outcrop, the stulls being 8 to 10 in. in diameter. In a case of this kind, where the walls are strong, the cap may have but one post under it, the other end of the cap being hitched into the wall in a recess about 8 in. deep. Similarly, on the floor of this lane, a sill may be set hitched into the wall; where it is impractical to hitch the timber, it is



METHODS OF CAVING EMPLOYED IN CUMBERLAND, ENGLAND wedged between the walls. Over the sills of this first set, planks or round poles are set, which serve later in keeping the outcropping material separate from the ore when the overburden is lowered.

The first lane on a pillar having been completed, a second lane is immediately begun about 9 ft. below the top of the sills placed ,in the first lane. Before doing this, however, the upright post timbers are withdrawn so as to cause the roof over the first lane to drop, the fallen ground being waste material. The second lane is started in the same way as the first, the posts being set under the sills of the first lane, the horizontal pieces which serve as sills for the first lane becoming caps for the second. This, in general, is the principle of the caving system for all widths of vein, except in case a middling is left. In this particular instance the vein was narrow, but in wider veins the principle is practically the same, with exceptions in the details of timbering.

The ore is disposed of by lowering it in small cars. When several pillars are robbed simultaneously, one rise may be handling the product from two adjacent pillars, and when pillars are robbed at different points in the mine, several rises below may be equipped as main inclines down which the ore is conducted to the shaft level. The headings below each pillar may be considered sub-levels connected with the nearest hoisting level by means of the bords between the pillars.

The ore is not necessarily sent to the hoisting level in a straight line, but may be sent down a series of rises or bords which are not in the same plane, but which afford the best available route. The rises which are used for the lowering of the ore to the hoisting level are maintained more thoroughly than the others. Bad roof conditions in certain sections of the mine determine the choice of haulage location. The re-handling necessary at the foot of various sub-levels, in many cases probably overbalances the cost of maintaining the roadways in a definite straight line.

In the thick irregular deposits, which sometimes become as wide as 100 ft., the work has all been merely blocking out. This has consisted in driving headings and cross-headings 10x10 ft., with an intervening middling of 10 ft., i.e., a series of 10x10-ft. headings blocking out pillars 30x40 ft., then dropping down 20 ft. and repeating this operation. Wherever the deposit shows regularity, these headings are, if possible, kept in the same vertical plane.

Hoisting levels are usually about 60 ft. apart. From the first level raises are driven from convenient points to the top of the orebodies, and from the second level connections are made with the workings on the first in a similar manner. From the top of the raises breaking-out levels are started, and at 30-ft. intervals, sub-levels. The work of blocking out the 30x40-ft. pillars may, of course, be carried out at several levels at once, but it is well to do considerable development work first, in order that the form of the orebody may be well determined, permitting an intelligent policy to be outlined in advance.

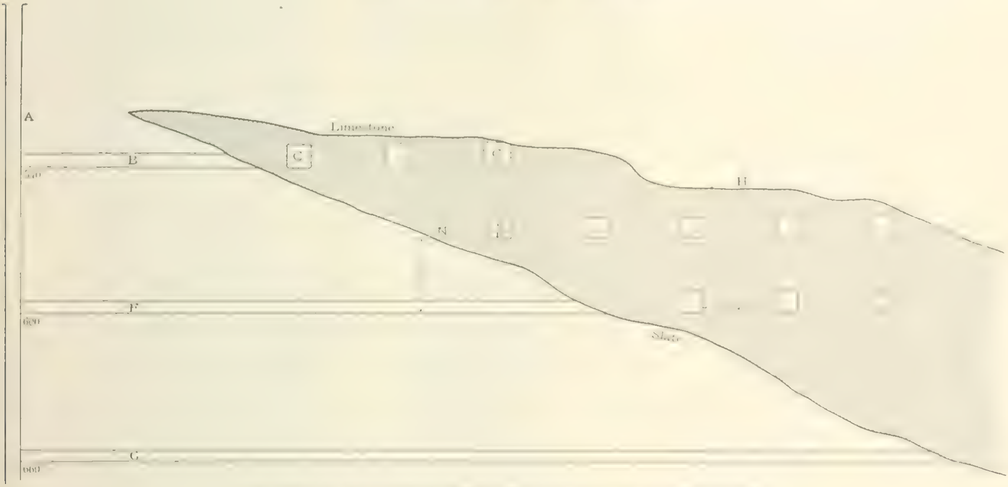
In the irregular deposits a great variety of conditions are met, and extensions are necessarily made from time to time which, when following stringers, often lead to the discovery of new pockets.

Hodbarrow Mine

Hodbarrow Point lies at the extreme southern end of Cumberland, near a town called Millom, which is about a half hour's ride out of Whitehaven, and borders on a little bay of the Irish Sea. The sea plays a very important part in the mining operations of the Hodbarrow company.

The ore is a hard hematite, averaging about 57 per cent. iron, and lies in great bodies dipping slightly seaward. These bodies are as thick as 100 ft. in parts of the property, while thicknesses of 10 to 20 ft. are common. Above the ore are alternating beds of sand, blue gravel clay and a harder variety of clay, called "pinnal clay." As the deposit approaches the sea a limestone roof comes in over the ore.

Mining has been going on in this vicinity for many years, but early developments were discouraging, and Lord Lonesdale, the owner of the ground some time ago granted a lease to the Hodbarrow Mining Company, which is now mining nearly half a million tons annually. Owing to the previous condition of the strata overlying the ore, underground work presents great difficulty involving not only danger, but also considerable outlay in the endeavor to check the inrushes of sand and water.



THE OREBODY AT [illegible] MINE [illegible]

During the eighties, a timber wall was built to hold back the sea from the sur[illegible] tions were to be carried on. This wall was destroyed by the sea and in 1890 a masonry wall was built. Previous to the [illegible] been well prospected. The wall is formed of concrete blocks keyed the one into the other. Puddled clay was used to make the wall impervious to water. The structure stood until a rush of quicksand un[illegible] it began to subside. Following this, a [illegible] this wall was inaugurated. Diamond drilling from floats was not without its difficulties, but from the arrangement of holes shown on the company's map, it appears that the work was done skilfully.

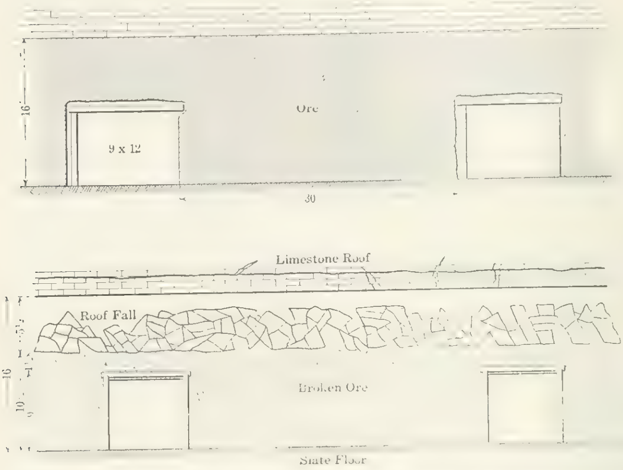
Hodbarrow Outer Barrier

A large acreage was finally outlined showing a continuation of the ore seaward, and it was decided to build another wall to hold back the Irish sea. This is the famous Hodbarrow outer barrier, built at a cost of about £500,000. A lighthouse was placed on the wall, in accordance with the stipulation of the government when rights to the area were granted.

The length of this new wall is 6870 ft. Its construction covered a period of five years. Its shape is the segment of a circle. The designers were Coode Son & Matthews, who, I understand, also built the Zambesi dam in Egypt. The area inclosed by the wall is about 170 acres of which, according to the geological maps, at least half shows ore. While it is quite certain that the ore extends farther under the sea, this will probably be the last wall the company will be permitted to build, because of Government restrictions to preserve the river channel.

The form of the wall varies to a certain extent with geological conditions of the bottom. It consists of an outer and inner limestone barrier, formed like truncated pyramids. Within these two pyramids is a wall of puddled clay to make the barrier watertight. The top of this wall is 5 ft. above high water. Where the clay bed underlying the bed was regular, the central puddled clay wall was keyed into the bottom, but where the bed was irregular and formed of coarse sand, 30-ft. sheetings of steel were driven, the result being a massive steel construction. In front of the outer limestone bank are strewn concrete blocks which weigh from 15 to 25 tons each.

One point has been borne in mind in the design of the structure, the necessity of flexibility; so that in the event of foundation subsidence, the entire structure will sink intact instead of failing by fracture as in the case of the first wall.



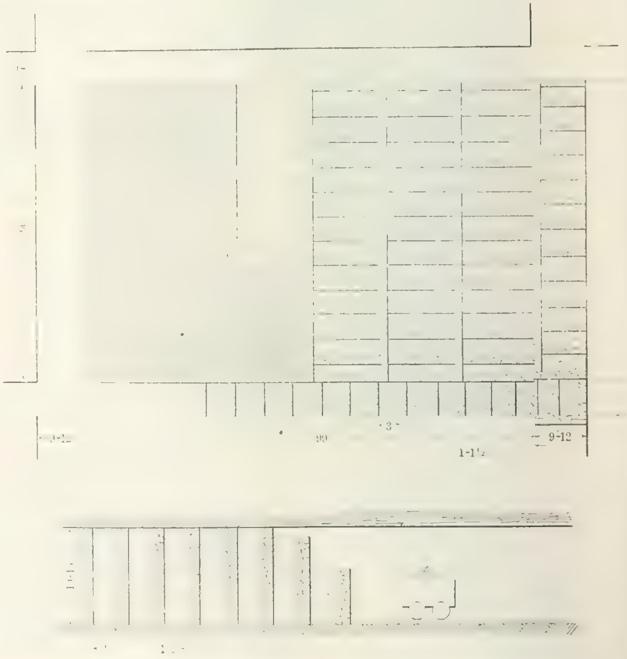
CAVING 16-FT. BED OF IRON ORE, HODBARROW MINE

Mining Below the Sea Bed

In mining under the inclosed area of the sea, greater care is required than in work within the shore line. By the stipulation of the lease pillars of larger dimensions are cut than in the older work.

All but one of the shafts on the property were sunk in ore, and this one is quite a recent attempt to have a shaft on the property which will outlast the mining operations. The other shafts have been more or less affected by the work of mining, in spite of the fact that large pillars have been left about the pits. Considerable difficulty was encountered in shafts where sand strata were found. A telescopic method of shaft sinking was adopted, starting with a diameter of 19 ft. and tapering down to 11 ft. at 60 fathoms, the difference being due to the thickness of metal in each succeeding length of tubing.

An interesting attempt to introduce the American square-set system was made in one of the large orebodies. This immediately met with considerable favor, following as it did the radically different caving system in use up to that time. The new method worked successfully for a long time in a territory adjoining ground which had been mined out by the old system. However, as the work progressed in the new orebody, the fallen area of the old work was approached, and with insufficient side support for the timber sets, a bad creep resulted in the toppling over of the entire framework. It was then decided to attempt no further introduction of square sets, and the caving system alone has since been in use throughout these mines.



METHOD OF PILLAR ROBBING AND FILLING AT PARK PIT

In working the deposits the ground is first systematically laid out in squares by means of drifts usually about 9 ft. square. The policy is to make the drifts as wide as consistent with roof conditions, and 9 ft. has been found to be economical in the greater part of this mine.

The method of mining varies to a certain extent at Millom, in accordance with the thickness of the ore. Where the ore is but 10 or 12 ft. thick, the system would resemble in a measure, the methods used at Cleveland, always keeping in view the eventual withdrawal of the pillars. With this thickness, the ore is taken in one lift, and where the overburden is soft, forespiling must be used in all drifts. In the ordinary landward work the pillars are blocked out 30 ft. square, but under the ground reclaimed between the two sea walls, the pillar requirement is 90 feet.

The ground being well blocked out in advance, a regular system of caving is started in the usual manner. When limits of the orebody have been reached steps are taken for caving the pillars. When the overburden is hard and blocky, no particular precaution is exercised in laying flooring to keep waste rock separate from the ore; but where the overburden is soft, 2x4-in. planks are placed on the floor upon which the roof is allowed to fall.

Short Talks on Mining Law —VIII

By A. H. Ricketts

The United States Mining Act defines the term "placers" as including all forms of deposit excepting veins of quartz and other rock in place. It has been held by the courts that by the term "placer claim (as used in the act) is meant ground within defined boundaries, which contains mineral in its earth, sand or gravel; ground that includes valuable deposits, not in place, that is, not fixed in rock, but which are in a loose state, and may in most cases be collected by washing or amalgamating without milling," but the mode of reduction is not material. Legislation, supplemental to that act, specifically provides that land chiefly valuable for building stone (whether for business or ornamental purposes), or containing petroleum, or other mineral oils, salt springs, or deposits of salt in any form may be located under the provisions of the law in relation to placer-mining claims. Coal lands in Alaska and the Phillipine Islands are subject to special acts.

Under the decisions of the courts and the rulings of the Land Department, the following are declared subject to location as placer claims: Agate; alkaline earths; alum; aluminum; asphalt; auriferous cement (also as subject to lode location); borax; brick clay; building stone; coal; coprolites; china clay; diamonds; fahlband; fire clay; granite; gypsum; gypsum cement; guano; gold-bearing gravel; iron (also as subject to lode location); kaolin; limestone; natural gas; mica; marble; mineral-paint rock; nitrate of soda; opal; plumbago; petroleum or other mineral oils; phosphates; potash; resin; rock salt; sandstone; stockworks; sulphur; saline lands; salt springs; soda; stone suitable for making lime; slate; tailings; umber. "Valuable deposits" must be located according to the classification to which the mining act has declared and the courts have decided that they belong, but when their classification has not been so particularly determined the manner of locating, whether as a lode or a placer deposit, depends upon the form, character, and manner of occurrence of the deposit.

Whether a "valuable deposit" may be located as a lode or placer claim is determined by the form and character of the deposit or the specific requirements of the law in relation to the locating of claims.

It has been held that the law permitting placer locations is not a "catch-all system allowing parties to play fast and loose to suit their own caprice, and locators insisting upon the validity of a location by reason of a particular mineral, must show that the location was made for that purpose and no other." But it is not necessary to specify in the location notice the particular mineral upon which the location is based, as it will include all minerals found therein subject to placer location. Whether land is chiefly valuable for its minerals is a question of fact. It is not permissible to locate a mere water right as a placer claim.

"Lode claims" are those located upon veins of quartz and other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposit, whether metalliferous or non-metalliferous. The term "rock in place" as used in the mining act is synonymous with what miners call "country rock;" that is, not float nor isolated bunches, boulders of rock, debris, detritus or alluvium, but rock which is inclosed and embraced in the general fixed and immovable mass of the earth's crust. It has been held that "this term (rock in place) should be given the most liberal construction that the language will admit of, and every class of claims that according to either scientific acuracy or proper use can be classed or applied for as a vein or lode claim, can be acquired under the law;" but the vein itself may consist of loose, broken or disintegrated matter.

The Entry as Mineral Ground of Ground Claimed Otherwise

There must be an appropriate discovery in either class of locations to validate the claim. A placer locator is not compelled to embrace within his lines land which is unfit for mining, although within the lines of the public survey; but the discovery must be within the limits of the claim.

At any time before final entry of a homestead application the land covered thereby is subject to lode or placer location, provided entry upon the land can be made peaceably. The duty, however, devolves upon the mineral claimant to institute proper proceedings in the local land office to determine the character of the land, and to prove that the land is more valuable for mining than for agricultural purposes; otherwise the land may be patented as agricultural, notwithstanding its true character. Possibly, as the result of such hearing, the court may order a segregation survey to be made so as to divide the land into mineral and non-mineral land; each claimant then to take his respective part of the land in dispute.

It has been held that lands within an unpatented townsite may be located as mineral land, although in actual occupancy, but if application for patent has been made and final entry has been had, only land known to be mineral at the time of such application is excluded from the operation of the townsite patent. Therefore, such patent does not properly include a known mining claim.

Coal Lands

A preferential right of entry is acquired by the location of coal lands, but entry in the land office is not confined to one having such right. A location of coal land may be made upon surveyed or unsurveyed lands and, for safety, entry in the local land office should be made within 60 days after the first day of actual possession and improvement, provided the township plot has been filed already in the local land office; otherwise, 60 days after filing of the township plot. Final entry should be made within one year, but in the absence of an intervening adverse right, it may be made after that time. It is sufficient to prevent adverse homestead entry of the land if coal is developed in paying quantities.

Coal lands are not patentable under the mining act, but must be patented under a special act. Any person over 21 years of age who is a citizen of the United States may enter 160 acres, or an association or company 320 acres of land, but, if the association is composed of four or more persons and has spent not less than $5000 in working or improving the ground, it may enter not more than 640 acres. The right of entry, whether the entry is made by an individual or by an association, is exhausted with application made, although it may be for less than the maximum acreage. Hence, an association cannot exercise the right if one of its members has previously made such entry.

Oil Lands

The fact that surface indications of petroleum oil or the geological formation

---

*Member of San Francisco Bar, San Francisco, Cal.

of the country may be such as scientific research and practical experience has shown to be likely to lead to petroleum oil in paying quantities, or that the land has been reported by the surveyor general as mineral in character, or that land in its vicinity is valuable for its minerals, does not serve to constitute a sufficient "discovery" within the meaning of the law, for, until the place of deposit from which the oil is drawn is discovered, the location must remain a speculative one.

Petroleum oil with its natural gas, unlike other mineral deposits, is movable by virtue of its own inherent force, as well as by virtue of its liquid character. The normal condition of petroleum oil is one of repose and not of motion, and it belongs to the rock in which it is imbedded. The mining for mineral oils or natural gas cannot be conducted as is other mining by awaiting the development of other claims of similar character.

Mining for oil is looked upon by the courts, as in the nature of the capture of wild animals. That is, from their propensity to escape, he who first has actual possession, is first in right. Hence, the possession of a petroleum-oil or natural-gas claim is a qualified one and mining thereon should, for safety, be carried on, either before or contemporaneously with similar mining by, say, adjoining owners. Otherwise there is the risk of the loss, through drainage by prior work, of mineral value in the land in which the actual work of extraction is delayed. The difficulty in the way of preventing the recovery by the owner of the petroleum oil or natural gas would be the impossibility of making the necessary proof of ownership. It may be said that the rule for the government of rights against draining percolating water does not prevail as to underground seepages or percolations of minerals oils, as such oil is not intended for agricultural purposes, and has a commercial value only to the producer.

Drilling or operating oil wells within or upon the dependable territory of a navigable river or below high tide, or on an ocean beach, or from a wharf, or within three miles of the shore, is conducted by the forbearance of the Federal and State Governments. Mining on tide lands and in navigable waters in Alaska is permitted by reason of special Congressional legislation affecting that district. Elsewhere, such operations are a technical trespass.

Hydraulic Mining

By legislative enactment in California, hydraulic mining is defined as "mining by means of the application of water under pressure through a nozzle against a natural bank."

The essentials to the practical conduct of hydraulic mining operations are these: In addition to obtaining a permit to conduct the same when required by law and compliance therewith, water must be obtained in quantities and carried to the mining ground under pressure sufficient to disintegrate and wash down the natural bank; for these purposes reservoirs, ditches, flumes and pipe lines are indispensable. The soil and gravel thus eroded must be carried, by gravity and the force of the refluent water, through cuts, sluice ways and flumes where the gold, by reason of its greater specific gravity, is deposited, caught and gathered. Lastly, by aid of the same beneficient agent, the resulting waste matter, or mining debris, as clay, sand, stones, rocks, boulders, soil and gravel, must be carried away through convenient channels so as not to impede further operations or constitute a pubic nuisance.

The hydraulic method of placer mining is not in itself unlawful, nor necessarily injurious to others, but is highly useful and commendable when properly conducted and without injury to the property or rights of others; but as the detrital matter became a menace to navigation by its deposition in navigable and unnavigable streams tributary thereto and was an interference of the rights of property of others by overflowing their lands, its continuance was practically enjoined in California in 1884. Subsequently in 1893 Congress passed what is popularly called the "Caminetti Act," or sometimes "Debris Act," by the terms of which such mining could be resumed within certain areas (San Joaquin and Sacramento river systems) in that State; the flow of detritus to be restrained by means of impounding dams built and maintained by the mine owner, and also by the Government, under regulations prescribed by a commission created by that statute. This act has been held mandatory and constitutional. It is not lawful to conduct such mining within the prescribed areas unless under permit from such commission and in compliance with its instructions. A permit given may be revoked by the commission. The courts also exercise a supervisory power in the matter and sometimes nullify the permit by enjoining the licensee from mining thereunder by determining that the impounding or restraining works erected by him are not sufficient for their intended purpose, or that no permit has been granted.

Lands subject to hydraulic mining which are without the said prescribed areas are not within the jurisdiction of the commission, but mining may be carried thereon wherever and whenever it will not result in material injury to navigable streams, or to the land adjacent thereto.

Dredge Mining

Dredge mining is another method of placer mining. It differs in a material feature from hydraulic mining, in that the waste material is deposited and left upon the land, often in the "pit" made by the dredge. Such mining is carried on in a navigable stream by the forbearance of the Federal and State Governments. The bed of such a stream is not subject to mineral location as it belongs to the State and not to the United States, although such a waterway is said to be "the property of the nation." As navigable streams are public highways, any unauthorized obstruction or interference thereon by a private individual is a public nuisance and may be enjoined. The right to mine therein cannot be acquired by custom nor by prescription.

The right to dredge the banks and nearby land may be acquired by location, if it is chiefly valuable for its minerals, and still belongs to, and is not reserved by the United States. If the land has passed into private ownership, the right to dredge must be secured by purchase or agreement from the owners. An unnavigable stream and the bed thereof within a State belongs to the United States, and generally, may be covered by a placer mining location. The location may be laid so as to include the bed of the stream and a part of one or both banks of the same and contiguous land, or so as to follow the course of the bottom of the stream. It will be sufficiently marked, in California at least, because of the absence of any statutory enactment, or possibly a local rule therein regulating the manner of location, by posting a notice of location on some object in the stream, as a stump or snag, by giving the measurements of the claim, identifying the stream and showing a definite relation between the stream and the selected object upon which the notice is posted. From this data the boundaries can be readily traced and that is all that is required by the mining act of Congress, which governs all locations not affected by local statute or rule.

Laws Applying to Mineral Land in the Philippines

The locating and patenting of mining claims in the Philippine Islands are subject to the provisions of a special (amended) act. This act adopts some of the features of the Mexican mining law, as well as some of those of the United States Mining Act, and provides for the regulation of some matters of detail which, in the latter statute, are left to regulation by local law or local rule. It provides for "square locations" not exceeding 300 m. (about 1000 ft.) in length and 300 m. in breadth, to which no extra-lateral right attaches. It requires that the claim shall be marked by two end lines and a discovery post at the point of discovery, each post to be marked in a prescribed way, and that the line between the end-line posts shall be distinctly marked. Fractional claims must be denominated as such in the record which, in all cases, must be filed within 30 days after location and have upon the back of the notice (declaration, it is called in the act) a sketch plan showing as nearly as possible the position of the adjoining mineral claims, and the shape and size (expressed in meters) of the claim or fraction desired to be recorded. The "holder" is not entitled to more than one mineral claim on the same vein or lode. A claim may be abandoned by filing written notice thereof with the recorder.

Work or improvement worth [illegible] pesos is a condition precedent to patent and the Government must be paid 25 pesos per hectare for the land embraced in the claim. Placer claims cannot exceed eight hectares for an individual claimant and 64 hectares for an association of persons, irrespective of the number of persons composing such association. Millsites are limited to two hectares. Tunnel claims, as such, are not recognized.

Coal lands may be entered by a competent person more than 21 years old to the extent of 64 hectares, or 128 hectares by an association. The Government price for the land ranges from 50 to 100 pesos, according to the situation of the land. Saline lands are subject to auction or private sale for not less than six pesos per hectare.

This act seems to foreshadow the temper of Congress in relation to ultimate changes in the United States Mining Act, which was originally passed (1866) after an opposition so determined that it bore the singular title of "An act granting the right of way to ditch and canal owners, and for other purposes," the better to conceal its purpose and insure its enactment.

Back-stoping vs. Underhand Stoping in Large Bodies of Iron Pyrites

By J. J. Rutledge*

Theoretically, in mining large bodies as uniform in nature as iron pyrites it would seem that the overhand or back-stoping method would be most economical, and yet in several large iron-pyrites mines, it has been found by experience that the best method is that of underhand stoping. A consideration of the conditions which have led to the adoption of the underhand method may not be out of place.

Ordinarily, when back-stoping has been the method of mining employed, it has been necessary to drive the drift above the stope in order to open it up and this has added to the cost of the stoping as well as delaying the rapid opening out of the stope. The usual practice is to use stulls in mines in which the walls require support and the deposit dips at a high angle, and to allow the ore and rock to fall on the stulls at the bottom of the stope, chutes being used to load the ore into the cars in the level below. By this method gravity assists in the work of mining and less powder is necessary to break the ground than in underhand stoping. The ore is separated from the rock on the stulls and the rock left to support the walls, instead of being sent to the surface.

Little labor is required to load the cars, since the chutes are always kept full of ore and the cars can be loaded almost instantly. The miners usually are close to their work and can examine the ground overhead at all times and pull down any loose pieces of ore or rock.

DISADVANTAGES OF BACK-STOPING

The method of back-stoping, however, usually has the following drawbacks: When a top drift and pillar are left at the top of the stope, it is necessary to hoist the stulls into place instead of lowering them, as in underhand stoping. Again the back-stope occasionally requires the shooting of rock from the walls in order to fill the stope and give the miners access to the breast. While this work is being done no ore is being produced and consequently there is no output from this particular stope. Back-stoping gives an uncertain output. There may be a stope full of ore on one day and it may require several days' labor before the chutes can be again filled.

If drills are placed on staging made usually of lagging poles, instead of being set upon the loose rock and ore in the stope, there is always vexatious delay in cutting hitches for the lagging poles, before the staging can be erected. The spring of the lagging, if long, bothers the driller and the staging often falls, endangering the lives of the driller and helper; there are often loose scales of pyrite, sometimes of considerable thickness, which must be dislodged before the staging is set up, or before any work whatever can be done in the stope, and this delay of necessity retards all other work; loose pieces of ore are found over the back of the drifts, as well as over the stopes, and become very dangerous, for they cannot easily be detected, as the ground may be solid one moment and the next a dangerous piece of ore or rock may become loosened from the backs.

All holes drilled are necessarily dry holes and must be carefully tamped and fired or there will be great danger from [illegible] going the drillings fall down upon the drill and tend to shorten its life. Drillers and timbermen, especially those inexperienced, generally dislike to trim the breasts and walls of back-stopes, or to prepare for and erect the stagings, for the work is dangerous. If the stope is wet the men cannot as easily avoid the droppers as they can in underhand work

UNDERHAND STOPING

With this method properly employed it is only necessary to drive one drift to open up the ground, i.e., the drift on the uppermost level. All the levels below can be opened without the necessity of driving drifts, unless it is decided to leave pillars over the stopes. Under careful management the drillers, timbermen and muckers always work in safety under well-lagged stulls and, if the walls are carefully trimmed of all loose pieces and closely and constantly watched, there can be no danger from falls of ore or rock. The drillers, muckers and timbermen have all their work underfoot instead of overhead as is the case in overhand stoping and consequently the ground is constantly under inspection.

Stulls can be lowered into the hitches instead of being raised as is the case in overhand stoping. All the holes are down holes, and wet, hence the danger from sulphur fumes is nearly negligible. There is no fine ore falling upon the drill as when all holes are dry. If floor or jointing planes occur in the orebody, advantage can be taken of this fact more readily in this method than in the other one. Water falling over the underhand stope can be caught by canvas sheets or light planks and led off to the footwall.

It is true that all waste in the orebody worked is more easily handled and disposed of in overhand work than in underhand, but, by keeping well-lagged stulls close to be breast of the stope, the muckers can easily pass all waste rock up to the lagging on the bottom stulls and stow the rock at that point. There may be cases, however, in which it will be cheaper to load and hoist the rock to the surface than to pass it through the handling necessary to stow it on the bottom stulls.

Of course, mucking and tramming are usually easier and cheaper in overhand than in underhand stoping but, by placing boiler-iron plates, or a floor of heavy 3x12-in. planks at the bottom of the stope, before the shots are fired, all muck can be dropped on this flooring and thence easily shoveled into the cars. By such means, and the use of low, open-ended cars, the mucking in underhand stoping can be done nearly as easily and cheaply as in overhand stoping. By making stopes of sufficient hight and working three or more benches simultaneously, there will always be working places for the drillers and at all times a good quantity of muck at the bottom of the stope.

The underhand method gives greater safety in mining, yields a much more uniform daily output, and usually mining can [illegible] overhand stoping.

Tom Johnson (*Journ.* Chem., Met. and Min. Soc. of South Africa for March, 1908) states that in waste-filled stopes, when the hanging-wall of the stope gives [illegible] area, and on the Rand he thinks this subsidence will travel to surface with little diminution.

---

*Mining engineer, Baltimore, Md.

The Ore Deposits of Magdalena, New Mexico

Hematite and Zinc Blende Are Found Associated at the Ground-water Level, Creating a Zone of Impoverishment Instead of One of Enrichment

BY PHILIP ARGALL*

Magdalena, a town of about 1200 inhabitants, is connected with the main line of the Sante Fe railroad by a branch running up from Socorro, N. M., while a spur track about three miles in length extends from Magdalena to the Graphic smelter near the village of Kelly, the heart of the mining district. Kelly is situated on the western slope of the Magdalena range at an altitude of 7500 ft. The ore deposits extend along the slope of the range both north and south from Kelly; my knowledge of them, however, is limited to the exposures in the two principal mines of the district, both lying north of the village of Kelly.

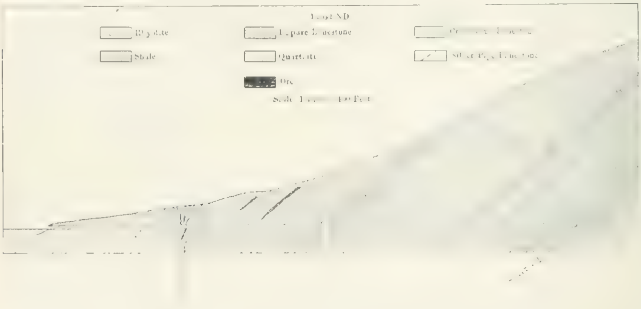


FIG. 1. SECTION OF GRAPHIC MINE THROUGH WALDO TUNNEL

Historical

The mines were first worked for lead carbonate discovered by Col. J. S. Hutchison, who located both the Graphic and the Juanita claims early in 1866. The easily reduced lead carbonates were shortly after that date smelted in adobe furnaces (Mexican fashion) and the resulting pig lead was shipped over the old Santa Fe trail by ox teams to St. Louis, Mo. Some years later other pioneers conducted smelting operations in adobe furnaces, at a point close to Kelly, known as South camp, where also the first water-jacket furnace erected in the district was put in operation in 1880. As active developments were carried out large bodies of lead carbonate were discovered in the Kelly and in the Graphic claims in 1878-9, when it might be said the district took on its first boom.

The Rio Grande smelter at Socorro was built in 1881 by the late Gustave Billings who, having previously purchased the Kelly mine, was also largely instrumental in having the railway extended in order to facilitate shipping the Kelly ores to his furnaces. The Rio Grande smelter was successfully operated for several years, obtaining a supply of silicious ores from various mining camps tributary to the Santa Fe system. The plant, however, was not sufficiently well located either as regards ore supply, fuel, or fluxes to compete successfully with the large and well established plants in Pueblo and elsewhere, particularly when the local carbonate supplies began to fall off materially in their production and quality; hence, after the practical exhaustion of the lead carbonates of the Kelly mine, coincident with the depression of 1893, the Rio Grande smelter closed down and has not since been operated. A smelter of about 100 tons daily capacity was erected at the Graphic mine in 1896, but inasmuch as an ample supply of profitable silicious ore was not obtainable in the Magdalena districts, a smelter there would be compelled to obtain its profits from smelting lead-carbonate ores, or from the importation of silicious ores at heavy freight rates on a mountain road with an uphill pull on fuel and supplies. This plant was, as one would expect, short lived. The suspension of smelting operations at the Graphic plant may be said to mark the closing of the lead-carbonate period at Magdalena, and with the exhaustion of the large bodies of these ores, mining in the district came practically to a standstill. As usual, however, the mines were leased, so that the gleanings from the old stopes and workings might be harvested, and peradventure some new bodies discovered by the intelligent work of the leasers. The leasers here were destined, as in so many other cases, to bring the district in a short time from a state of suspended animation to one of vigorous activity.

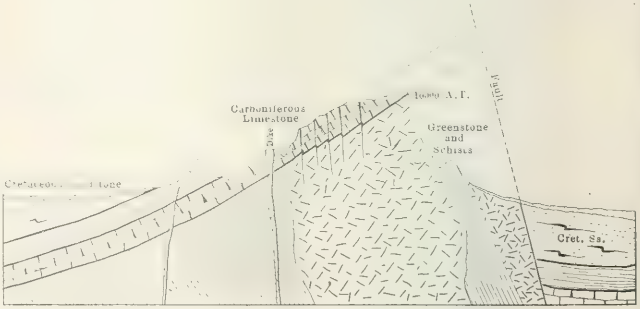


FIG. 2. GEOLOGICAL CROSS-SECTION OF THEMAGDALENA MOUNTAINS, NEW MEXICO

The Beginning of the Zinc Industry

In 1893 some leasers recognized the zinc carbonate ores so abundant in the zone of oxidation in close association with the lead-carbonate ores; they were equally fortunate in being able to secure a market for them in Wisconsin and in Missouri (Joplin) where smithsonite ores were for some time in high favor with the zinc-pigment manufacturers. Active prospecting opened up large bodies of zinc carbonate in both the Kelly and the Graphic mines, from which heavy shipments were made for several years. The smithsonite ores, however, gave place at a shallow depth to mixed oxide and sulphide of iron ore carrying zinc blende in varying quantities (a peculiar combination to be described later), and at moderate depth passed into solid sulphides in the Kelly mine, and doubtless will also do so in the Graphic when developed below the groundwater level.

---

*Consulting mining engineer and metallurgist, Denver, Colo.

This brings us to the last, or sulphide, period which was ushered in by the development, from 1904 to 1906, of large deposits of mixed iron oxide, zinc blende and pyrite, with some galena and chalcopyrite disseminated in small bunches throughout the deposit, in both the Graphic and the Kelly mines. The Kelly mine made quite heavy shipments during the latter year, while the Graphic company pushed development, to the extent, it is said, of developing about 100,000 tons of mixed oxide-sulphide ores, the zinc contents of which is not high enough to be valuable as a spelter ore; hence some method of eliminating the iron oxides and sulphides is necessary in order to raise the ore to the spelter tenor.

GEOLOGY

The Magdalena mountain range extends in a northerly direction from Kelly. The basal visible rock is an exceedingly compact schist, greenish in color and called by the miners "greenstone." This rock appears to form the principal mass of the mountain range and extends along its western flank, dipping about 30 deg. to the west and forms the floor of what we may call the ore measures. There is seldom any clean line of demarkation between the bottom bed of the crystalline limestone and the schists. They usually merge into each other, but in places in the Graphic mine a thin bed of quartzite occurs near the base of the crystalline limestone; in other places in both the Kelly and the Graphic mines a thin bed of pyritic material, carrying some copper, occurs adjacent to but above the quartzite. The copper oxides, on exposure, make a verdant coloration that excites the imagination of the miners, who invariably predict a rich copper deposit in depth, notwithstanding the fact that the ore deposits, confined to the limestones, are replacement deposits and that this particular cupreous pyrite bed is the lowest mineralization known in the ore measures. Some workings that have penetrated the underlying schists have, however, shown insignificant veinlets carrying chalcopyrite, but they lack continuity in both strike and dip and are simply gashes in the schist, which were probably filled from above.

The ore measures are well shown in Fig. 1, a section on natural scale through the Waldo tunnel of the Graphic mine. It will be noticed that the crystalline limestone is separated into an upper and lower series by a thin band called the "silver-pipe" limestone, a fine-grained, fossiliferous limestone about 6 ft. thick. This band is of such regularity and persistence throughout the district that it is invariably followed as a sort of indicator in the development of the mines, and because it has in places formed the plane of a bedded fault giving loose and better ground in which to drift.

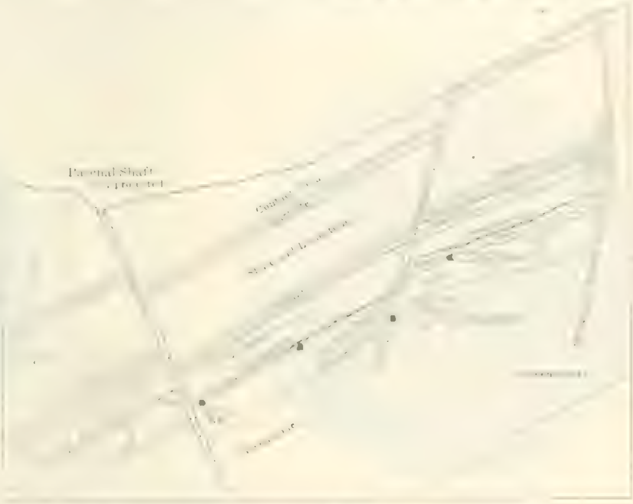
The main ore deposits occur close to the silver-pipe stratum mostly in lower crystalline limestone in the Kelly mine, with the silver pipe forming the roof; and on both sides of the silver pipe in the Graphic; the formation is, however, mostly below it, but always in the crystalline limestone. This silver-pipe limestone has been but seldom attacked by the solutions that deposited the primary sulphides, yet strange to say, many acres of it have been replaced by the menstruum that circulated in the zone of oxidation; atom for atom, as it were, all structural details in this impure limestone are reproduced in the ore. Crinoid stems and shells of mollusks are found perfect in detail, but in zinc carbonate instead of the original lime carbonate. At the point where the Waldo tunnel intersects the silver pipe there is a well-pronounced bedded fault that can be traced almost to the end of the development north and south of the tunnel, a distance of 2000 ft. The throw, as I determined it at the dike which I fortunately located in a raise above the tunnel, is 40 ft. The ore measures on the line of this section, Fig. 1, are barren, while 800 ft. north on the strike of the silver pipe the upper and lower crystalline limestones have been almost entirely replaced by ore, while the silver pipe is either absent or included in the mineralization.

Overlying the upper crystalline limestone, Fig. 1, alternating beds of shale and quartzite occur, ending with a thin bed of limestone, mineralized in places (No. 4 winze). Next follows a thick bed of black carboniferous shale which brings us to what the miners call the "outer lime," an impure earthy limestone containing one, or perhaps two, horizons of mineralization which have been worked in several places in the oxidized zone. The ore is, however, of low grade and occurs in quite irregular deposits replacing the limestone metasomatically. This limestone is cut off on our line of section by the eruptive marked "rhyolite," a sort of granite porphyry called rhyolite in the field. Irregular deposits of blende and galena with pyrite occur in the shattered zone adjacent to this eruptive.

[illegible]

The positions of ore deposition in this formation which I have called the ore measures can now be summarized:

(1) The cupreous pyritic bed near the foot of the lower crystalline limestone; (2) the main and, so far, only important deposit, immediately above or below the silver-pipe stratum, sometimes on both [illegible] talline limestone underlying the massive bed of carbonaceous shale; (4) the irregular deposits in the outer limestone. All four are metasomatic replacements of the limestone by the solutions that deposited the primary sulphides; (5) the vein-like deposit in the crushed and shattered zone between the outer limestone and the intrusive eruptive. It will be noticed that the Waldo tunnel penetrated this eruptive for about 400 ft. before reaching the shattered limestone zone; very little development has been conducted to open up the exposed ore at the contact, which consists of zinc blende, pyrite and galena, occurring in small lens-like deposits in soft porphyry and which forms a vein paralleling the outline of the eruptive. There are also some small and quite irregular replacement deposits in the shattered limestone. The eruptive porphyry is quite massive and in



[illegible] SECTION SHOWING [illegible]

all probability extends across the valley and forms part of the western mountain mass. If so, it effectively cuts off the ore measures on their westerly dip.

Faulting in the Kelly Mine

Another section, Fig. 3, is taken through the most productive part of the Kelly mine. It shows three faults each filled with a dike. These I have called faulting dikes, the eastern one is a down-throw of something like 250 ft. The middle faulting dike results in a western down-throw of about 60 ft., while the western faulting dike is an up-throw of 25 ft. toward the west. The ore measures have been eroded east of the section, possibly to the top of the mountain, leaving the schists exposed. It will be noticed that almost the entire thickness of the upper and lower limestone has been stoped at the first faulting dike, while an upper vein has, in places, been indicated. Furthermore, the ore appears to have been continuous between the faulting dikes, and to have been mostly lead carbonate; the silver-pipe stratum was extensively mined for zinc carbonate. The workings varied from 8 to 20 ft. in hight, were in a dangerous condition at the time of my visit (1905), and collapsed shortly afterward. The silver-pipe stratum wherever visible showed replacement by zinc carbonate to more or less extent, and was in many places in a decidedly leached condition, having a honeycombed or loose, granular structure, usually quartzose. The "transition zone" may be said to begin at the bottom of the 60-ft. down-throw, but is, of course, irregular; some sulphides occur at the top of the down-throw and oxides are found 50 ft. below the bottom of it, notably in the chamber, indicated in hatched lines on the section, which was filled with impure smithsonite. Between the second and third faulting-dike, No. 1 incline follows the silver-pipe contact for 250 ft. through solid limestone without indication of mineral; but on nearing the up-throw faulting dike the rock became softened, stained with oxide and contained some ore at the dike, while north of the plane of section a large deposit of ore occurred. Another incline showed somewhat similar conditions, the most persistent ore near the dikes thinning out and disappearing in the intervening ground and indicating a close relation between the dikes and the ore deposits. These dikes in the Kelly faults corresponded to the main north and south faults that extend parallel with the main uplift of the mountain range and appear to me to antedate the ore deposits. There is another system of cross-faults, east and west, apparently of recent origin; in some cases they occurred possibly later than the main oxidation period, but mostly they were formed prior thereto. These, with the north-south faults, block out the ore measures in rough parallelograms. According to Charles R. Keyes,[1] the Magdalena range is one of the oldest in the basin region of New Mexico. It is, he says, a huge tilted block from which 5000 ft. of sedimentaries have been almost entirely removed, down to the Cambrian complex. Over the greater part of the range, the sedimentaries have been entirely eroded, leaving the schists to constitute the main mass of elevation while the ore deposits are situated on "one of the enormous plates of limestone that have been able to resist the attack of the elements." Fig. 2 shows "the general geotechnic features of the Magdalena range," with a main fault to the east of "not less than 5000 feet." Keyes considers the schists and granites to be Protezoic; the lower part of the limestone sequence, early Carboniferous; the upper limes late Carboniferous; while the north-south faults, in the mineralized area, are approximately parallel with the great fault, producing the mountain block, but of much later date. Be that as it may, I am inclined to the opinion that the faulting dikes are of the same period as the massive granite-porphyry eruptives that cut off the ore measures on their western dip (Fig. 1) and that the ore deposition is subsequent to both.

Confining my observations to the Kelly mine, I noticed the faulting dikes were in places practically filled with vein quartz, blende and sulphide ore; that is to say, they had been in part changed by circulating waters from eruptive dikes to mineral veins by the removal of some of the rock constituents and the deposition of quartz, pyrites, etc., in their stead. This occurred, however, only in the region of the large ore deposits. At most places the dikes are straight granite-porphyry eruptives with no particular evidence of mineralization. They vary in thickness from a few inches up to 10 ft.

Irregularities of Ore Deposition

Owing to the extensive oxidation near the dikes I could not find any primary sulphides from which deduction might be drawn regarding the order of ore deposition or faulting. Briefly, however, my observations in the Kelly mine show:

(1) That the ore is found in larger quantities and of greater value adjacent to the north-south faulting dikes; (2) the crystalline limestone at the silver-pipe contact is not uniformly replaced by ore from one faulting dike to another, but the ore becomes thinner and more irregular as it is followed away from a given dike, finally ceasing at a moderate distance along the dip of the beds; (3) the primary sulphides, as seen in the deeper workings, point conclusively to metasomatic replacement of the lower crystalline limestone, immediately below the silver-pipe stratum, by iron, zinc and lead sulphides in lens-like deposits; (4) the oxidation has extended, in the deeper workings, from the faulting dikes, both up and down, along

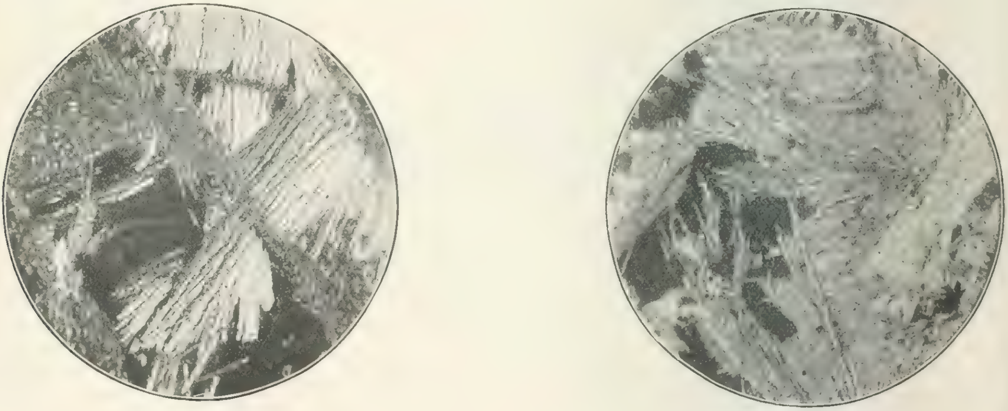


FIG. 4 BLENDE AND HEMATITE FIG. 5

---

[1] *Mining Magazine*, Aug., 1905, p. 109.

the bedding plane of the limestone, [illegible]ing that the faulting dikes are even now water channels or at least planes of permeability favoring the descent of meteoric waters.

For these reasons I am rather inclined to the theory that the ore deposits of the Kelly mine were formed by solutions which circulated in the north-south faulting-dike fissures.

The ore deposits in the Graphic mine appear closely related to dikes and faults, but as the workings are mostly in the oxidized zone and to a large extent abandoned, I could not obtain any data (May, 1907) on the exact relation of one to the other. The mine superintendent, however, informed me that he had not observed dikes to occur in the north-south faults in the Graphic mine. The large mass of mixed sulphides occurring on the eighth and ninth levels, north of the Waldo tunnel, show several small north-south faults, but no dikes that I could detect. Faulting along the plane of the silver pipe is, in the Graphic mine, everywhere in evidence, and this bedded fault has carried oxidation to great depths.

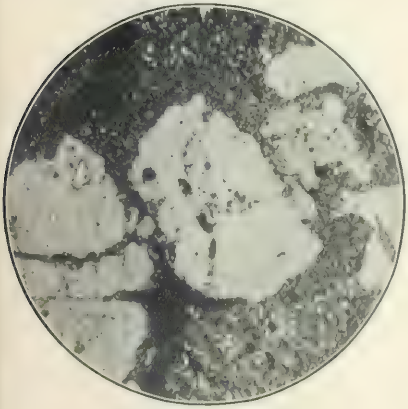
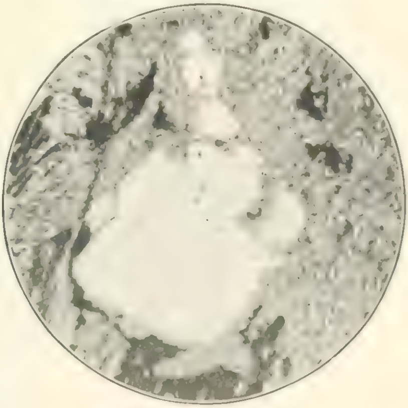


FIG. 6

PYRITE AND HEMATITE



[illegible]

Ores and Minerals

The commercial ores are cerrussite, smithsonite, zinc blende, galena and oxidized copper ore, together with some native copper. Owing to the great variety of minerals found in the oxidized zone, these mines have long been famous for their rare mineral specimens. Zinc occurs as smithsonite with its variations, hydrozincite and monheimite in various colors, green, brown, yellow, pearl and gray with several intermediate shades. A beautiful green variety much sought after for jewelry was analyzed by Prof. W. P. Headden, with results as follows: CO_2, 35.12 per cent.; ZnO, 60.97; CuO, 3.48; CdO, 0.16; CaO, 0.44; FeO, PbO, and MnO, traces. Aurichalcite, the basic carbonate of zinc and copper, and chalcophanite, the oxide of zinc and manganese, are both rare minerals, but are not uncommon at Kelly.

Copper occurs in the native state, sometimes in masses of several tons while as scales and veinlets, penetrating the smithsonite deposits, it is quite common. Cuprite and azurite occur in beautiful crystals lining cavities. Malachite and other oxidation products of copper are of common occurrence; in fact, I believe a close examination of the Magdalena ore deposits would disclose nearly all the oxidized zinc and copper ores known, while a close study of the zone of oxidation in which all these secondary minerals occur would throw a flood of light on a subject that has not received the attention its importance would appear to demand.

Primary, Secondary and Tertiary Ore Deposits

The primary ores are undoubtedly mixed sulphides; that is to say, iron pyrites, zinc blende and chalcopyrite occurring quantitatively in the order given. I have seen them only in two places in the Kelly mine, and possibly one place in the Graphic where a drift on the ninth level, passing out of the faulted zone, entered massive and solid sulphides inclosed in marbleized limestone.

Between the zone of complete oxidation and the sulphide zone, there occurs in the Kelly mine, and to a much greater extent in the Graphic mine, a zone of mixed oxides and sulphides in which the predominating mineral hematite—chiefly of the specular variety—is difficult to distinguish from zinc blende in the mines; the red streak, however, first called my attention to the combination while sampling the Kelly mine about two years ago.

I am indebted to Prof. William Campbell, of Columbia University, for an examination of this peculiar ore, and for the micrographs that accompany this paper. His description follows: "The principal mineral is hematite, which is shown as rosettes in Figs. 4 and 5; the black ground-mass is chiefly blende, and is, therefore, much later, I believe. Fig 6 shows rounded and fractured grains of pyrite, seemingly eroded before the hema-[illegible] chalcopyrite occurs around the pyrite, though the print does not show it. Fig. 8 shows more blende, which constitutes the black ground-mass. Fig. 9 shows fractured, dull grains of pyrite, a bright irregular mass of chalcopyrite opposite and to the left, and black blende. The rough matrix is hematite as before. The apparent order is pyrite, hematite, chalcopyrite and blende."

The order of deposition is somewhat peculiar, inasmuch as zinc blende, usually the first sulphide to pass into solution in the zone of oxidation, is the last to be reduced in the region of secondary sulphide deposition; but there is a possible [illegible]

[illegible] by Professor Campbell, occur practically at the ground-water level. The main ore-shoot contains numerous small pipes of oxidized ore within its mass, while many of the larger joints and faults are also filled with iron ochre. In a word, it is a transition deposit lying between the principal zones of oxides and sulphides, merging on following upward, into the thoroughly oxidized deposits; no doubt it will pass into the zone of primary sulphides when followed to depth below the ground-water level; thus it belongs in part to both zones and for distinctness we will call it the "transition zone."

In the Kelly mine I have traced the ore deposit from the zones of oxidation, through that of transition into what is undoubtedly the zone of primary sulphides. Here galena appeared to favor the footwall portion of the deposit, pyrite [illegible] the beginning or termination of an oreshoot. Both the mixed sulphide ores and the crystalline limestone have been subject to extensive corrosion in this transition zone. In one place I noticed a white, amorphous, zinc carbonate (evidently a chemical precipitate) filling an irregularly corroded channel or water-course, in the mixed sulphides and hematite ores of this zone. This zinc carbonate assayed: Zinc, 41.20 per cent.; lime, 0.40; insoluble, 12.60; sulphur, 0.51. In other places similar, white carbonate marked the bedding plane in these ores, while channels or pipes of corrosion, partially filled with oxide of iron or entirely with an impure partially crystalline smithsonite, are of common occurrence. I examined one cavern in this crystalline limestone, in the Kelly mine, out of which was mined about 15,000 to 20,000 tons of semi-crystalline smithsonite averaging about 34 per cent. zinc. This ore crystallized in a pre-existing cavity. In fact all the crystalline smithsonite is "cave ore;" that is to say, it crystallized in open cavities, which usually occur in crystalline limestone.

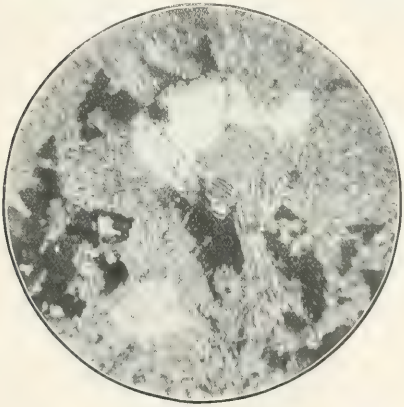


FIG. 8

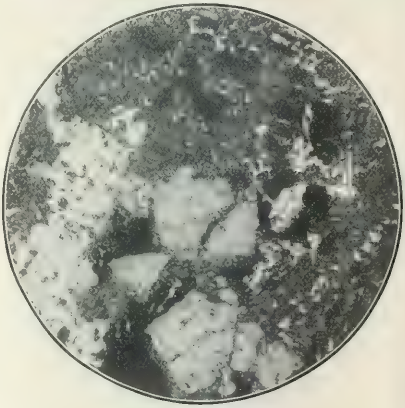


FIG. 9

PYRITE, BLENDE AND HEMATITE

In the Graphic mine, from which the specimens examined by Professor Campbell were obtained, the transition zone is much broken and contains many open joints resulting from a bedded fault and some small vertical faults. The great mass of the developed oreshoot, however, consists of a mixture of hematite, zinc blende, pyrite, etc., which is shown in the micrographs. Beyond the influence of the faults, where the ore occurs in solid, unaltered limestone as in the 9th level, northeast Waldo, the formation is mostly pyrite, with resin blende, second in order of abundance; these are followed by galena, which forms about 4 per cent. of the sulphides, and chalcopyrite constituting less than 2 per cent. These I believe are the primary ores, and they are largely pyritic and it is safe I believe, to assume that the present "transition zone" has been subjected to much corrosion from circulating solutions through which the finer blende particles have been removed with the more soluble sulphides, leaving spaces for the deposition of secondary minerals, with pyrite as one of the reducing agents.

The complex faulting with the shallow rock cover over the ore deposits presented ideal conditions for oxidation. The climate was arid in all probability, as at present, and the oxidizing menstruum was very limited, resulting in strong solutions and intense corrosion. The metals probably did not travel far, zinc sulphate becoming fixed as carbonate replacing the lime in the silver-pipe stratum and, in part, the crystalline limestone. Copper salts were reduced to the higher oxides or to metallic copper close to the point of oxidation, while galena, the last sulphide to oxidize, is found as carbonate in cave-like deposits near the point of oxidation, not unlike the Leadville lead-carbonate deposits. Thus it would appear that iron salts alone moved downward in relative abundance toward the ground-water level and became deposited in the corroded veins as hematite, to be later augmented by chalcopyrite and zinc, the base iron forming the greater mass of the secondary deposit. The usual zone of enrichment in mineral veins becomes here a *zone of impoverishment* so far as the pay ores, zinc and lead, are concerned. The Leadville and the Magdalena deposits are both in the Carboniferous limes and are mineral-bearing at Red Cliff, Aspen, Leadville and elsewhere. The Leadville deposits were doubtless oxidized in the presence of an abundance of water which washed out nearly all of the zinc, and much of the iron. Whereas, the Kelly deposits are, I presume, typical of arid-climate oxidation with the zinc and copper fixed close to the point of oxidation, but in another form. The possible deposition (I can see no other way to account for it) of the hematite in such abundance at the ground-water level, reversing the usual order of things and creating a zone of impoverishment where there is usually one of enrichment, is something novel.

CONCLUSIONS

On the foregoing tentative assumption the oxidation might be considered to progress somewhat as follows: (1) Oxidation of zinc sulphide, the resulting sulphate replacing certain limestones as zinc carbonate (secondary ore), the lime passing into solution. (2) In part contemporaneous with the first; pyrite oxidizing; descent of corrosive solutions and iron salts; formation of caverns, water courses, etc.; and deposition of hematite in the vein near the ground-water level. (3) Leaching of the secondary zinc carbonate ores (bedded deposits) formed, during the first oxidation period, possibly by carbonated waters and the crystallization of the soluble zinc carbonate in the previously eroded caves, water courses, etc., adjacent to the ground-water level; these formed the so-called "tertiary ores." Part of the zinc carbonate was doubtless deposited as sulphide (zinc blende) in the vein matrix during this period. (4) Moisture permeating these tertiary smithsonites emerges in places as highly concentrated solutions of zinc carbonate and these deposit in cavities, or as linings of geodes, crystalline smithsonite of great purity, but strained with copper and other metals. The semi-precious smithsonite might perhaps be called a Quarternary ore.

Owing to shortage of labor some of the gold mining companies of Brazil, according to the *Brazilian Engineering and Mining Review*, are negotiating with the Japanese minister to Brazil for the importation of Japanese to supply the shortage.

Mining Lode Tin in Malaya

Special Correspondence

In a recently issued report, J. B. Scrivenor, geologist of the Federated Malay States, describes the tin-mining industry of the Malay peninsula, giving particular attention, however, to those localities in which tin ore is being recovered from its native rock, and having but little to say about the better known alluvial deposits. The importance of the lode deposits is becoming more and more pressing as the end of the rich alluvial workings gets nearer, and it is not unlikely that the lode deposits will soon have to provide an important part of the output from the Malay peninsula.

East Coast

Tin mining in Pahang is handicapped by difficulty of access, but there are many reasons to suppose that important alluvial deposits, though perhaps not equal in size to those on the west coast, exist here, waiting only for conditions more favorable to their discovery. The former idea that the granite axis of the peninsula is the seat of the tin ore and that the greater magnitude of the alluvial deposits on the west coast is due to the preponderance of the drainage in that direction, is now being abandoned. Tin ore has lately been found in granites, schists and limestones at a distance from the axis of the peninsula, and it is not necessary to look to the central granite mass for the origin of all alluvial deposits in the country. Some of them have doubtless been formed by decomposition of tin-bearing rocks close to the present position of the alluvial workings.

The best known mines on the east coast are those of the Pehang Consolidated Company, at Sungei Lembing, in Kuantan. The deposits here bear a striking resemblance to the veins of Cornwall. The country is a hard, dark slate with some andalusite and tourmaline schist; the tin ore occurs chiefly as an impregnation in the walls of fissures. The workings will soon pass into granite, into which it is expected that the veins will enter with undiminished richness.

The Bundi Tin Mining Syndicate's mine at Bundi, Kemaman, is second in importance. The deposit is a mass of clay, sand, quartz, soft sulphides and hard iron oxides, resting in a trough in granite. The trough is 1500 ft. long, has a maximum width of 120 ft., and a depth ranging from 80 to more than 150 ft. Tin ore occurs in workable amounts in the soft clay and in the iron-stone. It is peculiar in structure, being found almost always in the form of small, slender, sharply defined, pale yellow needles, which are occasionally grouped into a spongy mass. Tin ore is also found in the fresh granite, but not in workable quantities.

At the Machi tinfield, which lies to the south of Bentong and not far from the Negri Sembilan border, the principal operations are in shallow alluvial soil, and are conducted in a wasteful manner by Chinamen. A tin-bearing lode also has been found and slightly developed. It is 8 ft. wide and is contained in a hard, silicified shale. The vein filling is mainly quartz, carrying a large proportion of a pale yellow, opaque garnet, together with cassiterite, blende and arsenopyrite. An average sample gave 6.20 per cent. tin oxide.

Main Range

Nearly all the tin ore recovered on the main range of the peninsula is obtained by native tributers working on a small scale by washing and picking in the beds of rivers. Such operations in the Chinchong river, in the hills back of Bentong, have uncovered great numbers of boulders of a remarkable rock which is quite likely the original source of the alluvial tin The rock is composed of quartz, topaz and cassiterite, all about of the same grain. The cassiterite, constituting about 7 per cent. of the rock, occurs in easily discernible, brilliant little crystals. The topaz also constitutes about 7 per cent. of the rock, but is not easily distinguished from the quartz except by a microscope. These boulders are thought to be in sufficient quantities to warrant investigation into a method of working them for their contained tin.

On the top of Gunong Gapis, at an elevation of 2400 ft., is a mass of soft pegmatite carrying disseminated tin, which is also found in stringers and pockets with tourmaline and quartz. The deposit is being worked by the Sempam and Gapis Mining Syndicate. Near Bukit Fraser, at an elevation of 4000 ft., the Sempam Tin Mining Company owns a large area of land which it is working through tributers. At one spot is a mass of ore in granite consisting of quartz, tourmaline and cassiterite. Tin-bearing pegmatite also occurs in the neighborhood.

West Side

On the west side of the main range, increased attention is being paid to lode and other deposits in which the tin ore is contained as an original constituent. At Chin-Chin, Malacca, a surface deposit of laterite containing tin is being worked by quarry methods, owing to its being cemented with iron oxide. The tin ore occurs in sharply angular lumps varying in size from grains to pieces weighing several pounds. Near Tanjong Serai, Malacca, a suction dredge is extracting tin ore from below low-tide mark. The original rock in this locality is a schist which has been decomposed into laterite. The bulk of the ore, which is very rich, was taken from a thin layer of black mud on the sea bottom, which represents the concentration of cassiterite by wave or other action.

The Bruseh Hydraulic Tin-Mining Company has finally abandoned its hydraulicking operations on surface soil and alluvial ground and has turned its attention to a multitude of thin tin-bearing veins in schist. The company is now confining its work to the hill between the Pinang and Durian rivers. On the Durian river side a huge pit has been dug with an outlet to the valley and a face 230 ft. high. The schists were originally of the garnet-pyroxene variety, but have decomposed into sandy and clayey masses. The veins are numerous and generally rich in tourmaline, which extends for some inches from the fissure, the latter being filled nearly solid with cassiterite. The average thickness of the veins is 1 in.; they are generally parallel to each other, and seem to favor the sandy portions of the decomposed schist. The schists are sufficiently decomposed to permit working by hydraulic methods, with giants, although occasionally a face has to be left for a month or more to weather, before the giants can make an impression on it. The average yield of ground in which the veins are inclosed is 0.60 lb. per cubic yard.

The operations of the Jeher Hydraulic Tin-Mining Company, near Tanjong Malim, resemble somewhat those of the Bruseh company, just described. The country is sandstone and shale, in which are quartz veins carrying cassiterite. The veins have clean-cut walls, and tourmaline is nearly absent.

The Serendah Hydraulic Tin-Mining Company is working with giants on old alluvial workings, but has also uncovered a large area of soft granitic rock which contains tin-bearing quartz veins and also greisen zones carrying tin. One such zone stands up like a dike above the soft granite; it is 20 to 30 ft. wide and 150 ft. long. Its constituents are quartz, muscovite, tourmaline, kaolin and cassiterite, the latter seeming to be an original component of the rock.

Tin Ore in Limestone

Payable deposits of tin ore have been discovered in limestone at a number of localities in Perak. At the Changkat Pari mine, near Ipoh, a large shaft has been sunk 100 ft. The deposit has an elliptical outline, but without distinct walls; a division can be seen, however, between the calcite associated with the cassiterite and the crystalline limestone country. A yield of 5 per cent. tin oxide from the bottom of the workings is considered low. A typical specimen of the ore shows a mass of calcite crystals inclosing short prisms of dark brown cassiterite, pyrite, arsenopyrite, chalcopyrite and bornite; tourmaline, fluorite and quartz are absent. The ore is stamped, roasted and then washed in a riffle box.

The Ayer Dangsang deposit, near Lahat, worked by the Société des Etains de Kinta, strongly resembles the one just described. A big shaft has been sunk 88 ft. The mineral associations are the same as in the Changkat Pari, with the addition of a little quartz, fluorspar and tourmaline. The same French company is operating a deposit at Siak, near Siputeh, which consists of limestone fissured and impregnated in small zones with cassiterite, fluorite, arsenopyrite, quartz and calcite, all in well shaped crystals. The company prospected with a diamond drill and decided that underground work would not pay.

In Jesophat's valley, Singei Siput, Kuala Dipang, is a peculiar deposit in limestone. There is a deep fissure from which a soft, muddy ore was taken for some time, but as the work got deeper the ore became harder and had to be stamped. The ore is hoisted out of the fissure on an inclined tram and then lowered down the side of the hill to a small stamp mill with a Wilfley table. The ore consists of a matrix of iron-stained calcite inclosing rounded grains of quartz, ilmenite and cassiterite. The yield of the mine for a year averaged more than 4 per cent. tin oxide. The junction between the ore and the limestone wall is sharp, and there is no sign of impregnation. The deposit seems to have been a "swallow hole," into which tin and other heavy minerals have been concentrated by stream action, and have finally been cemented together with calcite derived from the surrounding limestone. The presence of neighboring granites and tourmaline-bearing sedimentaries, as well as original cassiterite in surrounding limestones, would account for the source of the ore minerals.

The Lahat "pipe" is a remarkable occurrence of tin ore. It is near the village of Lahat, and is worked by the Société des Etains de Kinta. The pipe has been worked to a depth of 150 ft., is almost cylindrical, and has a diameter of 25 ft. It descends into the limestone at an angle of about 5 deg. from the vertical. It was filled with a hard, red mixture consisting of limonite, calcite and cassiterite, the latter being in sharp, angular fragments. Tourmaline is absent, and rounded grains of quartz are rare. It is difficult to state with decision the origin of this remarkable deposit, but the weight of evidence seems to favor an origin like that of Jesophat's valley, which is evidently a detrital deposit.

The characteristic features of all these limestone deposits are the abundance of sulphides, especially arsenopyrite, and the absence of tourmaline. Quartz, likewise, is found only sparingly at the Ayer Dangsang mine, and not at all at the Changkat Pari.

Maximum profit per ton, not minimum cost per ton, should be the aim in mining and in metallurgy.

Electrolytic Determination of Zinc

F. C. Frary (*Journ.* Am. Chem. Soc., XXIX, pp. 1596-1603) describes a series of experiments in rapid determination of zinc by electrolysis. The apparatus used was that devised by the author, in which the electrolyte is electromagnetically rotated. A few preliminary experiments with an acetate solution gave coarse crystalline deposits of the metal which were adherent enough to a dish to allow of washing, but which were easily brushed off from a gauze cathode, while an alkaline electrolyte gave good results. In the experiments when the electrolyte was rotated a cylindrical gauze cathode was used, but in most of the other cases a nickel disk was employed. The zinc was dissolved from the nickel cathode, after weighing, by a sulphuric-acid treatment. The amount of nickel dissolved by this treatment varied from none to 10.4 mg., the average being about 1 mg. per determination.

The cathode was 5 cm. high and fitted the beaker closely. The anode was a spiral of 1-mm. platinum wire which slowly became brown by use. Various acid treatments did not remove the color, but ignition at a comparatively low temperature restored the platinum color. The loss in weight of the anode was negligible for ordinary work.

In the experiments carried out by the author the volume of the electrolyte was from 100 to 125 c.c. In some of the experiments in which the electrolyte was magnetically rotated, the electrolyte was cooled by surrounding the beaker with a coil of lead pipe through which flowed a current of water. The cover glasses and sides of the beaker were washed down with water 5 min. before the end of the electrolysis, or, in cases in which the current was reduced for the second part of the analysis, the washing immediately followed the current reduction.

At the end of the electrolysis the current was reduced to one ampere and the alkaline solution drawn off and replaced with distilled water, without interrupting the current, at the same time being careful not to expose the zinc deposit to the air until the replacement was practically complete. The first 200 c.c. of the alkaline liquid was reserved for testing. The cathode was rinsed with alcohol, dried at 100 to 120 deg. C., cooled in a dessicator and weighed. The electrolyte used contained about 8 grams sodium hydroxide per 100 c.c. of electrolyte.

The test used for zinc in the spent electrolyte was to acidify the first 200 c.c. with sulphuric acid and then to add 3 to 4 c.c. of a 10-per cent. solution of potassium ferrocyanide. The test was allowed to stand 10 min. if no precipitate showed at first, because with small amounts of zinc precipitation takes place slowly.

The points particularly investigated were the time necessary for complete deposition, and the effect of temperature. The results are best shown in the author's summary as follows:

(1) With electromagnetic rotation of the electrolyte 0.1 gram zinc can be completely precipitated by 4.5 amp. in 30 min. on a nickel gauze cathode. About 8 grams of sodium hydroxide should be used and the electrolysis should be conducted at as low a temperature as possible.

(2) For quantities of zinc up to 0.2 gram, the current strength should be 4 to 5 amp. for 15 min. and then about 1.5 amp. for 20 min., the other conditions as in (1).

(3) The testing of the liquid after electrolysis is essential.

(4) It is highly improbable that complete precipitation of 0.2 gram zinc can be obtained with 5 amp. in 15 to 20 min. as stated by Exner and Ingham.[1] From the results obtained it would also seem improbable that the concordant results obtained by Miss Languess[2] with 10 to 13 amp. in 3 min. represent complete precipitation.

---

[1] *Journ.* Am. Chem. Soc., XXV, 896. Ibid., 26, 1269

[2] Ibid 29, 459.

Mount Lyell Mining and Railway Company

The report of the Mount Lyell Mining and Railway Company is for the half-year ended March 31, 1908. The ore treated was as follows: From Mount Lyell mine, 139,691 tons; from North Mount Lyell, 63,250 tons; total, 202,941 tons, averaging 2.45 per cent. copper, 1.77 oz. silver, and 0.049 oz. gold per ton; also 7525 tons of metal-bearing fluxes and 204 tons of purchased ore. The total production was 4301 tons of blister copper containing 4247 tons of fine copper, 344,608 oz. silver and 10,489 oz. gold.

A net profit of £128,981 was made for the half-year, after providing £17,631 for prospecting and development not charged to the mine preparatory works account, and £9723 for depreciation of plant and buildings. The cost of producing blister copper was $3.6878 per ton of ore against $3.704 in the previous half-year.

The ore reserves in the Mount Lyell mine are estimated to be 3,523,000 tons, averaging about 0.54 per cent. copper, 1.96 oz. silver, and 0.03 oz. gold; in the North Mount Lyell mine, including Lyell Tharsis, the reserves are estimated to be 606,600 tons averaging 5.75 per cent. copper, 1.33 oz. silver and 0.005 oz. gold.

The development of the mines at depth is encouraging. At the 1000-ft. level the orebody continues as large as at the 850-ft. level, and at the latter point and upper levels the orebodies have been proved to cover a larger area than was supposed.

Drill steel should be bought in lengths suitable for cutting up without waste.

Smelter of Penoles Company, Mapimi, Mex.—II

Several Innovations Have Been Introduced; When Work of Centralization Is Completed the Plant Will Be One of the Most Modern in Mexico

BY CLAUDE T. RICE

Formerly the Peñoles company operated three smelters at Mapimí, but gradually during the last few years the smelters and the power plant have been undergoing a process of centralization. As yet this centralizing and modernizing of the smelter has not been completed and much construction work is still going on, but when the work is completed, this smelter will be one of the most modern in Mexico, and several innovations in smelting will be tried out.

Formerly the plant was equipped with several reverberatory roasters in which the ore was roasted down to about 11 per cent. sulphur and then charged into the Huntington-Heberlein pots, the plant being equipped with 12 of these; but these reverberatories have been converted into furnaces for recovering arsenic from the flue dust. Consequently, as only a small amount of sulphide ore is being smelted, this ore as it accumulates is roasted in a small circular-hearth furnace and in the Heberlein pots. The oxidized ore and the roasted ore are then mixed with sufficient siliceous ore and concentrates from Pachuca, Zacatecas and other silicious camps to flux the Ojuela ore which, as has been said, has an irony, calcareous gangue.

At the blast furnaces the old hand-feeding methods are being replaced by a system of mechanical charging, and new stock bins and tracks, on which to take the ore directly to the charging hoppers over the furnaces, have also been installed. These bins, which have a capacity of 10,000 tons, are arranged in a double series, divided into compartments, the gates of which face each other and between which the tracks for the charge cars extend. In front of each pair of doors Anaconda track-scales are installed to permit quick weighing of the charge, and the compartments are equipped with a new type of hydraulically operated gate door, operated by a hand lever placed near the scales. In the different compartments flux, ore and coke will be kept; trains of charge cars will be run under the chutes and quickly loaded with the right proportion of ore, flux and coke.

The charge cars are then run in trains, [illegible] over the hoppers of the furnaces and there dumped into double feed hoppers, two different types of which are being tried. One type has no bottom gates in it, the ore feeding down into the furnace as the charge melts; in the other type the hoppers are equipped with four bottom gates, operated by levers so that in this type of feed hopper the distribution of the charge in the furnace can be regulated.

The smelter is equipped with six 162x46-in. furnaces having Robinson air-tight tuyeres. These appear to work admirably for there is a remarkable absence of leakage about the tuyeres, and it is stated that, compared with the amount of air necessary when other types of tuyeres were used, a 20-per cent. saving in the amount of air used per ton of charge has been effected by the use of the Robinson tuyere.

SLAG SETTLERS, AND SLAG TRAINS LOADING, MAPIMI SMELTERY

BLAST FURNACES, MAPIMI SMELTERY

MOVABLE SLAG RECEIVER USED INSTEAD OF FOREHEARTH, MAPIMI SMELTERS

[illegible]

A Movable Slag Pot Used Instead of Forehearth

Another feature of these furnaces is that they have no forehearths, but instead the slag and matte are flowed into large movable slag pots which, when full, [illegible] the slag settler resembling a small reverberatory furnace. The bullion is drawn off in the usual way.

The large slag pot, which receives the slag and matte, consists of a pot proper having a capacity of five tons, to which a long bail is fastened by means of trunnions which, extending beyond the bail, serve as wheels when the pot is sliding down the inclined track into position under the slag spout. This inclined track is made long enough to extend beyond the overhang of the furnace so that the crane can lower the pot upon the track; the bail of the pot is also made long, permitting the operator to hook the tackle of the crane directly into the ring of the bail.

The pot, when full, is taken by the traveling crane to the settler, which has a capacity of 80 tons. Here another hook is lowered from the crane and hooked into a ring near the bottom of the pot. The crane car is then run out over the short trough leading to the settler, and the slag and matte are poured out of the pot. The slag pot is then returned to the furnace and the operation is repeated.

The advantages of this method of movable receiving pot and settler are: The furnace is always accessible and not encumbered with a lot of tracks and slag cars; the slag can be allowed to remain quiet long enough to assure a complete separation of any matte or metal entrained in the slag; the amount of fumes about the furnace is decreased; and finally the slag trains are made up without disturbing the work by switching in and out at the different furnaces.

The furnaces are being equipped with balloon dust-settlers, which will greatly improve conditions about the furnaces. The dust from the dust-settlers, composed mainly of arsenical oxides (the Ojuela ore carries about 9 per cent. arsenic) is being treated in a reverberatory furnace, equipped with numerous baffles, where it is refined for the market. None of the bullion is refined at this smelter, but is shipped in bars either to Antwerp, Belgium or to the United States to be refined.

The smelter is equipped with two Connersville blowers, having a capacity of 35,000 cu.ft. per minute, driven by Nordberg engines. One of these blowers is held in reserve, and there is also a small blower driven by an electric motor, which is cut-in automatically by means of a manometer which makes an electric contact whenever the pressure of the blast drops below 20 oz. per sq.in. This prevents any accident which might result from the sudden stoppage of the blast to the tuyeres due to a sudden break-down of the main blower.

The power plant is now completely centralized and is well equipped with Heine boilers, Corliss engines, alternating-current generators for supplying power to the mines, and direct-current generators for the smelter circuit. A storage battery, large enough to run the auxiliary machinery at the smelter for four hours in case of a break-down, is also added to the direct-current circuit so as to equalize the load on the generator.

The smelter is being equipped with self-supporting steel chimneys, 300 ft. high, and one of these is already in use, but at present one of the wooden stacks, 340 ft. high, is still in operation. These wooden stacks are supported by timber framing, as shown by an accompanying illustration. They are cheaply and quickly built and work well, except that they are somewhat liable to catch fire. The capacity of the smelter is 1000 tons, but at present only about 700 tons are being smelted, most of this being oxidized ore.

TREATMENT OF EMPLOYEES

The Compañia Minera de Peñoles has always been noted for the good treatment of its employees and it is encouraging to learn that all connected with the company seem to think that this policy has paid. The Mexicans working at the mines are better paid than elsewhere in eastern Mexico, and many provisions have been made for their comfort. Consequently during the recent active times, when other companies were short of miners, the Peñoles company had no trouble in getting all the miners that it desired. Although the town of Ojuela, owing to the nature of its *peon* inhabitants, is far from being above improvement, it would be well for some other companies in Mexico to follow the public-spirited way in which the Peñoles company deals with its employees at the mine.

WOODEN STACK, MAPIMI SMELTERY

In the first place, the Compañia Minera de Peñoles depends upon its mines and smelter for its profit. It runs no stores and rents no houses to its employees, but instead it furnishes houses free to the employees at the mine. It also provides free baths with hot and cold water for its single employees at the mine, and for the families of the miners free baths are furnished at the town. The stores, billiard halls, etc., at Ojuela are rented to individuals at a nominal price, and the company has built a modern, electric-lighted theater, where the employees can have entertainments, or which traveling theatrical companies can rent at a price merely sufficient to pay the cost of lighting and cleaning. In short, the company does every reasonable thing that can be done to improve the condition and comfort of its employees; for instance, as the miners' wives found it hard to wash owing to the scarcity of water on the mountain, the company erected a number of stationary wash tubs for the town's use. The company pays for the two teachers who teach school at Ojuela, and also built the school house. In order that the employees shall have pure drinking water, the water for cooking and drinking is pumped from the spring at Mapimí. But water for the boilers, for washing, and for other purposes is pumped out of the mine.

At Mapimí the company has a nice modern hospital, in charge of a head doctor and two foreign trained nurses, where there is an excellent operating room and full equipment for all necessary surgical work. The assistant doctor lives at Ojuela, where he keeps a full line of drugs and looks after the health of the miners. Part of the expense for medical care is borne by the men and part by the company, the day's-pay men paying a certain percentage of their wage and the contractors paying a certain percentage of the amount that they earn on contract.

The men are paid as much of their wage each day as they desire, this being carried on the books as *prestamos*, or loans, and balanced each month, but the contractors are only allowed *prestamos* once a week, for they are expected to be somewhat more provident than the ordinary miner.

CONCLUSION

As the reader will notice, there is novelty at the mine and at the smelter, and especially in the treatment accorded the miners. In my mind this latter feature is most worthy of admiration, for while, obviously, the miners profit greatly through such treatment, it is gratifying to see that the company is sure that it profits equally.

In conclusion I wish to thank Dr. Kuno B. Heberlein, the general manager of the company, O. R. Whittaker, the superintendent of the mine, H. S. Mulliken, superintendent of the smelter, and C. Q. Schlerett, the engineer at the mine, for the many kindnesses shown me while I was at Mapimí.

Cottrell Process for Condensing Smelter Fumes

This Electrostatic System Is in Successful Operation at the Selby Smelter; Description of Apparatus Employed and Principles Involved

SPECIAL CORRESPONDENCE

The Cottrell process for the separation of suspended particles from gaseous bodies, details of which have not been obtainable up to the present time, has awakened, among those engaged in the smelting industries, much interest and speculation as regards the principle on which the process is based and the method employed in its operation. The successful application of the process by the Selby Smelting and Lead Company, of San Francisco, for arresting the ojectionable elements in the fumes escaping from its smeltery at the entrance of Carquinez straits, as mentioned in the JOURNAL of August 1, 1908, suggests a possible solution of the problem which has always been a source of annoyance, and often great expense, to many smelteries in this and other countries.

Foreign patents covering the process are well under way. Application was filed for the United States on July 9, 1907, but for some reason issue of the patent (No. 895,729) was with-held until August 11, 1908. The application names Fred'k. G. Cottrell, assignor to International Precipitation Company, of San Francisco, as the inventor.

Principles of the Process

Mr. Cottrell sets forth in the specifications of the patent that the invention relates to the art of separating finely divided particles of solids or liquids, originally held in suspension in bodies of gas or vapor, by the application of electric charges.

It has long been known that when gases containing suspended particles, such as smoke, fog, dust, mists, etc., are brought into the neighborhood of a body charged to a high electric potential with respect to its surroundings, that is, into an electric field, the suspended matter tends to be deposited. This is especially noticeable in the case of charged points, the particles being repelled from these. It has repeatedly been proposed to employ such agencies in technical operations; but, difficulties in their application and control have, up to the present, greatly limited their general introduction on a practical scale.

The improvements described are the logical outcome of an analysis of the underlying principles, with due regard to the structural and instrumental difficulties to be met with in their application. The result of such analysis leads to the following as conditions favorable for successful operation:

(1) The use of essentially direct currents, that is, constancy of direction of the force in the electric field.

(2) The charging of suspended particles by the action of an electrode presenting a considerable extent of surface over which a fairly uniform and moderately intense discharge of the brush or glow type, is maintained into the surrounding gas.

(3) The attraction and collection of the particles thus charged, by electrode surfaces of opposite polarity, upon which brush or glow discharge is reduced to a minimum.

(4) The passage of the particle-laden gases through the electric field produced by these electrodes, in such wise as to secure the most thorough and uniform treatment of the whole.

(5) Aside from the current carried by the gas and moving particles, the maintenance of as perfect insulation as possible between the two electrodes, more especially guarding against short-circuits and leaks through the material deposited out of the gases themselves during the operation.

The process has been designed to fulfil all the above conditions, and consists of the four essential elements and their combination, as follows:

(1) The maintaining at suitable relative electrical potentials of two types of electrode surface; (2) the charging of suspended particles by brush or glow discharge from the one type of electrode surface; (3) the attraction of the thus charged particles to the other type of electrode surface; (4) the prevention of the deposition of the suspended particles upon the surface of the solid insulating supports between the two types of electrodes.

Description of the Apparatus and the Method of Operation

The following description, in which it is indicated how each of the chief requirements may actually be met in practice, is a rather full abstract from the specifications:

"Fig. 1 is a general view of an apparatus by means of which my improvements may be carried out. Fig. 2 is a view showing a modification of the electrodes. Fig. 3 is a view showing another modified arrangement of the electrodes. Fig 4 is a view showing a modification of the synchronous contact device.

"Referring to Fig. 1, the gases or vapors containing the suspended particles enter the precipitation chamber *A* through the pipe *B*, and come into the proximity of the active electrode *C*, the body of which may be made of any suitable material. In the apparatus shown, the second "active electrode" (the two oppositely charged conductors or systems of conductors, between which the precipitation actually takes place, will hereafter be referred to as the "active electrodes" whatever their structure or other relations may be) consists of the walls of the precipitation chamber itself; but, the apparatus is not necessarily limited to this form of construction. For instance, in dispelling fog, the ground or water might be made one electrode and the other suspended freely above it. If the surface of both electrodes is as smooth as possible, the efficiency of the apparatus becomes relatively small, but, if the surface of one of the electrodes is supplied with sharp points and the potential difference is high enough, a rapid repulsion of the particles from these may be observed, together with a corresponding collection of deposited material on the other electrode. Modern theories explain this action on the ground that the gas in the neighborhood of the points becomes ionized, chiefly by brush or glow discharge, and the ions combine with or condense upon the suspended particles, dragging these with them toward bodies of opposite polarity. If, in each considerable region of the gas, wholly or partially bounded by the electrodes of opposite polarity, there are points on but one of the active electrodes, the ionization of the gas, produced in this region, will be practically of but one sign, and the particles will all move toward the other electrode, provided the polarity of the electrodes remains the same. If, on the other hand, both electrodes bounding this region are provided with points, or their polarity is being rapidly reversed, ions of both signs will be produced in the gas space and attach themselves to particles. Some of these will reach each electrode, but others will mutually neutralize each other in the gas space, possibly giving rise to larger aggregates in so doing, but, on the whole, the efficiency of precipitation is reduced. This is particularly true when the electrodes are excited from a source of alternating current, as in this case the same particle is drawn first one way and then the other, if the duration of alternation is small compared with the time of travel of the particle from the point where it receives its charge to the point of deposit.

"Just as many electro-chemical processes using unattackable electrodes in liquid solutions depend upon the character of the electrode surfaces, so in the present improvements, the character of the electrode surfaces is of the utmost importance. Bare metallic electrodes of various forms and structure, including rods or wire with sharp points, wire gauze, fairly fine wire bristles, thin sheets, disks, etc., have all been tried and found impractical for treating large masses of gas; the chief objection to them lying in the intensity of electric field required and the great tendency for the discharge to become sharply localized. These difficulties are all avoided and the efficiency and ease of adjustment of the apparatus greatly increased, if the electrodes are simply covered, in whole or in part, with some soft, fibrous material, such as cotton or asbestos presenting a pubescent surface. These, although relatively poor conductors, amply suffice under the usual conditions and, if necessary, the material may be so treated as to increase its conductivity. Such an electrode shows in a dark room a uniform development of luminous discharge all over its surface, even when at a comparatively great distance from the other electrode. This permits a much lower potential difference, and the employment of a greater and less uniform distance between the electrodes.

The form of active electrode *C*, in Fig. 1, has been found very satisfactory. It consists of a cage of wire supported by a conducting rod *D*. Upon the surface of the cage, including the bottom, is wound or stretched some asbestos, very conveniently in the form of a small cord or thread *c*. The gas, issuing from the inlet *B*, receives the discharge from the filaments *c* of asbestos on the bottom of the cage, and many of the particles are driven back and precipitated in the lower part of the chamber. Those that escape and pass between the asbestos and wire meshes into the interior of the cage, are found to follow, approximately, the direction of the arrows, emerging from the sides of the cage, apparently because of a draft or current of gas maintained by the electric discharge from the electrode *C* to the walls of the vessel *A*, and the consequent rush of particles and gas in the same direction. In so doing, the current of gas is, of course, subjected to a second purification from suspended matter. The purified gases finally pass out by the exit *F*.

"Owing to the relatively high difference of potential between the two electrodes, they must be kept well insulated from one another. If this is effected merely by the use of solid insulators, at ordinary temperatures, there is great danger, in many cases, of the insulation being broken down by the deposit of some of the suspended matter upon the surface of the insulation, and consequent formation of a conducting film. This danger can be reduced somewhat by bringing the connection to and support for the inner electrode through the outer wall of the precipitation chamber in a part where the gas has its maximum purity from suspended matter. To further guard against any contamination from suspended matter that may have escaped precipitation by the electrodes before reaching this part of the chamber, an arrangement is shown in Fig. 1 for passing in about the insulating support *E* of the inner electrode, a slow current of pure dry gas through the inlet *G*. This is supposed to be supplied at a sufficient rate to prevent any diffusion or convection of the gas in the main chamber back into the constricted space *H*, the walls of which may also be made of insulating material. Another method, which may be used as an alternative or as an auxiliary to that just described, consists in heating the space *H* to such a temperature that deposition of the suspended matter, either in solid or liquid form, is impossible. In the drawing, the heating is shown as effected by a winding of wire *h*, through which an electric current is passed; but, any other suitable means of heating may be employed.

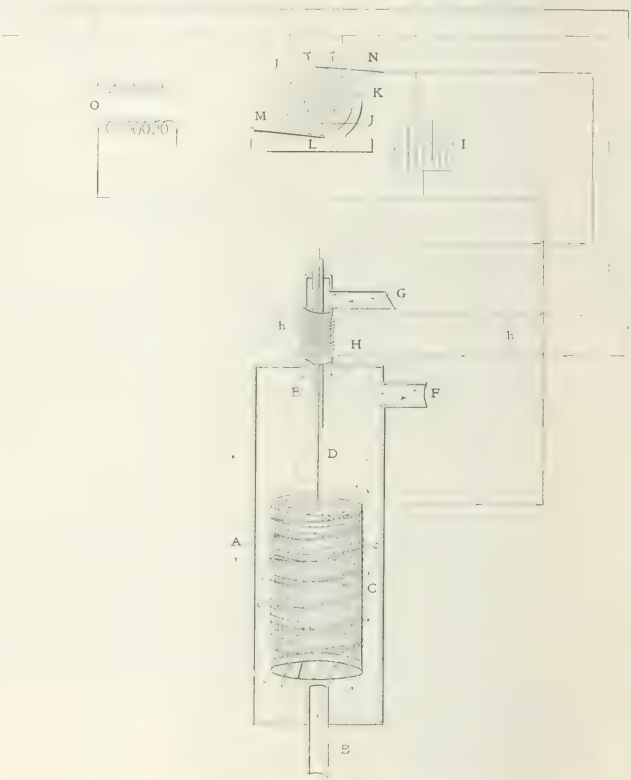


FIG. 1. GENERAL ARRANGEMENT OF APPARATUS

"The deposited matter may be removed from the precipitation chamber *A*, in any manner most convenient, the mode depending upon its character and amount. If liquid, it may be drained off from the bottom of the chamber. If solid, it might be flushed down and out with liquid, or scraped out as a solid. These processes might be intermittent or continuous.

"As previously stated, a direct current has decided advantages as a charging source for the electrodes, but its production by the usual means, at the potentials here desired, presents certain well known technical difficulties. For the production of an electric current of the relatively small magnitude actually demanded by the present improvement, the method illustrated in Fig. 1 has answered well, and has the great advantage of extreme simplicity, coupled with ease of installation and maintenance of the apparatus required. One of the active electrodes is permanently connected with one terminal of a high potential alternating-current circuit, while the other active electrode is connected with the other terminal of the same circuit through a make-and-break, operated in synchronism with the alternations of the circuit, and in which contact is made once each cycle, and only for a portion of each cycle. By properly choosing the points in the cycle at which the contact is made and broken, any difference of potential may be impressed on the electrodes, from zero up to the maximum of the alternating-current line. without having to alter the latter at all. It is probable that in actual practice, the maximum will generally be chosen

"In order to maintain the potential difference of the active electrodes nearly at its maximum during the portion of each cycle when the connection with the alternating-current line is broken, the condenser *I* may be connected in parallel with the active electrodes, thus increasing the capacity of the electrode system as a whole, of which it is to be considered a part. The electrodes, in themselves, constitute an air or gas condenser, and in some cases may suffice without the auxiliary condenser *I*. in any case, they supplement its capacity.

"A very satisfactory device for the make and break above referred to has been found in a system of metallic contact points *J*, mounted on an insulating disk or hub *K*, driven by a synchronous motor *L*, run by the same system of alternating current as that supplying the active electrodes, and by its rotation making and breaking contact between the brushes *M* and *N*. The arrangement of disk and contacts, shown in Fig. 1, assumes two complete cycles for each revolution of the disk, but, by a proper change in the number and position of the contact points and brushes, it may be adapted to any other whole number of cycles per revolution, and, if more convenient, the disk and contacts may be mounted directly upon or driven directly from the shaft of the alternating-current generator, which supplies the system. The synchronous motor, or the generator, as the [illegible] may be, will, in practice, most probably be operated at a lower voltage than that used for charging the active electrodes, this being indicated by the introduction of the transformer *O* between these two circuits.

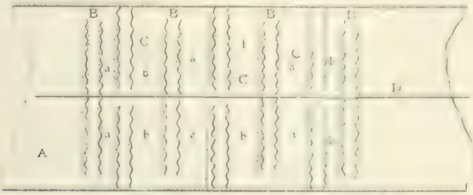


FIG. 2

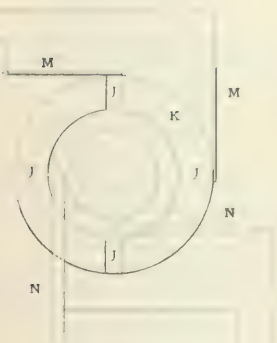


FIG. 4

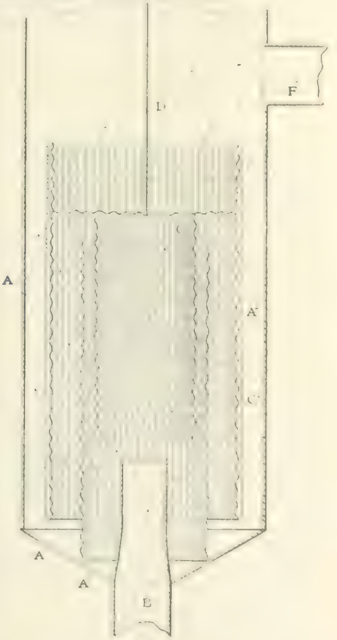


FIG. 3

MODIFICATIONS OF THE ELECTRODES AND SYNCHRONOUS CONTACT DEVICE

"The above description serves to illustrate one of the simplest modes of carrying out my improvements. I shall now point out some of the modifications of detail which also fall within the scope of said improvements.

"It is possible to combine smooth with pubescent surfaces on the same electrode and retain the advantage sought, if the disposition of the smooth and pubescent areas on the two electrodes of opposite sign be such that nowhere are pubescent surfaces of opposite sign both discharging into the same region of gas. Fig. 2 serves to illustrate what is here meant *A'* is a flue through which the gas is passing, and *B' B' B' B'* is an electrode, each of its four sections being made, for example, of two sheets of wire gauze. slightly spaced from each other, and the left-hand one only of each section having a pubescent surface, as shown. *C' C' C'* make up a corresponding electrode of opposite polarity. In each of the regions *c a a*, the gas and particles are being charged negatively, while in each of the regions *b b*, they are being charged positively, but, in no single region of any important extent are they receiving noteworthy charges of both signs.

"The relative motion between gas and electrode may, in some cases, be best produced by moving the electrode itself through the gas, as, for example, when treating air in the open, or any gas in very large chambers. A further extension of the same principle of electrodes shown in Fig. 1, is shown in the modified arrangement in Fig. 3. Herein is illustrated the surrounding of the active electrode *C* of Fig. 1, by a concentric cylinder A^2 of wire gauze or other suitable material, resting on the bottom of the main vessel *A*, and forming an extension of the inner surface of this vessel. Surrounding this again is another concentric cylinder C^2 of similar construction forming a part of the electrode *C*. The upper portion of the electrode *C* may be made solid, if desired, to still further guide the gas through the meshes of the several cylindrical shells. The principles of construction illustrated in Fig. 2 may, of course, also be combined with those of Fig. 3; and the number of concentric shells may be indefinitely increased. Both active electrodes may be connected and disconnected twice each cycle to the two terminals of the alternating-current circuit in such wise that their relative polarity remains the same. This has the advantage of utilizing both alternations of each cycle. For this purpose, the disk, brushes and connections may be modified in some such way as is shown in Fig. 4. Corresponding parts are lettered as in Fig. 1. A second system of contact points *J'*, similar to points *J*, is mounted on the opposite side of hub *K*, its contact points dividing the arcs between those of points *J* in halves; the systems of points *J* and *J'* being insulated from each other by hub *K*. The brush *N* makes permanent contact with points *J*; and brush *N'* with points *J'*. Brushes *M* and *M'* each make contact intermittently with points *J* and *J'*.

At the Ozark Zinc Oxide Works, Coffeyville, Kansas, a drum is used to mix the ore going to the Vezin sampler

A New System of Modern Coke Ovens

Details of Construction and Operation Which Permit Saving By-products and Excess Gases. Discussion of Horizontal and Vertical Flues

BY F. FIESCHI*

The different kinds of coke ovens actually in use may all be classed as follows: First, ordinary coke ovens in which the gases produced by distillation pass straight from the oven into the pier to produce heat. The heat not absorbed by carbonization and which was formerly completely lost is now utilized for the production of steam. The construction of these ovens admits of no arrangement for the collecting of by-products and the gases in excess. This first type of oven has been almost abandoned, being only advantageous in small plants incapable of enlargement. In fact, the expense incurred in the construction of recuperative apparatus, is more in proportion, for a small number of ovens than for forty. Therefore, the sinking of capital is greater than the profit accruing from the recuperation. Twenty ovens can be considered as the minimum number, and under this, profit becomes doubtful.

The second class are the ovens for the recuperation of by-products. The construction of these ovens is such as to permit the products of the distillation of coal to pass through a combination of apparatus destined to condense the coal tar, to retain the ammonia (often also the light hydro-carbons and sometimes cyanides) before going into the piers to be burnt for the purpose of heating the oven.

After having heated the ovens, the hot gases produced by combustion escape the piers at a temperature of about 1000 deg. C. This heat, lost by the ovens, is used for heating the steam generators and these gases, when sufficiently cooled, escape by a chimney into the air. It is possible, in certain cases, with a sufficiently bituminous coal, to have excess combustible gases which constitute a profitable by-product.

The third class of ovens are those of recuperation with regenerators. This class of ovens works like those of the second class, except that the calories not absorbed by the heating of the oven, are not used for producing steam, but for heating the air necessary for the combustion of gas.

This operation is accomplished in chambers of fire-brick filled with bricks, piled in a special manner, receiving alternately hot gas and air. This method of procedure is comparable with the reheating of air-feeding blast furnaces.

In this manner the greater part of the calories carried away by the products of the combustion of gas are restored to the burning elements. The immediate advantage of this method of operation is to render available a large quantity of gas produced by the distillation of coal. This method permits equally the transformation into coke, of coal which, while possessing sufficient coking qualities, does not furnish by distillation in a closed chamber, a sufficient quantity of gas to maintain the ovens of the second class at the temperature necessary for carbonization.

The excess gases, which in ordinary recuperative ovens are seldom more than 20 per cent. of the total, increase with ordinary coking coal, to 40 per cent. and sometimes exceed 50 per cent. with coals of a bituminous character.

Superiority of the Ovens with Regenerators. Demonstration by Calculation

It is easy to demonstrate by a simple calculation, the superiority of ovens with regenerators to ovens with ordinary recuperation. Take, for instance, a battery of ovens with recuperation carbonizing an average of 300 tons of coal in 24 hours. The production of gas per ton is equal to 250 cu.m. and all this gas freed from by-products, tar, light oils and ammonia, is necessary for the heating of the ovens.

The heating power of this gas has been found equal on an average to 3800 cal. per cu.m. (air at 0 deg. C. water non-condensed). The combustion requires practically 4.9 cu.m. of air to the cubic meter of gas, and this combustion produces 5.8 cu.m. of gas. The 5.8 cu.m. proceeding from the combustion of 1 cu.m. of gas, leave the piers at a temperature of 1090 deg. C.; they carry off, therefore:

$$0.33 \times 5.8 \times 1070 = 2048 \text{ cal.}$$

and the heat given to the oven is, therefore:

$$3800 - 2048 = 1752 \text{ cal.}$$

These gases are partially cooled in passing under generators of steam, then escape to the atmosphere by a chimney. The temperature of the gases on leaving the generators being 250 deg., the loss of heat is equal to

$$0.33 \times 5.8 \times 250 = 478 \text{ cal.}$$

The 3800 cal. produced by the combustion of 1 cu.m. of gas are, therefore, divided in the following manner:

	Calories
1. Heating of the ovens .	= 1752
2. Heating of the boilers .	= 1570
3. Losses by the chimney	478
Total .	3800

For the entire battery the production of gas is

$$250 \times 300 = 75{,}000 \text{ m cal.}$$

which, in burning, furnish:

$$3800 \text{ cal.} \times 75{,}000 = 285{,}000{,}000 \text{ cal.}$$

distributed in the following manner:

		Calories
1. Heating of the ovens,	1752 × 75 000	131,400,000
2. Heating of the boilers,	1570 × 75,000 =	117,750,000
3. Losses by the chimney	478 × 75,000 =	35,850,000
Total	. . .	285,000,000

Observe, in passing, the poor output of ordinary ovens not utilizing lost heat. These ovens losing, in fact, more than half the heat developed by the phenomenon of carbonization. Taking 1.80 as the coefficient of utilization of heat in the generators, the production per 24 hours of steam at 10 kg. (feeding water at 35 deg.) will be:

$$\frac{117{,}750{,}000}{606.5 + 0.305 \times 179 + 35} \times 0.80 = 150{,}455 \text{ kg.}$$

which when utilized in perfected steam engines consuming 6 kg. per horse-power per hour, will produce a power of:

$$\frac{150.455}{6 \times 24} = 1044.8 \text{ h.p.}$$

Let us suppose, now, that the system of regenerators is applied to this battery. The gases, leaving the piers at 1070 deg., pass into the regenerators, and leaving there a part of their calories, escape into the chimney at a temperature, which to correspond with the above, we will suppose is equal to 250 deg., a result which is always possible to attain.

The 1570 cal., serving first for heating the generators will be restored to the air necessary for combustion and will assist in the heating of the ovens, by means of the brick pilings. The quantity of the heat furnished for this purpose by the combustion of 1 m. cal. of gas will be:

$$1752 + 1570 = 3322 \text{ cal.}$$

and the loss by the chimney will still remain 478 cal., since the gases enter the chimney always at the same temperature, namely 250 deg. We have seen above that for the carbonization of 300 tons of coal it is necessary to have 131,000,000 cal., consequently the quantity of gas necessary for the whole battery for 24 hours will be:

$$\frac{131{,}000{,}000}{3322} = 39{,}544 \text{ m. cal.}$$

and as the production is 75,000 m. cal., there will be.

---

*Mining engineer, 125 Avenue La Septembre Douai, France

$$75{,}000 - 39{,}554 = 35{,}446 \text{ m. cal. of gas in excess.}$$

If this gas is employed for heating the boiler, it is clear that the same motive power as above will be produced, since the total quantity of heat generated will be the same, and the same quantity of hot gases must be allowed to escape to the air. The installation of regenerators would occasion useless expense, and would only become advantageous if it were desired to heat generators at a great distance from the battery, gas being much more easily transported than steam, and the losses occasioned by condensation avoided.

It is, however, not the same, when gas motors are used. According to the opinion of experts in this matter, it is necessary with a gas motor to have per horsepower, and per hour, a quantity of gas able to produce by its combustion 3300 cal.; consequently the power, which can be produced by the means of this excess of gas will be:

$$\frac{35{,}446 \times 3800}{3300 \times 24} = 1700 \text{ h.p.}$$

instead of 1045 obtained by the means of steam; the increase is, therefore:

$$1700 - 1045 = 655 \text{ h.p., or say, } 62.78 \text{ per cent.}$$

Observation on the Use of Regenerators

By the preceding calculations we have seen that if circumstances correspond on all points, it is the use of regenerators combined with that of gas motors which enables us to obtain the maximum of motive power with coke ovens; we therefore have a right to inquire why this system which was applied nearly 20 years ago, has been subsequently almost abandoned, and has only been revised in recent years. It is true that G. Hoffman (1884) constructed ovens, in which gas and air were heated in recuperators. The heating of gas had great drawbacks: Dissociation of its elements, danger of explosion, and also, with each reversing, there was a loss of gas equal to the capacity of the recuperator; thus the heating of gas was soon abandoned, as the volume of air was equal to five or six times that of the gas.

The construction of this oven in which the air alone is heated, and whose working was satisfactory, has not become general, because the utilization of these gases with high-heating power was difficult; the question of the high-power motors for rich gas not having been solved.

At the present time this is no longer the case, and this problem appears to be understood. In the beginning of 1906 there were divided among different coal mines in Germany, either working or in construction, 35 motors operated through the use of gas from coke ovens; these motors were capable of producing a total of 30,000 horsepower.

The superiority of ovens of recuperation and regenerators is, therefore, incontestably proved, and with these results before us, we have every reason to believe that the construction of this class of ovens will become more and more general.

Conditions that Must be Filled in the Construction of the Coke Oven

These conditions are of two kinds, according to the point of view taken into consideration; that of recuperation, or that of the coke produced. The quality of coke produced is most important, and should be considered first, as coke is the principal product.

If we are given a coal that is destined to be carbonized in a specified time, that which should be required of an oven is the production of a coke which will be neither under, nor over-carbonized; all other qualities (hardness, density) depend solely upon the quality and the constitution of the coal used. It is not necessary to take the output into consideration. It is sufficient, in order to attain the maximum, that the construction and the management of the ovens be exact and careful, in order to avoid air entering which would provoke combustion of part of the coke. These conditions of good working are realized by regular heating and by a correct temperature of all the walls.

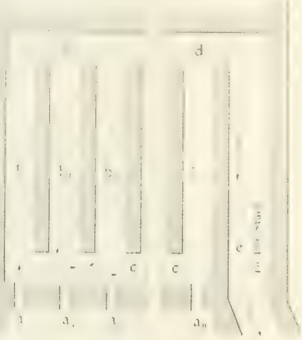


FIG. 1 THE GASEOUS CURRENT TAKES SHORTEST ROUTE

Uniformity of Heating

Uniform heating is obtained, first, by driving the entries of air and gas equally over a large number of points, throughout the hight of the pier; second, in shortening as much as possible the distance traversed by the gas for combustion, which latter, though quick at first, rapidly becomes slower; third, in preventing burning gases from taking another route than that marked out for them; this is, in order that each elementary surface of the wall may come into contact with the same quantity of gas.

Let us see in what manner these three conditions are realized in the present ovens: I will speak only of horizontal ovens called the Belgian two-door ovens; all other types having now fallen into disuse. These ovens may be divided into two classes: Ovens with horizontal flues, and ovens with vertical flues, both working with or without recuperation.

Ovens with horizontal flues have only been revived because they lend themselves more easily to recuperation; they do not fulfill the two first conditions enumerated above. The admission of air and gas being made horizontally cannot be equally divided over a large number of points, and the gases pass through from 10 to 20 or 25 m. before reaching the hearth of the oven.

Experts have tried to remedy this by dividing the entry of the combustible matter over the whole of the distance, by means of special little conduct pipes. This proceeding complicates the construction of the oven considerably, the conduct pipes become easily stopped up, also the incomplete combustion of the gas at the beginning provokes dissociation of the gas, from which there results a deposit of lamp-black, and consequently dimunition of the calorific power of the gas. Furthermore, these deposits cause dimunition of the conductibility of the bricks, and augumentation of resistance to the flowing of the gases in the flues. As to the third condition, it is for the most part realized.

Ovens with vertical flues without recuperation (such as those constructed by Coppee & Bernard), fulfil almost completely the three conditions given above; coke manufacturers agree that the best coke is obtained with these ovens.

If we consider the different types of ovens with vertical flues and with recuperation, in use at the present time, it is easy to see that if the first condition is realized, the second is only relatively so, and the third is not fulfilled at all.

These latter ovens have a certain number of vertical flues communicating at one extremity, and more often at both, with a horizontal flue, so that instead of dividing itself equally among all the vertical flues, the gaseous current tends to take the shortest route, thus certain flues become overheated, while others are scarcely heated at all. It is this which is shown, in the diagram, Fig. 1. The combustible mixture arriving in some way by a, a_1, a_2, instead of ascending while burning, into the corresponding vertical flues b, b_1, b_2, tends to follow the routes indicated by the arrows, in such a way that these flues become hotter in the proximity of c, and at the beginning are scarcely heated at all.

In the arrangement represented by Fig. 2, this disadvantage is shown more clearly still. The gases hot or in combustion enter the flue C, following the arrows, and should divide themselves equally amongst b, b_1, ..., to escape afterward by a, a_1, ..., but that which actually occurs, however, is this; the greater quantity passes by the flues on the left, while the more distant flues on the right receive scarcely any at all.

Inventors have tried to remedy this defect placing a small dumper to each vertical flue, this dumper enabling the section to be narrowed more or less. But, owing to the difficulties due to the inaccessibility of the dumpers, and to the exactitude, which this operation requires in order to be efficacious; this regulating, though theoretically good, is in practice quite fallacious, and only complicates the construction of ovens.

Conditions From the Point of View of Recuperation

Conditions with reference to recuperation should be such that the ovens, which fulfill them, give a maximum output of by-products, including gas in excess. To obtain the maximum of gas in excess, it is obviously necessary to produce the smallest consumption possible, which is done when the conditions before enumerated are fulfilled. For the other by-products, the only thing which must be required of the oven is, that the gases of distillation shall not be over-heated (as is the case with most of the current systems) in order to avoid harmful dissociations.

A factor which plays a part in the output of by-products is the temperature of the distillation, but this concerns more particularly the management of the ovens, and depends upon the manner in which they are regulated. The discussion of this question would, therefore, lead us beyond the limits of this article.

Regulating the Ovens

Whatever point of view is taken, it is evident that the regulation, that is to say, the quantity and proportion of air and gas admitted, can be performed in a satisfactory manner. This regulating is easy to effect and to control in ovens having horizontal flues, but it becomes difficult in ovens with vertical flues.

Conclusions

If we consider the ovens in actual use, we see that: Ovens with horizontal flues, although simple to manage and to regulate, are inferior in the quality of coke produced and for the output of available gas, owing to the inequality of the treating of the walls. Ovens with vertical flues without recuperation, are easily worked and give the best coke (consequently uniformity of heating). Ovens with vertical flues and recuperation, while realizing important advantages, are difficult and complicated, if not impossible to regulate, and are far from having the uniformity of heating.

We saw at the beginning of this article that three different classes of coke ovens can be recognized, each class including a large number of different systems; generally ovens with recuperation can be worked without recuperation, and must so be operated in order to set them in motion. This working is always conducted under unsatisfactory conditions and cannot last long. When ovens have been operated for a certain time a change of system can only be effected after considerable expense.

In summing up the various systems of ovens in use, there is none which possesses the property of working satisfactorily in all the three different ways, with the same perfection; that is, first, without recuperation; second, with recuperation; third, with recuperation and regenerators. The absence of ovens capable of working in three ways is a serious disadvantage, since all the ovens so far constructed must operate in one manner only.

In order to appreciate the advantages, which such a system would offer, let us imagine a company with limited means and having decided on (a case in point at this moment) the reconstruction of a certain number of ordinary ovens which have been given up. Recuperation must be abandoned, and thus the lost flames will serve to produce steam by means of the existing generators. The by-products should be collected by constructing the necessary plant (when resources permit). Then, little by little, battery after battery, in proportion as the various machines become insufficient or out of order, working with heated air can be adopted, and steam machines will be replaced by gas motors. Besides, if the steam machines are maintained, they could, in case of need, serve as auxiliaries, since it would suffice to again resume working without heating the air, to bring the boilers back into pressure.

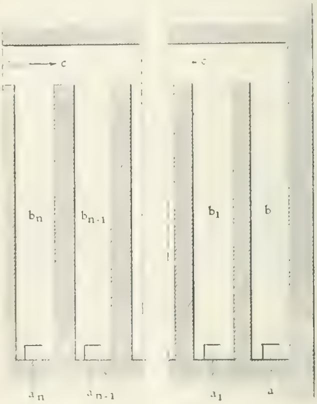


FIG. 2. SHOWING POOR ARRANGEMENT OF FLUES

The New System of Coke Ovens

In this new type of oven (Figs. 3, 4, 5, 6 and 7), each pier is composed of 32 vertical flues forming 16 groups of two flues g and h, which communicate with one another at the top part by the conductor w and at the lower part by means of the flues f and f'; the regenerator i is placed directly under the oven. These regenerators are alternately brought in connection by v and k with two large flues l, placed along the battery in front and behind and communicating either with the chimney or with the atmosphere. At the top of each of the 32 vertical flues there is a conductor a, which acts as a gas burner and is closed at the top by the stopper a^1. By this arrangement the inside of the flues can be examined, so that the regulating may be ascertained.

These burners can communicate, first, with the pipes r that serve for the return of gases when cleared of the by-products by means of the pipes m and n. This system of pipes is arranged in such a manner that the burners of the odd row have a feeding absolutely independent of that of the burners of the even row; second, they can communicate with the interior of the ovens by means of the holes e^2 for the two extreme burners, and by means of the holes e and e^1 for the others. These latter run alternately into the ovens on the right and on the left. This communication which is direct for the other burners, is established through the medium of the little conducts f and f^1 for the others. A stopper d is placed so as to establish or cut off this communication. A second stopper d^1 shuts off the communication with the outside.

Each set of two flues can, moreover, communicate directly with the air by means of the stopper b. The stopper b^1 may then be replaced by a metallic plug (which is not described in the accompanying drawings), which serves to regulate the inflow of the fuel.

Working Without Recuperation

The stoppers d being taken away and the holes c^2 opened (which can easily be done when the oven is open), the gas proceeding from the distillation passes from the oven into the burners a, as remarked above. The sections of the orifices are so calculated as to give admittance to the gas in a ratio which increases as we go further from the axle of the battery, so as to take into consideration the cooling of the farthest ends of the oven caused by the surrounding air. The stopper b having also been taken away, the air, the entering of which can be regulated by the plug replacing b^1, comes in at w and is divided equally between g and h. The combustion begins, therefore, by the conic extremities of the burners, and the products of the combustion, induced by the draft of the chimney, reaches the lower part where the combustion must be complete and hence they go by j and j^1 the regenerator i, and the flue k to the great pipe L and then to the chimney. The

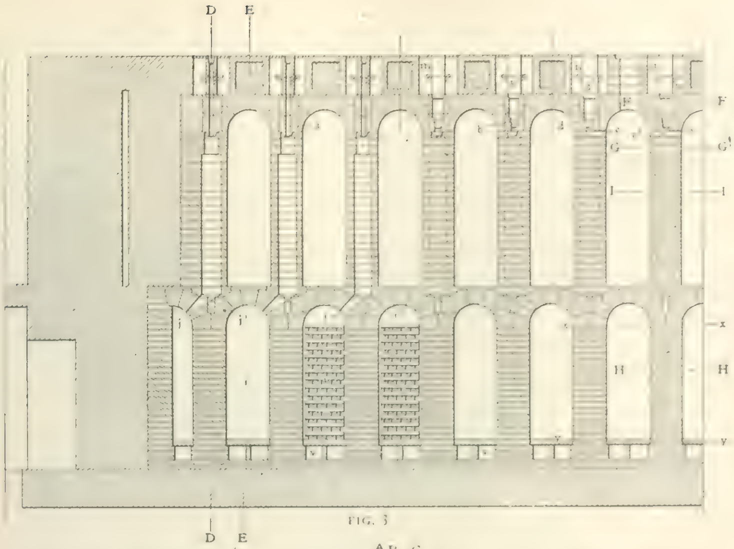


FIG. 3

[illegible]

FIG. 3. [illegible]

FIG. 4. [illegible]

FIG. 5. [illegible] Line E-E, Fig. 1.

FIG. 6. [illegible] Lines F-F, Figs. 1 and 3.

FIG. 7. [illegible] Lines F-F, H-H, G-G [illegible]

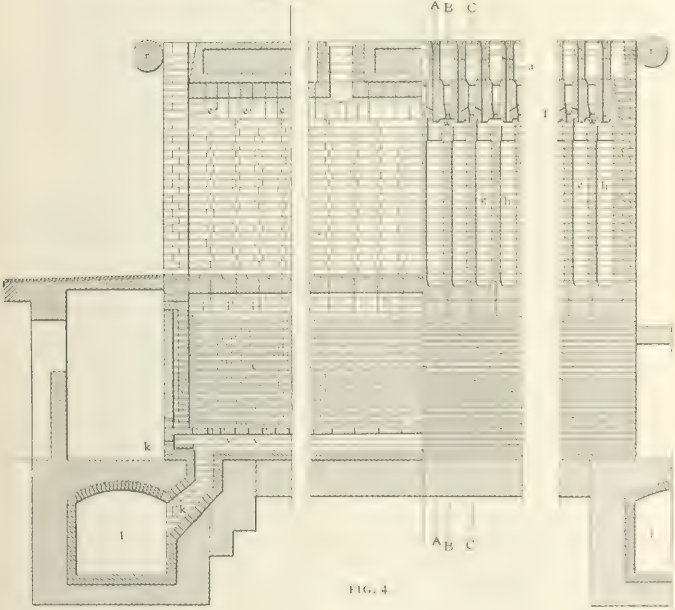


FIG. 4

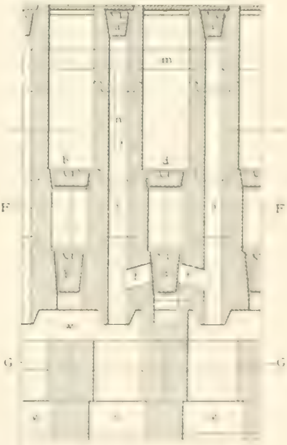


FIG. 5

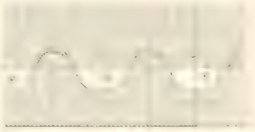


FIG. 6

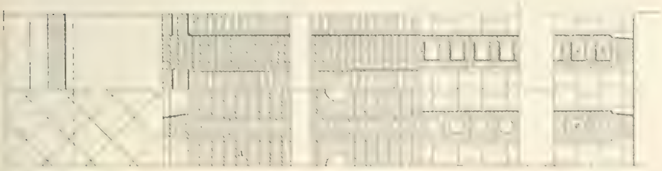


FIG. 7

SECTIONAL VIEWS SHOWING GENERAL CONSTRUCTION, SCHEME [illegible] draft is regulated for each pier by means of the dampers k^1.

For each of the 32 flues, the draft is regulated by the construction of the oven, in giving to the sections of communication j and j^1, variable values in connection with the equality of gas allowed in a and with the distance that the gases must run over, into the regenerator, to attain the outlet k.

Operating with Recuperation of the By-products

The stoppers d and d^1 are carefully luted, as also are the stoppers of the holes e^2. The gases coming out from the recuperation feeding all the burners a and the air necessary to the combustion, continue to come on as in the working described in the preceding paragraph. This being stated, the course of the gases and the heating take place as before outlined.

Working with Recuperation of By-products and Heating the Air

The stoppers b, b^2, d, d^1 are placed and carefully luted. The combustible gases enter as in the preceding process, but in consequence of a set of plugs, only the burners of the even row are fed during 20 min.; then for the following 20 min. the contrary takes place. At the same time, as this change occurs, one of the large canals l which was in communication with the chimney is put into communication with the air, while it is the contrary that takes place for the other canal. The automatic gearing which produces this working, is regulated in such a manner that when a set of burners receives the gas, the 16 vertical corresponding flues communicate by j, i, k and l with the chimney and the other 16 flues by the same medium communicate with the air.

Therefore, if the burners in connection with the 16 flues h are fed, the draft of the chimney will produce a current of air which, coming in by l, will travel across the regenerator, and being heated, will go up the 16 flues g and distribute to ignite the gas coming at the top of the 16 flues h. The product of the combustion will then go into the chimney through the regenerators, which will be reheated so as to abandon part of their heat to the air, which will go through them during the 20 min. that follows. During this time the same cycle will be produced anew, but inversely, and so on.

Advantages of the System

This oven, as it appears from the preceding explanations, allows the following conditions to be realized: First, it keeps a free vertical descent for the gases and divides them among numerous flues. The advantages of such an arrangement has been recognized and has been long employed in ovens working without recuperation. Second, it forms a unique type of oven, able to work indifferently either with or without recuperation, and in case of recuperation, with or without heating of the air by means of regenerators. Third, absolute uniformity in heating, the piers being made of 16 independent elements, each of two flues, gas and air arriving in each element, serving solely for heating the two flues; it is impossible for the gaseous current in all its course and whatever may be the operation, to follow any other course than that which has been laid out for it. The circuit of the gases is reduced to the minimum of length, since it is only equal to the hight of the oven. This circuit of gas attains a length three or four times greater in ovens with vertical flues and 10 or 12 times more in ovens with horizontal flues. The gases coming under the hearth, are completely burned, and the hearth is not heated to a high temperature. It is nearly certain that an output of free gas exceeding the quantities obtained with the usual types of ovens, is obtained with such an oven.

Fourth, easy regulation and control, also easy passage from one operation to another. These operations being executed above the oven and in free air by means of stoppers which are easily managed.

The coming in of the gas forming reversed burners makes all obstruction impossible, and the waste falling into the flues during the construction reaches the regenerator, or the flues which replaces it, from which it is extremely easy to remove. Furthermore, from the point of view of construction, the absence of horizontal flues running the whole length of the pier, and which are to be met with in all ovens with vertical flues, sometimes above, sometimes below, increases greatly the solidity of the piers.

Colliery Notes

It is estimated that the total amount of coal in North China, which is considered the largest Chinese coalfield, is 605,000,000,000 tons, which is 45,000,000,000 tons less than the United States government's estimate of the total amount of coal in the Appalachian fields.

The newly patented Shedlock process of manufacturing briquets consists of a combination of tar distillation and the consolidation of small particles of waste coal of all kinds into dense blocks of fuel, smokeless and possessing a high calorific value. The process consists in first effecting a perfect mixture of the small particles of coal with any suitable tar; each particle is covered with a thin film of tar. The quantity of tar used depends entirely upon the nature of the coal, in any case not exceeding 6 per cent. of the whole. The prepared materials are then automatically and continuously fed into and pressed in thin layers through a heated machine, where the fuel materials are raised to such a temperature as to separate the oils from the tar, which are withdrawn and condensed. The thin film of pitch deposited on each particle of coal is the adhesive substance which under pressure binds the material into blocks more homeogenous and harder than the coal used in their construction.

Figures recently submitted by the coal-carrying railroads in the commodity-clause suit, give some interesting facts relative to the distribution of anthracite coal. They show that nearly half of the entire production of the anthracite mines is consumed in the States of New York and Pennsylvania, and all but 10,000,000 tons are consumed in the Eastern States. The figures were based on the 1905 market and are representative in every respect.

Pennsylvania	11,520,883
New York	18,125,419
New England States	8,692,504
New Jersey	7,212,341
Western States	6,904,314
Supply to railroads	4,613,426
Canada	2,187,450
Southern States	2,080,078
Pacific Coast	1,743
Foreign countries	42,533

The size of mine timbers may often be materially reduced if they are kept sound, as then no allowance in size has to be made to offset decay.

When about to treat pine timber with a preservative, remember that absorption is more easily controlled by varying the length of the cold bath than by variation in the length of the hot bath.

Mine ladders should be strong and set on an incline if possible, for when so placed they are much easier to climb, and there is less danger of accidents from slipping than when ladders are set vertically. The rungs should be set at equal distance from each other and should never be allowed to remain broken or cracked for any length of time. Vertical ladders should be fitted with trap doors at frequent intervals. All ladders should be securely nailed to the uprights. Metal ladders give good use in mines free from acid water, though there is more danger of slipping than with wooden ladders.

The superior points of the new German steel bands which are used in place of leather belting are: On account of its solidity, a much narrower band can be used, one-sixth of the width of the usual leather band being sufficient; as a result of this, the steel band is not as heavy as the customary leather band, and it can be tightly adjusted; the distance between the engine and the machine is not of such vital importance as where leather belting is used, and the transmission of power depends upon the weight of the hanging belt; the slipping is much reduced. The entire loss of power is small, and will not exceed 1 per cent. Because of the lightness of weight of the steel belting, the influence of the centrifugal force is not so great and allows of an increase in velocity.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for July, 1908, was 44,500 copies.

August 1	12,000
August 8	9,500
August 15	9,500
August 22	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
The Mineral Industry, Vol. XVI 383
Zinc Mining in the Joplin District 383
The Price of Silver 384
*The Hematite Mines of Cumberland, England. *Lucius W. Mayer* 357
Short Talks on Mining Law. VIII *A. H. Ricketts* 363
Back-stoping vs. Underhand Stoping in Large Bodies of Iron Pyrites *J. J. Rutledge* 365
*The Ore Deposits of Magdalena, New Mexico *Philip Argall* 366
Mining Lode Tin in Malaya *Special Correspondence* 371
Mount Lyell Mining and Railway Company 372
Electrolytic Determination of Zinc 372
*Smelter of Penoles Company, Mapimi, Mex. II *Claude T. Rice* 373
Cottrell Process for Condensing Smelter Fumes *Special Correspondence* 375
A New System of Modern Coke Ovens *F. Fesch* 378
Colliery Notes 382
Correspondence
Geological Mapping of Mine Working *J. H. Farrell* 385
The Proposed New Mining Law in Mexico *Geo. A. Packard* 385
Analysis of Roman Bronze *Geo. H. Maynard* 386
Operating Costs, Homestake Slime Plant. *C. W. Merrill* 386
Effect of Discharge Level and Water Supply on Stamp Capacity 386
Sloss-Sheffield Steel and Iron Company 387
Iron Production in Canada 387
New Mineral Products in California. *Special Correspondence* 387
Personal, Obituaries, Societies and Technical Schools 388
Special Correspondence 389
Mining News 391
Markets, etc. 396
*Illustrated

The Mineral Industry, Vol. XVI.

The sixteenth volume of "The Mineral Industry" will be published about Sept. 10. This is a little later in the year than the appearance of Vol. XV, but there have been some unavoidable delays this year which it is hoped to overcome in future years; and also the forthcoming volume is considerably larger than any of its predecessors; but even so, the forthcoming volume is not much belated. Its price will be $10, instead of $5 as heretofore. It is fitting to offer a word of explanation with respect to this increase.

Fifteen volumes of "The Mineral Industry" have been published at a financial loss. The sale of each volume has been large, but the cost of production is inevitably so large that a greater sale than has heretofore been achieved is necessary to make the publication pay its way. Obviously unless that be accomplished, the publication cannot be expected to continue.

We feel confident that this frank statement of affairs will lead to the increased co-operation that is necessary. Many engineers who are conversant with the facts have expressed to us the opinion that the suspension of "The Mineral Industry" would be a serious loss to the profession. During the 16 years of its existence it has been recognized as the only universal source of information respecting matters connected with the statistics, technology and trade of mining and metallurgy. In looking for data pertaining to such subjects, it is the first reference book to which the mining and metallurgical engineer turns; similarly with the teacher and student, with the merchant and banker, and indeed, with all concerned in the great industry of which it is the exponent. If there were no "Mineral Industry" there would be a serious absence of ability to obtain its mass of absolutely necessary information.

Few appreciate the great expense and enormous concentration of effort involved in bringing out a volume of "The Mineral Industry." The average scientific or technical treatise is a work of about 400 pages, with about 400 words to the page. From the time when the manuscript is received from the author to the time of the publication of the finished volume, there is usually a period of six months. "The Mineral Industry" is a volume of about of 1000 pages, and 500 words go to the page. Its publication is executed in the period of six to seven months, which includes not merely the putting of the book through the press, but also the preparation of the entire manuscript and the collection of its multifold statistics, the latter work alone involving the writing of thousands of letters and telegrams and the co-ordination and tabulation of the statistical reports. "The Mineral Industry" is not merely a valuable contribution to commercial and technical knowledge; it is an institution of international importance and benefit; yet many who ought to support it have failed to do so. Its future will depend largely upon the support that it receives this year. Even at the new price of $10 it must have the active co-operation of many professional men. We feel confident that it will receive this necessary support.

Zinc Mining in the Joplin District

A subject that is attracting attention in the Joplin district is the organization of an effort to secure the imposition of a tariff on zinc ore at the next session of Congress. In several of the towns of the district zinc-ore tariff clubs are being formed. The purpose is to effect the exclusion of Mexican ore and thereby elevate the price of American ore by reducing the supply that heretofore has been available to the smelters.

It is obvious that such an arbitrary restriction of ore supply would increase the price of domestic spelter within certain limits, and would correspondingly increase the price of domestic zinc ore. The bill would be paid by the consumers of spelter. During the last 12 months this scheme would not have worked successfully, because the consumers have not wanted to buy much spelter, and the offering of the metal at comparatively low prices has not prevented the accumulation of a large unsold stock, which still exists. However, under the stimulus of a revival in business, a restriction of the output would naturally have the effect of advancing the price more rapidly and higher than otherwise. But there would be a limit to such an advance at the point where it would become profitable to import spelter and at the point where many consumers would be led to abandon the use of zinc and employ cheaper substitutes.

The smelters are naturally opposed to any movement in this direction. Theoretically the smelter is a middleman, who does not care whether the price for spelter be high or low, provided he is able to realize an adequate margin. Practically, the smelter prefers a high price to a low price, because under the former condition his margin is generally larger. However, the smelters who have large investments in plant cannot contentedly look forward to the creation of high prices by artificial methods which would restrict their ore supply and put a large part of their plant out of business. Even under the boom conditions of the first half of 1907 there was at the end of that year a great surplus of smelting capacity.

This last condition would also tend to reduce the advantage resulting to the miners from an arbitrary elevation of price. The cost of smelting rises rapidly according as the smelting works falls short of operating at full capacity. The Western smelters in 1907 used about 551,000 tons of ore, of which about 110,000 tons were obtained from Mexico and Canada. If they were deprived of the foreign ore, the logical expectation would be a scramble for the diminished supply, an increase in the average smelting cost, an elimination of the less favorably situated concerns, a reduction in the smelting capacity, and finally the victors in possession of the field, with the ability temporarily to dictate terms, would undoubtedly direct their attention toward recouping previous losses during a brief period of large profits, which in themselves would induce new competitors to enter the business. The imposition of a tariff on zinc ore would not present a happy prospect to the Western smelters.

On the other hand, it is to be recognized that the present lot of the miners in the Joplin district is not a comfortable one. A large proportion of the mines are still idle, unable to work profitably under present conditions. This results from the reduction in the average grade of the ore mined in the Joplin district during the last four or five years. The old pocket deposits, which as recently as six or seven years ago were furnishing the bulk of the district's production from ore yielding upward of 5 per cent. mineral, have gradually given place to the sheet-ground mines, which yield but 3 per cent., or less, of mineral. In the meanwhile, royalties have not been materially reduced, and no concerted effort has yet been made to effect a readjustment in that particular. It is commonly overlooked that while the operators in the Joplin district may be only playing even, the district as a whole is nevertheless profitable, but the profit is all going into the pockets of the fee-owners. To impose upon ore that is worth only $1.15 to $1.40 per ton, as it is raised from the mine, a royalty of 10 per cent. and upward is a burden that few mines, anywhere in the world, can stand.

In spite of the low prices for ore that have prevailed during 1908, the shipments of zinc ore from the Joplin district during the first 31 weeks averaged nearly 4600 tons per week, or at the rate of nearly 240,000 tons for the year, which is less than 20 per cent. falling off as compared with 1907. This is surprising in view of the large number of mills that anyone can see to be idle. The explanation that is offered is that many of the men who have lost their company employment have gone to mining on their own account in the old diggings, and in this way are producing a good deal of ore in the aggregate.

The Price of Silver

The decline in the price of silver, to which reference was made sometime ago, has continued, with only occasional reactions. Silver has been between 55 and 52c. per ounce in New York since April, and last week a still further decline set in in which has carried the price down to 51c. in New York and 23½d. in London, with some signs of further decline. This is almost an approach to the lowest price on record, which was reported over five years ago. In January, 1903, the average prices for the month were 47.57c. in New York and 21.98d. in London. From that there was a gradual recovery until in April, 1903, the average was 50.56c., New York, and 23.38d., London, or not far from the current quotations of the present week. Since that time there has been a large appreciation in values, the highest point having been reached in November, 1906, when the averages were 70.813c. in New York and 32.671d. in London.

So far as this country is concerned, exports have not been at all reduced by the low prices as might have been expected. For the seven months ended July 31 the total exports of silver from the United States were valued at $35,174,251 in 1907, and $30,445,291 in 1908. This is a decrease of 13.4 per cent.; but owing to the lower prices ruling this year these values indicate an actual increase in quantities, from approximately 52,200,000 oz. in 1907 to 56,850,000 oz. this year, a gain of 8.9 per cent. These exports, it must be remembered, include a large quantity of foreign silver refined here. The exports of refined silver this year exceeded the imports in bullion and other forms by approximately 9,800,000 oz. only.

The key to the present situation is to be found, as usual, in the conditions in the Far East. The shipments of silver from London to the East in the seven months ended with July fell in value from £7,768,426 to £5,604,403, a decrease of 27.8 per cent. Here, as above, the difference in quantities varied from that in values, owing to the lower prices this year. The approximate quantities were 59,900,000 oz. in 1907, and 53,500,000 oz. in 1908, a decrease of 10.7 per cent.—quite enough, with an undiminished supply, to make a weak market.

The chief decrease has been in shipments to India, where unfavorable crops and consequent general poverty resulted in a smaller demand both for coinage and for private use. China took a considerable quantity early in the year, but has since been a seller rather than a buyer of silver; while the Straits Settlements have been almost entirely out of the market. The East absorbs so large a proportion of the world's silver production that its influence in the market cannot fail to be predominant.

Some minor causes, however, have aided in the fall. The demand for silver for use in the arts has been light, owing to the general business depression. Purchases of silver for coinage in Europe have been light, France and the other countries in the Latin Monetary Union placing only small orders. The United States Mint bought about 5,000,000 oz. early in the year, but has been entirely out of the market since April. All of these have helped in the depression.

A better account of the rains and crop prospects comes from India, but the effect will not be felt for some months to come, so that low prices will probably prevail for a time. The position of silver is peculiar, in that its production is so largely in connection with that of other metals.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Geological Mapping of Mine Workings

The practical value of geology is being more fully realized among mining men every day, but the geologist is still regarded by many practical miners as a person who "can't see any farther into the ground than any one else." The inference is that there is a good deal of bluff to be credited to the geologist. The first man who took a transit underground to do exact work, and who drew accurate maps of his mine, may have been looked upon in the same light. I should like to point out, in a very general way, why geological work is of value more directly than from a complex scientific standpoint.

If a map showing the relations of underground workings is valuable, even indispensable, in conducting mining operations, why should not a map bringing out geological features be of use? When you see the various pieces of a picture puzzle scattered before you, your idea of the whole is necessarily vague. So it is with the facts of underground geology; not until the scattered bits of evidence are collected and presented in concrete form, can you grasp the true conditions and connections. But when this has been done you may even be able to imagine the missing portion of the picture to find the orebody sought for. A method of exploration or development based on an abstract idea of the nature of a deposit is merely a step better than a purely haphazard scheme.

If the thing can be put on a more certain basis, how is it to be done? For the most part by plotting to scale on maps of the mine levels such geological features as may be ascertained by a reasonably careful examination of the workings. In general a map should show the size and shape of the deposit where already developed; strikes and dips of stratified formations, of veins, fractures, and cross-fractures; boundaries of different formations, and boundaries of altered portions of any particular formation. Other points may occur to the worker in special cases. With these things shown it is easier to reach a conclusion as to the nature of the orebody and conditions governing its formation.

Among the things emphasized by such mapping are, for example, the association, perhaps, of ore with some particular type of rock; the importance of cross-fractures, or the occurrence, extent, and nature of faulting. But the important point is that there is a graphic representation of conditions which appeal strongly to the mind; with this at hand it ought to be much easier to direct exploration and development along the most productive lines.

THE WORK NOT DIFFICULT

It does not require a man of specialized geological training to make a map of this kind; it can be done by anyone who can distinguish rock types and use a compass, or by an engineer who has had the average college mining course. The time required for such work is comparatively little in return for the advantage to be derived from it and once the workings have been mapped the question of keeping up to date is negligible.

Of course, there are problems which must be referred to men who have made a careful study of such things, problems which can only be solved after close investigation and, perhaps, as a result of previous experience. But the work of such an expert would be greatly facilitated if he had at hand maps on which he could see at a glance the general conditions which will confront him underground. It would also be of great assistance if a series of rock specimens, with their locations, were at his disposal. Possibly some highly paid "expert" would rather go through the routine work of mapping and collecting specimens; possibly the company would like to pay such a man to do that kind of work. I think, however, that the answer is negative in both cases.

RECORDS OF DRILL HOLES

While speaking of maps and records which would simplify and expedite the work of geological examination, there comes up the point of records of drill holes. In the earlier days on the Michigan iron ranges, thousands of feet of drilling were done and the only record [illegible] occasional entry, in a dilapidated note book, such as, "Ore from 800 to 820 ft." The core was thrown away. Since the iron-bearing series is now more fully worked out geologically, this is no longer the case; the geologist can see any given hole as well as if he had picked out and examined the core on the spot. Samples are kept, labeled with their hole number and depth, and the core trays [illegible] with a record of ore analyses, give the complete history of the hole. In general, the importance of such records in faulted formations is well understood.

However, holes are often driven from underground workings in prospecting vein [illegible] great deal of crosscutting is saved by this method. If a parallel stringer of vein material is encountered, a note is made of it; aside from which it is unusual to keep any record. [illegible] something of the country rock in its re- [illegible] classified core to work on, and the value of that is very little. With the ordinary machine used for such drilling the runner has to pull his rods and empty the core barrel for every 10 ft. advance, often more frequently. Hence it would not be difficult for him to furnish a piece of core for every five feet of the hole, nor would it take long to paste on a label with the number of the hole and the distance of the specimen from the working face. Someone at the office could examine this core, [illegible] tray.

To find maps, collections of rock specimens and samples of core, all in proper condition and available for immediate use, would fill the heart of the examining geol- [illegible] him do it all, and in the meantime use the haphazard system—follow the line of least resistance?

J. H. FARREL

Camp Bird, Colo., July 28, 1908.

The Proposed New Mining Law in Mexico

[illegible] the discussion in the JOURNAL concerning the proposed legislation in Mexico dealing with the ownership of mining property by foreigners. I note, however, the editorial and the remarks of the correspondent from Mexico City in the issue of Aug. 1, and I believe legitimate mining companies need [illegible] work, or acquiring and retaining title under any law which may be passed. I am told that the irresponsible have been in the habit of conducting operations in Mexico without complying with any of the laws of the country, not even registering the [illegible] any legal representative. Many of our own States require foreign corporations doing business within the State to file copies of papers relating to their incorpor- [illegible]

I believe the idea of the Mexican gov- [illegible] an experience which occurred last fall before the proposed legislation was talked of. At that time certain men wished to acquire title to mining property within the Twenty-League zone, adjacent to the boundary of the United States, in which the ownership of property by foreigners has always been prohibited. Advice as to the method of procedure was asked of the State Department and referred to the American minister at the Mexican capital. In replying our minister stated, in effect, that permission to hold property was commonly granted on application, but if not the matter could be arranged by the formation of a company in which the title would be vested under the laws of Mexico. He further added that it should be understood that the Mexican government does not look with disfavor upon this scheme as a subterfuge for acquiring title, but rather desires to encourage foreign capital in obtaining title in this way.

On looking into this matter further I found that companies so organized possessed rights and legal standing far superior to those of a company not incorporated under the laws of the country. In fact I question if there may not be many companies operating in Mexico today which hold their titles, not having complied with the laws of Mexico, but simply through the sufferance of the officials. And I believe that any law which receives the sanction of the Mexican government will prove to be a safeguard to the interests of foreign capital.

Geo. A. Packard.

Butte, Mont., Aug. 10, 1908.

Analysis of Roman Bronze

During a visit to the Washoe smelter at Anaconda, Mont., E. P. Mathewson, the general manager of the plant, showed me a piece of bronze which had been broken from the shaft of an old water wheel in the lower Roman workings of the north lode of the Rio Tinto mine, Solomon mountain.

The water wheel was probably built about the time of Christ. Coins found nearby were of the age of Vespasian, 70 to 81 A.D. The broken shaft was recovered in May, 1903. The analysis, which follows, was made on April 29, 1904, by Henry N. Thomson, the metallurgist of the Washoe plant: Arsenic, 0.5 per cent.; antimony, trace; copper, 77.3; iron, 1.1; tin, 9.2; lead, 10.5; silver, 10.2 oz. per ton; gold, 0.2 oz. per ton; total, 98.8 per cent.

As there is no record of the occurrence of tin in the neighborhood of Rio Tinto, it was probably brought from Lusitania (Portugal) or the Cassiterides (Cornwall), where the Phoenicians and Romans worked mines before the Christian era.

Geo. W. Maynard,
Mining and Metallurgical Engineer.

New York, Aug. 12, 1908.

Operating Costs, Homestake Slime Plant

The accompanying tabulated and analyzed statement of operating costs of the Homestake slime plant for March, 1908, shows the results of a typical month.

We are now adding two more presses and will begin grading shortly for several more in order to take care of the additional proportion of fines which will result from the operation of the fine-grinding plant now being installed.

C. W. Merrill.

San Francisco, Cal., Aug. 4, 1908.

OPERATING COSTS, HOMESTAKE SLIME PLANT, MARCH, 1908.

COST PER TON.

	Labor.	Electric Power and Lighting	Chemicals.		Other Supplies.	Total
				Cost.		
Thickening	$0.00370				$0.00006	$0.00376
Transportation					0.00030	0.00030
Neutralization	0.00625	$0.00116	Lime, 4.476 lb	$0.02236	0.00006	0.02985
Filling and discharging, Merrill slimeing presses	0.01040	0.00347			0.00239	0.01626
Dissolving and washing	0.02468	0.01502	Cyanide, 0.31 lb. HCL	0.06200 0.02324	0.00014 0.01 (cloths)	0.13508
Precipitation, Merrill method	0.00281		Zinc, 0.127 lb.	0.00762	0.00026 0.00057 (cloths)	0.01126
Heating	0.00218				0.00537	0.00755
Assay office	0.00348				0.00518	0.00866
Superintendence	0.00911				0.00043	0.00954
Miscellaneous	0.01272				0.00117	0.01389
Fire protection					0.00054	0.00054
Refining, bullion expressage and mint charges					0.00864	0.00864
Total	0.07533	0.01965		0.11524	0.03511	0.24533

General Notes

Hydrochloric acid	@	$4.30 per carboy, 10 carboys per press.
Cyanide	@	0.20 " lb.
Lime	@	0.005 " "
Zinc	@	0.06 " "
Labor	@	3.00 + per 8-hour shift.
Power	@	7.50 per H.P. per month.

One suit of filter cloths lasts one year. For 24 presses cloth consumption is 2 suits per month or $0.01 per ton of slime treated.

Total tons treated, 49,946.

Effect of Discharge Level and Water Supply on Stamp Capacity

A paper by Harry T. Pitt (*Journ.* Chem. Met. and Min. Soc., of South Africa, June, 1908, p. 373) gives the results of a series of experiments to determine the influence of the hight of the chuck block and the manner of supplying water to the mortar upon the crushing capacity of the battery. The tests were made at the Rose Deep mill, Transvaal, and the results led to the recommendation of the shallow-front mortar box and the introduction of water through pipes beside and below the feed chute so as to strike the back plate vertically, falling upon the dies in a fan-shaped stream with insufficient force to drive the uncrushed rock against the screen. The advantage of the shallow mortar box is that the discharge may be kept level with the top of the dies, by changing the chuck block as the dies wear down, thus avoiding the necessity of introducing false bottoms.

Six tests were, under varying working conditions, as follows:

(1) Weight of stamp, 1150 lb.; hight of drop, 7 in.; number of drops per minute, 105; size of screen, 500 light mesh; screen area, 520 sq.in.; water supply let into top of mortar box; discharge level with face of dies, the level being maintained by means of false bottoms under the dies and by lowering the chuck block; crushed per stamp per 24 hours 6.153 tons coarse rock and 6.253 screened rock, 1½-in. mesh.

(2) Conditions the same as in (1) except that the discharge level was 1 in. above the face of the dies; crushed per stamp per 24 hours 5.723 tons coarse rock and 5.797 tons 1½-in rock.

(3) Conditions the same except that the water was admitted through four 1½-in. holes level with the ore-feed chute at the back of the mortar box; dies 1 in. below the discharge; crushed per stamp per 24 hours 5.740 tons of coarse rock and 8.878 tons of fines.

(4) Conditions the same as in (3) except that the dies were level with the discharge; crushed per stamp per 24 hours 5.941 tons of coarse rock and 6.034 tons of 1½-in. material.

(5) Conditions the same as in (4) except that the screen was inclined giving 173 sq.in. more area; crushed per stamp per 24 hours, 5.771 tons of the coarse and 6.390 tons of the 1½-in. rock.

(6) Conditions the same as in (1) except that water was admitted through five 1¼-in. holes in the back of the mortar box level with the top of the dies and the discharge lip; crushed per stamp per 24 hours 6.630 tons of coarse and 6.627 tons of 1½-in. material.

Sloss-Sheffield Steel and Iron Company

This company owns extensive tracts of coal and iron-ore lands in Alabama, on which it operates a number of mines. It also owns coke ovens and blast furnaces and is a large producer of pig iron. The report for the year ended Nov. 30, 1907, recently issued, shows capital as follows. Common stock, $10,000,000; preferred stock, $6,700,000; mortgage bonds, $4,000,000. The net surplus over current liabilities is $1,892,449, constituting the working capital.

The earnings and expenses for two years past are reported as follows:

	1906.	1907	Changes
Gross earnings....	$6,290,014	$6,654,303	I. $364,289
Expenses....	4,938,268	4,831,457	D. 106,811
Net earnings...	$1,351,746	$1,822,846	I. $471,100
Depreciation	$ 140,901	$ 133,183	D. $ 7,718
Bond interest ...	210,000	210,000	....
Total charges.	$ 350,901	$ 343,183	D. $ 7,718
Surplus	$1,000,845	$1,479,663	I. $478,818

Appropriations in 1907 were $969,000 for dividends--7 per cent. on preferred and 5 per cent on common stock leaving a surplus of $510,663. Adding the balance of $2,650,917 from previous year made a total of $3,161,580. The expenses include charges for depreciation of coal and iron-ore lands; charges of 35c. per ton on coke, and 25c. per ton on pig iron, to cover repairs and renewals. In addition to the amount charged in expenses, the sum of $660,000 was expended in rebuilding blast furnaces, in new machinery and in improvements and machinery at coal mines and iron mines. Several new coal mines were opened, and new tipples and washers put in. New air compressors at the Sloss iron mines were put in; new washers and other machinery at the Russellville mines.

Business was somewhat restricted in the early part of the year by car shortage; and in October and November by the break in the iron markets.

As this company now owns probably the largest area of unmined iron ore outside of the holdings of the United States Steel Corporation, the following statements from the report are of much interest: "Your company owns 65,000 acres of coal lands and 51,125 acres of iron-ore lands. A pretty fair estimate can be formed as to the coal, as the general thickness of the several seams and the territory covered are pretty accurately known. There is on file in the company's office, an estimate made by one who was unusually familiar with the coalfields of Alabama, in which your coal lands are divided into various groups according to the railroads they may be tributary to, and the coal-bearing acreage in each is carefully computed, and an estimate given of the amount of coal in each seam under it. The statement gives the aggregate amount of coal in the several divisions and seams as 1,435,090,348 tons.

"It is more difficult to make an approximate estimate of the iron ore, as so small a proportion of the 51,000 acres has, as yet, or will for a long time, be developed. In the hard-ore field where the veins are regular about 2060 acres have been developed, and in the brown-ore fields about 1924 acres have been thoroughly tested by numerous test-pits, etc. The ore in the developed hard-ore fields, may be safely, we think, estimated at 72,600,000 tons, and in the 1924 acres of brown-ore land at 26,000,000 tons. Deducting the foregoing hard-ore acreage, there is left on which to estimate 24,695 acres of hard ore. Some of this hard-ore land, it is known, carries a thick vein of ore, while on some of it the vein is thinner, running from 4 to 6 ft. Taking into consideration that not all the acreage is ore bearing, we think it conservative to estimate that the vein on the entire undeveloped acreage will average 5 ft., which should yield 17,000 tons per acre, or a total on the undeveloped hard-ore lands of 419,800,000 tons.

"In the Russellville tract you have 18,600 acres of brown-ore land. The Southern Railway Company having bought the Northern Alabama Railroad, and desiring to know what business there was tributary to the road, employed Joseph Squires, a competent and trustworthy mining engineer, in 1901, to make a report on the Russellville orefield. A copy of this report is on file in the office. The report deals with this orefield at considerable length and sums up the conclusion as follows:

'"In my estimate of the quantity of brown ore on the above 18,400 acres, while there are some acres on said tract that have yielded 25,000 tons to the acre, still, after going over the territory, I have formed the opinion that the whole 18,400 acres will yield an average of 6000 tons of 2240 lb. to the acre, making an aggregate of the whole amount of 110,400,000 tons.'

"Practically all of the 18,400 acres is now owned by your company. Besides the foregoing brown-ore lands located in Franklin county, your company owns 2700 in Tuscaloosa and Bibb counties, 2030 acres in Colbert county, and 2400 acres in Jefferson county, and one-half interest in the Champion mine, owned jointly with the Tennessee company, and estimated to contain 650,000 tons of ore.

"Taking Mr. Squires' report as a basis, and making due allowance for any overestimate, and after deducting 25,000,000 tons from our total estimate, and not including any interest in the Champion mine, we feel that it is conservative to estimate the brown ore owned by your company at 133,500,000 tons. We would, therefore, seem justified in stating that you own: Hard ore, developed, 72,600,000 and undeveloped, 419,800,000; brown ore, developed, 26,000,000 and undeveloped, 107,500,000 tons; making a total of 98,600,000 tons of developed and 527,300,000 tons of undeveloped ore; or a total probable reserve of 625,900,000 tons of iron ore."

Iron Production in Canada

Pig-iron production in Canada for the first half of 1908, as reported by the American Iron and Steel Association, was 307,062 long tons; being 36,962 tons more than in the first half of 1907, but 3984 tons less than in the second half. The production in detail was, compared with the first [illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Of the iron reported this year, 301,673 tons were made with coke or bituminous coal, 4798 tons with charcoal, and 591 tons in the electric furnace. In the first half of 1908 and in the second half of 1907 small quantities of ferrosilicon were made by electricity. This production is included in the total figures given above.

[illegible] Canada had 16 completed blast furnaces, of which seven were in blast and nine were idle. Of this total 13 were equipped to use coke and three to use charcoal. In addition three coke furnaces were partly erected on the same date, work on which was indefinitely suspended some time ago.

During the first half of 1908 the total number of furnaces in Canada actually in blast for the whole or a part of the period was [illegible], of which [illegible] used coke and [illegible] used charcoal.

New Mineral Products in California

[illegible]

In Riverside county, in California, not far from Hemet, are deposits of both magnesite and manganese, which are claimed to exist in large quantities. A new company has begun work on the magnesite mine, and is constructing roads, buildings, etc. The manganese mines have never been worked, though recently the owners tried to get a satisfactory freight rate to Pittsburg by rail. This they were unable to do, except for the higher grade of ores. Much of the ore is of such low grade that it will not bear shipment. The magnesite mine has not yet become productive.

Citizens of Santa Barbara are organiz- [illegible] lithographic stone at Pine Mountain in that county, which they declare is of excellent quality. Reports have been favorable, but tests have yet to be made in New York.

T. B. Ferris, of Kern county, has found a large deposit of yellow ocher at his Golden mine, in Amalie district.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. B. Tyrrell, mining engineer, of Toronto, has gone on a trip to Port Arthur, Ont., and Edmonton, Alberta.

J. C. Gwillim, of the School of Mines, Kingston, Ont., has been visiting Whitehorse copper camp, in the Yukon.

George Alexander, manager of the Kootenay Ore Company, has returned to Kaslo, B. C., from a visit to Europe.

W. H. Jeffery, formerly with La Rose Company, is now superintendent of the Chambers-Ferland mine, Cobalt, Ontario.

Lawrence P. Adams, manager of the Guanajuato Amalgamated Mines Company, has returned to the mine from New York.

August Raht, of New York, has been visiting mines and smelters in the Boundary and Kootenay districts of British Columbia.

J. L. Parker is superintending some development work for the Tyee Copper Company at Sidney inlet, west coast of Vancouver Island.

Arthur W. Jenks, of Seattle, Wash., has gone to Alaska on a professional engagement. He will return to Seattle about the middle of September.

Geo. M. White, of White & Newcomb, Mexico City, has gone to Temascaltepec to begin construction on the new mill of the Seguranza company.

Jules Labarthe, manager of the Consolidated Mining and Smelting Company's works at Trail, B. C., has been spending a month at Salt Lake City, Utah.

J. W. Bryant, mine superintendent for the Tyee Copper Company, has returned to Victoria, B. C., from an examination of copper claims in Whitehorse camp, in the Yukon.

Walter S. Keith, late superintendent of the Oregon Smelting and Refining Company, Sumpter, Oregon, has opened offices as consulting metallurgist in Seattle, Washington.

Godfrey D. Doveton is in Mexico City. He is designing a lixiviation and copper-leaching works for a Guerrero mine, with which he is connected as consulting metallurgist.

E. J. Babcock, dean of the School of Mines of the State University, Grand Forks, N. D., with a party of students, has been looking through mines and smelters in the Boundary district of British Columbia

A. B. Critchton has been appointed consulting engineer for the Winifrede and Belmont coal companies, Kanawha district, West Virginia, and is at present spending several weeks looking after improvements in those mines.

Chas. Biesel, superintendent of the Consolidated Mining and Smelting Company's Snowshoe mine, at Phœnix, B. C., has returned to the mine from Trail, to resume shipment of ore after seven or eight months' suspension there.

H. Stuart Martin, late general manager of the Dowlais and Abercynm collieries in South Wales, has been appointed consulting engineer to H. Eckstein & Co., of Johannesburg, who control large mining interests in the Transvaal.

Hon. William Templeman, Canadian minister of mines, accompanied by Dr. R. W. Brock, acting director of the Geological Survey, has gone to British Columbia, to investigate mining conditions in the Kootenay and Crow's Nest districts.

William C. Wiper, of Malta, has been appointed coal-mine inspector for the Fourth district of Ohio—Perry, Muskingum and Morgan counties—to succeed James Pritchard, who resigned to become superintendent of mines for the Sunday Creek Coal Company.

Alexander Colledge, mining engineer of Singapore, Straits Settlements, is expected in New York in September. Mr. Colledge represents several large American makers of mining machinery in the Far East, and intends to visit the chief mining centers in this country to investigate recent methods of ore treatment.

Obituary

George Beckman, manager of the Union Coal Company, died in Pittsburg, Penn., Aug. 11, aged 35 years. He had lived in Pittsburg all his life, and had been a coal operator for a number of years.

I. K. Pierson, a civil engineer of Cleveland, O., was killed by falling from his horse, near Puerto Cortez, Honduras, July 24. He was engaged in the improvements planned by the Caribbean Development Company, of New York.

Capt. M. J. Urquhart died at Steubenville, O., in July, 1908, at the age of 69 years. Captain Urquhart was connected, for many years, with the old Jefferson Iron Works at Steubenville, which are now owned by the La Belle Iron Works. He was also president and general manager of the Junction Iron and Steel Company at Mingo Junction, Ohio.

Ernest Thies, manager of the Haile Gold Mines, in South Carolina, was so badly injured by the explosion of a boiler at the mine, Aug. 10, that he died the following day at Charlotte, N. C., to which place he was taken atfer the accident. He was a son of Captain A. Thies, so widely known as an expert in chlorination, who made the Haile the most successful mine in the South. Ernest Thies spent most of his active life at the Haile, for some years as assistant, and after the retirement of his father some years ago, he was appointed manager, and continued the work with success. He had also done some work as mining and consulting engineer in the Dahlonega goldfield in Georgia.

Societies and Technical Schools

American Electrochemical Society—The fall meeting of this society will be held in New York City, Oct. 30 and 31. Dr. J. W. Richards, Bethlehem, Penn., is the secretary of the society.

Michigan College of Mines—The year-book of the Michigan College of Mines, Houghton, Mich., for 1908, shows full courses in mining and metallurgy. It is expected, early in the year 1908-9 to move the library into the new library and mineralogical building now in course of erection. Accompanying the year-book is a series of views of the buildings and field work.

Wisconsin State Mining Trade School—This school, founded at Platteville last year, will reopen Aug. 31. Prof. H. C. George, formerly instructor in mining engineering at the Western University of Pennsylvania, succeeds R. B. Brinsmade as director. Courses have been revised and laboratory equipment completed. The purpose of this school is not to graduate mining engineers, but rather mine-foremen and mill-men and to train young men to fill subordinate positions in mining. A two-years' course is offered. A common school diploma or its equivalent upon entrance examination are the requirements for the regular course.

New Mexico School of Mines—The catalog of this school at Socorro for 1908 shows courses in mine engineering, metallurgy, mining geology and civil engineering. This school, we believe, is the only one which owns and operates a mine. It has become the owner of the Torrance gold and silver mine at the base of Socorro mountain, only two miles from the campus. This mine affords excellent opportunities for the practice of mine-surveying and for a study of all the various features of practical mining. Here are to be studied a double-compartment incline shaft, a fine example of mine-timbering, various levels, crosscuts, winzes, shafts, stopes, orebodies with associated geological structures and other features of interest to the student. The school has also come into possession of the private library of the late Major John W. Powell, for many years director of the United States Geological Survey. The collection embraces several thousand titles, chiefly works on mining, geology and philosophy, many of which are rare, and all of practical value. Especially well represented is the literature relating to the Rocky Mountain region and the Southwest. It was in these fields that Major Powell did most of his work

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Goldfield, Toronto and Mexico

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 12—The Selby Smelting and Refining Company has filed in the Superior Court at Fairfield, Solano county, a motion for a rehearing of the action through which an injunction was secured by the county prohibiting the company from operating its smelter on account of the fumes carried to Benicia by the trade winds. More than 100 affidavits were filed in support of the motion and an appeal will follow the expected denial. The company contends that the enforcement of the injunction now is unfair because the Cottrell electrical system for controlling the poisonous vapors is on the eve of completion. Further test runs were prohibited by the injunction being enforced completely at request of the Benicia citizens. Ten days' time has been given the company to file additional affidavits in the request for the new trial.

The large gold dredge of the Shasta Dredging Company, at Horsetown, Shasta county, was entirely destroyed by fire last week, entailing a loss of about $125,000. The cause was in connection with the electric power appliances on the boat. This dredge had only been in operation for two months, and was the second built by the company. The first one, at the same place, was also burned.

It is supposed that Eastern capital will shortly lend its aid to enlarge the smelting plant at Needles, San Bernardino county on the Colorado river, on the line of the Santa Fe railway. The present smelter is the only one in southern California and the only one accessible to southern Nevada nearer than San Francisco or Salt Lake. Three years ago Manager Godshall, aided by Pennsylvania capital, bought the old plant of the Fletcher Smelting Company, enlarged it and rebuilt it to handle both lead and copper ores, and lately a new furnace has been added to meet the growing business from southern California, Nevada and northern Arizona.

There are now no dredges operating in Trinity county, but a Keystone drilling apparatus has been set at work prospecting the gravel beds on the Junkans ranch near Weaverville, and if the tests are satisfactory, a dredge will be built to work the ground. A Florence drilling apparatus has also been taken to prospect the ground of D. N. Ulm on Clear Creek in Shasta county. In this connection it may be stated that Thos. Rockhill and R. H. Richardson, of Ely, Nev., C. W. Gaby, of Osceola, and F. B. Weeks, are about to test the placer ground with drills in Snake Valley east of Osceola.

Wallace, Idaho

[illegible] county the assessment on the big dividend-paying mines of the district has been lowered about $42,700. The companies affected are the various properties of the Federal Mining and Smelting Company, Hercules, Bunker Hill & Sullivan, Hecla, Gold Hunter and Frisco. The apportionment of the decrease to each company is as follows: Federal Mining and Smelting Company, $13,500; Bunker Hill & Sullivan; $10,000; Hercules, $6000; Frisco, $5000; Hecla, $4200; Gold Hunter, $4000. The total valuation placed by the assessor on these companies together with the Snowstorm, Cœur d'Alene Mining Company, Golden Chest and Success amounts [illegible] Hecla, $76,130; Hercules, $113,900; Snowstorm, $119,914; Bunker Hill & Sullivan, $241,277; Cœur d'Alene Mining Company, $27,684; Federal Mining and Smelting Company, $466,566; Frisco, $27,250; Golden Chest, $9775; Success, $10,350.

Goldfield, Nevada

[illegible] amicable settlement of the litigation between the Consolidated and the Jumbo Extension, ex-Gov. C. S. Thomas, of Colorado, chief counsel for the Consolidated, has made formal application to the Federal court for dismissal of the apex suit brought on account of the Wedge claim. A deed to the claim in question has been conveyed to the Consolidated and it has been filed for record, as has also the counter agreement regarding the ore to be extracted from the Vinegarone and Polaverde properties.

The new process of treating concentrates being worked out by the Consolidated has succeeded so far beyond the company's best hopes that a plant is being designed as auxiliary to the new 600-ton mill to treat the concentrates from the latter. An extraction of 95 per cent. is practically assured.

Salt Lake City

[illegible] will disburse its initial quarterly dividend September 30, of 50c. per share. Inasmuch as there are 75,000 shares of convertible stock, the aggregate sum to be disbursed is as yet indefinite. However, there are 660,000 issued shares outstanding; but if all of the convertible stock is issued there [illegible]

[illegible] company is arranging to increase the ore-treatment capacity of its Garfield concentrator to 10,000 tons per day, the present facilities providing for 6000 tons.

The Boston Consolidated Mining Company is going to increase the production of its Bingham mine and by September 1 four more sections of the Garfield concentrator will be in commission, the number now in use being four. Each section is designed to treat 200 tons of ore per day. The management recently succeeded in obtaining a modified smelter contract which is much more favorable.

Although no official statement has been released, it is reasonably certain that the Ohio Copper Company, of Bingham, will resume construction on its concentrating mill at Lark in the Bingham district. It comes from a reliable source that the bonds authorized by the directors have been underwritten, which assures ample funds to round out the enterprise. Ohio Copper is one of the really big low-grade copper mines of Utah. The initial capacity of the mill is for 2000 tons of ore per day.

Butte

August 13—The Butte-Balaklava Copper Company has instituted action against the Butte, Anaconda & Pacific Railway Company for the purpose of quieting title to the Balaklava lode claim. The complaint states that the railway company asserts an interest to a portion of the claim adverse to the mining company.

F. B. Lindman, secretary of the Montana Mine Owners Association, announces that the Panhandle smelter at Sand Point, Idaho, is ready for treatment of ore. The decision of the Montana railway commission with reference to railway rates on ore shipments is expected within a short time, and when it is announced, the mine owners hope that the rates will be suffi[illegible] the State to resume operations. At the hearing before the commission, the railroads raised the point that, since shipments between Montana and Idaho would be interstate commerce, the State commission would be without jurisdiction to [illegible] the mines of association members in Montana to the association smelter in Idaho. The success of the smelter will depend [illegible] the commission.

[illegible] an adverse suit against the Tuolumne Mining Company for the purpose of determining the right to patent of the Smoky Moke lode claim. The plaintiffs state that they located the claim in 1904 under the name of the Marrimac and that in May, 1908, the defendant company applied to the Government land office for patent to the same ground under the name of the Smoky Moke claim.

Peter Lackner, formerly managing director of the Butte & Buxton Copper Company, has resigned, and Charles Fasel has been appointed to succeed him.

Denver

Aug. 14—On Aug. 12, passenger-train service on the Moffat road was inaugurated to Toponas, 176 miles from Denver. The rails have been laid to Yampa, a further distance of nine miles.

The gold strike in the vicinity of New Castle is still attracting attention, and all the desirable ground has been taken up. Some assays taken by miners from Leadville ran 2 oz. gold per ton, it is claimed.

Mining in Leadville is slowly reviving from the depression of last fall, and with the increasing price of lead and zinc preparations are under way to resume mining on the usual Leadville scale. Developments in the Yak tunnel have resulted in the opening of considerable stoping ground. A fair tonnage is now being produced, and the new portion of the Rowe mill is kept in full operation. In the process used there the mixed pyrite-blende ores are treated by low-tension magnetic separators after a preliminary roast in White-Howell furnaces, and apparently with success. The larger and older portion of the mill was designed to treat the raw ores by high-tension International separators, but this portion of the plant has not been in operation for some time. Possibly the diminished output of the camp has something to do with this state of affairs, yet some of our leading metallurgists have long held that the magnetic roast was essential to a close separation of the pyrite from the Leadville blende. The Iron Silver Mining Company is developing the Tucson claim, on top of Iron hill. The shaft has been sunk to the Cambrian quartzite, and larger bodies of zinc ore found in the white limestone. Should this ore make below all of the big ore shoots of the old Iron mine, as some experts predict, it would add a new lease of life to this once famous producer and oldest mine in Leadville.

It is reported that a contract has been let to an Eastern engineering concern for the erection of a steel building at Ironton, for the matte smelter which is being built for the reduction of the copper ores of the Mono-Baltic property, of Red Mountain, in the San Juan region.

Shipments of ore and concentrates from Idaho Springs during July show an increase of 20 per cent. over the corresponding month of last year. One of the most important mining transactions of the week in Gilpin county was the granting of a lease by the Waldorf Consolidated company, of a large block of its ground to a Kansas City syndicate. The lease is for an indeterminate period, and calls for work requiring $30,000 or $40,000 expenditure.

Indianapolis

Aug. 17—Just as the mining situation had changed to that of activity the idle mines resuming operation and work plenty for all the miners, many of whom had been idle all summer, a strike has been declared in District 11, affecting nearly 10,000 men in the Indiana bituminous field. The calling out of the men by President Von Horn of the mine workers is the outcome of the action of the Indiana Operators' Association in declaring relations with the miners severed. This action is due to what the operators declare a violation of the agreement on the part of the miners. This agreement provides that no miners shall stop work as long as an effort is being made to settle an existing difference. A driver was discharged in the Rood mine of the Hudson Coal and Mining Company near the line of Vigo and Sullivan counties and in the absence from the State of President Coulson of the Operators' Association, Vice-President Curry of the miners' association called the men out at the Rood mine. The immediate cause of the present trouble at the Rood mine is trivial, but the real dispute is regarding the clause in the wage contract that provides that grievances can be appealed to the secretary of the Operators' Association and the president of the Mine Workers' Association of the district, and stipulates that these two officials shall be a court of last resort; furthermore that they must reach an agreement.

The grievance at the Rood mine was taken up by these officials, but before an agreement was reached and while Secretary Penna of the Operators' Association was absent from the State, the vice-president, acting in the absence of the president, ordered the men to quit work. President Lewis of the International Association advised the vice-president to put the men back to work holding that the step was a violation of the agreement, but his advice was ignored.

The operators regard the action of the miners as serious, and have declared that until the mine in question resumes work, the relationship between the association and the mine workers of District No. 11 are severed. Further, that the check-off for all purposes would be discontinued until further notice.

This last decision of the operators to stop taking out of the pay of the men the amount of their dues to the labor organization is conceded to be a vital blow, as ex-President John Mitchel has always frankly said that if these dues were not collected in this manner by the operators on pay-day the life of the organization would be menaced.

The strike in the bituminous field does not affect the Block Coal district, the men remaining at work,

It is conceded that a strike or suspension of work in the Indiana mines at this time works hardship on both miners and operators. The mining situation had just begun to assume normal conditions. Many unemployed men had begun work, and others were to begin Aug. 16. The idle mines have been cleaned out at great expense to operators and a delay in starting fall business will prove disastrous. Just at present the operators want coal, and in this way the miners seem to have the best of the situation. The operators, however, state that the fight is to the finish; that the check-off system in the entire State will be abandoned and that the officials of the mine works will hereafter have to collect dues from their members themselves if any are collected. They are determined that the provisions of the agreement shall not be violated at will by the miners.

Mexico City

Aug. 9—In connection with the efforts of the Chamber of Mines to prevent the passage of the new mining law, the recent circular issued by the president of this body is of interest. The circular is for the public generally and miners in particular and asks for data. It reads in part: "We would be greatly obliged by your forwarding to us, either in the original or copied, the letters or paragraphs contained therein which are pertinent to this subject, and which you may have received from prominent persons in this country or abroad, and at the same time inform us, if possible, what negotiations for the purchase of mines or for the organization of foreign companies for that purpose have been suspended through fear that such a bill will pass."

The article to which objection is made is as follows: "Foreign companies shall hereafter be incompetent to locate or acquire, under any title whatever, mining properties or real rights over the same within the territory of the Mexican republic."

The mining outlook is brighter in Mexico than it has been for a long time. Construction work which had been delayed or entirely stopped has started again, and one hears of contracts being let on all sides. The new water-power plant near Temascaltepec has stimulated building in that vicinity. It is reported that the "La Quimica" will build a cyanide addition to the concentrating mill. The "Seguranza" has practically let the contract for a 20-stamp, fine-grinding mill and cyanide plant. This mill will be equipped with tube mills, Brown air-agitation tanks and vacuum filters.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

The total value of the gold bullion received at the United States Assay Office, Seattle, Wash., during the year ended June 30 last was as follows: From Nome, $3,805,145; Tanana, $8,450,033; other Alaska, $550,908; total from Alaska, $12,806,086. Receipts from Washington, Oregon, etc., were $71,536. From British Columbia, $1,515,838; from Yukon Territory, $1,552,733. This makes $12,877,622 from the United States and $3,068,571 from Canada; $15,946,193 in all.

Arizona

COCHISE COUNTY

Calumet & Arizona—The July output of blister copper from the ores of the Calumet & Arizona and Superior & Pittsburg mines was under 4,000,000 lb. An average of 1400 tons of ore per day was smelted, 100 tons less than the usual tonnage. Several repairs and changing of air pipes at the smelter necessitated the partial shutting down for a short time during the month.

Superior & Pittsburg—On the 1300-ft. level junction a large body of sulphide ore carrying 12 per cent. copper has been opened up. This body of ore is immediately under a similar body on the 1200-ft. level. Preparations are being made to start stoping on the small bodies of high-grade oxide ore lying above the 90-ft. level of the No. 3 shaft and outcropping on the surface near the shaft. Since the No. 3 shaft has no railroad connections this ore will be lowered in cages to the 1000-ft. level and hauled by mules to the Cole shaft. A crosscut in the Supplement claim has developed 50 ft. of 5-per cent. oxide ore. This crosscut is about 150 ft. from the side line of the Buckeye claim of the Calumet & Arizona. About 15 ft. of 12-per cent. oxide ore has been cut in a raise in the northeast corner of the Sunnyside claim on the 1000-ft. level. A crosscut on the 1100-ft. level has passed through 50 ft. of oxide ore carrying 10 per cent. copper, but high in alumina.

Shattuck [illegible]—Nothing [illegible] has been given out about the erection of the new smelting plant at Douglas, but the mines are kept in readiness for shipping ore. The sulphide stope on the 800-ft. level where a big body was taken out before shipments were stopped has been kept open and is in shape to ship 250 tons daily carrying 5 per cent. copper. In addition the oxide stopes can furnish 50 tons of high-grade ore. The development work consists of one drift on the 600-ft. level and three drifts on the 700-ft. level. The southwest drift on the 600-ft. level has passed through 30 ft. of good oxide ore. Crosscuts east and west on the 700-ft. level have recently cut bodies of low-grade sulphide ore.

Warren Realty and Development Company—The three-compartment shaft has reached a depth of 700 ft. A tongue of porphyry 3 ft. thick was recently cut. The porphyry was iron stained and carried small quantities of copper. For most of its depth the shaft has been sunk in hard gray limestone.

Butte & Arizona—Development work has been resumed with a force of 30 men on this property, which was shut down the latter part of June.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—The production for July was 1320 tons of copper. Operations at the furnaces were interrupted by putting in new flues.

Arkansas

LOGAN COUNTY

Standard Coal Company—This company has been organized to open and operate coal mines. W. H. Foster, Paris, Ark., is president.

California

AMADOR COUNTY

Valparaiso—A small 3-in. seam of "black metal" of very high grade has been found in this mine. It is first roasted and then crushed, at the mine.

CALAVERAS COUNTY

Conradi—At this hydraulic mine, Railroad Flat, a contract has been let to run a 700-ft. open cut, and to cut down the tail-race so they can bottom the channel.

Live Oak No. 2—Louis Thomas of San Francisco has bonded this mine (also known as the Haley) at El Dorado, and men have been set at work.

McCann—At this gravel mine, Chile gulch, F. W. Peck, superintendent, the tunnel is being cleared out and other improvements made.

[illegible] Bros. have installed a new pump at this property and are unwatering the Hedrick and Anderson claims.

[illegible] COUNTY

[illegible] the new mill at this company at Trimmer has been completed and the first clean-up has just been made.

HUMBOLDT COUNTY

Weitchpec—A number of new placer claims have been located at this place and water will be brought in from Hopkins creek.

[illegible] COUNTY

Tecopa Consolidated—Work has been resumed at this property with 50 miners employed. The lead ore is shipped to smelters at Salt Lake.

KERN COUNTY

La Cross—A gasolene hoisting engine, with compressor and machine drills, has been shipped to this mine at Sunshine.

LASSEN COUNTY

Lassen County Mining and Milling Company—This company has completed the installation of its cyanide plant in conjunction with the new 10-stamp mill.

MARIPOSA COUNTY

Mariposa—Manager F. T. Maguire of the Mariposa Mining and Commercial Company is about installing a 10-stamp mill at this mine, and the main shaft is to be retimbered. Leases in the different levels will then be let.

NEVADA COUNTY

Mayflower—This mine at Canada Hill, Nevada City district, has been bonded to people from Honolulu. It is well equipped with necessary machinery.

Colorado

[illegible]

Gillett Mill—O. P. Grimes and associates, who lately reconstructed the old Gillett mill, are now engaged in installing concentrating tables and will have the mill in full operation soon. The plant, which has a capacity of 150 tons per day, has been in continual operation for some time treating the old Kimball dump on the property, and a fair extraction is reported. The dumps contain enough material to run the mill for six months.

Longaconing—Lessees on this mine, on the western slope of Beacon hill, have opened up a promising vein.

Mayflower—Lessees in this mine have struck a vein which gives good results in gold. They are now sinking to find whether it continues.

[illegible]

ry—This company, capitalized for $500,000, has been formed for the purpose of operating on the Fluorine property on the south stope of Copper mountain. Incorporators are Henry Rassbach, William Galloway and H. L. Bull. The leasing company has opened up a body of milling-grade ore. A mill on the property of 50 tons daily capacity will be used to treat the product. Operations are conducted through the Blanchard tunnel at a distance of 1100 ft. from the portal.

Roanoke—An examination is being made of this mine on Mineral hill, under direction of President W. F. Burns of the Cripple Creek Land and Mining company, owning that claim and the Emma placer adjoining just beyond the corporate limits of the city. The property has been sunk to a depth of 335 ft., and bodies of low-grade ore are exposed in the different levels.

Kansas

ZINC-LEAD DISTRICT

Chicago - Quapaw — This company is erecting a 150-ton mill on the Julia S. Shopp land at Baxter Springs.

Lucille—This company has let a contract to Wiggington & Milton, of Webb City, Mo., for a 250-ton mill on its land near Baxter Springs.

Kentucky

MUHLENBURG COUNTY

Green River Coal and Coke Company—This company has bought a large tract of coal land near Penrod, and is having surveys made preparatory to beginning development. C. H. Shattuck, Parkersburg, W. Va., is president; S. D. Brady is chief engineer.

WHITLEY COUNTY

Superior Coal and Coke Company—This company has been organized to open and operate a coal mine near Halsey, W. C. Tucker, Halsey, Ky., and G. W. Stephens, Chattanooga, Tenn., are incorporators.

Michigan

COPPER

Keweenaw—Daily rock shipments, varying from 250 to 350 tons, are being made to the Phoenix mill. The rock is coming from the stock pile, which at the beginning of mill operations was estimated to contain approximately 75,000 tons; nothing has been shipped direct from the underground openings to the mill. Everything at the mill is working satisfactorily and the new Woodbury jigs will soon replace the present jigs.

Seneca—The new shaft which is being sunk on this property is down more than 40 ft. This shaft is going down in the footwall about 60 ft. behind the lode and with the same dip as the lode. The first level will be established at a depth of 150 ft. and a crosscut driven to cut the lode. The drills, at the present, are being run by steam, but a compressor will soon be installed.

Copper Range—Preparations have been about completed to begin drifting from the 1000-ft. level of the shaft on the Globe tract, which is held under option by the Copper Range company. In cutting a landing at this level some copper-bearing rock was encountered. All work for the present will be centered at this point.

Ojibway—The concrete collar at No. 1 shaft has been completed and the same work was commenced at No. 2 shaft. Sinking is going on in No. 1 shaft at a depth of 300 ft. and in No. 2 at 365 ft. A crosscut will be driven from each shaft at a depth of 500 ft. to cut the lode and drifts extended from the point of intersection.

Atlantic—Sinking is going on at a depth of about 90 ft. below the 16th level at the section 16 shaft, and the formation encountered is more settled and firmer. The south drift from the 12th level is nearing the Baltic line.

Superior—The crosscut from the 10th level of No. 1 shaft has reached the lode which at that point is found to be as well mineralized as at the levels above. The temporary shaft house will soon be ready for erection and while this is being assembled the shaft will be widened from the 2nd to the 4th level to accommodate two skipways.

Minnesota

IRON-VERMILION RANGE

Chandler—The last shipments from this mine were made July 31, taking all that remained of the accumulated stock-pile, which was about 200,000 tons at the opening of the present season. This is probably the last shipment that will be made from this famous mine. It has been known for some time that the end of the mine was approaching, and it is now understood that last winter saw a practical end of hoisting in the shaft. The Chandler mine was the second Minnesota mine to ship ore. The first ore was sent down in 1887 and since that time, exclusive of the ore mined last winter, 9,096,639 tons have been shipped. The deposit was discovered by James Sheridan, is located on land owned by Martin and W. H. Pattison, of Duluth, was opened up by Capt. Joseph Sellwood, the operating lease was acquired by the Minnesota Iron Company and later transferred to the Oliver Iron Mining Company. The ore from the Chandler, like that from the Pioneer which adjoins it, is a hard bessemer ore, always noted for its grade, holding up well over 60 per cent. iron.

Montana

BUTTE DISTRICT

Reins—At a special meeting of the stockholders, held in Butte recently, for the purpose of voting on the issuance of bonds to provide funds for the operation of the property, directors were authorized to issue bonds to the amount of $600,000, the bonds to bear 6 per cent. interest for a period of five years. Operations at the property of the company were suspended last fall owing to financial troubles, but with the issuance of the bonds it is reported that work will be resumed.

Butte & Milwaukee—At the Colonel Sellers claim, the installation of a new first-motion Nordberg hoist has just been completed. Work is now progressing on the installation of electric pumps preparatory to the resumption of operations. When the shaft has been unwatered sinking will be begun. The shaft is now down 800 ft.

Pilot-Butte—A special meeting of the stockholders has been called for Aug. 17, to be held at Milwaukee. The notice states that the purpose of the meeting is to provide means for making a payment on the option now held by the company and for raising additional funds by sale or mortgage of the company property.

LEWIS & CLARK COUNTY

Pittsburg & New York Copper Company—The company has been recently formed for the purpose of working gold properties situated in the Seven Mile mining district, west of Helena. The company holds under lease and bond what is known as the Umatilla group of claims, consisting of eight quartz claims, two timber claims and a millsite. The properties have not been worked for a number of years and have never been explored to a greater depth than 50 feet.

DEER LODGE COUNTY

Butte - Cable Mining Company — The property is situated 16 miles west of Anaconda, in the same district with the Southern Cross, Gold Coin and Cable Consolidated mines. The shaft has been sunk 40 ft. and drifting is being done on the vein. The management states that a recent small shipment of ore showed $50 per ton, principally gold, with some copper and silver.

JEFFERSON COUNTY

President Copper and Gold Mining Company—This company has been recently organized by Butte men for the purpose of exploring a group of gold claims in the Big Foot mining district, about 10 miles southeast of Boulder. The company holds 11 claims, in which two shafts have been sunk, one to the depth of 210 ft. and the other to the depth of 80 feet.

Nevada

CHURCHILL COUNTY—HAZEN

The sampler of the Western Ore Purchasing Company, at Hazen, is handling an average of 300 tons of ore per day from Goldfield and Rawhide, and from Churchill and Humboldt counties.

CHURCHILL COUNTY—WONDER

Gibraltar Investment Company—This company, owning the June Wonder, Rex and Queen properties, will start work on company account immediately, and will also grant several leases. This company owns between 50 and 60 mining claims.

ESMERALDA COUNTY—GOLDFIELD

Production—The output for the week ending Aug. 11 was smaller than usual, due partly to the shut-down of the Western Ore Purchasing Company for four days to overhaul machinery. The Combination mill treated 665 tons of Consolidated ores and the Kinkead mill treated 60 tons of Combination concentrates. The Nevada Goldfield Reduction Company treated from the Engineers' lease, 278 tons; Combination Fraction, 190 tons; Consolidated Red Top, 178 tons; Frances Mohawk, 47 tons; Commonwealth, 51 tons; Florence Annex, 5 tons; Sandstorm, 17 tons; Mohawk Jumbo, 102 tons; Black Butte, 40 tons; Mohawk Combination, 30 tons; Hayes dump, 65 tons. The Western Ore Purchasing Company handled from the Little Florence dump, 49 tons; Engineers' lease, 84 tons; Johnston & Fox lease, 13 tons; Mushett lease, 271 tons; Mohawk Jumbo, 100 tons. A total of 2001 tons valued at $181,905

Albermarle—Company work has stopped temporarily. The leasers will continue.

January White Rock—Both sinking and crosscutting, except on the upper level, have been suspended, due to the flow of water on the 370-ft. level.

Consolidated Jumbo—The shaft of this new lease has reached the 160-ft. point, and a crosscut at 150 ft. has been started.

Goldfield Rosebud—The Rosebud is in low-grade vein matter and work is being pushed to pick up the shoot of the Rogers Syndicate

Engineers' Lease—Shipments from the Engineers' lease are being kept up at the rate of 60 tons per day. The ore is coming from a stope from the 300-ft. level and is maintaining an average value of $200 per ton.

Daisy—The property has laid off 20 men and is now practically idle. No plausible excuse is given for the shutdown.

Lone Star—The Truax lease on the Lone Star has resumed shipments.

Mohawk Jumbo—The company has resumed work on its lease on the Wedge claim, recently released from injunction, and has already made a shipment. Five machine drills are at work in the stopes between the 400- and 500-ft. levels.

Plymouth Mining Company—This company, operating a lease on blocks 6 and 9 of the Combination No. 3 of the Consolidated ground, has resumed operations after a temporary shut-down.

WHITE PINE COUNTY—ELY DISTRICT

Dolly Varden—The management has decided to sink a new three-compartment shaft to the 1000-ft. level. A hoist and air compressor plant, both of large capacity, will be installed.

Star Pointer—This mine is idle at present, but it is rumored that operations will soon be resumed. The mine has a very large and elaborate steel gallows frame and good accommodations for several hundred men.

Copper Flat—About 200 men are employed around the steam shovels and churn drills. One steam shovel is engaged in stripping and the other is furnishing 500 to 700 tons of ore per day.

Giroux Consolidated—At Kimberly the 500-ton concentrator is completed and ready for business while the 250-ton smelter is rapidly reaching completion.

North Carolina

MONTGOMERY COUNTY

Iola Gold Mining Company—Milton L. Jones, of Minersville, N. C., has been appointed permanent receiver.

ROWAN COUNTY

Gold Hill Mining Company—In the Rowan county court last week B. B. Miller, of Salisbury, N. C., was appointed receiver of this company in a suit brought by W. G. Newman, formerly president of the company, who has claims against it for about $300,000. The mine is one of the oldest in North Carolina, and was for many years worked as a gold mine. With depth copper ore was found, and in recent years it has been worked as a copper mine. The present company was organized as a copper company in 1900, with $5,000,000 capital stock. In 1903 Mr. Miller was made receiver, but in 1906 the company's difficulties were arranged and the receivership closed. Mr. Newman retired from the presidency at that time, but claims that he advanced money to settle the debts of the company, which is still unpaid, and that the company has placed a mortgage on the property, without the knowledge of the other creditors.

Oregon

BAKER COUNTY

Morning—This mine, in the Greenhorn district, has been leased to J. Hazelwood, of Sumpter, who has begun work upon it.

Red Boy—Development work is being carried on at this mine with some success. A new pump has been installed to handle the heavy flow of water.

St. Anthony—George H. Phillips is now in charge of this mine. Development work has made such progress that he has leased the Alamo mill for the purpose of treating the ore.

Pennsylvania

BITUMINOUS COAL

Pennsylvania Coal and Coke Company—On the application of the Scranton Trust Company, trustee for the bondholders, Thomas H. Watkins, of Scranton, Penn., was appointed receiver for this company on Aug. 15. The company's entire property is leased to a holding company, the Pennsylvania, Beech Creek & Eastern, which agreed to pay as rental interest on the bonds and a dividend on the stock. The application for the receivership was based on a default in the payment of rental by the holding company. The Pennsylvania Coal and Coke Company owns directly, or through subsidiary companies, about 117,000 acres of coal lands in Cambria, Blair and Indiana counties, on which 33 collieries are in operation, besides 1000 coke ovens. The production of these collieries is over 12,000 tons a day, when demand is good. The company also owns a large number of cars, besides shipping piers and barges at tidewater in New York harbor, and other facilities for marketing coal. By the latest report there were outstanding $3,893,000 common and $3,768,000 preferred stock; also $6,563,000 in consolidated bonds.

South Carolina

LANCASTER COUNTY

Haile Gold Mine—A large boiler at this mine exploded Aug. 10, wrecking the engine-house with two 100-h.p. engines and badly damaging the large stamp mill. The full extent of the damage has not yet been ascertained. Ernest Thies, manager of the mine, was fatally hurt and three others were badly injured. The Haile mine is the only gold mine successfully worked in South Carolina

Virginia

MONTGOMERY COUNTY

[illegible] Coal [illegible]—[illegible] has bought a large tract of coal land on Price mountain, and is preparing to open a coal mine [illegible] daily. William Beacham, Christiansburg, Va., is manager.

Utah

BEAVER COUNTY

A Salt Lake syndicate has recently acquired a large area, about 70 lode mining claims, contiguous to the Horn Silver mine at Frisco, and has organized the King David Mining Company, which will immediately begin development. A shaft will be sunk [illegible] hope to encounter a continuation of the vein of the Horn Silver.

JUAB COUNTY

[illegible] Mines [illegible]—This company, operating in the Tintic mining district, has returned to a dividend basis after a recess of about six months, and pays 12c. a share, or $120,000, Aug. 20. The new compressor plant recently installed, is in commission.

Salt Lake County

Ohio Copper Company—This company has resumed work in earnest. While $2,000,000 in bonds were authorized some time ago, it is said only a portion of the allotment will be issued, as the expenditure of one-fourth the amount is practically all that will be required to put the mine in shape to produce ore economically through the Mascotte adit, with which the main workings of the mine will soon be connected, and complete the equipment of the mill at Lark. The initial capacity of the mill will be 2000 tons per day, but it is proposed to increase it to at least 4000 tons per day during 1909.

Summit County

Silver King Coalition—At the September meeting of directors of this company, operating at Park City, payment of dividends will be resumed. A quarterly distribution of 15c. a share, or $187,500, will occur about Sept. 20 next.

Tooele County

Boston & Sunshine—This mine, near Mercur, will soon be producing again. Interests identified largely with the Consolidated Mercur have acquired the property and have begun altering the mill, preparatory to installing equipment similar to that in use at the Mercur. The Sunshine mine contains extensive bodies of low-grade gold ore.

Consolidated Mercur—This is the oldest active gold mine in the State of Utah. It is located in the Camp Floyd district and has been in continuous operation since early in the 90's. While the earnings are not what they used to be, yet the management has overcome serious metallurgical difficulties, and is again making money with the expectation of returning to a dividend basis in the near future—possibly in September. The mine is producing nearly $80,000 monthly in gold bullion. The June production was $78,000. The mill is treating 800 tons of ore per day, with the slimes plant operating on oxidized ore entirely, as that on sulphides was not entirely successful. The company's metallurgists are still experimenting with every hope of overcoming the difficulty.

Sacramento—This company, which paid dividends regularly for several years out of a deposit of cinnabar, has leased its mill dump, and the lessees are getting ready to install equipment to extract the gold.

West Virginia

Boone County

Fork Ridge Coal Company—This company has been organized to open a coal mine near Madison. C. A. Croft, Madison, and others are directors.

Harrison County

Parkersburg Coal Company—This company has bought 2000 acres of coal land near Clarksburg, and will soon begin work.

Putnam County

Hurricane Branch Coal Company—This company has bought coal lands near Hurricane, and is preparing to work them. E. C. Marshall, Welch, W. Va., is in charge.

Wisconsin

Zinc-lead District

Board of Trade—This company has just completed a new 100-ton mill on its property at Cuba City and work in the mine will be resumed.

Empire—This mine, under management of the Wisconsin Zinc Company, is turning out between 40 and 50 tons of concentrates per day, milling two shifts. The green concentrates are being roasted again and make a finished grade testing between 60 and 62 per cent. metallic zinc. Two Kirksy tables just installed in the mill are making a big saving in the sludge.

Kennedy—The No. 2 mill was put into commission recently, thus increasing the milling capacity from 150 to 300 tons of concentrates per week. Gasolene power is used in the new mill and steam power in the old plant. The Kennedy was the second mine in the district to be equipped with a modern concentrator, and has been one of the biggest and steadiest shippers in the last eight years.

Klondike—Cleveland parties who secured this lease are breaking ground for the erection of a dry separating plant of the Sutton, Steele & Steele type. Four tables will be installed, calculated to handle about 50 tons of dirt per shift. Ore tests from this property were made recently at Dallas, Texas.

Washburn—This company has company has completed a 50-ton mill on its property, 14 miles north of Platteville, installing gasolene power.

Wyoming

Natrona County

North American Asbestos Company—At this company's asbestos mine on Casper mountain, seven miles from Casper, the tunnel recently started is in 400 ft., intersecting the shaft at a point 75 ft. below the surface. The asbestos vein under development is 12 ft. wide at the shaft, and has a good fiber.

Canada

Ontario—Cobalt District

Ore Shipments.—Shipments of ore for the week ending Aug. 8 were as follows: Drummond, 66,800 lb.; La Rose, 184,000; Nipissing, 190,230; O'Brien, 191,760; Townsite, 41,000; Temiskaming, 100,600; Total 774,390 pounds.

Crown Reserve.—On Aug. 11 a find was made in the crosscut about 20 ft. from the main shaft at the 100-ft. level. Two nuggets of about 100 lb. each were taken out. A new compressor plant will soon be in operation.

La Rose.—On Aug. 12, a good strike was made on the Princess property of this company which adjoins the McKinley-Darragh, Silver Queen and Hudson Bay companies. Several veins were encountered in the northeast drift at a depth of 60 ft.; one was 3 in. wide carrying smaltite, niccolite and native silver. A statement of the output for the months of June and July gives a total of 744 tons carrying 501,286 oz. silver and valued at $210.196.

Nipissing.—Two new strikes have been made in the Myers and Fourth of July veins in the property lying in Cobalt. The strike in the Myers vein was in the west drift at a depth of 105 ft., the vein is 4 in. wide and shows calcite and native silver. A good showing of silver was found in the shaft of the Fourth of July vein at a depth of 75 feet.

Ontario—Wahnapitae

Crystal.—A gold bar valued at $400, has been received in Toronto, the result of the treatment of 56 tons of ore from this mine.

Nova Scotia

Boston-Richardson.—This mine at Goldboro, the largest gold mine in Nova Scotia, has gone into liquidation and is in the hands of a receiver. The liabilities of the company amount to about $52,000 on current account.

North Atlantic Collieries.—The well-known Blockhouse seam has been struck at a depth of 125 feet on the north shore of Cow bay. It was found to be about 9 ft. 9 in. thick.

Ontario—Vermilion Lake District

Northern Pyrites Company—Development work is being steadily carried on; the shaft is down 200 ft. with drifts and crosscuts at the 100-ft. level. A Lidgerwood hoist and 5-drill duplex compressor are in operation. The vein is 60 ft. wide with good sulphur content, but owing to transportation difficulties no ore is at present being taken out except in development. Upon the completion of the Grand Trunk Pacific Railway, the mine will be connected by a spur.

Ontario—Oxford County

Oxford Oil and Gas Company—This company, which is being incorporated with an authorized capital of $250,000, has been prospecting for some time near Innerkip, where it holds leases covering 5000 acres. Serious obstacles were encountered owing to a flow of water, but recently natural gas was struck at a depth of 1000 ft. There was 800 ft. of water in the hole, but the flow of gas was so strong that it forced the water up 200 ft. from the surface. Five drills will be started boring more wells. It is the intention of the company to pipe the gas to Woodstock, Ingersoll, London and other places.

NOVA SCOTIA

Dominion Coal Company—The output of coal for July was 364,673 tons, the largest for any month of this year. For the seven months ended July 31 the total was 2,051,985 tons in 1907, and 2,284,556 in 1908; an increase of 232,571 tons.

Mexico

CHIHUAHUA

Mexicana-Urique—This recently organized New York company has begun operations at several properties in the Urique district. John Paul is the manager in charge. The president and secretary are respectively Edward S. Beach and Karl H. Behr, both of New York city.

Rio Plata—The June production of this company's Santa Barbara mine near Guazapares was about 93,000 oz. silver in concentrates. It is the plan to have the cyanide plant in readiness toward the close of the year.

Los Lamentos—The Seawell-Robinson properties in this lead-silver district, reached from Moctezuma station on the Mexican Central, have lately been bonded to Geo. P. Squires and El Paso associates. It is the plan to carry on extensive work shortly.

Eucinillas—J. L. Saint-Dizier has succeeded M. J. de Morambert as manager of this company's smelting and mining interests. The Santa Rosalia smelter has not yet been blown in.

Coyame—Henry Faivre lately made another shipment of high-grade zinc ore from his property in this section to the east of Chihuahua, along the Orient railroad.

Chihuahua Copper Mining Company—This company is producing about 350 tons of copper concentrates, which carry considerable nickel. The property is near Falomir in the eastern part of the state. R. D. McCausland is president of the company.

Columbia—It is reported that this property in the Terrazas copper camp has been bonded to Corrigan, McKinley & Co., of Cleveland, Ohio, who are operating neighboring property under the organization known as the San Rafael Mining Company. The Columbia was formerly owned and operated by the Federal Copper Company, of El Paso. The San Rafael company's work is in charge of R. B. Hutchinson as managed and Capt. M. D. Murray as superintendent.

Candemania—These old silver mines in the Ocampo district are producing approximately 20,000 pesos monthly. The treatment process is lixiviation, following amalgamation. J. Royval is the owning operator.

Parral Production—The production of the Parral camp for the week ending Aug. 1 amounted to 9290 tons, of which 5040 tons were locally treated and the balance shipped to outside smelters. The July output was 28,935 tons.

HIDALGO

Amalgamated Mining and Milling Company—This company, capitalization 5,000,000 pesos, has been organized to operate a group of old mines in Pachuca. The stock is to be floated by one of Thomas W. Lawson's Boston companies.

JALISCO

Virginia—The mill and plant in the Hostotipaquillo district have been delayed, but construction work is again being hurried, and the plant will be running before the end of the year, according to the management. Fine grinding, air agitation and vacuum filters are features which are expected to reduce the time of treatment of the silver ore.

MEXICO

Oro Nolan—A 400-h.p. pump has been contracted for, and another of similar size will be purchased by the Dos Estrellas company. Recent discoveries in the Esperanza offer encouragement to those who believe that the mines of the El Oro district have not been bottomed.

Victoria—A new company has been formed to operate this mine in the El Oro camp. This mine was formerly thought highly of while the Dos Estrellas vein was being worked. When this was lost new backing was needed and the new company, composed of English capitalists, will try to find the lost vein.

OAXACA

[illegible] Minas Prospects Company—At the San José de Gracia property, 30 miles from Oaxaca, the mill is in operation and experiments are being made to cyanide an old accumulation of tailings. At present the mill can only concentrate.

Europe

SPAIN

Exports of metals from Spain for the five months ended May 31 are reported by the *Revista Minera* as below, in metric tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

There was a considerable increase in copper, but decreases in lead and quicksilver. Exports of minerals were as follows, in metric tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Imports of phosphate of lime were 29,489 tons, an increase of 13,129 tons; of Thomas or basic slags, 34,774 tons, a decrease of 3839 tons. Imports of sulphur this year were 6110 tons and exports 3 tons.

Asia

[illegible]

Kolar Goldfield—Gold production in July was 43,975 oz. bullion, an increase of 157 oz. over June. For the seven months ended July 31 the total was 304,361 oz. bullion in 1907, and 305,068 oz. in 1908; an increase of 707 oz. The bullion reported this year was equal to $5,675,176, or 274,561 oz. fine gold.

Other Mines—This year two mines—the Hutti Nizam and the Dharwar Reeis—have been producing outside the Kolar district. Their output is reported at 1887 oz. in July and at 12,595 oz.—or $260,339—for the seven months ended with July.

KOREA

Recent advices from Seoul, Korea, report that the mining laws of Korea have been changed by the Japanese authorities in a manner which will be advantageous to new enterprises. In future all mining machinery used in the development of mines and material necessary will be admitted free of duty. The export duty on copper will be abolished, and as soon as the state of the treasury permits, all minerals will be freed from export duty. Other changes in the mining law provide for the absolute security of investments in mines and other properties for all foreigners in Korea. In other words, the laws and regulations have been made so explicit that in future they will not be open to misconstruction. It is hoped that these changes will attract foreign capital to Korea.

Australia

NEW SOUTH WALES

The gold production in July is reported [illegible] over July, 1907. For the seven months ended July 31 the total was $3,324,430, or [illegible]

[illegible]

[illegible] 44,000 oz. fine gold, or $928,083. The ore crushed is reported at 64,300 tons.

WESTERN AUSTRALIA

[illegible] oz. fine, a decrease of 3284 oz. from June [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 19—In the West the event of the week is the strike of the miners in the Indiana bituminous district. The present indications are that it may be a prolonged trial of strength between the operators and the miners' union. It will affect business to some extent, though Illinois and Ohio mines are quite able to make up any shortage in the supply which may be caused. The strike is referred to fully on another page.

In the East trade is dull, both in bituminous and anthracite coal. Little business is being done, and prices are weak. The Coastwise trade is quiet.

The Navy Department has let a contract for 15,000 tons of coal for the Pacific fleet to Barber & Co., New York, at $7.30 per ton, delivered at Magdelena Bay and at Bremerton, Washington.

The scarcity of water supply, owing to continued drought, is interfering with the operation of many collieries in the anthracite region; and also with some in the Clearfield bituminous district in Pennsylvania.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Aug. 8, in short tons:

	1907.	1908.	Changes.
Anthracite.....	3,438,072	3,085,670	D. 352,402
Bituminous .	23,199,063	19,462,584	D. 3,736,479
Coke........ ..	8,530,512	4,061,666	D. 4,468,846
Total. .	35,167,647	26,609,920	D. 8,557,727

Total decrease this year to date, 25.2 per cent.

Receipts of coal at Boston, seven months ended July 31, reported by Chamber of Commerce:

	1907.	1908.	Changes.
Anthracite...........	1,237,408	1,025,279	D. 212,129
Bituminous..... ...	1,792,430	1,838,791	I. 46,361
Total domestic....	3,029,838	2,864,070	D. 165,768
Foreign.......... ..	310,605	247,550	D. 63,055
Total...............	3,340,443	3,111.620	D. 228,823

The foreign coal received comes chiefly from Nova Scotia.

New York

Anthracite

Aug. 19—There is no activity in the hard-coal market either in prepared or small steam sizes. On Sept. 1 the winter rates for prepared coal will be in force and at this time there is usually considerable business; but this year consumers are not availing themselves of the lower prices. Possibly this is due to the fact that prepared sizes are selling below circular prices. The hard-coal movement to upper Lake ports has been quite active this week.

Quotations by the large dealers are as follows: Broken, $4.65; egg, stove and chestnut, $4.90; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

There is nothing encouraging to report in the soft-coal trade. Throughout all consuming territories dullness prevails and consumers are not anxious about taking on coal. In New York harbor there is no market and good grades of steam coal are offered at $2.40@2.45; there does not seem to be any offerings of even the poorer grades at as low a price as last week, the lowest being $2.35 per ton. Transportation from mines to tide is fair and cars are again plentiful. In the Coastwise vessel trade freight rates are firmer, but no advance has been made. It was reported that the rate from Newport News to Boston had advanced to 60c., but this report is unconfirmed and, moreover, vessels have been offered at 50c. per ton. Freight rates for large vessels from Philadelphia are as follows: To Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Newburyport, Gardiner and Bangor, 70@75c.; Portsmouth, 55@60c.; Saco, 90@$1; to the Sound, 45@50 cents.

Birmingham

Aug. 17—Coal production in Alabama is improving by degrees, as new labor is brought into the district and put to work. The production, however, is far from normal. The military and special guards are still on duty in the mining fields throughout the coal-bearing section. The Operators' Association, at a meeting held the past week, declared that there was no question for arbitration, that it was intended to operate the mines on the open-shop plan and under no consideration would there be dealings with the union. National Vice-President John P. White, of the United Mine Workers of America, has issued a statement that the strike is far from being lost.

Coal and coke both are being brought into the Birmingham district in order that there be no delay at the furnaces and other plants, the home supply not being sufficient.

Chicago

Aug. 18—The coal market shows activity in the harvesting business and some lines of domestic coals show improvement. Steam trade is still dull. Eastern coals in general are much better regulated as to shipments, and Western coals are not so badly affected by shipments on which demurrage causes sacrifice sales as in former years.

Indiana and Illinois lump is finding increasing sale at $1.75@2.25 in car-lots; run-of-mine brings $1.60@1.70 and screenings, $1.35@1.50. The market for fine coals is not so strong as a week or two ago. Brazil block is in fair demand at $2.25@2.35.

Smokeless still runs 20 or 25c. off circular price of $3.30 for run-of-mine. Hocking is strong, the best firm at $3.15, with no surplus on tracks. Youghiogheny is quiet at $3.15@3.25.

Anthracite shows practically no change.

Pittsburg

Aug. 18—Production shows a slight decline this week, due chiefly to the closing of a number of the river coal mines on account of the large stocks awaiting shipment. Many railroad mines are running on slow time. Slack continues to be a drug, and sales have been made at less than 40c. Mine-run coal on contract continues to be held at $1.15 at mine, and there are no reports of shading, although it is possible a producer might make a concession rather than close his mine.

Connellsville Coke—Conditions show some improvement and several independent interests have increased operations. The H. C. Frick Coke Company also has fired more ovens. Sales of furnace coke at slightly reduced rates are still being made by some interests that cannot hold it, but these have been few. There is no drop in the regular quotations of foundry coke, $2.10@2.25 on contract; furnace coke $1.65@1.75 at ovens. The Pickands-Magee Coke Company has made several important contracts for both foundry and furnace coke. One of them calls for 25,000 tons for delivery through the year. The *Courier* gives the production in both Connellsville fields at 192,845 tons. Shipments, 7226 cars as follows: To Pittsburg, 3147; to points west of Connellsville, 3723; to points east of Connellsville, 356 cars.

Foreign Coal Trade

Spanish Fuel Imports—Imports of coal into Spain, five months ended May 31, were 798,934 metric tons, a decrease of

55,025 tons from last year. Imports of coke, 137,695 tons, an increase of 35,287 tons.

Belgian Coal Production—Coal production of Belgium, six months ended June 30, metric tons:

	1907	1908	Changes
Coal mined....	11,868,655	11,813,650	D. 5[illegible]
Stocks, June 30....	459,101	919,060	I. 4[illegible]

The decrease in coal mined and increase in stocks show an apparent decrease of 514,964 tons in consumption. Number of men employed, 140,863 in 1907, and 144,176 this year.

German Coal Production—Output of coal in Germany, six months ended June 30, metric tons:

	1907.	1908.	Changes
Coal	69,571,431	72,695,452	I. 3,124,021
Brown coal	29,602,022	32,047,323	I. 2,445,301
Total mined....	99,173,453	104,742,775	I. 5,569,322
Coke made.	10,629,561	10,612,140	D. 17,421
Briquets made .	7,721,908	8,765,208	I. 1,043,300

Of the briquets reported this year 6,805,213 tons were made of brown coal, or lignite.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Aug. 8: Best Welsh steam, $4.20; seconds, $3.96; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.60; seconds, $3.36; best small steam, $2.34; seconds, $2.04. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Aug. 19—Improvement in the iron market is slow. There has been a little more inquiry for pig iron, especially for basic, but buyers are still looking for bottom prices. In foundry the Southern makers are best provided with orders, some being practically out of the market.

In finished material more specifications are reported. There is some structural business coming forward; but contractors are still taking business at prices which indicate lower rates for material. A possible large order for steel cars for the Southern Pacific lines is attracting a great deal of attention. No rail orders of any size are pending.

Baltimore

Aug. 17—Exports for the past week included 857,106 lb. tin scrap to Germany and 3004 lb. aluminum sheets to Great Britain. Imports included 225 tons ferromanganese and 16 casks silicospiegel from Liverpool. Receipts of iron ore were 5300 tons from Cuba.

Birmingham

Aug. 17—Southern manufacturers of pig iron are enjoying a better demand for iron. No. 2 foundry is selling in small lots at $12.50 per ton, the larger consumers reporting purchases at $12 per ton. The home consumption is healthy. The make has been improved by the blowing in of a furnace at Ironton, belonging to the Alabama Consolidated Coal and Iron Company. The Sloss-Sheffield furnace at Florence is not quite ready. The Tennessee company will, within 30 days, be ready to start up one or two furnaces at Ensley.

The Tennessee company will start up its Bessemer, Ala., rolling mills this week, giving employment to 300 men. The day's record in steel-rail making was broken during the past week when 1504 tons of rail were produced at Ensley.

Cast-iron pipe and other foundries are busy. Other concerns using pig iron are doing better now than for some time.

Chicago

Aug. 18—Buying of pig iron continues to be small; but considering that we are in the dull season of midsummer it is not discouraging. Lots of a carload to 500 tons are most numerous, and are chiefly for delivery in the next three months. Future-delivery orders—for the first half of 1909—are not numerous, but inquiries increase.

Southern No. 2 foundry is not selling below $12 Birmingham ($16.35 Chicago), on any but extraordinary orders. For most business $12@12.50 Birmingham has obtained. The tone of the market is decidedly stronger as regards contract requirements—those for deliveries more than 30 days hence. Some quotations in good faith run up to $13 Birmingham, or $17.35 Chicago.

Northern iron remains about $17@17.50, though this also has a tendency to stiffen. Northern charcoal iron is a little less in demand at $19.50@20.50, and the production limited closely.

For iron and steel products the market is in general, dull. Coke is quiet at $4.90 for first-class Connellsville.

Philadelphia

Aug. 19—The most significant feature of the pig-iron market is the many evidences of the depletion of stocks among holders. The most discouraging feature is the large idle capacity. Careful inquiry among consumers shows an irregular increase in consumption. Orders coming to furnace offices are for less than 100 tons generally. Scarcely any of the larger concerns are buying yet for fourth-quarter delivery, and their needs up to Oct. 1 are supplied. The cast-iron pipe makers continue to catch large orders and they cover immediately. No. 2 foundry is quoted at $16; gray forge sold today at $15.50; basic is $15.50.

Steel Billets—Manufacturers of billets are anxious to obtain orders, but buyers want them to shade about 50 cents.

Bars—The city bar-iron men are taking a philosophic view and expect no improvement. Refined iron is about all that is selling.

Sheets—Manufacturers have succeeded in gathering in a fair amount of autumn-delivery business, mostly from stores.

Pipes and Tubes—Our consumers are doing a little more work, but not enough to make an impression.

Structural Material—Some good business has come this week for immediate delivery.

Scrap—There are calls for heavy steel scrap and large lots could be sold, but buyers will not pay the prices asked. The stocks available are not heavy. Railroad scrap keeps moving at holders' own terms.

Pittsburg

[illegible] change in the iron and steel markets during the week, but there has been some improvement. In several of the finished lines demand has fallen off, but in others there is an improvement. The general average of the mills in Pittsburg may be safely put at around 60 per cent. of capacity. In the finished material being figured on are 7000 steel cars for the Harriman lines and several hundred miles of 12-in. line pipe for the Standard Oil Company. More new business is being booked by the Carnegie Steel Company, which has necessitated an increase in its pig-iron production. More mills are on at the Homestead and Duquesne plants. The Clairton and the Edgar Thomson plants are running to about 35 per cent. of capacity. Additional tinplate mills have been closed, reducing the number owned by the American Sheet and Tin Plate Company to 126 active and 116 idle. The independent companies are doing fairly well in both sheets and tinplate. In order to give its idle members an opportunity to get to work the strikes at the Washington Tinplate Company, Washington, Penn., and the Standard Tinplate Company, at Canonsburg, Penn., have been de-[illegible]

Pig Iron—There is no improvement in pig-iron prices, but inquiries and sales are more satisfactory. The contract for 4000 tons of malleable bessemer is still pending. The Standard Sanitary Manufacturing Company has increased its order for foundry and forge iron from 8400 to 9600 tons, for September and October delivery. The lowest price so far named on bessemer was $15.35, at furnace, for 200 tons. Quotations for third-quarter delivery are: Bessemer, $15.40@15.50; malleable bessemer, $15; basic, $14.75@15; N[illegible] $13.75@14, all at Valley furnaces.

Steel—Several fair sales of bessemer and open-hearth billets have been made at the regular price of $25. Pittsburg. Sheet and tinplate bars are still quoted at $27.50; plates, 1.60c.; steel bars, 1.40c., Pittsburg.

Sheets—More mills are running. Prices firm, black sheets, 2.50c. and galvanized sheets, 3.55c. for No. 28 gage.

Ferro Manganese—For prompt shipment has declined 50c., Pittsburg, sales having been made at $45. For future shipment $46 can be done.

Sault Ste. Marie Canal

The freight passing through the Sault Ste. Marie canals, to and from Lake Superior, for the season to Aug. 1 is reported as follows, in short tons:

	1907	1908.	Changes.
East-bound.	18,906,348	8,759,790	D. 10,146,558
West-bound	6,075,207	4,330,684	D. 1,744,523
Total	24,981,555	13,090,474	D. 11,891,081

The decrease in east-bound tonnage was 53.7 per cent.; west-bound, 28.7; total, 47.6 per cent. The number of vessel passages this year was 5841, showing an average cargo of 2,242 tons. The mineral freights included in the totals above were, in short tons, except salt, which is in barrels:

	1907.	1908.	Changes
Coal	5,512,821	3,869,451	D. 1,643,371
Iron ore	16,364,443	7,106,322	D. 9,258,121
Pig and manuf. iron	140,480	121,055	D. 19,425
Copper	35,291	35,960	I. 669
Building stone	100	577	I. 477
Salt, bbl	402,227	308,737	D. 93,490

The chief decreases were in iron ore and coal. Iron ore formed 54.3, and coal 29.6 per cent. of the total tonnage this year.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports the production of pig iron in June at 956,425 metric tons, being 54,492 tons less than in May, and 87,911 tons less than in June, 1907. For the half-year ended June 30 the production was, in metric tons:

	1907.	1908.	Changes.
Foundry iron	1,095,225	1,122,890	I. 27,665
Forge iron	394,680	349,506	D. 45,174
Steel pig	501,687	501,962	I. 275
Bessemer pig	235,788	211,533	D. 24,255
Thomas(basic)pig	4,128,573	3,863,830	D. 264,743
Total	6,355,953	6,049,721	D. 306,232

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Aug. 19

At all U. S. Ports in July and year.

Metal.	Exports.	Imports.	Excess.
Gold			
July 1908.	$4,845,272	$2,916,408	Exp. $1,928,864
" 1907.	7,478,366	3,410,782	" 4,067,584
Year 1908.	58,363,247	29,324,304	" 29,038,943
" 1907.	43,779,098	24,879,429	" 18,899,669
Silver			
July 1908.	4,930,746	2,982,074	Exp. 1,948,672
" 1907.	5,955,042	3,387,225	" 2,567,817
Year 1908.	30,445,291	24,123,422	" 6,321,869
" 1907.	35,174,251	25,782,836	" 9,391,415

Exports of specie from New York, week ended Aug. 15: Gold, none; silver, $886,745, nearly all to London. Imports: Gold, $151,873, from the West Indies, Central and South America; silver, $51,565, from the West Indies and Mexico.

Foreign trade of the United States, as reported by the Bureau of Statistics, Department of Commerce and Labor, seven months ended July 31:

Merchandise	1907.	1908.
Exports.	$1,068,999,907	$980,997,732
Imports	875,901,076	608,857,471
Excess exports	$193,098,831	$372,140,261
Add excess of exports, silver		6,321,869
Add excess of exports, gold		29,038,943
Total export balance		$407,501,073

The gold and silver movement in detail is given in the table at the head of this column.

Specie holdings of the leading banks of the world, Aug. 15, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York			$324,635,900
England	$182,754,515		182,754,515
France	644,227,355	$181,250,200	825,477,555
Germany	196,185,000	81,305,000	277,490,000
Spain	78,405,000	135,290,000	213,695,000
Netherlands	38,524,500	21,116,000	59,640,000
Belgium	20,493,335	10,246,665	30,740,000
Italy	183,680,000	22,000,000	205,680,000
Russia	577,640,000	39,970,000	617,610,000
Aust.-Hungary.	235,125,000	66,770,000	301,895,000
Sweden	20,150,000		20,150,000
Norway	8,680,000		8,680,000
Switzerland	21,525,000		21,525,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in France, six months ended June 30:

	Imports.	Exports.	Excess.
Gold	Fr.512,397,000	Fr.14,463,000	Imp.Fr.497,934,000
1907	150,668,000	73,963,000	Imp. 76,705,000
Silver	75,635,000	84,248,000	Exp. 8,613,000
1907	81,785,000	82,301,000	Exp. 516,000

Silver Market

SILVER AND STERLING EXCHANGE.

August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
13	4.8650	52	24 1/16	17	4.8645	51¼	23 11/16
14	4.8655	51¼	23 11/16	18	4.8645	51¼	23 11/16
15	4.8640	51⅛	23⅝	19	4.8645	51⅛	23⅝

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has suffered a further fall the past week, the price dropping from 24 1/16 to 23⅝d. in London. The weakness has been due to sales by Bombay, and the market tendency still depends on India. The shipment of Sycee silver from Shanghai to Bombay has been a disturbing factor.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Aug. 6:

	1907.	1908.	Changes.
India	£7,316,924	£5,175,493	D. £2,141,431
China		516,400	I. 516,400
Straits	544,012	90,510	D. 453,502
Total	£7,860,936	£5,782,403	D. £2,078,533

Receipts for the week were, £112,500 from New York; exports, £178,000 to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

August.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
13	13¾ @13⅞	13½ @13¾	60⅝	30½	4.57½ @4.60	4.67½ @4.72½	4.52½ @4.57½
14	13⅝ @13¾	13½ @13⅝	59¾	30	4.57½ @4.60	4.67½ @4.72½	4.52½ @4.57½
15	13⅝ @13¾	13⅜ @13½	....	30	4.57½ @4.60	4.65 @4.70	4.50 @4.55
17	13½ @13¾	13⅜ @13½	59⅞	29¼	4.57½ @4.60	4.65 @4.70	4.50 @4.55
18	13½ @13¾	13 @13½	60 1/16	29½	4.57½ @4.60	4.65 @4.70	4.50 @4.55
19	13½ @13¾	13 @13½	60⅞	29½	4.57½ @4.60	4.65 @4.70	4.50 @4.55

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Aug. 12 the market has been very dull, the transactions that have been made, both in Lake and electrolytic, having been chiefly in copper from second hands. Considerable sales of this copper have been made at the lower of the range of prices, and even under the quotations. As to first hands, one of the large producers was offering electrolytic copper at 13½c. up to Saturday, but it then withdrew and since has been holding aloof along with the other producers, who are asking prices somewhat higher than buyers at present are willing to pay. It is expected that liquidation of speculative accounts, now apparently about completed, will be followed by another upward turn in the market, as to which the sentiment is optimistic. The market closes at 13½@13¾c. for Lake, and 13⅜@13½ for electrolytic in cakes, wirebars or ingots, and 13⅛@13¼ for casting copper.

Credence is given the reports that Wall Street operators had considerable commitments in the London standard market, which they liquidated when prices broke on the Stock Exchange last week. Refined copper had also been largely bought on speculation, and the decline in London scared the holders into selling. Consumers, who had supplied themselves liberally in previous weeks, were not in a hurry to relieve them and forced concessions in prices, which are really somewhat out of proportion with the quantities involved. When the increase in the statistics of 2600 tons was published, it turned out that the bad effect had been thoroughly discounted in the standard market, and since then there has been a recovery, the market closing firmer at £60 17s. 6d. for spot and £61 2s. 6d. for three months prompt.

Refined and manufactured sorts we

quote: English tough, £63 10s.@64 10s.; best selected, £63 10s.@64 10s.; strong sheets, £75 10s.@76 10s.

Manufactured Copper—Sheets, cold rolled, 19c.; hot-rolled, 18c. Wire, 15¼c. base. It is reported that these prices are being shaded.

Tin—Advices of large shipments from the East during the first half of the month served to depress the market, which, however, closes somewhat above the lowest, at £133 for spot and £133 15s. for three months prompt.

There is no life in the domestic market, and even the lower prices did not attract buyers. Spot tin at the close can be bought at about 29½ cents.

Lead—Business is of small proportions, and the market is quoted at 4.57½@4.60c. New York.

The London market is again lower and barely steady at £13 7s. 6d. for Spanish lead and £13 8s. 9d. for English.

Spelter—There has been no material change. Every order is eagerly competed for and prices have suffered a further decline to 4.65@4.70c. New York and 4.50@4.55c. St. Louis.

The London market is also somewhat weaker, and the close is cabled at £19 10s. for good ordinaries and £19 15s. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru Ill., less 8 per cent.

Other Metals

Antimony—The market abroad is weak, and in New York no business is being done. Quotations are 8¼c. for Cookson's, 8@8⅛c. for Hallett's, and 7⅝@7⅞c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Occasional offers of foreign metal are reported.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is lower, at $42.50 per flask for large lots, and $44 for jobbing orders. San Francisco is nominal at $42 for large orders, domestic delivery, and $40@40.50 for export. London, £17 7s. 6d. per flask, with 1s. 3d. less quoted from second hands.

Platinum—Prices remain unchanged at $22.50 per oz. for hard platinum, $20 for ordinary and $15 for scrap.

Wisconsin Ore Market

Platteville, Wis., Aug. 15—The current price for 60 per cent. zinc ore this week was on a basis of $36@37 per ton for 60 per cent. zinc. For 80 per cent. lead ore $61 per ton was paid. The ore shipment this week comprised more high-grade zinc than for several weeks past, the higher base price inducing several companies to let go of a portion of their reserve stock. The Acme and Empire roasters at Platteville are again in commission.

Shipments of ore, week ended Aug. 15:

Camps	Zinc ore, lb.	Lead ore, lb.	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]
Year to Aug. 15	[illegible]	[illegible]	[illegible]

Harker shipped the previous week 104,030 and Mineral Point 150.000 lb. zinc ore, not then reported, but now included in the totals for the year. Shipments to electrostatic separator, Platteville, 332,800 lb.; to Joplin Separator Works, Galena, 261,800 lb.; to Enterprise roaster, Platteville, 185,000 lb. zinc concentrates

Missouri Ore Market

Joplin, Mo., Aug. 15—The highest price paid for zinc was $39, the assay base ranging from $37 to $36 per ton of 60 per cent. zinc, and the average price, all grades was $34.12. A base of $37.50 was rumored. The highest price paid for lead ore was $63, medium grades selling at $61 @ 62, and all grades averaging $61.76 per ton.

The shipment was again heavy this week, exceeding last week by 240 tons of zinc and 162 tons of lead ore, and exceeding the zinc content fully 1000 tons. All reserve stock for sale on the present level of prices has been sold and most of it is now delivered. It is reported here that the smelter owners are preparing to fire additional blocks. Buyers are nearly all looking for a quieter market next week, as the smelters have accumulated stocks during the past three weeks of heavy buying.

Following are the shipments of zinc and lead from the district for the week ending Aug. 15:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	2,951,140	188,640	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Alba-Neck	[illegible]		[illegible]
Granby	[illegible]	[illegible]	[illegible]
Prosperity	[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	[illegible]	[illegible]
Spurgeon	[illegible]	[illegible]	[illegible]
Oronogo	[illegible]		[illegible]
Carthage	[illegible]		[illegible]
Zincite	[illegible]		[illegible]
Quapaw-Baxter	[illegible]		[illegible]
Badger	[illegible]		[illegible]
Aurora	[illegible]	[illegible]	[illegible]
Carl Junction	[illegible]	[illegible]	[illegible]
Sarcoxie	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
Totals	[illegible]	[illegible]	[illegible]
33 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week [illegible]; 33 weeks [illegible]
Lead value, the week, [illegible]; 33 weeks [illegible]

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month	1907	1908	Month	1907	1908
January	45.84	[illegible]	January	[illegible]	[illegible]
February	[illegible]	[illegible]	February	[illegible]	[illegible]
March	[illegible]	34.19	[illegible]	[illegible]	[illegible]
[illegible]	48.24	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	45.98	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	44.82	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	45.79	31.67	[illegible]	[illegible]	[illegible]
[illegible]	43.22		August	59.54	
[illegible]	40.11		[illegible]	[illegible]	
October	39.83		[illegible]	[illegible]	
November	35.19		[illegible]	[illegible]	
[illegible]	[illegible]		[illegible]	[illegible]	
Year	[illegible]		Year	[illegible]	

Chemicals

[illegible] ical market is unchanged and spot business is not heavy. Prices hold firm, but inquiries are not over-abundant

Copper Sulphate—[illegible] ceased and the salt is held firmly at $4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate of Soda—[illegible] has been forthcoming and trade has been in small lots for prompt delivery. Prices are about 2.30 c. for spot and 2.25 @ 2.35c for futures.

Phospates—Paul C. Trenholm reports the shipments of phosphate rock from Charleston, S. C., by rail in July at 5713 long tons. No coastwise shipments

Mining Stocks

New York, Aug. 19—The Stock Exchange has been variable through the week, but generally active, with fluctuations in both directions that are plainly the result of large professional operations It closes with business heavy, prices irregular and no definite tendency apparent

The curb market has been generally active, with a good demand for copper stocks. Nevada Consolidated was the leader and made some gains on large sales Other copper stocks also sold well. The Nevada gold stocks were only moderately active. Cobalt stocks were dealt in to a large extent. The close in the curb market was rather strong.

Boston

[illegible] in the market and a softening of prices, but the tone remains good. The Lawson campaign has undoubtedly been reflected to some extent in the course of prices Today saw some renewed interest taken and the Lake stocks displayed buoyancy, which may indicate that the shell has been broken. Amalgamated broke from $81.87½ a week ago, to below $75, but has recovered to $78 North Butte broke $4.50 to $70.50, but has more than recovered the loss, even though the dividend rate was maintained at $1 for the quarter. Calumet & Arizona fell $8.75 to $110, recovering $3 of it. Dividend action by this company will be taken shortly

In the Michigan group, Adventure has been well bought, having risen $2 to $10.75. Centennial spurted $6 to $36.25 on slight buying orders, and Isle Royale rose $2 to $23. Mass spurted to $7.37½. Lawson's Trinity ran off $2.50 to $17.50, recovering to $21. Utah Consolidated broke $3.50 to $45, recovering partially, and Butte Coalition reacted to $26.50. Old Dominion fell $2 to $39, with subsequent recovery.

It is believed that the successful floating of the North Lake will bring out other properties in that vicinity. Davis Daly affairs will now be put in shape, although it will cost the company a 15 per cent. commission to have the $2 assessment underwritten.

San Francisco

Aug 14 A somewhat unusual thing for California gold mines is the listing on the San Francisco Stock and Exchange Board of the Hazel Mining Company, which owns quartz mines in Siskiyou and Shasta counties. Its most noted mine is the Gladstone, in French gulch, Shasta county, which is a steady producer, having yielded altogether over $1,250,000 in gold.

Some of the San Francisco mining stock brokers are about to purchase seats in the Stock Exchange at Seattle, Wash., which begins operations Sept. 1. The main business at first will be in mining stocks, but industrial quotations will also be furnished. It is stated that steps will be taken to assure the listing of only bona fide mining companies.

STOCK QUOTATIONS

NEW YORK Aug. 18 Name of Comp.	Clg.	BOSTON Aug. 18 Name of Comp.	Clg.
Alaska Mine.	3/16	Adventure	10¾
Amalgamated	78	Allouez	38½
Anaconda	47	Am. Zinc	29
Balaklala	2	Arcadian	4
British Col. Cop.	6	Arizona Com.	22
Butte & London	....	Atlantic	14
Butte Coalition	27	Bingham	60
Colonial Silver	½	Boston Con.	13¼
Cum. Ely Mining.	8¾	Calumet & Ariz.	123
Davis Daly	2¾	Calumet & Hecla.	685
Dominion Cop.	2	Centennial	36
Douglas Copper	4	Con. Mercur	43
El Rayo	3	Copper Range	77½
Florence	3⅜	Daly West	10
Foster Cobalt	.42	Franklin	12
Furnace Creek	.18	Greene-Can.	11¾
Giroux	4½	Isle Royal	23¼
Gold Hill	½	La Salle	14
Goldfield Con.	6 11/16	Mass	7½
Granby	102	Michigan	12½
Greene Gold	⅛	Mohawk	67
Greene G. & S	¼	Nevada	15½
Greenw'r & D.Val.	.75	North Butte	84
Guanajuato	2½	Old Colony	.50
Guggen. Exp.	177	Old Dominion	41
Hanapah	‡.20	Osceola	111
McKinley Dar.	⅞	Parrot	27
Micmac	2	Quincy	96
Mines Co. of Am.	1 3/16	Rhode Island	4
Mitchell Mining.	1½	Santa Fe	2
Mont. Sho.C	¼	Shannon	15¼
Nev. Utah M. & S	3½	Superior	24
Newhouse M. & S	6½	Tamarack	71
Nipissing Mines	9	Trinity	21¼
Old Hundred	½	United Cop., com.	11
Silver Queen.	1.04	U. S. Oil	26⅞
Stewart	⅞	U. S. Smg. & Ref.	42¾
Tennessee Cop'r.	37	U.S.Sm. & Re., pd.	45¾
Tri-Bullion	1 5/16	Utah Con.	46½
Union Copper.	1 1/16	Victoria	5½
Utah Apex	4½	Winona	6½
Utah Copper	44½	Wolverine	142
Yukon Gold	5	Wyandotte	2

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24½
Am. Smelt. & Ref	94¼
Am. Sm. & Ref., pf.	107
Bethlehem Steel	22
Colo. Fuel & Iron.	34
Federal M. & S., pf.	‡87
Inter. Salt	18½
National Lead	86
National Lead, pf.	‡104
Pittsburg Coal	‡12
Republic I. & S.	23¼
Republic I. & S., pf.	78
Sloss-Sheffield	63
Standard Oil	648
U. S. Red. & Ref.	‡15
U. S. Steel	46
U. S. Steel, pf	109
Va. Car. Chem.	28

BOSTON CURB	
Ahmeek	88
Black Mt.	‡4
East Butte	8
Hancock Con	6
Keweenaw	6¾
Majestic	.71
Raven	1
Shawmut	‡.33
Superior & Pitts.	13¼
Troy Man.	‡.50

ST. LOUIS Aug. 15

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.05	.03
Center Cr'k	2.25	1.75
Cent. C. & C.	68.25	67.25
C. C. & C. pd.	78.00	76.00
Cent. Oil	110 00	100.00
Columbia	5.00	4.00
Con. Coal	19.00	17.00
Doe Run.	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	13 00

LONDON Aug. 19

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 14 9
Esperanza	3 6 3
Tomboy	1 2 6
El Oro.	1 8 0
Oroville	0 8 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 19.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.20
Belcher	.18	St. Ives	.32
Best & Belcher.	.47	Triangle	06
Caledonia	.14	BULLFROG STOCKS	
Chollar	.17	Bullfrog Mining	.04
Comstock	‡.26	Bullfrog Nat. B	.05
Con. Cal. & Va	.72	Gibraltar	.05
Crown Point	.27	Gold Bar	.03
Exchequer	.27	Homestake King.	.27
Gould & Curry	.12	Montgomery Mt.	.09
Hale & Norcross	.21	Mont. Shoshone C.	.80
Mexican	.74	Original Bullfrog.	.02
Ophir	2.10	Tramp Cons.	.17
Overman	.10	MANHAT'N STOCKS	
Potosi	.10	Manhattan Cons.	.08
Savage	.19	Manhat'n Dexter	.04
Sierra Nevada	.29	Jumping Jack	.03
Union	.26	Stray Dog	.04
Utah	.05	MISCELLANEOUS	
Yellow Jacket	.57	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.09
Belmont	1 15	Lee Gold Grotto	...
Extension	.88	Nevada Hills	1.62½
Golden Anchor	.02	Nevada Smelting.	1 12½
Jim Butler	.28	Pittsburgh S. Pk.	1.07
MacNamara	.57	Round Mt. Sphinx	20
Midway	43		
Montana	1 43		
North Star	.10		
Tono'h Mine of N.	7.62½		
West End Con	66		
GOLDFI'D STOCKS			
Adams	05		
Atlanta	.30		
Booth	.46		
Columbia Mt	.25		
Comb. Frac	1 39		
Cracker Jack	.06		
Dia'dfield B. B. C.	.18		
Goldfield Belmont	.15		
Goldfield Daisy	.75		
Great Bend	.35		
Jumbo Extension	.50		
Katherine	...		
Kendall	.15		
Lone Star	.11		
May Queen	.05		
Oro	.14		
Red Hill	.29		
Roanoke	...		
Sandstorm	.30		

COLO. SPRINGS Aug. 15

Name of Comp.	Clg.
Acacia	6½
Black Bell	....
C. C. Con	‡3¼
Dante	6⅛
Doctor Jack Pot	7
Elkton	62¼
El Paso	38
Findlay	22
Gold Dollar	6½
Gold Sovereign	3
Isabella	29¼
Index	....
Jennie Sample	2½
Jerry Johnson	‡4
Mary McKinney	25
Pharmacist	3⅛
Portland	98
Un. Gold Mines	‡3⅞
Vindicator	85
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	July 17	Aug. 6	$0.02
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Chollar, Nev	July 8	July 30	0.10
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Helvetia, Ariz	....	July 20	0.50
Ingot, Utah	July 17	Aug. 5	0.01
Iowa Copper, Utah	July 13	July 30	0.05
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Lucky Calumet, Ida	July 3	Aug. 13	0.01
Maxfield, Utah	July 18	Aug. 17	0.02
Mexican, Nev	July 17	Aug. 17	0.10
Missoula Copper, Ida	July 25	Aug. 25	0.01
Oro Cobre, Cal	July 16	Aug. 3	0.02
Sierra Nevada	July 14	Aug. 4	0.10
Signet	Aug. 8	Oct. 6	0.01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Wabash, Utah	July 10	Aug. 1	0.10
Wheeler, Utah	July 16	Aug. 6	0.01½

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55.678	31.769	25.738
February	68 835	56.000	31 852	25.855
March	67 519	55 365	31 325	25.570
April	65 462	54 505	30 253	25.133
May	65.971	52.795	30 471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31 366	24.514
August	68.745	.....	31 637	....
September	67.792	.	31 313	. ..
October	62.435	.	28 863	. ..
November	58.677	.. .	27.154	. .
December	54 565	.....	25 362	.....
Year	65 327	.....	30 188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24.825	13 901	106.739	62 386
February	24 869	12.905	25.236	13.098	107.356	58 786
March	25 065	12 704	25.560	12 875	106.594	58 761
April	24 224	12 743	25.260	12 928	98 625	58.331
May	24 048	12 598	25 072	12.788	102.375	57 387
June	21 665	12 675	24.140	12.877	97.272	57.842
July	22 130	12.702	21 923	12.933	95.016	57.989
August	18 356	. .	19.255	... ..	79.679	......
September	15 565	. .	16.047	..	68.375	. .
October	13 169	. .	13 551	. .	60 717	. .
November	13.391	.	13.870	...	61.226	.
December	13 163	.....	13 393	......	60 113	....
Year	20 004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41 548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	....
March	41.313	30.577	September	36.689	..
April	40.938	31.702	October	32 620	. .
May	43.149	30 015	November	30 833	.....
June	42.120	28 024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6.000	3.725	19 531	14 250
March	6.000	3 838	19.703	13 975
April	6.000	3.993	19 975	13.469
May	6.000	4.253	19 688	12.938
June	5.760	4.466	20 188	12.600
July	5.288	4.447	20 350	13.000
August	5.250	......	19 063	....
September	4.813	......	19 775	.....
October	4.750	. .	18 531	.....
November	4.376	. ...	17.281	......
December	3 658	.....	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27 125	20 563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25 900	21.344
May	6.441	4.608	6.291	4.458	25 563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23 850	19.031
August	5.701	.....	5.551	......	21 969	......
September	5.236	. ...	5.086	.....	21.050	... .
October	5.450	....	5.280	.....	21.781	......
November	4.925	.....	4.775	......	21.438	.....
December	4.254	......	4.104	......	20 075	......
Year	5.962	......	5.812	......	23.771	......

*New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, AUGUST, 29, NO. 9.

Zacatecas, a Famous Silver Camp of Mexico

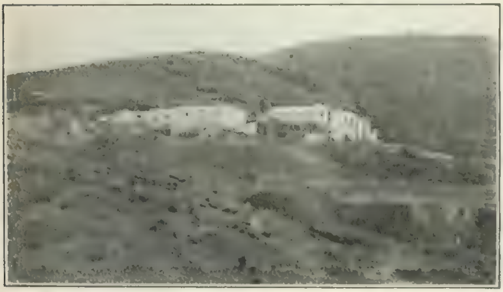
Few Veins Have Been Developed at Depth and as Only One Mill Is Now Running in the District the Silver Output Is Small

BY CLAUDE T. RICE

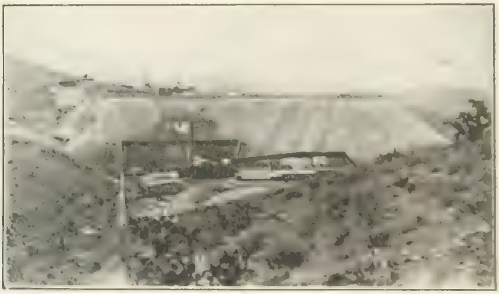
On the train from Torreon to Zacatecas several mining camps are passed, but at present these camps are producing little ore. At Jimulco the Jimulco copper mine, which has been shut down for some time, is to resume soon, but the famous camp of Fresnillo is very quiet. At Somberete, which is reached from Gutierrez, the Towne mines are shipping some ore, and it is said that considerable development work is being done.

MAGISTRAL MINE

SAN [illegible] MINE



EDEN MINE



[illegible] MINE

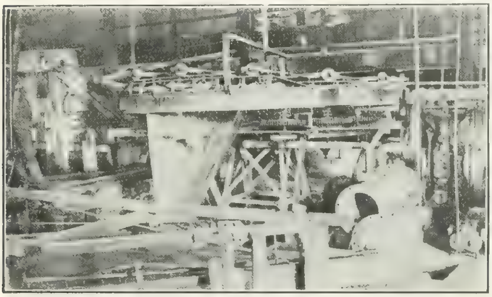
In summer the all-day ride from Torreon to Zacatecas is hot, dusty and uninteresting as the train slowly climbs to Zacatecas, the highest point on the Mexican Central between El Paso and Mexico City. At present Zacatecas is one of the most backward of the famous camps of Mexico. It is where Guanajuato was when the MacDonald brothers entered that district, and it might be mentioned that the MacDonalds were remodeling an old stamp mill near Zacatecas at the time that the financial depression began to be felt in the United States.

Scattered through the camp are old ruined *haciendas de beneficio* and surmounting the shafts are the horse *malacates*, well named the *malacate de sangre* (the blood-power hoist) in contradistinction to the *malacate de vapor* (the steam hoist). The dumps scattered over the district, the idle *malacates*, and the dismantled *patios* are indicative of conditions at Zacatecas. As if representative of the last throes of that magnificant past, only eight months ago some ore from the Veta Grande mine was treated by the patio process, and *malacates*, the exact reproduction of these hoists which Agricola pictured 350 years ago, are in operation at the Parroquia where *gambucinos* are hoist[illegible] shaft [illegible] depth of 192 meters.

To the stranger the crudity of hoisting with a *malacate* is appalling. A horse whim is a luxury compared to a *malacate*, and when one thinks of the deep mines that the Mexicans worked by means of these, such as the Valenciana and others on the Veta Madre at Guanajuato, the [illegible] still others elsewhere in Mexico, and remembers that some of these mines were very wet, he wonders how they ever did it: surely only a Mexican would have been able to stick to such methods so long. The malacate at the Parroquia mine was the only one I saw in operation while in Mexico, and possibly this one is far cruder [illegible] as, the headframes are low and no bucket or rawhide sack is used for hoisting, but instead the ore is laced up in a bull hide. This load is landed on a platform at surface and there unlaced, the ore being raked off into a wheelbarrow, as is shown in an accompanying illustration.

History of the Camp

Zacatecas is one of the oldest silver camps in Mexico for, as ore was found in 1546 at the San Bernabe mine, by Juan de Tolosa, it is several years older than Guanajuato. Soon afterward ore was discovered at the Veta Grande and the Quebradillas, the workings of which extend under the Alameda, one of the beautiful parks of Zacatecas. The camp flourished for in 1585 the town of Zacatecas, which had been founded in 1548, was raised to the rank of a city by the King of Spain. In the early days the camp was a large producer and, at the time of Humboldt's visit to Zacatecas, in the early part of the nineteenth century, the production was estimated by him to be from 300,000 to 400,000 *marcos* (1 marco = about 8 oz.) of silver per year, and he states that from 1785 to 1798 the king's fifth amounted to 1,204,721 *marcos.*



RIDGWAY FILTER, EL BOTE MILL

EL BOTE MILL

SORTING ORE AT MAGISTRAL MINE

SORTING ORE AT EL BOTE MINE

During the time when Mexico was passing through the wars that led up to its independence, the production was large when the mines were working, but this production fell off greatly whenever either army was in the vicinity; by 1875 the production was declining. In 1889, the smelters entered the market for silicious ores, offering a cheap rate and settling immediately for 95 per cent. of the silver content of the ore. As the extraction by the *patio* process, owing to the baseness of the ore, had dropped to 65 per cent., Zacatecas miners gladly abandoned it. A little later there was a drought which lasted several years, so that the death of much of the stock and the higher cost of fodder caused the abandonment of what few *patios* continued to run. Many of the mines, owing to the higher cost of mining, were forced to shut down and later, when the smelter raised the rates on silicious ores, more mines were allowed to fill with water. A few of the best mines continued to work, shipping their ore to the smelter. The El Bote company erected a pan-amalgamation mill to treat its lower-grade ore, and has thus been able to continue to the present its unbroken series of dividends during a period of over 60 years.

For the last 12 years most of the mines and *patios* have been shut down so that the production from the district has been small, coming from only a few mines; the last *patio* that treated custom ores was the Florida *hacienda.* With the decline of local beneficiating, Zacatecas has declined so that now the district which once boasted 70,000 can scarcely find 25,000 inhabitants.

Geology of the District

The Zacatecas district is composed of rounded ridges, rising 1000 to 1500 ft. above the surrounding country, which connect on the west with the foothills of the Sierra Madre range.

As the accompanying map (slightly modified from that given by Burkart[1], who worked out the geology of the district in the first half of the century) will indicate, the main rock of the district is a diorite which in places is capped by a later rhyolite. To the west of town are slates, the oldest rock of the district, which in some places have been altered by intrusions, especially near the contact with the later diorite, so that they are quite schistose in character. Near the town occurs a reddish rock called by Burkart a conglomerate, but which is probably an agglomerate as it is said to resemble the agglomerate of Guanajuato; since I did not visit any of the mines in that part of the district and therefore did not examine the rock, this is only a surmise on my part.

The veins have a northwest-northeasterly strike and dip generally to the southwest at a high angle, but the Mala Noche vein system and the Parroquia-Magistral vein are notable exceptions to this statement.

The Main Vein Systems

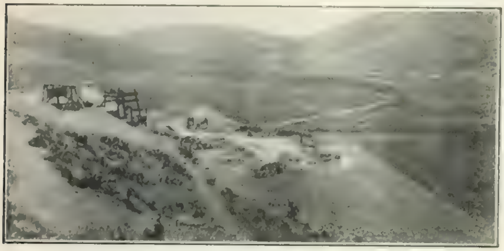
There are three main vein systems in the district, the Cantera, the Mala Noche and the Veta Grande. The Cantera, which is the most southerly of the three, is the largest and longest vein in the camp. On the east end this vein, which starts near Guadalupe, follows the contact between the diorite and the so-called red conglomerate; but to the west it cuts through the diorite and in the Bote property passes into the slates, being conformable with them in dip. The Cantera is on its western end more a vein system than a vein, for there are many branches, as can be seen on the map. South of town are the Veta de San Rafael and the Veta de los Campos, which appear to be especially strong spurs from the Cantera system, and to the northward is the Magistral-Parroquia vein, which also appears to be a branch of the Cantera system.

---

[1] J. Burkart, "Aufenthalt und Reissen in Mexico in den Jahren 1825 bis 1834." Stuttgart, 1836.

The ore from the Cantera system is characteristically silicious and quite free from sulphides other than those of silver. south. The ore carried a great deal of pyrite, but no copper; the pyrite content varies considerably along the vein, for on the west end, in the San Roberto mine, the ore has an excess of iron over silica, while in the San Bernabe on the eastern end where the vein is in the diorite, the ore is silicious, but carries 20 per cent. iron. On the east end the vein splits into several small veins, but to the west it strengthens and unites so that in the San Roberto mine, where the vein follows the contact between the diorite and the slate, present development shows a width of 100 ft.; beyond the San Roberto the vein passes out of the diorite and in the Zaragoza is entirely in the slate.

To the north of the Mala Noche vein is the Veta Grande system of fissuring. The veins of this system have a north-west-southeast strike and dip at a high



PARROQUIA MINE; MEXICANS SORTING ORE ON PATIO

MALACATE IN OPERATION, PARROQUIA MINE

THE MALA NOCHE MINE

COPPER BELT OF ZACATECAS

angle to the southwest. The ore in the Veta Grande vein system is a silicious silver ore resembling the ore mined from the Cantera vein. The Veta Grande mine, which has been one of the largest silver producers in the Republic, is the chief mine on this lode, but there have also been several other smaller producers and at present to the west of the Veta Grande mine some virgin ground on the same lode is being developed.

Besides these three main veins, there are others less well-developed, especially the Veta de Tajos and the Vetas del Oritas. The Veta de Tajos is a silver-producing lode to the north of the Veta Grande and near the town of Pánuco, while the Vetas del Oritas are gold-bearing lodes south of Zacatecas. It was in order to treat ore from the Cristóbal mine, one of the mines on this lode system, that the MacDonald brothers began to convert the old stamp mill, with which the mine was equipped, into a cyanide plant.

There are also a series of barren cross veins, which cross the Cantera vein, and it is at these points of crossing that the richer orebodies of the system are found; but it is said that at the Veta Grande mine no such characteristic enrichment was noticed.

[illegible]

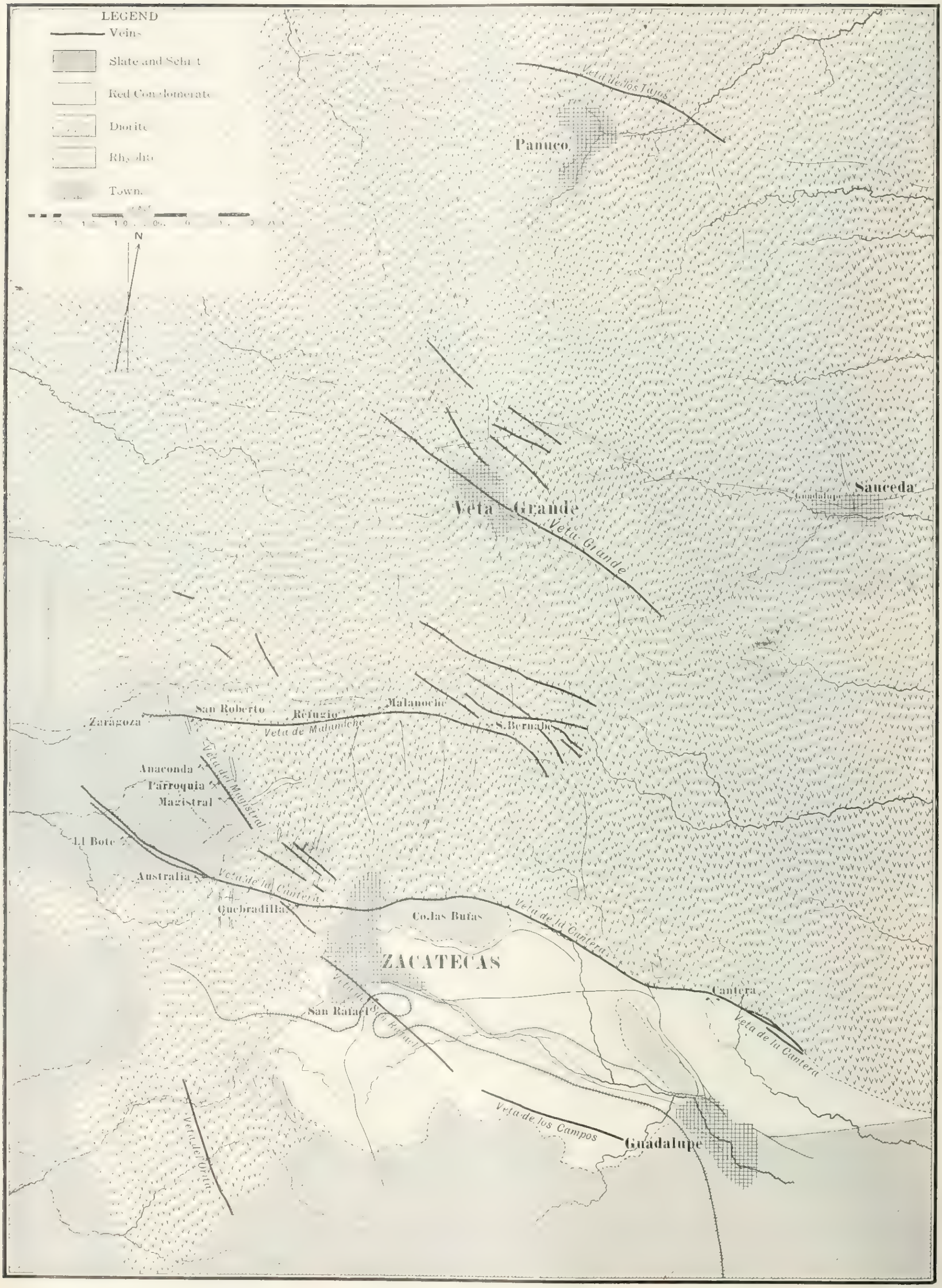
The zone of oxidation in the district extends to a depth of 150 ft., and at a depth of from 480 to 500 ft., a barren zone occurs in many, if not all, of the veins. The finding of this barren zone at several of these mines has discouraged deep development, but the fact is that very little is known [illegible]

In the zone of oxidation the silver occurs as a bromide, iodide or chloride and also native, but below this zone argentite is the most important silver mineral, although in some parts of the vein much ruby silver is found. In the Magistral-Parroquia vein, although apparently it belongs to the same zone of fissuring, the ore is a silicious silver-copper ore in which chalcopyrite and pyrite are the chief metal-bearing minerals.

The Mala Noche vein, to the north of the Cantera, differs radically from the other veins in the district, and the ore appears most closely related with the Magistral-Parroquia ore; in fact, some copper ore is found in a small separate vein in the San Roberto mine. The strike of the Mala Noche is east and west and the dip is toward the north instead of toward the

Zacatecas, for, although the Mexicans worked to considerable depth at Guanajuato, at Zacatecas the mining was done mostly above a depth of 500 ft. The deepest shaft in the district is at the San Rafael mine, the Lete shaft being 420 m. deep, but practically all of the development in that mine has been done above that depth. As the shaft is sunk along a barren part of the vein, the ore has not been developed by the small amount of work done on the deepest level of the mine. The Bote [illegible] most of the ore developed above that level has been mined. It is said that the vein in the deepest levels does not look nearly as promising as above. The Veta Grande is developed to a depth of 365 m., and there, while fewer bonanzas are found on the lower levels than near sur-

GEOLOGICAL MAP OF ZACATECAS, SLIGHTLY MODIFIED FROM THE MAP BY J. BURKART



face, the ore is said to be more uniform in character and of good grade. The Mala Noche shaft is 303 m., or about 1000 ft. deep. At that depth the walls of the fissure are said to be well defined, but the filling of brecciated country rock is not strongly mineralized.

The Ores

At present there are two classes of ore shipped from the district—copper ore and silver ore. The copper ore comes from the Magistral, the Parroquia, and a little from the San Roberto. About 1500 tons of copper ore per month are at present shipped from the district. This assays from 8 to 9 per cent. copper and 400 grams silver, but carries no gold. Ore assaying as low as 4 per cent. copper has been shipped in good times, but the present low price of the metal requires that the ore be handpicked in order to bring it up to about 9 per cent. copper. The ore carries considerable iron as the main sulphides in the ore are chalcopyrite and pyrite, but the silica is in excess.

At present less silver ore is shipped from the district than copper ore, although probably few people outside of Mexico know that any copper ore is mined at Zacatecas. In fact there are only 600 tons of silver ore shipped per month. There are two classes of this silver ore—the iron-sulphide ore and the straight silicious ore. The iron-sulphide ore comes from the properties along the Mala Noche vein, but there is also said to be considerable of this class of ore in the Quebradillas mine.

The iron-sulphide ore shipped assays 1500 grams silver and 20 grams gold per metric ton, 20 per cent. silica, 30 per cent. iron, and 2 per cent. zinc, with occasionally a little lead. The ore shipped from the San Roberto mine, which carries the largest excess of iron, averages about 2000 grams silver and 16 grams gold per metric ton, 31 per cent iron, 2 per cent. zinc, 24 per cent. silica, and 38 per cent. sulphur. The ore shipped from the San Bernabe mine assays 1200 grams silver and 15 grams gold per metric ton, 20 per cent. iron, 5 per cent. zinc, 24 per cent. sulphur and 40 to 45 per cent. silica. In these ores native silver and ruby silver are found as well as argentite. Much of the silver, however, occurs in the pyrite. The straight silicious silver ore, such as comes from the Veta Grande and the Cantera vein systems, is highly silicious, often containing as high as 75 per cent. silica. This ore, as shipped, carries, per metric ton, 1500 grams silver, 2 to 10 grams gold, and no lead, the silver occurring mainly as argentite, but also native and as ruby silver.

It is said that in the gold veins at the San Cristóbal much of the ore carries, per metric ton, 100 grams silver and 12 grams gold, in a highly silicious gangue.

Mining Conditions

The Bote and the Magistral are the only two mines that are doing any stoping at present; the veins are wide, being for much of their distance 20 to 30 ft., and in places as much as 60 ft. wide. The walls in both these mines are slate and stand well. In the Bote underhand stoping, with undercut drift and raises put up through the orebody, is used, but in the Magistral overhand stoping is used with waste filling. At the Magistral the ore is blasted down until the stope is filled; then it is mucked out and the stope again filled with waste. The diorite walls in the Veta Grande mine are said to stand well as do the walls of the Mala Noche, so that Zacatecas seems to be as fortunate as most of the other camps in Mexico in regard to strong walls.

The mines are not wet, for the Bote, which has been working on a large scale for 60 years and has as extensive workings as any other mine in the camp, makes less than 150 gal. of water per minute, this being handled by a Cornish pump. The Veta Grande mine makes a little more water, but probably no mine in the district makes over 200 gal. per minute. While the Bote, the Magistral, the San Roberto, the Mala Noche and some other of the properties are equipped with good steam hoists, the majority of the shafts still have only *malacates* for hoisting, and within the last few years large mines have been unwatered with nothing but a bucket and [illegible].

While formerly many *patios* were running in the district, very few are now intact, and although several mills have been erected, the Bote [illegible] is the only one that ever ran for any length of time.

HOISTING WITH A MALACATE, LANDING THE [illegible]

[illegible]

Owing to the present low price of silver, the Bote mill, in which the Boss continuous process is used, is one of the few [illegible] running. The ore from the Bote mine is crushed in a separate breaker house in a [illegible] then in rolls to ¾-in. size. It is then fed to six 8-ft Chilean mills which crush through a 55-mesh screen, but the resulting pulp is so fine that 60 per cent. of it will pass through a 200-mesh screen.

Before feeding the ore to the pans the pulp goes to dewatering tanks where it is thickened so that it is said to contain only about 50 per cent. moisture. There are 18 of these pans, 5 ft. 4 in. in diameter and 3 ft. deep, the pulp overflowing from one [illegible] muller no shoe is used as no grinding is done in the pans; the mill superintendent says that less mercury is lost through flouring when the shoes are not used. The pulp flows then to four settlers, 8 ft. in diameter and 3 ft. deep, running at 14 [illegible] on the mullers. The tailings are then sent to seven 6-ft. Frue vanners and two [illegible] six pans 200 kg., and in the last six pans

100 kg. Six kilograms of copper sulphate and 30 kg. of salt are added per ton of ore, 9 to 10 kg. of this mixture being added every five minutes.

The amalgam, which is lighter than the mercury, works out of the pan into an outside amalgam well connecting with the pan, from which the amalgam is removed every two hours. At the last pan lime is added so as to precipitate as much of the dissolved silver and gold as possible before the pulp leaves the pans, and at the settlers the pulp is greatly diluted so as to aid settling of the amalgam, quicksilver, etc. The amalgam coming from the wells is put into filter sacks, the amalgam from the day and night shifts being kept in separate bags, although retorted together each day.

The mill is treating 2200 tons of ore per month, and it is said this ore must assay from 800 to 900 grams silver per metric ton to pay for mining and milling; the ore also carries from 6 to 8 grams gold. It is said that an average extraction of 80 per cent. is made. All ore assaying over 1200 grams silver per metric ton is shipped.

Cost of Mining and Supplies

At Zacatecas there is an abundant supply of labor, so that it is low-priced but dear. The cost of driving varies considerably in the district, for the rock varies greatly in hardness throughout the camp. At the Magistral a 5x7-ft. drift is driven on contract for 16 pesos per meter, the mine furnishing everything and delivering the rock at the shaft. At the San Roberto a 6x6½-ft. crosscut in ore is driven, when the ore is soft, for as low as 12 pesos, but in harder ore from 20 to 35 pesos is paid.

At the Bote where the vein is wide the drilling and blasting (powder cost not included) averages about 50 centavos per ton. At the San Roberto, where mucking is done on contract, the ore is shoveled and delivered at the shaft for 20 centavos per ton.

For sorting the ore the price varies at the different mines. At the Bote for sorting the silicious silver ore 1.50 pesos per ton of accepted ore is paid; at the San Roberto mine for sorting the iron-sulphide-silver ore 2.25 pesos is paid per ton of accepted ore; at the Magistral 1.25 pesos is paid to the rough sorters per ton accepted, for sorting the chalcopyrite ore, all the ore being re-picked by company sorters before being accepted.

The wages in the district vary somewhat. At the Magistral property all men underground are paid 75 centavos per eight-hour shift. At other mines the miners are paid 1 peso per 10-hour shift, and *peones* 75 centavos to 1 peso. Head timbermen are paid 1.50 pesos; helpers, 1 peso; blacksmiths, 1.75 pesos; carpenters, 1.50 pesos; hoisting engineers, per eight-hour shift, 1.50 pesos; firemen, 1 peso; foremen, 30 pesos per week; shift-bosses, 2.50 pesos per day.

The prices of mine supplies bought in small quantities at Zacatecas are: Dynamite, 60 per cent., per case, 20.50 pesos; 40 per cent., 17.25 pesos; caps, 1.25 pesos per box of 500; fuse, ordinary, per 100-ft. roll, 50 centavos; gutta percha fuse, per 100-ft. roll, 1 peso; candles per kg., 40 centavos.

As has been said, labor is abundant, but only double-hand drilling is used as the miners at Zacatecas are poor with the single-jack hammer.

The Properties at Present Working

At present the Bote mine is still mining ore, but almost all the developed ore has been mined, although recently a small cross-vein assaying well in gold was found. The company is awaiting the arrival of large pumps before commencing to develop the vein at greater depth. The company has begun to transform the old pan-amalgamation mill into a cyanide plant so as to treat the 800,000 tons of low-grade ore now accumulated on the dump. The ore will be crushed in gyratory crushers, rolls, and ground in cyanide solution in Chilean mills. The ore will be agitated by compressed air in a tank 16 ft. in diameter by 38 ft. high, designed by the manager, J. S. Pattison. This tank has an inclined bottom, sloping toward one side, at the bottom of which is the hole connecting with the outside tube to which compressed air is admitted. This forces the slime up through the tube, which discharges into a cylindrical ring; this ring extends down some distance into the tank, confining the agitation and allowing an annular space in which, while the tank is being charged, clear solution can rise and overflow. This tank is also equipped with a decanting tube. The overflowing and the decanted solution will go to filter presses and the filtered solution will then be sent to the zinc boxes; the slime will be washed on some kind of filter. A Ridgway filter has been tried, but this only gave a capacity of 31 tons per day. Also at the Guanajuato Consolidated Company's mill at Guanajuato, where the Ridgway filter was tested, the capacity was low, although mechanically it worked nicely. The agents say that to obtain the full capacity with a floculent slime, one containing less than 50 per cent. moisture must be fed. This would require the use of special thickeners, like the Dorr thickener. The successful operation of this cyanide plant will mean much to the district.

The San Rafael mine, belonging to A. E. Stillwell and associates, is at present idle but it is rumored that the mine will soon start up and that a 50-ton cyanide plant will be erected. On the Cantera vein the Australia mine is doing a small amount of development work

The Parroquia property, belonging to F. O. Palmer, is being worked by *gambucinos*, while the Magistral property, next to it, is the largest shipper in the camp at present. In fact it is this property, on the vein whence once the *magistral* used in the patio process was obtained, which has made most interesting history in the last few years. About six years ago D. H. Norris and C. O. Gilbert began to develop this property. Since that time the mine has been developed to a depth of 650 ft. Nearby the mine a 250-ton smelter is being erected under the supervision of C. A. Heberlein, who also designed it, to treat the ore direct from the mine. This smelter will have a 46x150-in. blast furnace, 12 ft. high from tuyere to feed floor, and will be equipped with a blower having a capacity of 9000 cu.ft. per minute. Limestone for flux will be obtained from a nearby quarry which the company owns. Iron ore for flux will be obtained from Iron mountain, near Durango. This smelter site is near the tracks of the Mexican Central, so a short broad-gage spur will be built to the smelter. It is expected that this smelter will be running by Sept. 1.

But the latest development of importance is in the San Roberto, where work done by T. F. Van Wagenen, of Denver, has proved a width of 100 ft. for the Mala Noche vein at that point. Mr. Van Wagenen is also working the San Bernabe with good results. At the San Roberto a depth of 260 ft. has been attained and three levels have been driven. At the San Bernabe a depth of 400 ft. has been reached. The Zaragoza mine to the west of the San Roberto is also being developed and a depth of 300 ft. is said to have been reached in the shaft. Some development work is being done at a few other properties in the district, but only on a small scale.

Conclusions

The geology of Zacatecas is very similar to that of Guanajuato, for the same rocks, apparently of the same age, occur at both places. The ores are similar except that at Guanajuato no copper ore is found, and little silver ore carrying a large amount of pyrite, such as occurs in the Mala Noche vein. But at Guanajuato the Mexicans mined to considerable depth, while at Zacatecas their work has not been deep. This fact, together with the occurrence of a barren zone at a depth of about 150 to 170 m., has caused the impression that the ore does not "go down." The fact is that little deep mining has been done at Zacatecas, and therefore, practically nothing is known about the camp in depth. The camp needs development, for up to the present most of the mining at Zacatecas has been gophering. There is much virgin ground in the district and the developments at the San Roberto show the possibilities of good common-sense mining.

The camp will need, after the mines warrant their erection, cyanide mills for the silicious silver ore and concentrating mills for the ore from the Mala Noche vein in order to prosper. The mines furnish enough water for cyanidation provided the water is properly conserved, but for concentration water will have to be brought into the district or the ore hauled to the water; probably the latter is the more feasible.

The camp is not a shipping camp and will not flourish until the ores are again treated locally. The Bote, the only company which has run continuously for the last 70 years, has been enabled to do so because it has a mill to treat its low-grade ore. The other mines will have to do the same to be successful. The silicious ore can be cyanided as successfully as the Guanajuato ore and the iron-sulphide silver ore can be easily concentrated. It is not a question of metallurgical treatment upon which the future of Zacatecas depends, but upon the developments at depth in the mines, and it hardly seems possible that veins as large as those at Zacatecas and which have produced so large a tonnage, will not furnish milling ore at depth. Zacatecas, with its own special problem, lies waiting as did Guanajuato only a few years ago.

Determination of Sulphuric Anhydride in Sulphuric Acid

By Evans W. Buskett*

The amount of sulphur trioxide in sulphuric acid is generally determined by titrating a weighed portion of the acid with a standard solution of potassium or sodium hydrate. The standard solution is prepared by mixing 30 c.c. of concentrated chemically pure sulphuric acid with about 300 c.c. of water and diluting to one liter.

There are several ways of standardizing sulphur acid, but the sodium carbonate method is probably the most satisfactory for it gives the total acidity, which is not true of other methods. With litmus as an indicator the titration must be done at a boiling heat in order that all of the carbon dioxide may be driven off. The presence of carbon dioxide obscures the blue color of the litmus, which is the end point. Methyl orange is not supposed to be affected by carbon dioxide, but the presence of the gas in excess certainly obscures the end point. To prepare a solution of methyl orange for indicator dissolve 1 gram of methyl orange in one liter of water. Use about 2 c.c. of this solution to a one liter wash bottle, with which the acid is washed from the weighing bottles.

Standardization of Acid

To prepare sodium carbonate for standardizing, about 50 grams of chemically pure sodium bicarbonate is placed in a platinum dish in an air bath and heated to 200 deg. C. The temperature is then raised to 275 deg., but not as high as 300 deg. At 275 deg. the water and carbon dioxide are driven off converting the bicarbonate into carbonate. After heating for one hour the dish is removed and cooled in a dessicator. The carbonate will be found free from lumps and readily soluble in water.

To standardize weigh, in a weighing bottle, between two and three grams of the sodium carbonate. Wash the contents of the bottle into a No. 3 beaker, using about 100 c.c. of cold water. The water used should be tested for alkali with methyl orange and if any is found it should be neutralized with standard acid. In titrating run in the acid solution until the color of the methyl orange disappears. Remove the beaker and boil until all of the carbon dioxide is driven off. This generally takes about five minutes of active boiling. Transfer the solution to a 6-in. evaporating dish, cool, and complete the titration. Toward the end the solution should be added a fraction of a drop at a time, noting the change of color very exactly. The results are calculated according to the following equation:

$$H_2SO_4 + Na_2CO_3 = Na_2SO_4 + H_2O + CO_2$$

The temperature of the acid solution should be noted and a correction made accordingly. If the temperature was 20 deg. when the factor, 0.039592 was obtained, it would have the values given below at the temperatures named.

Degrees C	Factor
10	0 039792
15	0 039692
20	0 039592
25	0 039492
30	0 039392

Standardization of Alkali Solution

To prepare the standard solution of alkali weigh 560 grams of chemically pure potassium hydrate into a large evaporating dish and add about 500 c.c. of water, dilute to 10 liters and allow to stand for several days before standardizing. A thermometer should be suspended in the solution and a drying tube containing potassium hydrate should be inserted in the stopper. All air entering the bottle should pass through this tube, thus preventing any alteration of the solution by the action of moisture or carbon dioxide. The solution is siphoned through a glass tube only a short piece of rubber for the pinch cock being used.

To standardize the alkali solution draw 40 c.c. of the standard acid from the acid burette into a 6-in. evaporating dish and titrate carefully with the alkali until there is no further change of color. It is customary to run three checks when standardizing, the average of the three being taken.

Assay of the Acid

After violently shaking the sample so as to get a uniform mixture, 1 c.c. is drawn off into a weighed bottle. The pipette for this purpose is kept standing in a bottle of acid and is washed out two or three times with the sample acid before the portion for assay is drawn off. Weigh the bottle containing the sample to one-tenth of a milligram. Wash the sample into a 6-in. evaporating dish with water containing methyl orange. Wash the bottle and stopper until there is no longer any pink color. Titrate with the standard alkali until the color shows a decided change. Stir and wash down the sides of the dish. Finish the titration very carefully, taking only a fraction of a drop off the burette with the stirring rod, and noting the change of color when this is added to the assay. When no further change of color is detected the operation is complete.

---

*Peoria, Ill.

Hydrocyanic Acid Poisoning

Three Kafirs died suddenly last April at the Kleinfontein mill while cleaning out the tank which receives the decanted liquor from the vat used in digesting the short zinc with sulphuric acid. One Kafir had been working on the tank for an hour when another Kafir entered the tank to aid him in the work. Soon after that the two evidently became conscious of some overpowering agent, and began desperately to try to escape from the tank. A white man and two Kafirs hurried to their aid. The Kafirs entered the tank, but before they could get the others out they also were nearly overcome, and it was with difficulty that the white man at the top of the tank, who had also become very faint, succeeded in pulling out one of the Kafirs. According to the *South African Mining Journal* (May 23, 1908), it has been suggested that the accident was due to hydrocyanic acid, generated by the introduction of cyanide into the tank, in some unknown manner, by the second Kafir. This cyanide, on coming in contact with the dilute sulphuric acid in the tank, generated hydrocyanic-acid gas. To guard against a similar accident a compressed-air pipe has been connected to the bottom of the tank through which air may be blown when men are working in it.

This accident again calls attention to the constant guard that must be kept to prevent poisoning at cyanide plants, and shows that a careful watch should be kept to prevent the contact of acid and cyanide. In this connection it may be noted that at many cyanide mills in Mexico, especially at Guanajuato and Pachuca, acid treatment is not used, but instead, the short zinc caught on a 40- or 60-mesh screen is returned to the boxes and there used for precipitation until there is no further action. The zinc is fluxed off when the precipitate is melted. Thus the dangers attendant upon the presence of acid about the cyanide works are avoided.

The Pyritic Origin of Iron Ore Deposits

An Examination of the Evidence For and Against the Theory that Oxidized Orebodies Are the Result of the Decomposition of Pyrite

BY H. MARTYN CHANCE[*]

The argument which is presented in this article has been prepared to prove the following theorem:

All important deposits of iron ore occurring as magnetite, hematite or limonite, in strata of sedimentary origin, are residues from the oxidation of sedimentary deposits of pyrites,[1] excepting only the bog-ores and the oxidized outcrops of carbonates.

As a corollary of this proposition, it may be added: such deposits may be expected to continue in depth below the zone of oxidation as pyritic sediments commensurate in size with the residual bodies of iron ore remaining in the zone of oxidation.

Within the last few years, geologists who had rejected the sedimentary theory of the origin of iron ores, and taught by master minds of the preceding generation, have, by reason of the evident stratification of the Mesabi deposits, found it necessary partially to abandon the theories of secondary origin. Reverting to the views of earlier writers, they now ascribe the origin not only of the Mesabi ores, but practically of all of the "Lake" ore deposits to an "iron formation," sedimentary in origin and containing or including iron as chemical precipitates, precipitated, laid down, interstratified and commingled with the sands, muds, silts, clays and calcareous sediments which now form the inclosing rocks. There is, however, still a disposition to cling more or less tenaciously to the theory of "secondary" concentration.

EVIDENCE OF LEACHING

To support this theory diligent search has been made for data to prove that the iron was originally disseminated, and subsequently has been concentrated by percolating or circulating waters. This search has resulted in the discovery of the widespread distribution throughout the iron-bearing sedimentaries of granules or nodules of the mineral, grünerite (ferrous silicate), and of cherty iron carbonates, together with complex iron silicates which, taken collectively constitute a considerable proportion of the total rock mass, and in the aggregate perhaps contain sufficent iron to account for the vast quantities of iron ore, the origin of which is now ascribed to the decomposition of these minerals, the leaching out of their iron contents, and the reprecipitation of the iron in "concentrated" deposits.

But before this theory can be accepted, it will be necessary to show at least one locality in which the "iron formation" has thus been leached of its iron, and to show the changes resulting from such leaching. This has not yet been accomplished; neither has it been explained how silicates are decomposed and the iron dissolved, nor has the character of the residual rock mass after such decomposition been explained; nor has it been explained how the same waters have decomposed both carbonates and silicates and dissolved out their combined iron. If it be necessary to picture the decomposition of impure iron carbonates by meteoric waters loaded with carbonic acid, the removal of iron by such waters as carbonate in solution, and its reprecipitation as carbonate or as ferric oxide or ferric hydrate, and also the simultaneous breaking up of silicates by these same waters, and the selective removal of the iron, we must assume that in carbonic waters a universal solvent has at last been found, capable of performing astounding feats of chemical jugglery. If we credit these meteoric waters with such extraordinary decomposing and dissolving properties, it should indeed be difficult to find any portions of the original rock mass that can be recognized as such remaining near the surface, or above water level.

THE CARBONATE THEORY

There seems to be a decided tendency on the part of those studying the genesis of iron ores to favor the theory that a large part of the iron has been precipitated originally as carbonate of iron, more or less disseminated and subsequently leached and reprecipitated, and this extends not only to the conclusions of those who speak authoritatively upon the origin of the "Lake" ores, but applies as well to the writings of those who have discussed the origin of our eastern limonite deposits. This tendency seems unaccountable, because wherever carbonate ores exist there will be found a refutation of the theory. The fossil carbonates of the South, the Silurian carbonates of the North (as at Hudson, N. Y.), the Coal Measure carbonates of this country, those of the Cleveland iron district and many similar deposits, all conclusively prove: (1) That carbonate of iron is not readily soluble in meteoric waters; (2) that oxidation of iron carbonates is a very slow process, rarely proceeding at a rate much more rapid than that of the erosion of the surface; (3) that oxidation of iron carbonates usually extends to very slight depth beneath the surface; (4) that iron carbonates in oxidizing drop practically all of their iron, as insoluble oxides, *in situ*.

In other words, carbonate of iron in the presence of carbonic meteoric waters must be considered as a comparatively stable chemical compound, and, as compared with many other salts, relatively insoluble. By similar reasoning we may dismiss the theory that silicates are a source from which leaching meteoric waters are able to extract large quantities of iron; for while it is doubtless true that iron silicates, in common with other silicates, are slowly decomposed by carbonic waters, forming carbonates and oxides of the bases and freeing silicic acid, we are not warranted in assuming that by selective action the iron silicates are attacked and other silicates remain unaltered; for such an assumption inevitably leads to certain entirely untenable conclusions, which may be briefly stated.

If we assume the decomposition and selective removal by meteoric waters of the iron silicates, the residual honeycombed masses remaining after such leaching is completed could not well escape observation and description; but no such rock masses have yet been described. If, on the other hand, no such selective action has occurred, then we must assume that the whole rock mass must be decomposed and dissolved to extract the iron; the solvent waters in this event being loaded with salts of alumina, lime, magnesia, soda and potash, and silicic acid, which in the aggregate enormously exceed in quantity the dissolved iron. Under such conditions there is little reason to believe either that the iron would not oxidize at once and be precipitated *in situ*, or that it would be carried to certain horizons in the slates and there be precipitated in a relatively pure form; for precipitation implies either oxidation and replacement, and as precipitation is supposed to occur *below* the zone of oxidation, and as no reasonable theory of replacement has yet been formulated, this hypothesis does not appear to be based upon reasons which are plausible or in consonance with accepted chemical theories.

OBJECTIONS TO THE THEORY

While the solution of rock masses by meteoric waters is doubtless second only in importance to aërial and mechanical erosion in lowering the level of the surface, in the disintegration of the formations and in providing material from which chemical precipitates are added to sedimentaries during the deposition of these sedimentaries, the quantity of iron so dissolved and carried away probably forms a very small part of the total iron contained in the original rock mass; for the tendency of iron in the zone of oxidation is to oxidize to ferric oxide or ferric hydrate, and most of it is removed mechanically in these forms with the other products of erosion.

---

[*] Consulting mining engineer, Philadelphia, Penn.

[1] Sulphides of iron, pyrite, marcasite or pyrrhotite.

Another objection to these theories is that they fail plausibly to explain the occurrence of the grünerite nodules, the ferruginous jaspers and cherts and complex iron silicates as integral parts of a sedimentary formation; for it is not and cannot be assumed that these minerals are fragmental detritus derived from older rocks. To account for these ocurrences it cannot be assumed that the grünerite nodules were precipitated as such, and it is begging the question to state that they are concretions; for the bands of jasper, of ferruginous silicates and the chert, as well as the carbonate masses, are as important integral parts of the "iron formation" as the grünerite.

The sparing occurrence of pyrite in these rocks is a feature which, in my opinion, supplies a key to the unlocking of this problem. Its significance has apparently been overlooked or underrated. It furnishes a simple and rational explanation of the present condition of the "iron formation" in the Lake region, the occurrence of the ferruginous cherts, jaspers, grünerite and carbonates which doubtless owe their origin to disseminated pyrites, the iron ores being the residues of and concentrations from more concentrated pyritic sediments.

Hollow Masses of Limonite

In an article on the "Origin of Bombshell Ore," read before the American Philosophical Society, April, 1908, I have shown how limonite in hollow masses (empty, or partly or completely filled with sand or clay), is formed by the oxidation of pyritic slate or pyritic sandstone. The iron sulphide oxidizes to ferrous sulphate and sulphuric acid, the ferrous sulphate oxidizing to ferric oxide or hydrate and ferric sulphate,. or the oxidation being direct to ferric oxide or hydrate and sulphuric acid. The sulphuric acid decomposes the clay (silicates) of the gangue, removing it partially or wholly as sulphates of the bases and free silicic acid, which latter leaches out in solution or combines with iron oxides to form iron silicates. This action proceeds from the exterior toward the center of each integral block or fragment and finally leaves a hollow shell of limonite, containing in its interior the residual clay, sand, quartz, or other materials. Many specimens of "bombs" in various stages of formation, from pyritic slate or sandstone with an outside film of limonite, to the completely oxidized bomb, clearly show the method of formation.

Precisely the same reasoning will enable us to explain the origin of the nodules of grünerite and the masses and layers of chert, jasper and ferruginous silicates and carbonates of the "iron formation." In a slate or shale rock containing disseminated pyrite, each pyrite particle may, by the action of oxidizing waters, produce a nodule of grünerite; for the oxidation of the pyrite (FeS_2) to ferrous sulphate ($FeSO_4$), and sulphuric acid (H_2SO_4), will be accompanied by decomposition of the adjacent clay by the sulphuric acid, forming sulphates of the bases and freeing silicic acid which, reacting on the ferrous sulphate as this is being subjected to further oxidation, may form such ferrous silicate as grünerite, or other silicates of iron. Some of the iron is thus retained, the balance passing into solution as ferrous or ferric sulphate, to be redeposited perhaps in other zones where the decomposition of concentrated pyrite is progressing.

Complex Iron Silicates

By the same process of reasoning the oxidation of pyrite, existing in more concentrated masses or layers, may readily account for the complex iron silicates, jasper, chert, chalcedony, and other forms of silica existing throughout the "iron formation," these being silicious residues formed from the silicic acid set free by decomposition of clay slates, or other silicates, by the sulphuric acid resulting from oxidation of the pyrites. The carbonates are also readily accounted for by the precipitation (partial transposition) of ferrous sulphate by the carbonates of the alkalies and alkaline earths dissolved in these waters, together with oxidation of the pyrite and ferrous sulphate, such transposition and precipitation occurring practically simultaneously and *in situ*. The subsequent metamorphism produced by the heat of igneous flows and intrusions readily explains the subsequent cementation and induration of these rocks and the highly crystalline character of their enclosed minerals.

Hence, if this theory be accepted, the origin of the "iron formation" becomes one of extreme simplicity; it can be ascribed merely to ordinary mud, clay, silt, or sandy sediments containing more or less generally disseminated pyrite and some more or less concentrated layers of sedimentary pyrite.

[illegible]

An extension of this line of reasoning only is required, to account for the orebodies, it being necessary merely to assume that in some of the sedimentary strata large concentrated bodies of pyritic material were deposited. Under such conditions the pyrite either oxidizes directly to ferric oxide or hydrate, or the ferrous sulphate oxidizes to ferric sulphate, precipitating some of its iron as ferric hydrate, the percolating waters transporting the balance to portions of the deposit where active oxidation is progressing, and where the ferric iron may again be reduced to the ferrous form. These reactions occurring and recurring, eventually result in the precipitation of practically all of the iron contained by the original pyrite deposit at or near the site in which it was originally deposited, the precipitation of iron brought in solution from other portions of the formation, containing disseminated pyrite, resulting in an enrichment and enlargement of the orebody.

These reactions proceed slowly and the resulting ferric oxide or hydrate is virtually precipitated *in situ*, and the soluble bases of the gangue are removed as sulphates, while some of the silicic acid may escape in solution, or all, or a part may remain with the ore as various silicates of iron, jasper, chert, chalcedony quartz or sand.

Whether the chemistry of these various reactions be correctly described or not, the fact remains (as described in the article on "bombshell" ore above referred to, and as later elaborated in an article shortly to appear in the Bulletin of the A. I. M. E., explaining the "Genesis of Eastern Limonite Deposits"), that some extensive deposit of limonite ores owe their origin to the oxidation in place of pyritic slates and sandstones. In other words, these ores are gossans underlaid by an altered pyrite. Possibly in the Lake region, the pyritic strata may have been completely oxidized, or if any unoxidized portions remain, these may exist only at great depth, but in the Appalachian region oxidation of the precisely similar Siluro-Cambrian sedimentary pyritic deposits has in some places been quite shallow, the unaltered pyrite being found at depths of less than 100 ft. below the present surface.

Oxidation in the Absence of Free Oxygen

The preceding discussion has been confined to oxidation by meteoric waters carrying oxygen, and no attempt has been made to review the conditions of oxidation by hydrolysis in the absence of free oxygen, and although it has been shown by Stokes and others that pyrite, marcasite and pyrrhotite can thus be oxidized, I prefer to defer discussion of the conditions necessary to such reactions until the results of further experimental research now in progress are available for publication.

The reactions by which pyrite and marcasite are oxidized below the surface rarely set sulphur free, although this frequently occurs when these minerals are oxidized in the open air, especially if oxidized in the presence of organic matter, the equation commonly being written:

$$FeS_2 + 4O = FeSO_4 + S$$

Some probable reactions illustrating the formation of hematite and limonite by oxidizing water containing free oxygen, and the incidental formation of sulphuric acid, involving the oxidation of ferrous sulphate with precipitation of iron as ferric oxide and hydrate, and the de-oxidation by pyrite of the resulting ferric sulphate to ferrous sulphate, may be variously written, thus:

$$FeS_2 + H_2O + 7\,O = FeSO_4 + H_2SO_4$$
$$6FeSO^4+3\,O = Fe^2O^3+2Fe^2(SO^4)_3$$
$$6FeSO_4 + 3H_2O + 3\,O = Fe_2O_3,\ 3H_2O + 2Fe_2\,(SO_4)_3$$
$$2Fe_2(SO_4)_3 + 2FeS_2 + 4H_2O + 12\,O = 6FeSO_4 + 4H_2SO_4$$

the ferric sulphate continuing to react upon the sulphide to produce ferrous sulphate and sulphuric acid and the ferrous sulphate being oxidized to ferric oxide or hydrate and ferric sulphate, resulting finally in the *complete oxidation of the pyrite to ferric oxide or hydrate and sulphuric acid.*

The direct oxidation of pyrite or of ferrous sulphate to ferric oxide and hydrate and sulphuric acid, as shown by the following equations, is improbable except possibly in the presence of electrolytic polarization due to earth currents.

$$2FeS_2 + 4H_2O + 15\,O = Fe_2O_3 + 4H_2SO_4$$
$$2FeS_2 + 7H_2O + 15\,O = Fe_2O_3,\ 3H_2O + 4H_2SO_4$$
$$2FeSO_4 + 2H_2O + O = Fe_2O_3 + 2H_2SO_4$$
$$2FeSO_4 + 5H_2O + O = Fe_2O_3,\ 3H_2O + 2H_2SO_4$$

It is, however, unsatisfactory to attempt an exact analysis of possible reactions, because the iron in these sulphides has been shown by Dr. A. P. Brown to exist both as ferrous and ferric iron, and the oxidizing processes may, therefore, be complicated by corresponding differences in behavior, and further, many reactions, which must be more or less indeterminate, doubtless occur with the salts carried in solution by the meteoric waters. An illustration of the importance of this latter consideration is found in the large quantities of phosphorus found in the Siluro-Cambrian (Pottsdam formation) limonites of the Appalachian range, which evidently have been introduced by the oxidizing meteoric waters; for the pyritic deposits of which these limonites are the gossans contain small quantities of phosphorus.

Precipitating Agents

The influence of the salts of lime, magnesia, and the alkalies held in solution by these waters in causing precipitations, and as affecting oxidation, cannot accurately be predicted. In addition to these difficulties are those which may arise from the possible formation of other acids than normal sulphuric acid and from the possible formation of basic salts. In a similar manner we are halted in any attempt to portray in detail the part played by silicic acid (set free by the action of sulphuric acid upon clay and other sediments) by the uncertainty as to the particular type or types of silicic acid thus set free, and the possible behavior of such acids; our reasoning is, therefore, practically limited to speculations concerning the behavior of orthosilicic acid (H_4SiO_4) and metasilicic acid (H_2SiO_3).

The most common forms in which iron appears to have been precipitated in quantity and in concentrated deposits are as carbonate of iron and as pyrites. It appears to have been precipitated freely as carbonate only in the presence of conditions favorable to the deposition of calcareous sediments, most of the large and important beds of carbonate of iron being interstratified with or associated with limestone.

The deposition by precipitation of iron as pyrites is apparently confined to no class of deposits, pyrite being found indifferently with calcareous, argillaceous and arenaceous rocks, but precipitation appears to have occurred in larger quantity and more generally during the deposition of clays and sandstones, or in localities where these were being laid down; the more important deposits of this mineral being found in slates and sandstones.

The reduction and precipitation of iron as bisulphide is usually attributed to organic matter, and has been supposed in some cases to be due to the reducing action of growing vegetation. The precipitation of pyrite in marshes and peat-bogs has been accounted for in this way, and it is quite possible that the pyrite occurring in coal-beds may have a similar origin. It does not seem at all improbable that a profuse growth of marine vegetation (seaweeds) may have caused the precipitation of pyrite in quantity during the deposition of the sands and muds, and possibly the granular form of the pyrite may be due to the growth of pyrite in this form upon masses of floating seaweed, (similar to that found adhering to the sphagnum), the granules becoming detached and sinking to the bottom as the seaweed died or decayed. Other conditions may have caused a reduction and precipitation of the iron as bi-sulphide, conditions which our present knowledge does not enable us to imagine or describe. The subsequent concentration and distribution by waves or currents of the pyrite grains or granules, and the classification of these into coarse grains depositing with the sands and fine material depositing with the muds is easily understood.

The Evje nickel works produced 5781 tons of nickel ore in 1907, says the London *Mining Journal* (May 30, 1907); 5493 tons were smelted, which gave 200 tons of copper-nickel product, containing 81 tons of nickel and 53 tons of copper.

Hydrochloric Acid for Cleaning Cloths of Slime Filters

W. R. Dowling (*Journ.* Chem. Met. and Min. Soc. of South Africa) describes a method devised at the Knights deep mine, Transvaal, to overcome a not uncommon difficulty with slime filters. The tonnage of ore having increased, it was found necessary to install more solution clarifying arrangements. A filter-press containing 36 hollow frames and served by a 3-in. high-lift centrifugal pump was erected. The frames were 30 in. square and contained 450 sq. ft. of filtering area, admitting a 1-in. cake of slimes.

The pump suction was at first connected directly to the decanting main. With this arrangement it was found that the cloths had to be changed at least every 24 hours and sometimes oftener. The effect of steam applied for two hours for dehydrating colloidal silica was tried. This extended the life of the cloths up to 12 hours, but the cloths soon became hard, and the pores choked even after vigorous scrubbing in water.

On analysis it was found that 90 per cent. of the hardening deposit in the cloths consisted of carbonate of lime. Treatment with 10 to 20 per cent. hot hydrochloric acid, with rubbing to release the bubbles of carbon dioxide, left the cloths soft and apparently uninjured. The carbonate of lime which caused the trouble was apparently drawn into the suction pipe from the surface of the undisturbed slime solution. The suction of the pump was introduced into the sides of two of the ordinary sand filter vats at a point opposite the inflow and about 18 in. above the sand level, and a box open at top and bottom was placed over the intake to prevent the floating carbonate of lime from being drawn in. These means were so successful that cloths could be used three or four days, clarifying up to 800 tons per day.

Mining in China

The province of Shantung, China, according to Wilbur T. Gracey, U. S. Consul at Tsingtau, has valuable mineral resources, but these have not been worked extensively. At Tschoutschong there are deposits of mica of good quality. Copper and gypsum deposits as well as clays of good quality have also been found. On the Tiehshan (Iron mountain) near the railroad station of Tsinglingtschen an iron deposit of good size occurs. It contains both megnetite and hematite, and carries 65 per cent. iron. The German Mining Society is working this deposit and development is said to indicate a length of 2 km., and a thickness of 35 m.; the deposit dips at a high angle. Iron ore has also been found on Sy-bau mountain near the railroad station of Tschangtien.

Reclaiming Caved Ground after a Squeeze

By J. J. Rutledge*

In mining the iron pyrite deposit at the Davis mine, Davis, Mass., it has been the practice for several years to stope out the ore entirely from foot to hanging wall, between the levels, usually by underhand stoping, commencing at the shaft pillar and working outward away from the shaft. For some years it was customary to leave a 12- to 14-ft. horizontal pillar under each level. This pillar was in most cases backed up with timber from below, but, notwithstanding this precaution, the pillar usually fell, owing to the fact that the headings of the stulls fell out as the hanging wall began to crumble. This pillar in falling carried away all the stulls below it and ceased falling only when it reached solid ground, which ground was, of course, the stoping ground then being worked.

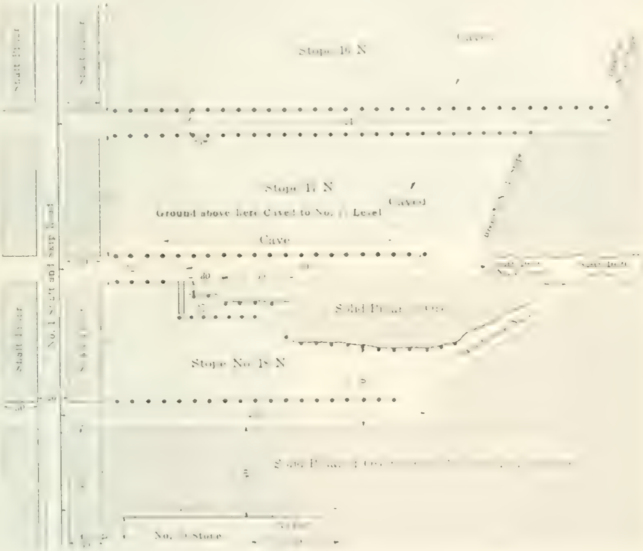
Disadvantage of the Method

While this practice of stoping out the entire orebody between each pair of levels and from wall to wall yielded the maximum amount of workable ore in the vein, still it had several drawbacks. When the ore was stoped out entirely and no horizontal pillar being left, it was necessary for the men working on the stopes to work under open ground, since the underhand system was employed. It was also necessary to tear up the track in the upper level, when two stopes were being worked together, before the bench could be started on the lower stope. When the pillar was left it was necessary to drive the drift below it, and such drifts had to be driven at every level where a pillar was left, whereas, when no pillar was left, it was only necessary to drive the drift at the uppermost level.

But the greatest drawback to the exhaustive method of mining and the one which to my mind renders debatable the utility of the method, is the fact that, when no pillars are left, the surface water has free access to the entire workings of the mine, and increases greatly the pumping and timbering cost, and compels every employee to work in a wet and disagreeable mine. The water running over the stopes causes the fine ore to set like so much cement and renders the mucker's work very hard and unpleasant.

To meet these conditions some mining men who have visited the mine have advocated leaving an entire level unstoped, say, every third or fourth one, merely driving the drifts above and below and blocking out the ground without stoping it. But this method was not practicable, and the following compromise plan was adopted several years ago. A horizontal pillar about 30 ft. thick was left over the level, a drift driven, and the ore below it worked by back-stoping.

This plan worked very well. All the water coming down the old workings was caught by shallow sumps made on the upper side of the pillar and pumped to the surface. The workings below the pillar were entirely dry. However, as no vertical pillars were left to support the horizontal pillars and, in some cases, but little timber was placed under the pillars, the pillars eventually fell from the additional influence of the crumbling of the hanging walls. The management appreciated the temporary character of these pillars, and always planned to have a new pillar protecting the advanced workings when the old pillar fell. In one instance the old pillar fell before the newer workings were provided with the protecting pillar, and a description of the method of recovering the caved ground may be of interest.



SKETCH SHOWING POSITION OF CAVE [illegible]

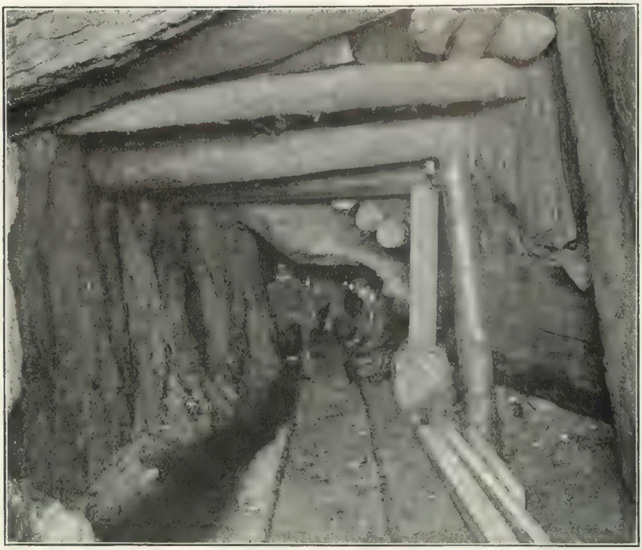
Recovering the Caved Stope

The vein varies from 10 to 20 ft. in thickness, and dips at an angle varying from 70 to 80 deg.; hence any weight on the ground is rapidly transmitted through the brittle hanging-wall of quartz schist. In this case, illustrated in the accompanying sketch, the pillar which fell lay over level No. 15, and above it all ground was caved to the pillar at the surface. Stopes No. 16 and No. 17 north were being worked at the time, and the advent of a cross-slip in the hanging in No. 17 north, aggravated the caving due to the [illegible] pillar eventually fell to level No. 17. This level had been splendidly timbered with heavy rock-maple stulls, but as stope No. 18 immediately below it was being worked at this time, legs resting on mud sills strung lengthwise of No. 17, were placed under the heads of the bottom stulls. This was necessary because No. 18 was also being worked by underhand stoping. The weight of the pillar was transmitted through the hanging-wall at No. 17, and the legs were pushed out from under the heads of the stulls. The entire No. 17 level was closed at one point by a mass of broken ore and rock. After the ground had settled and the noise made by the crushing ground had ceased, an examination of level No. 17 was made and a current of air was found passing through the caved material. This convinced the management of the presence of open ground inside the fall. The condition of the caved level is shown in an accompanying illustration; also its appearance after the loose material had been cleared away. The débris was carefully cleared away with the result that the stulls were found to be still resting in the hitches, but with their previous slope reversed. Upon crawling under the stulls in the water, which now poured out through the caved ground, it was found that 20 or more of the stulls had felt the effects of the fall and had been crushed down, as shown in the illustration. Near the breast of stope No. 17, ten stulls were still upright and uninjured, for the main fall of ground had occurred between the breast and the shaft.

---

*Mining engineer, Baltimore, Md.

This being the case, it was determined to attempt to reopen stope No. 17 from below. Previous to the fall of ground stope No. 18 had been worked underhand to a distance of about 72 ft. from the shaft to the point where the ladder appears in the sketch.



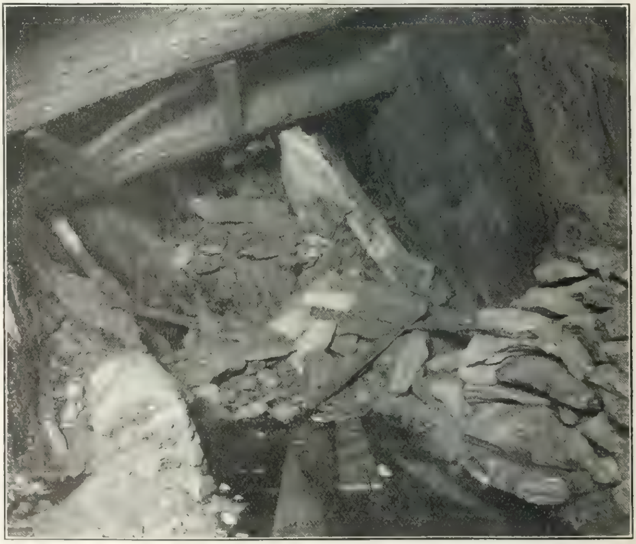
STOPE NO. 17 AFTER CLEARING AWAY THE DEBRIS

Use of a Protecting Pillar

The first displaced stull in No. 17 was notched, as shown, to permit of a Koppel car being used in cleaning up the level and the level was mucked out to the breast, where some caved material was also encountered. The stulls which had been displaced were braced by sprags, and the level south of the fall secured by cap and single-leg timbering, as shown in the illustration. A ladderway was made between No. 17 and No. 18 so as to give access to the breast of No. 17 from No. 18 when No. 17 level between the shaft and the ladderway should become closed by caving material. A pillar about 15 ft. thick was left between No. 17 and No. 18, and a drift started with the intention of working No. 18 stope underhand, as this method had been demonstrated by experience to be best adapted to the mine. But the back of the drift scaled off after a distance of about 30 ft. had been driven, and the pillar was increased to a thickness of 20 ft., and driven a further distance of 50 ft., when it was found desirable to abandon the attempt to underhand-stope the ground and to leave a 30-ft. pillar, back-stoping the remaining lower portion of the ground between No. 17 and No. 18.

As soon as work in No. 18 had reached a point below the solid ground in No. 17 a raise, having an angle sufficiently great to permit the muck made in driving it to fall by gravity to the level below, was driven to reopen the breast of No. 17 stope. The work was carried out, as shown in the sketch, the raise being about 5x5 ft. in cross-section, and reaching the solid ground a short distance north of the breast of stope No. 17. Level No. 18 was protected by bottom stulls, well lagged, as shown in the sketch. As there was but a small amount of stoping ground available, it was not thought advisable to construct chutes; hence the muck was permitted to fall on the sole of level No. 18, and was mucked and trammed from that point. The work was completed as shown in the sketch.

Below level No. 18 and between this level and No. 19 a solid pillar of ore 40 ft. thick was left. This pillar was 45 ft. thick at the shaft and 40 ft. thick north of the shaft pillar. It was securely supported below by stulls, levelers, and lagging. A 5x7-ft. drift under the pillar opened up stope No. 19, which was worked underhand, beginning at the shaft.



CONDITION OF STOPE NO. 17 AFTER THE SQUEEZE

Mineral Production of Tasmania

The report of the secretary of mines of Tasmania for the quarter ended March 31, 1908, gives the total production of gold in the State, including that in copper and lead bullion, at 16,739 oz. The production of copper was 2117 tons blister copper, containing 2090 tons fine copper, 167,142 oz. silver and 5446 oz. gold. The production of ores—other than those from which the metals reported above were won—was: Silver-lead ore, 17,818 tons; copper ore, 44 tons; tin ore, 1046 tons; iron ore, 1000 tons; tungsten ore, 3 tons; bismuth ore—obtained in connection with tin ore—0.15 ton. The coal mined was 14,182 tons. The total value of mineral products was £443,088 for the quarter.

The average number of men employed in or about the mines during the quarter was 6774, of whom 6698 were white men and 76 Chinese.

Douglas Smelting Works, Fundicion, Sonora

By W. F. [illegible][*]

The accompanying illustrations of the new smelting plant at Fundicion, Sonora, Mexico, one of the properties of the Douglas Copper Company, show some interesting details of this modern works which recently began operations. Fig. 1 is a view of two of the traction engines which haul an effective load of 45 tons of ore from the mines per trip; the train consisting of an engine and five trucks, each truck carrying three steel four-ton ore buckets. These buckets are picked up by an electric crane at the smelter and dumped into bins, from which the ore is drawn into narrow-gage cars. The first truck of the train, or the one which immediately follows the engine, has an auxiliary engine with a capacity sufficient to handle about 20 per cent. of the load on a steep grade. One of these auxiliary trucks is shown in Fig. 2. Fig. 3 shows the general arrangement of the ore-handling machinery.

The entire plant is served by a 36-in. narrow-gage railway. An ore train in yards and the trestle approach to the main ore bunkers are shown in Fig. 4. These narrow-gage cars have a capacity of five tons each. Ore is stored in heaps dumped from the trestle, as shown in Fig. 5. The general arrangement of No. 1 copper furnace is illustrated in Fig. 6. This furnace is 44x160 in., and is connected by means of a steel down-take with a balloon-shaped dust flue 150 ft. long, and of 12 and 15 ft. diameters, which discharges into a self-supporting steel stack 177 ft. high, 14 ft. in diameter at the bottom, and 8 ft. at the top. This equipment will carry two additional furnaces of the same size, thus giving the plant an approximate capacity of 1000 tons daily. The ore is hauled to bunkers, from which it is drawn in definite proportions into cars, which in turn are dumped into the boots of Jeffrey steel pan conveyers, and carried, thoroughly mixed, to the charge floor.

Figs. 7 and 8 give general views of the furnace building from the slag dump; Fig. 10 shows a part of the tapping floor, and Fig. 9, the arrangements for handling concentrates and flue dust. This material is run from the bins to the boots of elevators, and delivered to the pug-mill, the mixture consisting of flue-dust, concentrates, quick-lime and water. After being thoroughly pugged, it is [illegible] through disks at the end of the mill, cut into sections, and dropped into narrow-gage cars standing on the track below.

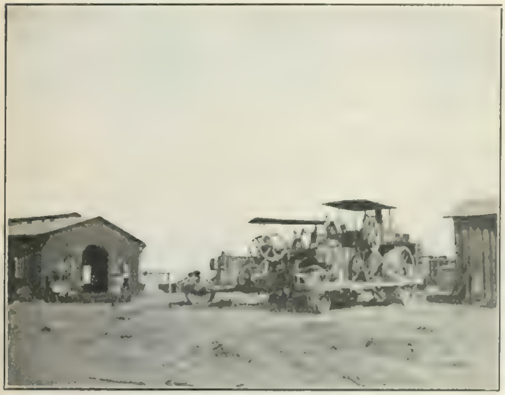


FIG. 1. TRACTION ENGINE FOR HAULING ORE FROM THE MINE

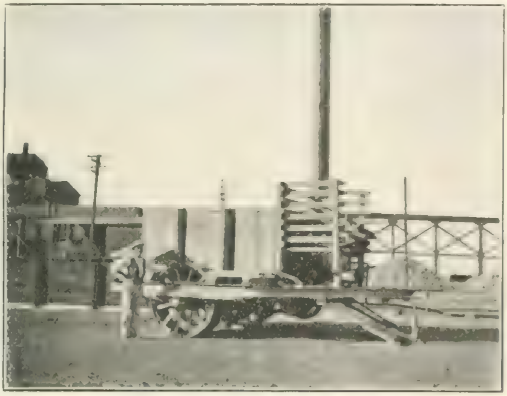


FIG. 2 [illegible]

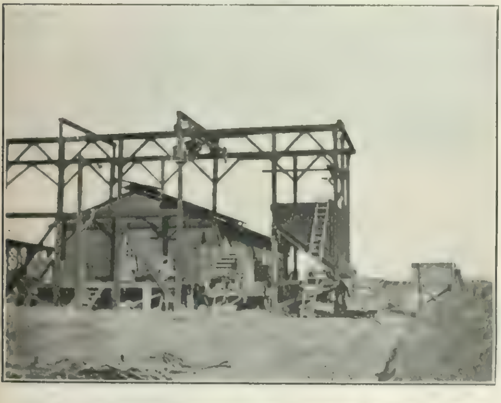


FIG. 3 UNLOADING ARRANGEMENT. TRACTION TRAIN IN SHED

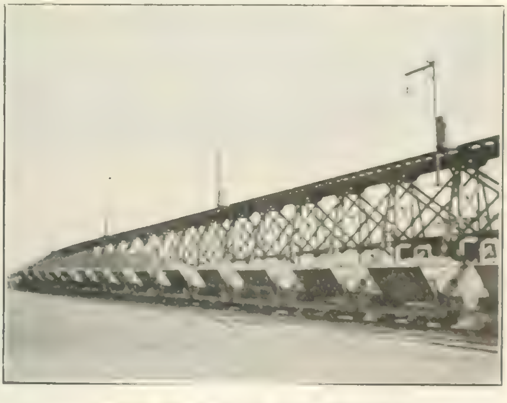


FIG. 4. NARROW-GAGE ORE TRAIN IN YARDS

[illegible] AND SMELTING [illegible]

The plant during the short time it has been in operation has proved itself to be satisfactory in every respect. The labor [illegible] has been as high as [illegible] tons of ore smelted per man employed, a record in the smelting practice of Mexico.

It was not until July 1 that the company, as a result of the operation of the plant

---

[*] Compania metalurgica y Refinadora del Pacifico, Fundicion, Sonora, Mexico.

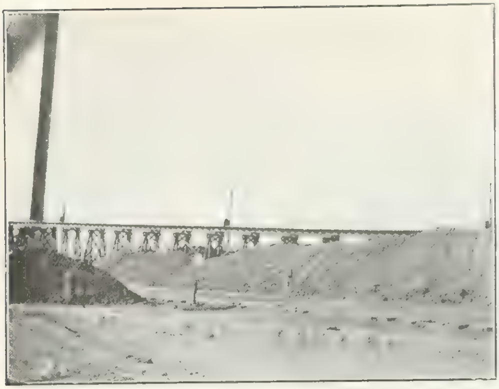


FIG. 5. METHOD OF ORE STORAGE

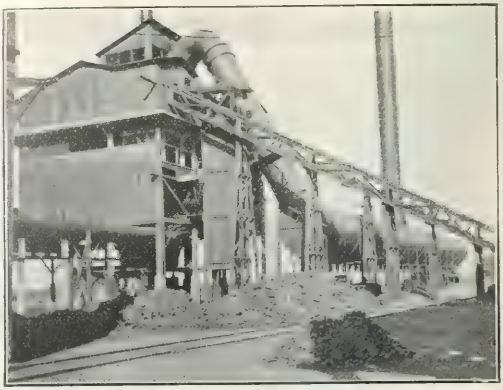


FIG. 6. GENERAL ARRANGEMENT, NO. I COPPER FURNACE

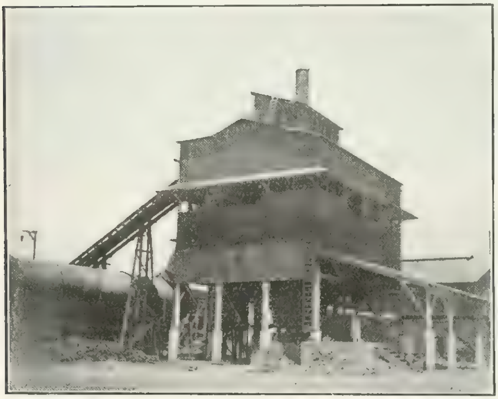


FIG. 7. FURNACE BUILDING FROM SLAG DUMP

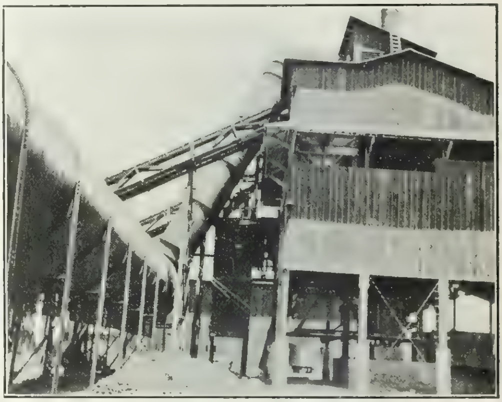


FIG. 8. FURNACE BUILDING AND DUST FLUE

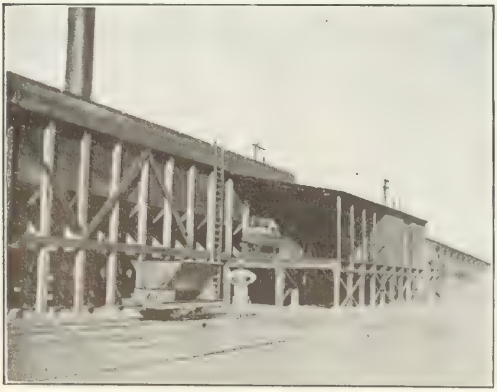


FIG. 9. HANDLING FLUE DUST AND CONCENTRATES

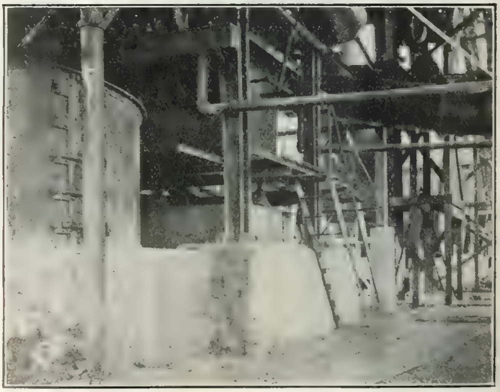


FIG. 10. TAPPING FLOOR

during June, was able to determine positively what its working costs would be. It was gratifying to find that they are quite within the provisionally estimated costs made by the company's engineers.

MINING COSTS, EL COBRE, PER TON OF 2000 LB

Direct Charges	Ore Extraction	Surface Handling	
Labor..	$1.75	$0.72	
Supplies..	0.67	0 30	
Power	0.24	0.15	
Blacksmith shop	0.10	0.06	
	$2 76		
Less timbering (pro rata).	0.65		
Total..................	$2.11	$1.23	$3 34
Indirect Charges.			
Salaries......	$0 54		
General expense...........	0.11		
Total..................	$0.65		$0.65
Transportation, El Cobre to Fundicion.			
Labor...	$1 12		
Fuel.....................	0.58		
Repairs...................	0.35		
Supplies and tools.........	0.16		
Total..........	$2.21		$2 21
Grand total, mining and transportation........			$6.20

SMELTING COST, PER TON OF 2000 LB.

Unloading, Sampling and Yard Charges.		
Labor..........................	$0.40	
Wood for locomotives............	0.01	
Tools and supplies..............	0.01	
Steam power.....................	0.15	
	$0.57	$0.57
Direct Charges.		
Labor..........................	$0.33	
Coke...........................	1.96	
Wood and Sundries..............	0.01	
Tools and supplies..............	0.01	
Repairs........................	0.03	
Steam power.....................	0.14	
	$2 48	$2.48
Indirect Charges.		
Administration..................	$0.06	
Taxes, etc......................	0.01	
General expense.................	0.10	
Laboratory expense..............	0.03	
Salaries.......................	0.20	
	$0.40	$0.40
Total smelting costs...........		$2.88
Grand total mining and smelting		$9.65

SUMMARY OF ALL CHARGES.

Mining...............................	$3.99
Development..........................	1.25
Transportation, El Cobre to Fundicion...	2.21
Sampling, handling and yard charges.....	0.57
Smelting.............................	2.88
Fluxes (estimated maximum)...........	1.50
Refining, transportation, selling commissions, etc........................	3.09
Federal government, taxes, etc..........	0.24
Total...............................	$15.73

These charges include all costs; mining of the ore, its transportation to the smelter, smelting, refining, transportation of product to market, selling commissions, and all the government charges.

It will be observed that an allowance of $1.25 per ton is made to cover future development. In the actual cost of production, this item should not be included. The allowance is estimated to be more than ample to develop an additional ton of ore for each ton extracted from the mine, thus making the company's visible tonnage an approximately constant quantity. On a basis of an average 5.65 per cent. copper recovered, with copper at 13c. per lb., and an average of $9.63 per ton gold and silver, the ore has a gross value of $23.67; and deducting the working costs of $15.73, will leave a net profit of $7.94, or a cost of 5.64c. per lb. of electrolytic copper produced.

The company's limestone carries an average of $1.20 in precious metal per ton, which is sufficient to cover the cost of mining and transportation to the smelter, and as the actual cost of smelting the limestone is included pro rata in the cost of smelting, there is no further charge against that item. The result is that the limestone flux costs the company nothing.

The company expects to develop in its own properties, or to secure as custom ore, a sufficient quantity of ore running high in iron to satisfy the iron requirements of the silicious ores of its El Cobre property.

With the handling of a larger tonnage, and a general improvement of conditions, as a result of the further development of the mining industry on the west coast of Mexico, and the completion of the railroads which are now building, making it possible to bring a large tonnage to the smelter, the working costs should be materially reduced.

Is China Clay a Mineral?

SPECIAL CORRESPONDENCE

In one of the English courts a case which lasted several days has recently been tried, the issue of which depended on whether china clay was a mineral or not. Important interests were at stake and no expense appears to have been spared as regards counsel or scientific witnesses by either side. The nature, origin, composition and uses of china clay were discussed at great length and the record of the trial may be regarded as an exhaustive treatise on the subject. The action was fought over the ownership of certain china-clay deposits in Cornwall, underlying a railway. Under certain agreements the china clay belonged either to the railway company or to the original vendors of the land and their successors, according to whether china-clay was a mineral or not.

The china-clay deposits in Cornwall undergo a series of washing and purifying operations before becoming a marketable article and the defendants claimed that the china clay was only decomposed granite, and, therefore, only the soil or subsoil and not a mineral. The view taken by the judge was that as the china clay occurred in such a manner that it could be readily distinguished from the granite with which it was associated and from which it was derived, it must be regarded as a separate substance and that that substance could properly be called a mineral. It was so regarded by geologists, mineralogists, and text-book writers for many years past, not only in England, but in America, France and Germany. The names of Professor Lapworth, Doctor Hatch, Professor Dana and Professor Miers were quoted as authorities who classed china clay as a mineral. The defendants made a distinction between kaolin of the text-books and china clay of commerce, but the judge considered these convertible terms, saying that the mere fact that clay can be turned to commercial uses without being altogether dissociated from foreign substances cannot alter its real character. Two of the witnesses, Professors Boyd Dawkins and Lapworth, called to prove that china clay was not a mineral, gave evidence only a few years back in another case that the two words kaolin and china clay were synonymous terms. These views they now discarded after more careful microscopic and local examination of china clay and the sources from which it is derived, and the conclusions that these examinations led them to are directly opposed to those which they shared with the scientific world generally down to the summer of last year. They now degraded china clay to an artificial product, a heterogenous compound or mixture of everything that is in the china-clay rock and unredeemed by any one of the qualities that, according to Doctor Hatch, are the essential characteristics of a mineral, namely definite mineral composition, definite physical qualities and definite crystal forms.

The case did not, however, depend on whether the term mineral for china clay was scientifically accurate or not, but whether the substance called china clay was a mineral within the meaning of the act of Parliament. The substance had been universally regarded as a mineral before the passing of the act and for 60 years after and ought now, so the judgment decided, to be treated as falling within the class of substances therein referred to as minerals.

Work of the British Mint

The coinage of the British Mint for the full year 1907 is reported as follows, in number of pieces struck:

	Imperial	Colonial	Total
Gold	[illegible]		[illegible]
Silver	[illegible]	[illegible]	[illegible]
Bronze	[illegible]	[illegible]	[illegible]
Nickel		[illegible]	[illegible]
Aluminum		[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]
Total 1906	[illegible]	[illegible]	[illegible]

The total face value of the imperial coinage was £[illegible] in 1906 and £23,198,378 in 1907. The gold used included 4,134,547 oz. in bullion, and 685,892 in old light coins; 4,820,439 oz. in all. The coinage of aluminum pieces is the only example of such use of that metal, we believe.

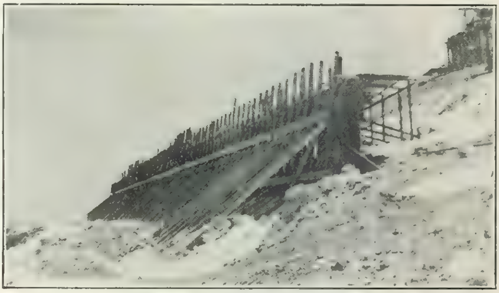
The Goldfield Consolidated Mill

The new mill now in course of construction for the Goldfield Consolidated Mines Company, at Goldfield, Nev., which is expected to go into operation in November, will include a crushing plant, stamp mill and amalgamation plant, concentrating plant, regrinding and amalgamating plant, cyanide and filtering plant and refining plant. The ore will be brought to the crushing plant over an elevated trestle in cars and delivered to the bins, from which it will be fed into a No. 7½, style "K," Gates breaker. The product of this machine will be delivered into an iron frame Gates revolving screen, 48 in. in diameter by 14 ft. long, the oversize being delivered into two No. 4, style "K," Gates crushers with specially constructed heads for fine crushing. The product from these crushers, together with the undersize from the revolving screen will be delivered to the stamp mill by a 26-in. belt conveyer which travels up an incline. The conveyer will pass an automatic weighing and recording machine which automatically records the weight of ore delivered to the mill.

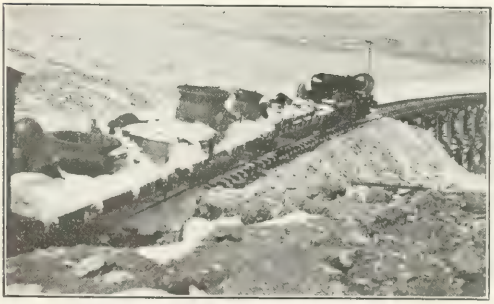
FOUNDATIONS FOR CRUSHING PLANT

FOUNDATIONS OF BATTERY FLOOR AND ORE BINS

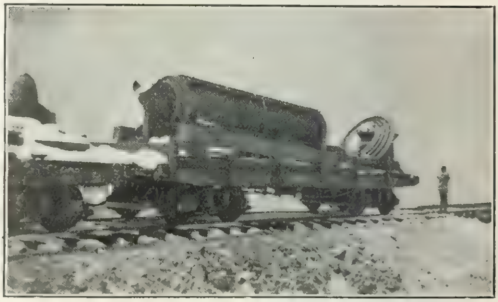
TRESTLES LEADING TO CRUSHING PLANT



WALL, LOWER END TUBE-MILL FLOOR



THE FIRST CARLOADS OF MACHINERY



SCREEN FOR THE CRUSHING PLANT

The discharge from this conveyer is so planned that a sample can be taken automatically from the stream of ore as desired, the sample being cut down to the required size for assaying by an arrangement of automatic samplers, crushing rolls and sample grinders, delivering the ground sample to the sampling floor.

The ore from the conveyer will be delivered upon a 26-in. belt conveyer extending entirely across the bins above the stamps, and will be automatically distributed into these bins by a reversible self-propelling tripper. The ore, drawn from these bins through gates, will be delivered to the batteries by Challenge suspended feeders. The batteries will in-

---

NOTE.—A detailed description of this mill will appear in an early issue of the JOURNAL.

clude 100 stamps, each weighing 1050 lb., arranged in batteries of 10 with five stamps in a mortar. The batteries are set on concrete foundation and are provided with special extra-heavy mortars for this purpose weighing about 11,000 lb. each.

The product from the stamps will be passed over amalgamating plates and then through an amalgam trap into a cone classifier or sizer. The overflow from these classifiers will be delivered to the concentrating tables and the spigot product to the tube mills through six Dorr mechanical classifiers to remove the slimes which are to be sent directly to the cyanide plant. The coarse sands will go to six 5x22-ft. tube mills, provided with silex linings and Danish flint pebbles, to be reground. The product from these mills will pass through six cone classifiers to remove any remaining coarse sands which will be returned by spiral sand pump back to the mills for further grinding. The fine product, after passing over amalgamating plates and through amalgam traps, is to be delivered to the cyanide plant.

In the cyanide plant the pulp will first be subjected to treatment in agitating tanks for the required time and then delivered to the pulp storage tanks, from which it will be drawn into the Butters vacuum-filtering system where the solution will be removed and the residue discharged. The gold-bearing solution will be precipitated by zinc dust and the solution returned for re-use.

The entire mill will be driven by induction motors arranged for individual drives. The capacity of this plant will be about 600 tons a day. The machinery is furnished by Allis-Chalmers Company. The accompanying illustrations show the plant soon after the beginning of construction. The plant was designed under the direction of J. K. Mackenzie, general manager of the company; F. L. Bosqui, consulting metallurgist, and G. B. Shipley, representing the Allis-Chalmers company.

Copper in British East Africa

According to a report of the commissioner of mines, copper has been found in British East Africa in the valley of the Tsavo river, which flows from Kilimandjaro eastward. The discovery was made by prospectors, who have been seeking for metals for a long time in the country about the Uganda railway.

The principal deposit lies about 70 km. eastward from the station of Tsavo on the Uganda railway, and consists of a quartz lode parallel to the railway carrying copper. The lode extends from the foot of the Kiulu mountain through the Tsavo valley in a southeasterly direction.

Besides the copper, the quartz contains gold in small quantities. Assays made in Nairobi show 30 per cent. of copper.

Hunter Dredge, Oroville, Cal.

The "Hunter" dredge shown in the accompanying illustration was erected at Oroville, Cal., in 1907, for the Oro Water, Light and Power Company and has been working placer ground averaging 38 ft. in depth from water line to bedrock. The hull is trussed along the well-hole line with an overhead structure. The bow gantry, supporting the digging ladder and buckets, is constructed so as to minimize warping of the bow pontoons. The buckets, each of 5 cu. ft. capacity, are close connected, and are provided with heavy, maganese steel lips. There are 82 buckets in the chain. A revolving screen, 6 ft. in diameter by 26 ft. long, having sections of perforated plates graduated to the size of material handled, disintegrates the gold-bearing gravel and clay under pressure from an 8-in. centrifugal pump. The gold is washed free from the gravel during its passage through the revolving screen and is carried through the perforated plates to a system of gold-saving tables under the screen. The tables are furnished with riffles of wood shod with iron. These catch the fine gold as it drops from the screen.

[illegible]

Large stones and boulders rejected by the revolving screen are passed through a hopper and carried well astern of the dredge by means of a 30-in. belt conveyer.

There are two winches on the boat, both placed forward; one on the port side, by means of which the digging ladder is raised and lowered; the other on the starboard side carrying the auxiliary lines used in swinging the dredge from side to side. The digging ladder is held up to the face of the cut by means of a steel spud 24x36 in.x50 ft. long.

A wooden spud is also provided, of the same dimensions as the steel spud, and this is chiefly used to move the dredge forward when a new cut is necessary. In the [illegible] raised and lowered until the dredge has stepped ahead to the position required.

This machine is operated entirely by electric power, current being delivered at 4000 volts and transformed on the dredge to 400 volts. The motors are all of the Westinghouse type "C. C. L." for the constant speed, and type "F" for those having a variable speed.

The entire cost of the dredge is $90,000, ready for operation; 106,000 cu.yd. of gravel were recently handled by this machine in one month's run, and still better results are looked for as soon as the machine reaches ground which is easier to handle.

The dredge was erected by the Western Engineering and Construction Company, of San Francisco, the dredging machinery proper being supplied by the Bucyrus [illegible]

Shaft Sinking on the Rand

The Brakpan Mines, Ltd., which holds the record on the Rand for fast shaft sinking in vertical shafts, has made a new record by sinking the inclined portion of the shaft 223 ft. during the month of June. The incline starts from the vertical portion of the shaft at a depth of 306 ft., and had at the end of June a length of 580 ft. The broken rock was hoisted from the inclined shaft by a 4x5¼-in. air winch, and through the vertical shaft by a 10x15-in. hoist, the rock being transferred at the curve where the two parts of the shaft meet. The inclined portion of the shaft is timbered only with sills placed at 7-ft. centers; the dip is 13 deg. and the size 19x7 ft. Holman 3¼-in. drills were used. By bratticing off one of the compartments an excellent ventilation was obtained so that the men could return to work quickly During the month 35 shifts were worked, 1376 holes, or 306 per round, of an average depth of 5 06 ft., were drilled, and 114 cases, each holding [illegible]

The Westby-Sorensen Process

By E. P. Jennings*

Experiments were made at the Utah Consolidated smelter, near Murray, Utah, in 1905 and 1906, to determine if a practical method could be devised to absorb and utilize the gases from the roasters which were discharging daily 400 tons of sulphur dioxide into the air. Plans and estimates had been furnished by a New York chemical engineer for a coke tower plant to absorb the SO_2 by water, but this would require 40,000 tons of water daily if a 1-per cent. solution were made, and the disposal of this amount of acid water would be as serious a problem as that presented by the smoke itself.

George C. Westby, a chemist employed at the smelter, discovered that the reverberatory slags could be decomposed by a dilute solution of sulphurous acid and the copper contained in them recovered. Experiments were conducted along these lines which showed that finely ground slag was readily decomposed, the iron and other bases, including copper, going into solution. It was also found that moistened slag was readily attacked by the hot gases (300 to 500 deg. F.), taken directly from the roasters. If the absorption of the gas and the dissolution of the slag could be accomplished in one operation, the process would be simplified and the amount of water would be greatly reduced.

The gases from the McDougall roasters contained from 2 to 5 per cent. SO_2 with traces of SO_3 and thionates, the average composition of the slag being: SiO_2, 39.6 per cent.; FeO, 53; CaO, 2; MgO, 1; Al_2O_3, 3; S, 1; Cu, 0.4. Twenty per cent. of the copper was in the form of Cu_2O; the remainder was matte. The process as proposed by Westby and Sorensen, the inventors, is: (1) The treatment of finely divided, moistened slag by sulphurous smoke whereby decomposition of the slag is effected; the bases being converted into sulphites, sulphates, and thionates; (2) the precipitation of the copper by the thionate in the solution upon the application of heat; (3) the recovery of the iron. This is of minor importance and need not be described. The process is also applicable to the treatment of lead and zinc slags, and the recovery of their contained metals.[1]

Initial Experiments

The first experiments were made in a wooden tower 50 ft. high and 2 ft. square, fitted with a large number of narrow shelves and connected with the outlet flue of a McDougall roaster, the gas being drawn through the apparatus by an aspirator. Slag wool was made by blowing steam through a stream of molten slag; the product, which was about one-third wool and two-thirds granules, was distributed on the shelves of the tower by the aid of a stream of water. Roaster gas, together with a small amount of water, was turned in, and the absorption of SO_2 and the solution of the slag began immediately. Slag wool was charged from time to time and the experiments were varied from day to day by changing the amounts of gas, wool, and water used.

The absorption of SO_2 often reached 90 per cent. when the tower was properly charged with fresh slag wool. This would continue for several hours, or until the gelatinous silica which formed began to coat the undissolved slag; then the rate of absorption would begin to diminish, but would still be satisfactory for many hours. The solutions from this tower were of a dark red color, due to the presence of ferric sulphite, and contained about 1.5 per cent. iron and up to 0.03 per cent. copper, some of which was derived from flue dust drawn in with the gas. Sulphates, thionates, and a little free SO_2 were always present. Copper could be precipitated completely from this solution, as Cu_2S by heating. An excess of water far above the actual requirements, was used to prevent the slag from clogging on the slats. This diluted the solutions and lowered their temperature below the point at which they would be most active, as well as allowing the absorption of a little SO_2. The experiments with this tower were considered successful from a chemical point of view, but the actual working of the apparatus was unsatisfactory because its operation could not be made continuous on account of the wool clogging on the slats.

Modifications of the Apparatus

The next experiments were made with a cylindrical tank 40 ft. long and 12 ft. in diameter, placed horizontally and capable of being revolved slowly. This tank was provided with shelves or baffles to increase the wetted surface and to produce a greater agitation of the slag and water. One end of the cylinder was connected with the outlet flue of a McDougall roaster and the other end with a tower 60 ft. high and 10 ft. square, filled with shelves similar to the first tower. Provision was made for admitting a regular supply of wool and water to both the tank and tower. Tests made with this plant gave excellent absorption. In one instance it was complete, but the tank was subject to numerous breakdowns that were both expensive and annoying, and its capacity was not proportional to the power required to operate it. Moreover the ratio of wetted surface to weight and cubical contents was too small for economical work.

Another plant, in which the agitation was obtained in a more inexpensive manner, was built. In consisted of a rectangular tank 40 ft. long, 15 ft. wide and 11 ft. deep, supplied with three revolving cylinders 10 ft. in diameter and 14 ft. long, supported by wooden axles. The cylindrical surface was formed of cocoa matting fastened to cross pieces in such a way as to form a series of ridges. These cylinders were placed at right angles to the course of the gases and made three revolutions per minute. Slag crushed to 40 mesh was substituted for the slag wool of former experiments. Good results, so far as absorption was concerned, were obtained in this modified apparatus, but the design and construction was poor and frequent breakdowns occurred. Sufficient tests were made with the plant to show that crushed slag was as efficient as slag wool in absorbing sulphur dioxide. The work was abandoned after these experiments for reasons not known to me, my connection with the work having ceased some time before.

In the original process all the copper was expected to be dissolved and recovered later by some precipitation process. As 80 per cent. of the copper in the slag was in the form of matte, it was desirable to oxidize this to render it more soluble in the dilute acid solution. This was found to be readily accomplished by the combined action of the steam and air in the wool-blowing operation. In all the experiments with the first tower, the copper passed into solution. Although it was known that it could be precipitated by boiling, the reaction did not take place in the tower since the temperature of the gas was not sufficient to heat the volume of water used; but with the larger plant the temperature was higher and the copper was precipitated and mixed with the undecomposed slag and flue dust, and the process became one of concentration by the removal of a large percentage of the slag. The residue, which contained all the copper of the dissolved slag, together with that derived from the flue dust and undissolved matte, was rich enough to smelt direct in a reverberatory.

With this modified method, the need of oxidizing the matte was removed and finely ground slag could be substituted for slag wool. Some matte was always dissolved by the action of the iron salts and free acid but was precipitated, together with the copper contained in the slag as oxide, by the combined action of heat and thionates which were always present. The failure of the process at the Utah Consolidated smeltery was due to the mechanical devices employed. If finely ground slag had been used in the first experimental tower instead of imperfectly made slag wool, which was difficult to handle in the plant, the results would, in my opinion, have been successful, both in the absorption of SO_2 and in the continuous operation of the plant.

The requirements of the process are simple. The contact of a slowly descending stream of finely divided, moistened slag with the hot ascending smoke is required. This could undoubtedly be accomplished in a tower fitted with a large number of shelves, placed at an angle, that would act as retarders to the slag and water. The shelves would increase the wetted surface greatly and in this way assist in the absorption. The separation of the silica is not a serious matter as the greater portion is retained in the solution until it has passed out of the tower.

---

*Mining engineer, Salt Lake City, Utah.

[1] U. S. patent No. 875,222, Dec. 31, 1907.

This process differs in several particulars from the method proposed by James W. Neill for leaching copper ores with sulphurous acid, as shown in the accompanying comparison.

COMPARISON OF NEILL AND WESTBY-SORENSEN PROCESSES

NEILL PROCESS	WESTBY SORENSON PROCESS
Treatment of copper ore with cold SO or roaster smoke in the presence of a large amount of water.	Treatment of slag by direct contact with hot roaster smoke and small amount of water.
Production of dilute solutions of sulphites and sulphates.	Production of saturated solutions, if required, of sulphates, sulphites and thionates.
Precipitation of the cuprous salts as cupro-cupric sulphite by heat, followed by the precipitation of the cupric salts by iron or other suitable reagent.	Complete precipitation of copper as sulphide in one operation.
Excess of SO_2 is essential to prevent separation of copper; requiring coke tower as an auxiliary if complete absorption is required.	Practically complete absorption of sulphur gases in one operation
Low temperature required to prevent separation of copper.	High temperature aids the reactions.
Oxidation avoided.	Oxidation desired.
Narrow application to oxidized copper ores	Wide application to slags and ores

The Westby-Sorensen process has the advantage over the filtering devices installed at a few smelters, in that it retains all the dust and fume, removes the sulphur gases and recovers the metals in the slag. The cost of installation and operation would be about the same as for a "bag house" of equal capacity.

The Iron Industry and Resources of Canada

SPECIAL CORRESPONDENCE

The report for 1907 of the Mines Branch of the Canadian Department of Mines,[1] recently published, and prepared under the direction of Dr. Eugene Haanel, is largely devoted to the iron resources of the Dominion. The statistical information embodied in the report as to the mineral production of Canada during 1907, representing a total value of $86,183,477, has already been given in a preliminary report published some months since. In addition to this feature the report presents the results of investigations made by the officials of the department with the object of promoting the mining and metallurgical industries in various parts of the country.

IRON ORE IN BRITISH COLUMBIA

One of the most important of these inquiries was undertaken by Einar Lindeman, who investigated the iron-ore deposits on Vancouver and Texada islands, British Columbia, and local conditions generally with a view of ascertaining the prospect for the establishment of the iron industry in that province. His report is to the effect that as regards ore supply, the deposits on Texada island and at Head bay, Klaanch river and Quinsam river on Vancouver island are of sufficient magnitude to furnish ore to a blast furnace for a number of years. These deposites of magnetite ore are all low in phosphorus, but as a rule high in sulphur, though not sufficiently so to render them unfit for smelting. The coal output of the collieries on Vancouver island for 1907 is estimated at 1,325,000 tons, with a coke production of about 17,000 tons. The coke contains from 15 to 16 per cent. of ash, but by more careful separation of the shale the ash could be reduced to about 12 per cent. The limestone deposits are of great extent and unusual purity, and would furnish an inexhaustible supply of excellent fluxing material. The deposits of raw material being adjacent to the coast are favorably situated for transportation, and shipments could be made all the year round direct to a furnace anywhere on the coast line. So far conditions for the establishment of an iron industry are favorable, the only drawback being that labor cost is higher in British Columbia than in other parts of Canada.

MAGNETIC SURVEYS FOR IRON ORE

Mr. Lindeman also made a magnetic survey of the iron-ore deposits on the Nipisiquit river, 15 miles from Bathurst, N. B., the results of which demonstrate the utility of magneto-metric surveys of magnetite, as it was found that the commercial value of the property did not consist in the deposits previously known, but in a large orebody on the other side of Austin brook, discovered by magnetic survey, and of which the value was proved later by boring. The location of the boreholes was fixed from indications of the magneto-metric survey. The property has been sold to a syndicate which will shortly begin operations.

Examinations by B. F. Haanel into reported iron ore occurrences near Penetanguishene, Ont., showed that there was no deposit of economic importance.

ELECTRIC PROCESSES FOR STEEL MAKING

The report contains a description of the Lash steel process, considered in regard to its application to an electric furnace for producing steel direct from iron ore, furnished by the Canadian Lash Steel Process Company, Niagara Falls. Successful experiments with the Lash process in the case of the open-hearth furnace on a commercial scale, indicated its possible availability for electric smelting. In this process finely divided ore is intimately mixed with carbon, a certain quantity of carboniferous iron—such as cast-iron borings or granulated pig iron—sawdust and fluxes suitable for the ore under treatment. The working of the process can be explained by comparison with the open-hearth ore process—which consists in forming a bath of molten pig iron and then adding thereto a sufficient amount of ore (iron oxide) to reduce the carbon content of the metal to the desired amount. The oxygen of the ore combines with a certain amount of the carbon in the pig iron forming carbon-monoxide gas, and setting free the iron of the ore to mix with the bath of molten metal. In this way a mixture of approximately 75 per cent. pig iron and 25 per cent. ore can be worked up. But in the Lash process the proportions are very different, for a large proportion of ore can be used with a small percentage of carboniferous iron. A typical mixture has the following percentage composition: Iron ore, 54; cast-iron borings, or granulated pig iron, 27; sawdust, 4; limestone, 4; coal-tar, 3; coke, 8 per cent. These constituents are in a fine state of division and intimately mixed; when heated to a high temperature the reactions that occur are similar to those found in the open-hearth furnace. The cast-iron borings correspond to the molten bath of pig iron and react with the ore, but the latter being in large excess, it is necessary to supply a certain amount of free carbon in the form of coke for the complete reduction of the ore. The great economy of the process lies in the substitution of a large amount of ore for pig iron or scrap. In using the Lash mixture in the open-hearth furnace, it is necessary to have a bath of molten metal, as otherwise it would not be practicable to heat it to the reacting temperature without losing carbon in the mixture by combustion. If, however, the charge is put into an electric furnace, no difficulty of the kind is met with, since the gas in an electric furnace is neutral, in contradistinction to the oxidizing atmosphere of an open-hearth furnace. Experiments—using the Lash mixture—have been made in the electric furnace on a small scale with successful results.

The average cost of the materials in Canada for the production of 100 tons of steel ingots in the regular open-hearth furnace is placed at $20.70 per ton; it is claimed that using the Lash mixture in the electric furnace this could be reduced to $16.22 per ton, and that by its use the technical difficulties which have hitherto prevented the commercial production by electricity of steel directly from the ore will be overcome. Arrangements have been made to test various electrical furnaces with the object of ascertaining those forms to which the Lash process is applicable.

---

[1] "Summary Report of the Mines Branch, Canadian Department of Mines, for the fiscal year 1907 S." Pp. 100; 8½x6¼ in., paper. Ottawa, Canada; King's Printer.

The Ferrites, Compounds of an Iron Acid

Oxide of Iron Forms a Number of Insoluble Salts When Heated in Contact with Zinc Oxide as in Roasting Ferruginous Blendes

BY J. S. C. WELLS*

Some time ago I was called upon to investigate a new process for the treatment of complex zinc ores, and the question of the possible formation of an insoluble compound of zinc and iron was an important one. The only literature on the subject available at the time was Prof. H. O. Hofman's article,[1] and a short reference by Ingalls,[2] both of which indicated the probable formation of such a compound, i.e., a zinc ferrite, not ferrate as it is there called. The ferrate would have the composition, $ZnFeO_4$, but as these compounds are unstable, there is almost no chance of its formation under the conditions existing in the roasting furnace. The composition of the normal ferrite would seem to be $ZnFe_2O_4$ (ZnO, Fe_2O_3).

Pelouze[3] in a paper published in 1851 describes the formation of a calcium ferrite, and gives its composition as $4CaO$, Fe_2O_3, containing 41.66 per cent. Fe_2O_3, and 58.34 per cent. CaO. His discovery of the compound was accidental. He was examining an earthy iron mineral containing considerable lime, and noticed that the yellowish white precipitate formed by adding potassium hydrate to a hydrochloric acid solution of the mineral changed after a few hours to a white one. On examination it was found to have the composition $4CaO$, Fe_2O_3. He made other experiments using ferric and calcium chlorides in varying proportions and always obtained a precipitate having the composition given. He describes it as "a light amorphous powder of a perfect whiteness," which when boiled with water containing carbonic acid or a soluble carbonate is decomposed and changed to a brick red color, the lime forming carbonate, and the ferric oxide being set free.

Analogous Compounds

Alumina and chromium oxides were also found to form similar compounds, but containing different proportions of lime. In the same volume[4] Ebelman described an aluminate of magnesium, or a spinel, which he had made in 1847, and which was crystalline and identical in all its properties with the native mineral; also an aluminate of zinc (zinc spinel or gahnite) which he made by fusing in a porcelain furnace a mixture of alumina, zinc oxide and boric acid, the alumina and zinc oxide being in nearly equivalent proportions. A mass of small octahedral crystals was obtained, transparent, and colorless, which scratched glass without difficulty. The specific gravity of the crystals was 4.58 and their composition, 55.9 per cent. Al_2O_3 and 44.1 per cent. ZnO, corresponding to the formula ZnO, Al_2O_3.

He also prepared a chromite of iron, obtaining it in octahedral crystals and having all the characteristics of the native mineral, also chromites of magnesium, manganese and zinc, corresponding to the formulas MgO,Cr_2O_3, MnO,Cr_2O_3, ZnO,Cr_2O_3.

The only ferrite he prepared was the ferrite of zinc which was obtained as small black crystals, octahedral in form and very brilliant. They scratched feldspar with difficulty, were slightly magnetic, had a specific gravity of 5.13, and were insoluble in cold dilute hydrochloric acid; the powder was dark brown. Their composition by analysis was, Fe_2O_3 66.5 per cent., ZnO 33.8 per cent., corresponding to the formula ZnO, Fe_2O_3, containing 66.4 per cent. Fe_2O_3 and 33.6 per cent. ZnO.

TABLE I.

No.	Proportion of Iron to Zn. Fe Zn.	Per Cent. Zn. Obtained as Ferrite.	Per Cent. Iron as Ferrite.	Hours Heating.	Remarks
1	56 : 65.4	50	100	2	Temperature bright red.
2	56 : 65.4	48.5	97.	2	Temperature bright red.
3	56 : 65.4	48.5	97.	2	Temperature bright red.
4	28 : 65.4	24.3	100.	2	Temperature bright red.
5	14 : 65.4	12.87	100	2	Temperature bright red.
6	7 : 65.4	7.97	100.	2	Temperature bright red.
7	112 : 65.4	41	41	1	Dull red over Bunsen burner.
8	112 : 65.4	99.	99	1	Bright red.
9	112 : 65.4	99.	99.	2	Bright red.
10	112 : 65.4	43.9	43.9	1	Red heat.
11	112 : 65.4	99.4	99.4	2	Red heat for 1 hour and 1 hour over blast lamp.
12	112 : 65.4	96.6	96.6	2	Bright red.
13	56 : 65.4	48.5	97.		Part of No. 3 heated over blast lamp.

He calls attention to the analogies between this compound and the mineral franklinite. The characteristics of the latter are all very similar to those of the zinc ferrite; both crystallize as regular octahedrons, are black with metallic luster, their powders are deep brown, and their densities are almost identical, 5.09 and 5.13.

The work of Pelouze and Ebelman has been confirmed by other investigations, and there seems no doubt that under certain conditions ferric oxide (Fe_2O_3) acts as an acid, also that the other sesquioxides, Al_2O_3 and Cr_2O_3 act in the same way.

Cobaltic oxide, Co_2O_3, should probably also be added to the list for Rinman's green is probably a cobaltite of zinc (x ZnO, Co_2O_3) for I find that it can be made by igniting a mixture of Co_2O_3 and ZnO at a high temperature.

Formation of Ferrites in the Laboratory

The fact that ferrite of zinc does exist seeming thus to be well established, the next step was to determine under what other conditions it could be formed, and if it is likely to be produced in the roasting of ferruginous zinc ores. With this object in view I have made a series of tests, varying the conditions in different ways. Instead of using zinc oxide, as was done by Professor Hofman, a solution of zinc sulphate mixed in varying proportions with an iron salt was used in most cases. In this way the substances were in molecular contact and conditions were more favorable for a complete reaction than would be the case if a mechanical mixture of the dry oxides were employed.

As a solvent for the unacted-on zinc oxide I used a solution containing 200 grams ammonium chloride, 500 c.c. strong ammonia (sp. gr. 0.90) and 750 c.c. of water, the same as given by Low for the analysis of zinc ores. This was found to be a more reliable solvent for zinc oxide than ammonium carbonate, the latter sometimes failing to dissolve the oxide after it has been heated to a high temperature.

The results given in Table I were obtained by precipitating mixtures of iron and zinc sulphates with ammonium sulphide, filtering, and drying the precipitated sulphides, and then roasting in a muffle, first at a low heat and then in most cases for two hours at between 800 and 900 deg. C.

My idea in thus precipitating them was, as before stated, to obtain them in molecular contact, and to approach as nearly as possible the conditions under which we may suppose a ferriferous blende to be formed in nature.

---

*Columbia University, New York.

[1] *Trans. A. I. M. E.*, Vol. 35, p. 856.

[2] Metallurgy of Zinc and Cadmium, pp. 6 and 32.

[3] *Ann. de Chim. et de Phys.*, Series 3, Vol. 33.

[4] *Ann. de Chim. et de Phys.*, Series 3, Vol. 33, p. 34.

Temperature and Contact

The results show that when the temperature is sufficiently high, and the amount of zinc present is not less than one molecule of the oxide to one of the ferric oxide, that practically all of the iron is converted into ferrite and makes a corresponding quantity of zinc insoluble.

The ferrite obtained in Nos. 8, 9, 11, 12, was a light brown powder, very slightly magnetic, and soluble in hot hydrochloric acid (sp. gr. 1.10). A sample of the same digested with cold sulphuric acid (10 per cent.) for 18 hours yielded 20 per cent of the zinc in the acid solution.

Test No. 13 was made to see if it were possible, at a high temperature and with an excess of zinc, to form a more basic salt than ZnO, Fe_2O_3; but this does not seem to be the case, at least under the conditions obtaining in the test. As will be seen later on it would seem that basic compounds are formed during the roasting of zinc ores on a large scale.

In Nos. 14 and 15, Table II, are given the results obtained by evaporating mixtures of ferric and zinc sulphates and igniting the residue in a muffle. It was noticed during the evaporation that the two sulphates seemed to have separated to some extent, which may account for the difference in the results. In No. 16 a mixture of the sulphates was made alkaline with caustic soda and allowed to stand for six days at the room temperature, then filtered, and the precipitate without drying was treated with the ammonium chloride solvent until the washings gave no test for zinc. The results show either that the reaction in the cold is very slight, or it may be that in the hydrated condition the ferrite is soluble in the solvent used to dissolve the zinc oxide.

TABLE II

No.	Fe : Zn	Per Cent. Zinc as Ferrite.	Per Cent. Iron as Ferrite.	Time of Heating.	Remarks.
14	112 : 65.4	69.3	69.3	2	Temperature bright red
15	112 : 65.4	97.4	97.1	2	Temperature bright red
16	112 : 65.4	5.2			Precipitation by NaOH in cold solution.
17	112 : 65.4	27.			Precipitated by NaOH in boiling solution.

TABLE III

No.	Fe : Zn	Per Cent. Zinc as Ferrite.	Per Cent. Iron as Ferrite.	Time of Heating.	Remarks.
18	56 : 65.4	38.6	77.2	2	Temperature bright red
19	56 : 65.4	47.9	95.8	2	Temperature bright red
20	56 : 65.4	40.2	80.4	1	Temperature bright red
21		49.6	99.2	2	Temperature bright red
22	112 : 65.4	94.			Temperature bright red
23	112 : 65.4	90.2			Temperature bright red and 1 hour over blast
24	1 : 2.1	54.7	100		Temperature 1000 deg. or over

In No. 17 a similar mixture was precipitated with caustic soda, boiled for one hour, filtered and washed with boiling water, and the precipitate treated with the ammonium chloride solution. In this case there is a much larger amount of ferrite formed, no doubt due to the high temperature.

Nos. 18, 19, 20, 21, Table III, give the results obtained when using mixtures of ferrous zinc sulphates. In these tests the proportion of iron to zinc is only one-half that in Table II, and the average amount of iron converted into ferrite is greater than that obtained in tests Nos. 14 and 15; but none of the tests using mixtures of the sulphates give as concordant results as when using the sulphides.

Nos. 22 and 23 show results obtained by heating a mixture of ignited ferric acid and zinc oxides to a bright red heat in the muffle; No. 23 was also heated over the blast lamp for one hour. These oxides were mixed very carefully by grinding in an agate mortar until they appeared perfectly homogeneous.

The results are decidedly different from those given by Professor Hofman, perhaps due to the fine grinding and thorough mixing as well as to the high temperature. No. 24 was a sample of calcines from a complex zinc sulphide ore that had been roasted in an Edwards furnace at a very high temperature, above 1000 deg. C. The percentage of insoluble zinc is very high and corresponds to a ferrite of the composition 4 ZnO, Fe_2O_3. The ore was "dead roasted;" so none of the zinc was left as sulphide.

Ingalls[5] joins the following table showing the results obtained by Prost in a sample of roasted zinc ore:

No.	Per Cent. Fe.	Per Cent. Zinc.	Zinc Soluble in Strong Ammonia
1	15.20	45.32	28.82
2	1.50	62.86	59.18
3	5.28	57.80	43.16

No. 1 would indicate the probable formation of a basic ferrite of the composition, 2 ZnO, Fe_2O_3, which would require 17.8 per cent. of the zinc to remain insoluble instead of 16.5 per cent., as given in the table. No. 2 corresponds to a ferrite of the composition 4 ZnO, Fe_2O_3, requiring 3.52 per cent. insoluble zinc instead of the 3.68 per cent. given. No. 3 probably has a similar composition requiring 12.42 per cent. Zn.

[illegible] in Practice

Burleigh[6] gives the results he obtained with an ore containing 32 per cent. Zn, 8 per cent. Pb, 14 per cent. Fe. This ore, when roasted to 0.18 per cent. S, only yielded 46 to 48 per cent. of zinc oxide soluble in caustic soda. This would indicate the formation of a basic ferrite having the composition 2ZnO, Fe_2O_3. The same ore quickly roasted to 3½ per cent. S., gave 78 per cent. of the zinc in a soluble form.

In all these results obtained from roasting on a large scale the ferrite formed seemed to be a basic one and not the normal one, ZnO, Fe_2O_3. From all the results noted it would seem that if a blende contains iron it is almost certain to form a ferrite during roasting, and the more intimate the mixture the greater will be the amount produced.

If the ore should consist of separate particles of blende and pyrite it is probable that the greatest amount of soluble zinc oxide would be obtained by roasting the ore in as coarse a condition as possible and so prevent to some extent the contact of the two oxides. When the iron and zinc sulphides are intimately mixed, it would seem to be almost a hopeless task to obtain all the zinc in a soluble form.

So far as it concerns the smelting of zinc ores, the production of ferrite is of little importance, except for the extra amount of heat necessary for its decomposition, an amount which is probably small. In leaching processes, however, it is of very great importance and no doubt accounts for many of the failures in that line.

Ferrous Ferrite

When making the tests on zinc ferrite it occurred to me that if it could be formed in the ways mentioned that it ought to be possible to make ferrous ferrite, Fe_3O_4, in the same manner; so some iron salt was precipitated with ammonium sulphide, and the air-dried precipitate used for the tests. A portion of it roasted at a red heat gave, as was to be expected, nothing but Fe_2O_3. Another portion heated carefully to 200 deg. C. gave a strongly magnetic residue, evidently consisting of Fe_3O_4, although some of the iron had oxidized to Fe_2O_3. Some of the original sulphide that had been left on the filter paper for several days was distinctly magnetic, probably due to the formation of magnetic pyrite or pyrrhotite, as this residue still consisted largely of sulphide.

---

[5] Metallurgy of Zinc and Cadmium, p. [illegible]

[6] [illegible]

If ferrous and ferric sulphates are mixed in the proportion of one equivalent of each and the mixture precipitated with sodium or potassium hydrate a black precipitate forms having exactly the same appearance as iron sulphide. It is no doubt a ferrous ferrite FeO, Fe_2O_3, or Fe_3O_4.

The formation of a magnetic sulphide and of magnetic oxide of iron, the latter by the oxidation of ferrous sulphide (FeS) at a comparatively low temperature may be of interest to our friends, the geologists.

Finished Iron and Steel Production

The production of rolled iron and steel in the United States in 1907, according to the report of the American Iron and Steel Association, was as follows, in long tons, showing a total increase of 276,354 tons, or 1.4 per cent.:

	Iron.	Steel.	Total.
Rails	925	3,632,729	3,633,654
Structural shapes...	3,973	1,936,379	1,940,352
Plates	30,277	2,629,783	2,660,060
Sheets	43,761	1,545,011	1,588,772
Nail-plate	15,095	36,932	52,027
Wire-rods	1,550	2,016,033	2,017,583
Forging billets	691	227,091	227,782
Merchant bars	1,440,356	2,530,632	3,970,988
Skelp	444,536	1,358,091	1,802,627
Splice-bars	10,115	183,108	193,223
Hoops	....	200,168	200,168
Bands & cotton-ties.	4,650	469,529	474,179
All other kinds	204,157	899,250	1,103,407
Total	2,200,086	17,664,736	19,864,822
Total, 1906	2,186,557	17,401,911	19,588,468

The production of forged iron and steel in various forms in 1907 was: Iron, 23,772; steel, 357,033; total, 380,805 tons, an increase of 28,164 tons over 1906.

Iron blooms, slabs, billets and bars made in charcoal bloomaries from pig iron and scrap in 1907 were 84,623 tons, a decrease of 10,376 tons from 1906. No blooms or billets are now made directly from ore, the last Catalan forge in the United States—Helton forge in North Carolina—having been abandoned in 1901.

The production of nails and spikes in the United States in 1907 was, in kegs of 100 lb. each:

	Iron.	Steel.	Total.
Cut nails and spikes..	309,968	799,170	1,109,138
Wire nails	......	11,731,044	11,731,044
Total	309,968	12,530,214	12,840,182

There was a decrease of 80,101 kegs of cut nails, but an increase of 244,397 kegs of wire nails, as compared with the previous year. Cut nails last year were only 8.6 per cent. of the total, wire-nails being 91.4 per cent.

Reopening Old California Mines

Special Correspondence

A recent feature in California mining has been the reopening of old mines and the revival of old districts, which were abandoned years ago as unprofitable. Many instances could be given, those which follow being the more prominent.

The once famous old Mariposa mine on the Fremont or Mariposa grant in Mariposa county is about to be reopened, and again worked after many years idleness. At the old mill-site a 10-stamp mill is being erected, and the main shaft is to be unwatered and retimbered. Leases will then be let on the different levels where bodies of paying ore are known to exist. Pay rock in quantities is known to exist also in the Stockton Creek end of the old mine. It is now the property of the Mariposa Commercial and Mining Company, which is preparing facilities for convenient and thorough working of the mine by leasers.

Another old and once productive mine being put in shape for thorough working again is the Idaho-Maryland at Grass Valley. The main shaft is being cleaned out and reopened to the 1000-ft. level, where the large pump has been under water several years. This once recovered, the entire mine may be unwatered. The main vertical shaft has already been retimbered to the 800 level, and while the rest of the unwatering is going on three shifts will work on the old 700 level north. When that is cleaned out, a drive will be made for the new ledge met in the 500 level. The main work is being done on the Idaho mine proper.

The old Boston mines, in Mokelumne river district, Calaveras county, at one time worked on an extensive scale, are being reopened by the Boston Consolidated Mines Company. The Boston itself is a quartz property carrying ore which can be worked to a profit in these days. The placers were worked in the early fifties, but considerable ground is still left. Power may now be obtained from one of two companies, and the extensive holdings can be developed and worked more cheaply than was the case during former operations.

The old camp at Darwin, Inyo county, profitably worked 40 to 50 years ago, has been inactive for many years, and was virtually given up when silver and lead declined in commercial value. Now the opening of the smelter at Keeler, and the advent of the new railroad to Mohave have made the abandoned properties of value again. In addition to this there have been recent discoveries of free-milling gold ore, and the old camp is experiencing a revival. The old Defiance has lately been surveyed, and the owners are deciding on the best method of operating it. The Lucky Jim is being operated by Boston men, and is making shipments of ore to the Keeler smelter. The Christmas Gift is also shipping some ore. The Rio Tinto copper mine has been acquired by Ely, Nev., men, who will work it; and an extension of the Modoc has been located and is being worked. In addition to these old mines a number of new ones are being opened and developed.

When the silver mines in the vicinity of Daggett and Barstow in San Bernardino county were in full blast years ago, extensive mills were built and operations carried on upon a large scale. At that time all the prospectors in the vicinity were searching for silver ores and hundreds of prospect holes were dug. Finally, when silver mining did not pay, the mines and mills were closed and the population left. For some years after a few leasers did more or less work, but not of any extensive character. Now all the old claims which were not patented have been relocated, and numbers of new ones have been taken up in the district and are being worked for gold. Most of these new gold claims are within a few miles of Barstow, but one of the groups, the Fremont, is 18 miles north on what is supposed to be the same mineral belt. The last named group is being worked on an extensive scale, as are other groups of gold properties in the vicinity. At two of the groups within a few miles of Barstow new mills are about to be erected for working the gold ores.

Production of Arizona Mines in 1907

Special Correspondence

In 1907 the Territorial Legislature, of Arizona, passed a law requiring all mining companies, whose production in one year had a gross value of $3750, or more, to file with the county assessor and the Territorial auditor a statement in detail of the gross product. These reports are used as a basis for assessment, the law providing that the valuation for assessment purposes of all productive mines shall be 25 per cent. of their production for the year. The valuation of the metals is determined by the average value in New York for a year, and for 1907 the figures reported by the Engineering and Mining Journal were accepted, as follows: Gold, $20.67 per ounce; silver, 65.327c.; copper, 20.004c. per lb.; lead, 5.325c. per pound.

The returns for the year 1906 and 1907 have become available, but this is the first time that a condensed report of every productive mine in the Territory has been compiled and tabulated in the detail presented for 1907 in the table herewith.

The statement represents practically the total mineral production of Arizona, as the output of any mines which produced in a year, metal valued at less than $3750, is negligible. The gold, silver and copper production is itemized in all instances, and where there was any production of base metal it has been figured in the total valuation, but not itemized. The base metal production in the Territory, however, is not important, as its value in 1907 was only about $150,000 in all.

A comparison between 1906 and 1907 is as follows:

	1906.	1907.	Change.
Producing companies	62	79	I. 17
Copper, lb	255,012,155	252,784,698	D. 2,227,457
Gold, oz	125,015	118,375	D. 6,640
Silver, oz	2,704,045	2,423,723	D. 280,322
Total value	$53,801,781	$54,788,674	I. $986,893

The output in Yavapai county and in Cochise county, in the famous Warren district, shows a slight decrease in 1907 from 1906, while in Gila and Graham counties, the other two great mining districts of the Territory, increases were made. The totals for the Territory show a slight decrease in production, but an increase in valuation, owing to the higher average value of copper for the year. In 1908 it is expected that production will not be lessened materially.

Development work was carried on all through the year and 17 new companies came into the productive class.

STATEMENT OF THE GROSS PRODUCT OF MINES AND MINING CLAIMS OF ARIZONA IN 1907.

Compiled from the Verified Statements Filed with the Territorial Assessor.

	Name of Company.	Location.	Copper, Lb.	Gold, Oz.	Silver, Oz.	Value
	Cochise County					
1	Copper Queen Consolidated	Bisbee	66,916,972	4,197	338,723	$13,694,107
2	Calumet & Arizona	Bisbee	30,039,473	5,647	154,359	6,226,664
3	Superior & Pittsburg	Bisbee	9,602,553		55,465	1,957,128
4	Shattuck-Arizona Copper	Bisbee	5,091,542			1,018,512
5	Tombstone Consolidated	[illegible]		6,321	454,412	[illegible]
6	Commonwealth Mining and Milling	Pearce		2,734	314,898	262,228
7	Arizona Consolidated	[illegible]	245,040		3,123	51,058
8	Bonanza Belt Copper	[illegible]	[illegible]		7,126	18,832
9	Copper Belle	Clifton	[illegible]	[illegible]	20,843	32,962
	Coconino County					
10	Canyon Copper	Grandview	[illegible]		468	16,507
	Gila County					
11	Old Dominion Copper	Globe	[illegible]	2,407	69,067	4,754,703
12	United Globe Mines	Globe	[illegible]		12,382	688,041
13	Gibson Copper	Globe	3,340,777			668,289
14	Saddle Mountain Mining	[illegible]	1,751,264	[illegible]	[illegible]	360,461
15	Arizona Commercial Copper	Globe	1,638,610		1,644	328,862
16	Warrior Copper	Globe	1,397,612		325	279,791
17	Live Oak Mining	Globe	588,347			117,693
18	Keystone Copper	Globe	208,801			41,769
19	D. D. Sullivan and others	Globe	67,021			13,407
20	Globe-Arizona Copper	Globe	57,231		431	11,730
	Graham County					
21	Arizona Copper, Ltd	Clifton	30,794,092			6,160,050
22	Detroit Copper	Morenci	[illegible]	[illegible]	4,814	3,476,660
23	Shannon Copper	Clifton	[illegible]	950	34,038	*2,217,735
24	New England & Clifton Copper	Clifton	[illegible]	62	[illegible]	410,397
25	Standard Copper	Clifton	[illegible]			99,477
26	Gila Valley Copper	Safford	[illegible]	[illegible]	233	*22,732
27	Standard Consolidated Copper	[illegible]	[illegible]	1,717		18,704
28	Ash Peak Mining	[illegible]			18,214	[illegible]
	Maricopa County.					
29	Rebel Gold Mining	[illegible]		[illegible]		10,522
	Mohave County					
30	Gold Road Mining and Exploration	Gold Road		21,597	10,397	453,210
31	Arizona-Mexican Mining and Smelting	Wallapai Dis		384	[illegible]	*63,149
32	Gold Star Mining and Milling	Wallapai D		1,962	6,634	[illegible]
33	Cerbat Mountain Mining	[illegible]		655	[illegible]	14,329
34	Chloride Gold Mining	[illegible]		[illegible]	4,701	*11,519
35	Schee Brothers	Wallapai Dis	16,930	17	3,564	6,059
	Pima County					
36	Imperial Copper	[illegible]	5,267,401		63,170	1,094,958
37	Oxide Copper	Silverbell	319,591		3,338	66,112
38	Helvetia Copper	Helvetia	191,666		1,394	[illegible]
39	Mineral Hill Consolidated	Pima District	169,538		1,478	[illegible]
40	Paymaster Consolidated	Pima District	64,735		[illegible]	[illegible]
41	Twin Buttes Mining and Smelting	Twin Buttes	94,056		[illegible]	[illegible]
42	El Tiro Copper	Silverbell	68,023			[illegible]
43	Omega Copper	Helvetia				[illegible]
44	Pontotoc Copper	Tucson	51,536			[illegible]
45	Gould Copper	Tucson	45,036			[illegible]
46	Pontotoc Copper	Tucson	40,553			8,112
47	L. D. Chillson	Pima District	21,712			[illegible]
	Pinal County					
48	Kelvin Calumet Copper	Ray	178,516			35,710
49	Silver Queen Mining	Superior	108,027	[illegible]	[illegible]	*31,924
50	Mohawk Gold Mines	Mammoth		1,151	[illegible]	23,907
51	Lake Superior & Arizona	Superior	92,120	189	1,041	23,011
52	Casa Grande Mining and Smelting	Casa Grande	86,344			[illegible]
53	Copperosity Copper	Casa Grande	72,698			14,543
54	Sultana-Arizona Copper	Riverside District	45,838		[illegible]	9,595
	Santa Cruz County					
55	Duquesne Mining and Reduction	Duquesne	421,487		9,622	*95,662
56	Frank & Josephine Powers	Harshaw	16,733		106,628	*74,210
57	Santa Cruz Mines and Smelter	Mowry	5,117	37	17,659	*43,802
58	C. B. Wilson	Patagonia	54,486		3,789	13,371
	Yavapai County					
59	United Verde Copper	Jerome	33,015,457	11,734	[illegible]	7,080,126
60	Ideal Mining and Development	[illegible]	361,257	12,005	117,583	397,212
61	De Soto Mining	[illegible]	1,016,170	933	22,216	[illegible]
62	Arizona Exploration	[illegible]	922,263	786	19,657	213,552
63	Congress Consolidated Mines	Congress		9,100	13,855	197,147
64	Poland Mining	Poland		4,217	16,609	*130,466
65	Tiger Gold	[illegible]	19,010	4,313	9,938	*100,870
66	Octave Mining	[illegible]		2,393	7,899	*59,283
67	American Copper and Gold	Blanchard	3,933	1,253	35,491	*56,705
68	Geo. A. Treadwell Mining	[illegible]	18,063	47	1,157	*34,128
69	Interior Mining and Trust	[illegible]		1,616		33,403
70	Yaeger Canon Copper	[illegible]	[illegible]		3,893	31,719
71	Lincoln Gold Mining and Milling	[illegible]	2,568	[illegible]	[illegible]	*31,220
72	Commercial Mining	[illegible]	125,598			25,125
73	Lone Pine Mining	[illegible]	91,098	[illegible]	[illegible]	*24,641
74	Spar Mining	[illegible]	3,098	151	3,660	*9,525
75	Rincon Mines	[illegible]		366	366	*8,562
76	Independence Mining	[illegible]		217		4,474
	Yuma County					
77	King of Arizona	[illegible]		12,022	[illegible]	251,622
78	Harqua Hala Mining	Harqua Hala		1,440	309	[illegible]
79	A. B. Rodgers, Manager	[illegible]				19,775
	Totals		252,784,698	118,374	2,443,723	*$54,788,674

---

* Includes a production of base metal figured in the value of the product but not itemized.

† Value of product estimated.

Chemical Control of Coal Washers

Methods of Sampling Preliminary to Laboratory and Physical Tests. Washery Determinations where a Calcium Chloride Solution Is Used

BY RANDOLPH BOLLING*

Coal washers operating with the Feldspar jig require careful chemical control in order to remove the impurities, slate and pyrites, and at the same time to prevent losses in coal passing over with the slate refuse. In the system of coal washing adopted by the Nova Scotia Steel and Coal Company, at the Sydney mines, the methods of operating are as follows: Slack coal from collieries Nos. 1, 3, and 5, is assembled at the disintegrating department of the washery and is crushed to pass a one-half inch, and a one-quarter inch screen. The half-inch coal passes over what are known as the coarse jigs and the quarter inch size and "duff" (fine coal and dust) goes over the fine jigs. Sizing of the coal is accomplished by a shaking screen with water jets playing on the plates; the separated sizes are carried by trough and flushing system to the different jigs arranged in two batteries of four each. The slate refuse from the coal-washing process is carried by an 8-in. pipe flushed with sea water to the sea beach 900 ft. away.

FIG. 1. GENERAL VIEW OF NOVA SCOTIA STEEL AND COAL COMPANY PLANT

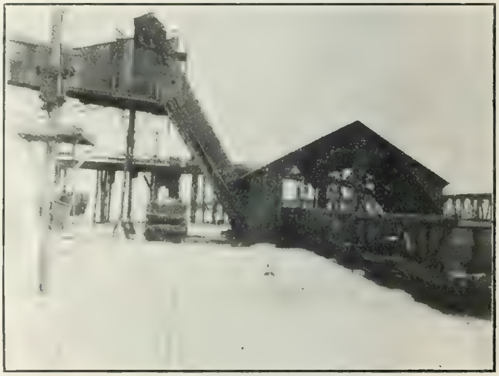


FIG. 2. ELEVATING RAW SLACK FROM 6-TON HOPPER TO ROBINS BELT CONVEYER

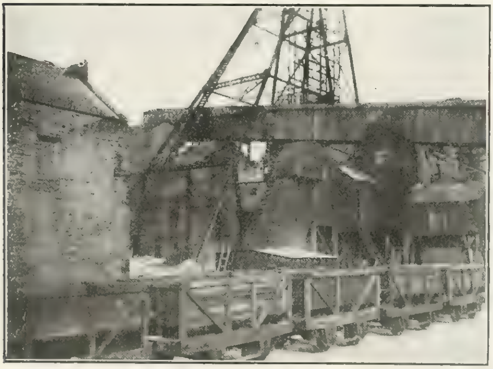


FIG. 3. SHOWING ROBINS CONVEYER DELIVERING SLACK TO WASHERY

FIG. 4. SOUTH SIDE OF WASHER BUILDING, SHOWING TANK FOR RECEIVING WASHED SLACK

Sampling of Raw Slack

Cars are dumped at the elevator boot and samples taken from every third bucket of the elevator to the crushing rolls. These samples are quartered down and one-quarter is reserved for chemical analysis; also one-quarter remains for the physical test. These portions are weighed in tarred pans and dessicated on a steam plate. The sample for chemical analysis is placed in the drum of a ball mill which is rotated by a 2 h. p. electric motor until reduced. The physical test sample is crushed in a laboratory jaw crusher to pass a half-inch sieve.

Sampling Washed Slack and Slate

The discharge from the washed slack chute of each battery of jigs is caught at regular intervals of 10 min. in sacks and placed in large cans with perforated bottoms, the mixture is allowed to stand four hours to drain and is then mixed, quartered and dessicated, and made into two samples, one of which is ground in the ball mill and the other is reserved for physical test. The slate is caught in sacks at the same time as the slack. In this system, the fresh water is kept circulating in the jig department by a large centrifugal pump and samples of the water are taken every hour.

---

*Chemical engineer, 610 W. Franklin street, Richmond, Virginia.

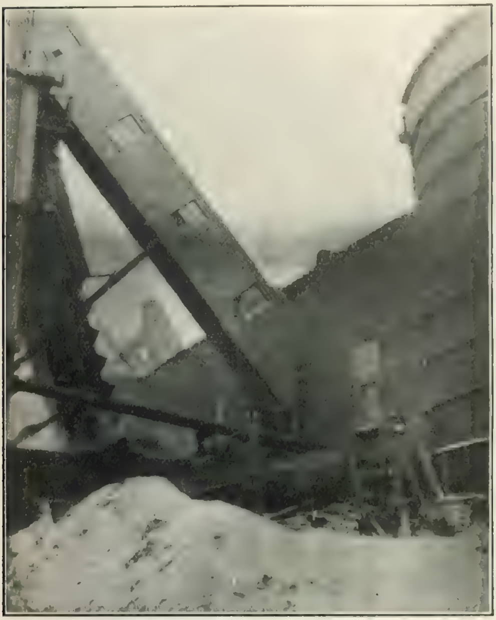


FIG. 5. ELEVATOR FROM WASHER TO TOWER, AND PIPES CARRYING SEA WATER FOR SLATE FLUSHING

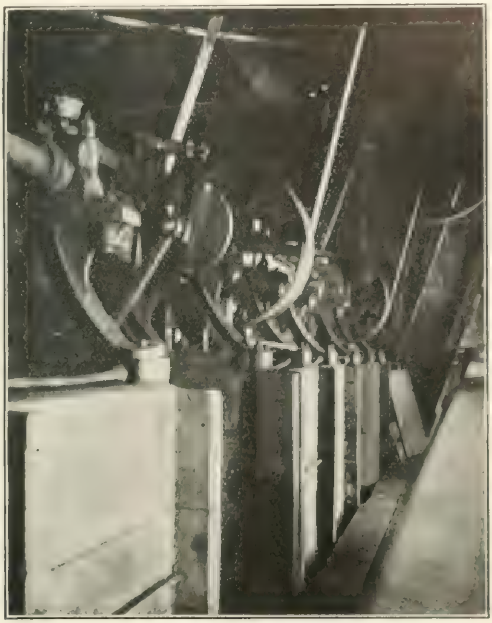


FIG. 6. SHOWING ECCENTRIC AND PLUNGER BOX OF LUHRIG FELDSPAR JIGS

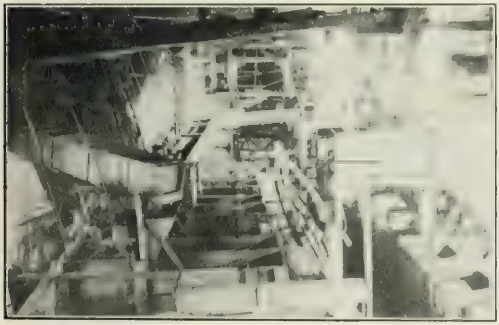


FIG. 7. GENERAL INSIDE VIEW OF WASHERY, SHOWING SIZING SCREEN IN BACKGROUND

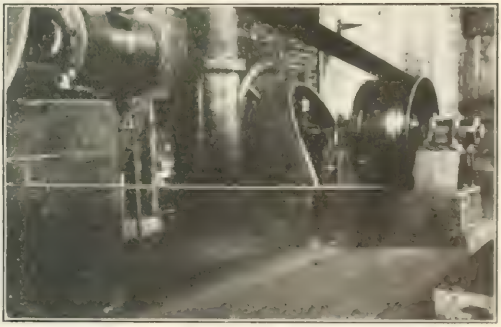


FIG. 8. CENTRIFUGAL BELT-DRIVEN CIRCULATING PUMP FOR ENTIRE PLANT

LABORATORY METHODS

As the plant works two shifts of ten hours and handles about 900 tons in 24 hours all samples are grouped so that each lot represents the work of each shift.

For chemical analysis, 1 gram of raw coal is weighed into a 10 c.c. platinum crucible with lid, and heated 7 min. over the full flame of a ½-tube bunsen burner; the crucible is supported by a platinum triangle. The sample is cooled in a dessicator and weighed, the loss being reported as volatile and combustible matter. The crucible is now heated to a low red to avoid fusing the ash until the coke is burned off, the sample is weighed again, and the loss reported as fixed carbon. This weight minus the weight of the empty crucible gives the weight of ash.

Sulphur is determined by the Eschka-Fresenius method; 1 gram of coal is ground up with soda-magnesia powder, using 3 grams, and the mixture is then transferred to a 40 c.c. platinum crucible; the coal is here incinerated at a low heat to avoid blowing out at first and is finally finished at bright red heat. The powder is transferred to a 100 c.c. beaker, boiled with distilled water, and washed by decantation twice on a 9 c.c. S. and S. No. 589 paper, and finished by wash bottle irrigation. The filtrate is caught in a 400 c.c. beaker and we then add 15 c.c. of bromine water, 5 c.c. of hydrochloric acid, 1.20 sp. gr., and the solution is boiled on an electric hot plate until colorless. A pipette is now used to add 10 c.c. of 10 per cent. barium chloride and the solution is allowed to stand overnight. The barium sulphate is filtered on a Gooch crucible with asbestos felt; the precipitate is then washed, ignited, cooled and weighed, and the weight multiplied by the factor 0.1375. The result is reported separately as sulphur. The washed coal and slate receive the same chemical treatment as the raw coal.

Physical Tests

By far the most important tests for control are those of a physical nature. Only one reagent is required, a standard solution of calcium chloride having a specific gravity of 1.35, or 39 deg. Baumé. This solution is made up in carboy lots by stirring commercial lump calcium chloride (crystals) until the hydrometer floats at 1.35 sp. gr.

Method of Operation

About 200 grams are weighed out and used in testing raw coal or washed slack. In testing slate, 100 grams is sufficient. Either of these quantities are placed in a one liter beaker and the calcium chloride solution is poured in with constant stirring until the beaker is completely full. The coal must be thoroughly wetted with the solution. The beaker should be allowed to stand 10 min. to allow deposition of all slate and fine pyritic dust.

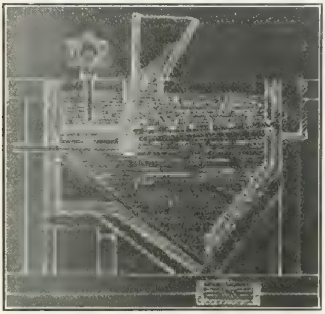


FIG. 9. DESIGN OF LUHRIG JIG FOR COARSE JIGGING

The pure coal which floats at the top is scooped out with wire gauze dippers and these are plunged into a beaker of water to free the coal which promptly sinks to the bottom of the beaker holding water. After skimming off the coal and washing it by decantation with water, it is filtered on open pore filter paper, dried and weighed; the slate can be determined by difference, but I usually calculate it directly. The calcium chloride solution is used over and over again, its density is kept up by new lump calcium chloride and it can be siphoned off so as to obtain it clear.

Reporting Determinations

The following is a sample report of washery determinations:

Chemical Analysis

Raw Coal to Washer.

	Moisture.	Volatile and Combustible Matter.	Fixed Carbon.	Ash.	Sulphur.
No. 1 slack.	4.86	29.11	56.73	14.87	2.14
No. 3 slack.	5.96	28.38	57.38	14.23	2.09
No. 5 slack..	6.51	23.11	54.27	22.61	2.45
Average.	5.77	26.87	56.13	17.23	2.23

Washed Slack Made

13 86	34 94	60 71	4 33	1 51

Slate Refuse from Jigs.

8 90	21 80	37.10	41 10	4 06

Calcium Chloride Tests

	Per Cent. Floating.	Per Cent. Sinking.
No. 1 slack	89 50	10 50
No. 3 slack	89.90	10 10
No. 5 slack	80.70	19.30

Raw Coal Mixture

Total ash	11.04	Total sulphur	2.30
By jigs, total ash	2.96	Total sulphur	1.23
By calcium chloride total ash	2.36	Total sulphur	1.10

Slate Refuse from Jigs

Ash........... 48.55 Sulphur........ 3.40

Slate Refuse by Calcium Chloride

Ash........... 55.56 Sulphur........ 3.47

(11.04—2.36) = 8.68 Free slate = combined ash, 2.36

(2.30—1.10) = 1.20 Pyritic sulphur=organic sulphur, 1.10

By Calcium Chloride

Slate, 11.04 ÷ (11.04 — 2.36) = 78.62 percentage of reduction.

Sulphur, 2.30 ÷ (2.30 — 1.10) = 53.00 percentage of reduction.

By Jigs

Slate, 11.04 ÷ (11.04 — 2.96) = 73.18 percentage of reduction.

Sulphur, 2.30 ÷ (2.30 — 1.23) = 46.52 percentage of reduction.

Slate Refuse Analysis

Percentage of coal float recovered from slate, 29 per cent.

Percentage of slate and pyrites sinking, 66 per cent.

	Coal Floated.	Original Sample.	Clean Slate.
Volatile and combustible matter.	34.50	21.80	15.10
Fixed carbon	62.00	37.10	14.80
Ash	3 50	41.10	70.10
Sulphur	1.77	4.06	6.37

Jig Water

	Grains per mp. Gal.
Pure from pipe line, total solid	3.17
After 1st hour, total solids	10.40
After 2d hour, total solids	15.90
After 3d hour, total solids	20.00
After 4th hour, total solids	29.90
After 5th hour, total solids	35.99
After 6th hour, total solids	42.04
After 7th hour, total solids	59.21
After 8th hour, total solids	65.14
After 9th hour, total solids	75.40
After 10th hour, total solids	89.90

The Feldspar beds on the jigs require close watching and the depth and stroke of the plunger should be regulated in accordance with the amount of impurities that have to be handled by them. However, with a close control system, and special determinations on the jigs, good work can be done. The general average specific gravity of the various materials is shown in the following table:

Specific gravity of slate	3 838
Specific gravity of coal	1.260
Specific gravity of bone	1.290
Specific gravity of pyrites	4 680

In Great Britain during 1907 there were 71 shaft accidents resulting in the loss of 97 lives, a figure considerably in excess of the average for the last 25 years, and a total which has only been exceeded three times and equaled twice during that period.

The Manufacture of Coke in Northern West Virginia

By James W. Knowlton*

The chemical properties of coke consist of moisture, volatile matter, fixed carbon, ash, sulphur and phosphorus. Moisture is variable, but can be largely controlled by a good coke-boss. The higher the moisture, the more heat that will be needed at the furnace to drive it off. Moisture becomes excessive when the coke is watered too much, or when the coke is drawn too hot and a second watering is required after the coke is on the ground. This latter system not only makes the moisture high but spoils the color of the product. The coke should be watered dead the first time, unless water runs from the oven door.

The volatile matter in coke is the unconsumed gases of the coal which have not been entirely eliminated in the process of burning. When the volatile matter is high, there are probably black ends in the coke. In furnace work, this is a loss for the iron manufacturers, and can be avoided by the coke-boss seeing that the oven is burned off before watering down. The ash is the troublesome part, and here is where the mine-foreman should pay particular attention. As to the necessity of some ash, it is true that there could be no coal or coke without this constituent. Ash forms a nucleus around which the carbon is deposited, and is to the coke what the skeleton is to the human body. Ash gives us considerable trouble in the Upper Freeport seam, and eternal vigilance on the part of the mine foreman is needed to keep this constituent as low as possible. Besides a 2-in. binder of slate, the seam here worked contains much boney coal. This boney matter begins about 4 ft. from the bottom.

There is a natural parting between the boney and the clean coal, and if care is exercised, little of the boney coal will get into the ovens. In the headings when this dirty coal is taken down, considerable care has to be exercised to carry the clean 4-ft. section ahead; when both sections are mined, it is almost impossible to separate the bone from the coal in the dim light of the mine. In the rooms, only the 4-ft. section is mined. Shooting on the solid should not be permitted, as it blows into small pieces the binder of slate, thus making it impossible to separate the clean from the dirty coal. This system of shooting also mixes in more or less boney top coal, which is undesirable.

After making hundreds of analyses of our 4-ft. coking section, I am convinced that with the binder out, the coal will not run over 8 per cent. in ash, which would make about 12 per cent. ash in the coke. Therefore, when the coke runs over 12 per cent. in ash it results from dirty mining.

---

*Chemical engineer, Elkins Coal and Coke Company, Morgantown, W. Va.

Sulphur and Phosphorus

The amount of sulphur in a coal is of great importance. The limit of this element has been placed at 1.2 per cent., but we try to have our coke run less than 1 per cent. Sulphur in coal generally occurs in the form of pyrite; the sulphur has five-eighths the heat value of carbon, but the iron combined with the sulphur has a disagreeable habit of making the ash run and thus form clinkers.

Phosphorus, the only other important element, is said to impart fluidity to coal and to act as a flux. There is nothing to guide the operator, as to the quantity of phosphorus, so far as physical appearance is concerned. A chemical examination is, therefore, the only course open to the coke producer, and it is advisable to make a thorough chemical examination of the measures, both vertically and longitudinally at regular points.

There is an increasing demand from furnace-men for low phosphorus coke, which usually means a coke containing about 0.015 per cent. of phosphorus. In view of the fact that the whole of this element in the coal goes into the coke, the maximum for the coal may be considered at about 0.010 per cent. to produce a coke with a maximum phosphorus content of 0.015 per cent. The physical characteristics of any good coke are as follows: Hardness of body, well developed cell structure, and lack of cross fractures. Hardness of body results from the carbonization of the charge from the top down as is done in the well known bee-hive type of oven. Most observers have noticed the bright deposited carbon at the top of coke; this condition is especially true where heavy charges have been burned off in hot ovens. The coke from by-product ovens lacks this luster, as here the gases are drawn off in the process of coking. For this reason, bee-hive oven coke is generally considered superior to by-product oven coke.

The coking property of a coal is due largely to some certain form of combination of the volatile matter, as well as to the total percentage present. In a typical coking coal, there seems to be an absence of cleats; it breaks more in the form of prisms.

The geological conditions in this field are the same as those of the Connellsville region. Our No. 1 mine lies directly in the Connellsville basin. Chemically, there is but little difference, and our main problem is merely a question of getting the proper percentage of ash. The coke made from Pocahontas coal is chemically more pure than ours, but does not have the same physical requirements in crushing strength; it also takes more pounds of coal per ton of coke, owing to the low volatile matter in the Pocahontas coal. The scarcity of coking coals of merit compared with the amount of other classes of fuel makes these Northern West Virginia fields worthy of note.

Methods of Operation

At present we are using the most modern system of bee-hive oven practice, including machines to draw and load the coke. The coke-drawing machine has come up to expectations as a labor-saving device in that it admits of drawing and loading the coke at less than one-third the labor costs involved in hand-drawing; however, the abrasion of the coke in the conveyers and the coke dust in the various parts of the machine has made the cost of repairs considerable. Furthermore, the coke is broken up more in this method than by hand-drawing, making 50 per cent. more ashes and breeze; the great advantage is that less men are required. Rectangular ovens of various shapes and sizes are being experimented with, and the next few years will probably bring forth some interesting developments.

The Use of Cement for Tubbing in Deep Shafts

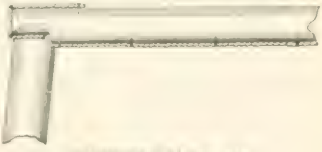
The great depth now attained in mine shafts in water-bearing soil renders tubbing difficult and costly, by reason of the increasing pressure which the tubbing has to resist; as a consequence, the iron circles or rings have to be made much thicker than heretofore. A new system of tubbing has recently come into use in France and has proved satisfactory. It consists in employing for any depth, rings not thicker than those ordinarily used (¾ in.), as they are not required to support the pressure coming from the water behind them; this pressure is borne by an interior banking of armed cement in the form of rings of any required depth, which act as supports to the iron rings with which they are placed in contact. The principal object of the rings is to protect the armed cement from contact with the water. The thickness of these rings of cement may be calculated according to the general rules governing the pressure they are called on to support.

When installing tubbing by this method, first place the thin iron tubbing in the ordinary way, ascending or descending, singly or in layers as desired. At intervals place water faucets to give exit to the water coming from behind the tubbing, conduct this water to the interior of the mine by means of temporary pipes so as not to interfere with the "banking" of the armed cement. This lining wall is made in rings of varying depths according to circumstances. When the cement is hardened on the surface of the section of the tubbing extending between two water-tight passages, the faucets mentioned, for which a corresponding passage through the cement has been reserved, are closed. The tubbing is then in position, supported by the cement lining; the joints are well soldered, which prevents any great quantity of water from coming in contact with the cement; subsequently, through their taps, an injection of thin cement is forced under pressure behind the tubbing. This latter mixture completely seals up all the issues to the water, insuring in this way indefinite preservation of the work.

Such a system of tubbing can be easily kept in repair, for, if at any point a filtering of water is observed, the taps in the neighborhood can be opened in order to overcome as much as possible the pressure at this point; after the pressure is thus relieved, the annular section of cement is demolished and the process commenced over again. The advantage of this method consists in the fact that iron tubbing of ¾ in. thickness, instead of 4¾ in. for a shaft 19.8 ft. in diameter represents an economy of 20 tons of iron for each 3.3 ft. depth of the shaft; also it would be virtually impossible to obtain iron tubbing of more than 4¾ in. thickness in cases where it might be required.

Reinforced Timber Cap

A simple method of adding to the strength of a timber cap upon which heavy pressure is likely to be exerted has been put into operation at a couple of German mines. It consists in nailing a piece of discarded wire rope, [illegible]



REINFORCED TIMBER CAP

diameter, to the underside of the cap, as shown in the illustration, allowing the ends to lap up over the ends. The weight of the rocks coming on these ends assists in holding the rope secure. Caps armored in this way have seldom been known to break transversely.

According to P. N. Dennison, "for thawing large quantities of dynamite, it is best to have a thaw house heated by hot-water pipes, the radiators being at the back or sides of the building and protected by a wooden partition. If it is arranged that the cartridges may be laid out on grooved shelves, each stick by itself, so much the better, for each cartridge will then obtain a uniform and regular heat. The house should be so constructed that a man could not get in on the explosive side at all; the door should open directly on the dynamite shelves. A door in the rear would enable a man to make the necessary repairs on the radiators."

Colliery Notes

The North Franklin colliery at Shamokin, Penn., is to be fitted with an electric underground hoist from the Buck Mountain seam, the first of the kind in the region.

The coal mines of the United States consume annually about 15,000,000 tons of coal for steam purposes. The railroads of the country consume 125,000,000 tons per year.

About 25 per cent., or over 120,000,000 tons, of the soft coal produced in the United States is machine mined. The average output per machine per year is estimated to be 10,000 tons.

An increase or decrease of atmospheric pressure has little or no effect on the volume of air passing through a mine in a given time, although it alters the weight of the air, which is a point of much importance.

The large deposits of peat in America which have hitherto been of small value may prove to be of great worth if the recent experiments of a French chemist in distilling alcohol from peat proves to be practical.

Loblolly and pitch pine are readily treated by the open-tank method of preservation. By immersing first in hot and then in cold, preservative fluids, green timber can be penetrated to a depth of 1 in.; by aqueous solutions of zinc chloride, common salt or creosote, dry timber is capable of being penetrated to a depth of from 4 to 5 inches.

The officers of the department of mines of Victoria, Australia, have invented a new diamond drill, called the "Pioneer Diamond Drill." It is portable, the total weight of the machine being only 400 lb. It can be worked either by hand or motor power, being capable of boring to a depth of 300 ft. by hand and 500 ft. by motive power. It bores a 2-in. hole, and produces a core 1⅛ in. in diameter.

In mines where electricity is used, much attention should be given to the wiring. The entrance to all butt-entries should be provided with switches, so that in case falls of roof or other accidents cause a short circuit or break in the cable, the trouble can be located with the loss of but little time. Wires should never be carried beyond the air current, and if possible, should be kept away from all gas.

Where seams are low and no gas is given off, electric locomotives for gathering purposes have a decided advantage over mule gathering. Where electricity is used, it is not necessary to brush the roof or take up the floor to make hight, as is often necessary in mule haulage. An electric locomotive can be used with as low a clearance as 3 ft., while mule haulage requires at least 5½ ft. clearance above the rail.

The following figures give the principal causes of fatal accidents in the anthracite mines of Pennsylvania during the year 1906, with the total percentage ascribed to each:

	Percentage
Falls of roof and coal	47
Explosions of gas	9
Mine cars	15
Explosions of powder, etc	6
Premature blasts	12
Total	89

This leaves but 11 per cent. for all other causes.

Hoisting accidents may be greatly reduced if not absolutely eliminated by observing the following points: (1) Have a good hand or foot brake attached to the engine in addition to the steam brake. (2) Have a plain indicator in proper working order, showing the passage of the cages in the shaft. (3) Have a code of signals that are thoroughly understood by those who use them. (4) Use improved detaching hooks, and automatic steam cut-offs. Above all employ only thoroughly competent engineers.

Gaseous mines should be provided with duplicate ventilating machinery. Fans and engines for use in such mines should have double the capacity of similar machinery designed for use in non-gaseous mines. To prevent the destruction of fans in case of explosion they should be placed as far back from the shaft mouth as is practical. The fan drift should be equipped with explosion doors placed directly over the top of the shaft. The fan should be so constructed that its action is reversible. Large slow-running fans give better results in gaseous mines than do small fans run at high speed, as they allow of greater expansion in the ventilating system.

A good tank for the preservative treatment of timber may be made from an old boiler. The latter should be set vertically in the ground to a depth of 5 ft.; it should be fitted with a double bottom, 1 ft. apart. In this space between the bottoms, run a coil of 1-in. pipe 20 ft. long, and containing a steam pressure of 110 lb. per sq.in. This amount of heating surface will give the preservative fluid a maximum temperature of 240 deg. F. Connect this coil to a 10-in. steam main. The timbers to be treated should be placed vertically in the tank, and kept in place by weights attached to their lower ends. A small hand derrick is necessary for handling the timber.

For mine flushing in Austria, clay, loam, fine sand and sandstone of rather coarse character are used; this mixture forms a dense packing similar in character to conglomerate. About 70 per cent. of the material used for the purpose is from ¾ in. to 3 in. in diameter. The proportion of water used for flushing is ½ to 1/3 cu.m. to 1 cu.m. of packing, which is a much lower percentage than is often deemed necessary for such work. The addition of a small percentage of coke dust has been found effective in hastening the drying of the material in the mine. Cast-iron flushing pipes with armored bends are used for this work. The average life of the bends is 25 weeks.

With coal that breaks easily and when the seam is steep and pitching, a practical method of lowering the coal from the working face to the gangway is by the use of a self-acting incline or jig. A balanced car or weight is pulled up the incline by a descending loaded car; the weight in its turn descends and draws the empty car to the working face. The balance car may be run on a narrow track between the car rails, or on a separate track in a parallel opening. The jig generally used on such an incline is a heavy cast-iron box, equal in weight to half the weight of the empty and loaded cars. If it is intended to run on a narrow track between the car rails it should be built low enough to allow the cars to pass over it.

An oil-burning locomotive is being tried in the Hazleton No. 1 and the William A. mines of the Lehigh Valley Coal Company. It is hoped that these engines will reduce the expense of mine haulage which has increased rapidly during the last few years. Such engines can only be used in mines free from gas. The oil burner at Hazleton No. 1 weighs 15,500 lb., and is 15 ft. long. It is equipped with four driving wheels 24 in. in diameter and runs on a track of 42 in. gage. The top of the smoke stack is even with the top of the boiler and the cylinder lies close to the sides. These engines have a capacity equal to 10 mules, and are capable of hauling from 12 to 15 loaded mine cars up a 3-per cent. grade.

According to a report of D. T. Randall, engineer in charge of the "Government smoke abatement investigation," the following conditions are necessary for a smokeless furnace: "The coal should be supplied to the furnace in small quantities at frequent intervals. The more nearly the feed approaches a continuous and uniform supply, the better the results. The air supply should be slightly in excess of the theoretical amount required and should be admitted at the front or rear of the furnace to burn the gases from the coal. The temperature in the furnace should be sufficiently high to ignite the gases given off from the fuel bed. There should be a fire-brick combustion chamber of sufficient dimensions and so designed as to cause the thorough mixture of the gases and the air, permitting complete combustion before the mixture reaches the boiler surfaces. The efficiency of the furnace depends upon the skill of the fireman, proper design of the furnace and boiler setting, character of the coal, capacity of the boiler and furnace and the load carried."

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec'y.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for July, 1908, was 44,500 copies.

August 1 12,000
August 8 9,500
August 15 9,500
August 22 9,500
August 29 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
 American Institute of Mining Engineers 429
 How to Sell a Mine 429
 The Indiana Coal Miners' Strike 430
 The Decline in Coal Production 430
 Prospects for Gold Output in California 430
*Zacatecas, a Famous Silver Camp of Mexico . . . . . . *Claude T. Rice* 401
Determination of Sulphuric Anhydride in Sulphuric Acid 407
Hydrocyanic Acid Poisoning . . 407
The Pyritic Origin of Iron Ore Deposits *H. Martyn Chance* 408
Hydrochloric Acid for Cleaning Cloths of Slime Filters 410
Mining in China 410
*Reclaiming Gravel Ground After a Squeeze . . . . . *J. J. Rutledge* 411
Mineral Production of Tasmania 412
*Douglas Smelting Works, Fundicion, Sonora . . . . . *B. P. Tucker* 413
Is China Clay a Mineral? *Special Correspondence* 415
Work of the British Mint 415
*The Goldfield Consolidated Mill 416
Copper in British East Africa 417
*Hunter Dredge, Oroville, Cal . . . 417
Shaft Sinking on the Rand 417
The Westby Sorensen Process *E. P. Jennings* 418
The Iron Industry and Resources of **Canada . . . . . *Special Correspondence*** 419
The Ferrites, Compounds of an Iron Acid . . . . *J. S. C. Wells* 420
Finished Iron and Steel Production . . 422
Reopening Old California Mines *Special Correspondence* 422
Production of Arizona Mines in 1907 *Special Correspondence* 422
*Chemical Control of Coal Washers *Randolph Bolling* 424
The Use of Cement for Tubbing in Deep Shafts . . 427
***Reinforced Timber Cap** 427
Colliery Notes 428
Correspondence:
 Sampling by Machines *John A. Church* 431
 Rocker for Washing Auriferous Gravel *A. R. Townsend* 433
 *Leading a Blast Hole ***H. L. Turner*** 433
 Overbalance Weight for Single Drum **Holst . . . . *S. A. Worcester*** 433
Questions and Answers 434
Patents 435
Opening the California Desert. *Special Correspondence* 436
Transvaal Mining Notes. *Special Correspondence* 436
Lead Production in Germany 436
Personals, Obituaries, Societies and Technical Schools 437
Special Correspondence 438
Mining News 440
Markets, etc 446
**Illustrated.*

American Institute of Mining Engineers

On account of the existing "labor" troubles in Alabama, the next meeting of the American Institute of Mining Engineers, which was to be held at Birmingham, Ala., will take place at Chattanooga, Tenn., beginning Oct. 1, 1908. Particulars will be sent to members by circular.

How to Sell a Mine

We might perhaps better entitle this article "How to Sell a Mine, and How to Finance Development Expense." We receive many inquiries of this character, which we are obliged to answer, as we feel, in an unsatisfactory manner, but we do our best to aid our correspondents. The man who tries to sell a mine, or to secure money to continue the development of one, is not necessarily aiming to fleece the unwary investor. On the contrary, we prefer to believe that most men are honest and are endeavoring to do a legitimate business. What then can be done to assist the honest owner of mining property who is seeking capital?

Here is a letter recently received, which is a type of many: "Please give me the names of two or three brokers in New York, who make a specialty of handling mining stocks and bonds; also names of promoters of mining property."

Another correspondent, whose letter was received in the same mail, desired to have the names of half a dozen good bond salesmen, who might be able to market the stock of a mining company. Both of these correspondents little knew what they were asking. There is an erroneous impression that there is in Eastern cities, particularly New York, a market for mines wherein they may be sold as real estate is sold among the board of real estate brokers. If there be any such market, we do not know of it.

Nevertheless, there is an active market for mines among the houses which make a business of the development of mineral property, such as the Guggenheim Exploration Company, the General Development Company, the Mines Selection Company, the Venture Syndicate, and several others. These companies are constantly on the watch for good mining property; indeed they do not wait passively for such to be brought to them, but they send out agents to find them. Any property presented for their attention receives careful consideration if it shows any sign of merit.

However, when we refer to these companies, the man who asks us how he can finance his mine, is apt to draw a long face, and remark, "It is useless to go to them; they will not consider my property unless I will give them the whole of it, and they will not be willing to pay me what it is worth." Now in this respect we do not suppose that the big mining houses are very different from anyone else in the business; i. e., everyone aims to drive the best possible bargain. Furthermore, there are few, if any, mining houses, that will not insist upon the control of the property which they are going to undertake.

The market for mines is not confined to the big houses. There are many smaller mining syndicates which do not figure so prominently in the public eye. Most of these are represented by a consulting engineer, who advises as to the purchase and operation of mining properties. It is, therefore, a good plan for the man who wants to sell his mine to address some of the well-known engineers (whose names and addresses are to be found in the professional directory published weekly in the JOURNAL) and inquire if any of their clients would be interested in what is offered. If the property offered is meritorious, the vendor may be fairly sure of developing interest in this way. But, again, he must be prepared to surrender the control of his property and also he must not expect to receive for it any more than it is worth.

This then is the real mining market, and when we have told about it, as above, we have given the best advice and assistance that we can. Any other species of mining market is amateurish or dishonest. By amateurish we mean this: An owner of a mine comes East to raise money, and putting up at the Waldorf aims to make the acquaintance of some person of means who will be attracted by the vision of great profit. (We refer to the Waldorf merely as an illustration; practically, its opportunities for such business are said [illegible]

After the failure which results nine times out of ten (or 99 out of 100) such persons have no further interest in mining. They are the amateurs. The sharks are the persons who seek anything—a mine, an [illegible] can be offered attractively to the gullible public. Neither the amateur or the shark has anything to do with the real mining market, although both buy mines, or alleged mines. However, the vendor or prospector who looks for assistance among such persons must seek it in his own way.

The Indiana Coal Miners' Strike

The strike of the miners in the bituminous coalfield of Indiana has been promptly ended by the president of the union. He reversed the action of the local authorities and insisted that the miners must abide by the clause of their agreement which provides that they shall not go out on strike while matters in dispute are subject to arbitration. In the Indiana case the trouble started over a comparatively trivial matter; but instead of submitting it to the board of arbitration, the district president ordered a strike. This the operators resented and threatened to withdraw from the agreement. Apparently there was the beginning of a long dispute, but it has been ended by the creditable action of President Lewis. The miners returned to work this week, and the original difference will be decided by the arbitrators.

The important point is the acknowledgement that the agreement is and must be binding on both parties—a point which the miners have not always been as ready to admit as they might. It is also an indication of the policy which is to be followed by the new officers of the union.

The strike in Indiana came just as the coal trade was beginning to recover from the depression of the earlier part of the year. If prolonged it would have seriously affected the Indiana mines in the competition which is sure to mark the revival of trade. Its early close will be a benefit to all parties.

The Decline in Coal Production

The appointment of a receiver for one of the larger coal-mining companies of Pennsylvania calls attention to the weakness of the coal trade which has resulted from the industrial depression. The returns of railroad traffic, which are made in sufficient numbers from various coal-producing sections to indicate the general course of the business, show that during the seven months of 1908 which have passed the production and shipments of steam coal have been only from 60 to 70 per cent. of those recorded in the corresponding period of 1907. So serious a loss in business is sufficient to strain the resources of many coal companies; and to this is to be added a reduction in prices resulting from the smaller demand. The loss in earnings is offset only in a small degree by lower labor costs. Fewer men are employed, of course, but there has been no material decrease in the wage scales; while the general expenses, fixed charges and depreciation are unchanged.

In the special case to which reference was made in our news columns recently, the company for which a receiver was appointed is itself entirely solvent, its present difficulties being due to an expansion of capital through the medium of a holding company, a device so popular in recent finances. The basing of capitalization on the business of a boom year has been followed by the trouble and complications that have arisen in so many other instances.

There has been no previous instance in which the reduction in the coal trade—like that in iron production—has been so sharp as in the present year. Coal and iron are closely connected, and it was inevitable that one trade should be largely affected by the other. While some recovery is now reported here and there, it is slow and gradual; so that the current year will probably be as conspicuous by its small coal output as 1906 and 1907 were by their great increases in production.

Prospects for Gold Output in California

The shortage of water thus early in the season, not only in the Mother Lode region of California, but at other important points, will have a very bad effect on the gold output of this year. Accounts are now coming in of various properties closing down on account of lack of water for power for hoists, mills, etc., and for washing gravel, as well as for furnishing electric current. The recent exceptional hot weather in the mountain and foothill region of the State has evaporated the water so rapidly, that the companies are having a hard time to keep their ditches flowing. The reservoirs are also losing these contents rapidly. The snow is now gone except in a few places in the high Sierras, and this is bad for people in the valley towns as well as those in the foothills, as electricity generated by water power now supplies light and power. The water in the rivers, on account of the light rains last winter and the continued heat, is at the lowest stage in years. Usually at this season there is plenty of snow in the Sierras, which feeds the streams, but this year snow is very light indeed. The Bay Counties Power Company has sent out a warning to people to be economical in their use of power. The South Yuba Water Company, which supplies Grass Valley, Nevada City, etc., has also officially warned the people and mining companies to be careful in the use of water.

The Mother Lode mines are frequently closed down in the fall for lack of water, but this does not generally happen with the mines in Grass Valley, the most productive quartz district in the State. In fact throughout the northern portion of California the streams are low and water is scarce. No rains of consequence are to be expected before November, so there are several months during which certain mining sections will not have water for power or washing purposes.

THE RECORD for treating low-grade gold ore comes very near being made by the Wanderer (Selukwe) mine, in Rhodesia, which reports for the year ended April 30, 1908, net earnings of 54.3c. per ton on a total extraction of $2.097 gold per ton. The mine is, practically, a large open quarry, from which there were taken last year 190,377 tons of ore at an average cost for mining of only 46.56c. per ton. Treatment costs were equally low, being only 37.48c. for milling and 41.28c. per ton for cyaniding. An addition of 20.6c. for general expenses brought the total costs up to $1.554 per ton. These figures, both for yield and costs, are lower than those of the Alaska-Treadwell, which have been generally accepted as the best made on a large low-grade mine.

THE PAYMENT OF its initial dividend by the Utah Copper Company marks the fructification of the first of the great enterprises for the mining of the disseminated copper-sulphide ore of the United States. The Boston Consolidated is gradually overcoming its difficulties and the Nevada Consolidated and Cumberland-Ely have begun to produce. Toward the end of 1909 these also ought to appear in the list of dividend payers. Next in order will be the Miami, at Globe, Ariz., which is developing a large orebody. The productiveness of these important mines marks a new era in the mining history of the United States.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sampling by Machines

When I sent to the Journal the article on "Sampling by Machines," I was certain the discussion would be received with the attention which the subject merits, and the three valuable contributions from Messrs. Austin, Argall and Mathewson justify my expectation. Mr. Mathewson hints that I may not have seen *modern* mills, and considering the number of sampling mills that have been built recently it is probably true that I have not seen the very latest; but since the Great Cobar mill, which I had under consideration is a very recent construction I think I cannot be accused of gravely considering antiquated plans. The Anaconda works themselves offer a justification for bringing the subject of sampling mills to the fore. There have been many descriptions of the great plant with pages of illustrations, but Mr. Mathewson's *modern* mills were so little thought of that the best description confines itself to saying that the mill is five stories high, covers 42x60 ft. on the ground and has a capacity of 600 tons. A lot of admiration has been written about the superstructure, but not a word upon the foundation of the whole business. Fortunately I am able to offer an example of modern design, although the plant is not yet running. The Balaklala mill for home ores has a shaking feeder to the first sampler and also to each pair of rolls that crush for subsequent samplings. The Balaklala custom mill has a shaking feeder to each of the first two samplers and each of the last two pairs of rolls, a difference worthy of notice. This is a great improvement over the haphazard delivery in the Cobar mill down to the last rolls, and it is undoubtedly debatable whether controlled feed to each and every machine is necessary, or whether a crusher and its sampler can be considered a coupled unit so closely bound together that controlled feed applied to one is sufficient for the other also. Experience alone can determine that question. The results of the Mathewson tests are of real interest in this aspect of the case.

RECENT OPINIONS ON SAMPLING

The Journal's three correspondents give us valuable indications of the conclusions to which competent and experienced engineers have come in regard to sampling, in other words, upon the state of opinion which governs the best sampling of the present day. Mr. Mathewson thinks that the tendency to what I may call automatic discrimination in mills has been overcome by reducing the length of spouts and using shaking feed for the crushers and rolls. Mr. Argall lays great stress upon a cut large enough to be fairly representative of the original mass of ore, undoubtedly an absolute essential. He, for instance, would increase the 15-per cent. cut on 3-in. ore of the Cobar mill to 25 per cent., and this very large increase is good evidence that there is not yet agreement among engineers on this subject. He also would increase very greatly the frequency to 25 to 50 of the cuts per minute and finally mix thoroughly after each crushing and feed "in a uniform and continuous stream" to the sampler.

I agree with Mr. Argall fully in emphasizing the importance of proportioning properly the size of the cuts. Such a succession as 15, 20, 15 and 15 per cent. again used at the Great Cobar seems to me illogical. If 15 per cent. is enough for 3-in. ore 20 per cent. is very much too large for 1-in., or ¾-in. material.

The frequency suggested by Mr. Argall, 25 to 50 cuts per min., seems to me excessive. Both of Vezin's sizers, Nos. 1 and 2, run at 20 r.p.m. No. 1 has a peripheral speed of about 195 ft., and No. 2 about 250 ft. From blueprints before me (unfortunately on a rather small scale) I judge that the sampling diameter is about 31 in. for No. 1 and 38 in. for No. 2, and speeds in the sampling circle are about 162 ft. and 199 ft. per minute. Compare this with the directions given by the makers of the Simplex sampler, "The best results are obtained with this machine when it is run at a peripheral speed of 175 ft. per minute," which figures out to 11, 15 and 24 r.p.m., for the three sizes. This gives a speed in the sampling circle (the sampler at the scoop edges having diameters of 47, 31 and 17 in.) of 136 ft., 122 ft., and 107 ft., or about 2.25, 2 and 1.8 ft. per sec. Paul Johnson gives his samplers speeds of 6 to 7 revolutions for No. 1, (3- to 5-in. ore), nine revolutions for No. 2 (¾- to 1¼-in. ore) and 12 revolutions for No. 3 (¼- to ½-in. ore); I do not know the diameter of the machines. Mr. Johnson has one spout (with provision for a second if wanted) on the first sampler and three spouts on each of the others which probably indicates his view of the requirements for good sampling of the different sizes. The Vezin has two spouts and the Simplex two.

[illegible]

Here we have a diversity of view which is worth discussion, and in spite of the justified reverence with which Henry Vezin's ability is remembered I think it is an error to give to the coarsest sampler the greatest speed of passage across the ore stream. It should have the least. I think 200 ft. a minute in the sampling circle is too great for ore which is large enough to be knocked aside with violence by such velocity. Two and a half feet a second seems to me better than 3.3 ft. for that size and at least sufficient for other sizes. Johnson's opinion on this subject is very clear from his provision for frequency. Assuming that his machines Nos. 1 and 2 are of the same size as Vezin's Nos. 2 and 1 (they are of the same general type) he gets a frequency of 12 to 14 cuts (with two spouts) on No. 1 at a speed of 60 to 70 ft. in the sampling circle, which compares with Vezin's 40 cuts and 199 ft.; and a frequency of 21 cuts on the No. 2 machine at a speed of 72 ft., which compares with Vezin's 40 cuts and 162 ft. Here are important differences in practice, which intelligent engineers will weigh carefully, making their final choice after thorough experiment. Like all other steps in this important business this question of speed of movement across the stream of ore deserves attention.

Professor Austin says, "There is bound to be some irregularity in the stream of ore, but the automatic sampler acts indiscriminately." I said that also, but endeavored to show that the movement of ore *to the sampler* was not indiscriminate, but subject to selective retardation and acceleration. Vezin overcame this selection, as the Journal in its editorial, and Austin and Argall in their letters point out, by reassembling the sample and treating it *de novo* as a new original mass. With modern work this must be done continuously which Vezin provided for by introducing a charging cylinder between each crusher and its sampler, and which I propose to accomplish by retarded and controlled flow over aprons and spouts. This has been done in a few mills, but they are too new to afford many examples of their work.

MATHEWSON'S TESTS

Mr. Mathewson's letter is especially valuable in giving us the first published results which, from his letter I am justified in assuming, were obtained in a mill of this kind. I have recalculated his table [illegible] work of the three mills for each lot, omitting the gold which is in such small quantities as to be affected greatly by errors of assay. In fact it is the work done on the copper ore that is most significant. I identify the lots by his second number only and calculate the percentage difference always on *A* as compared with *B* and *C* and on *B* as compared with *C*. The amount of silver in the first eight samples is not great enough to be useful for comparison, but is given in the last five. Differences of less than one per cent. are disregarded. As the copper varies from 3.42 per cent. to 15.11 per cent., I assume that the ores used were of a kind that ought to yield fair comparative results in a modern mill.

Here are three samples of copper ores taken in *A* and *B* mills, which varied 11.7, 13.4 and 13.6 per cent., and three others which varied 4.1, 4.5 and 5.8 per cent. Of course, the quantity variation was small usually. It was 4 lb. copper per ton in three samples, and 8, 9, 11 and 13 lb. in four samples. I think sampling should give better results than shown in the latter series, and the errors are especially important because they were made in sampling the original ore which is the only sample made usually. In the re-sampling the greatest difference was 3.5 lb., mills *B* and *C* running very much closer than *A* and *B*. Their highest variation was 3.5 per cent., which teaches us that extreme variations can be prevented. Mr. Mathewson would confer a favor on the profession if he would tell us what the differences of construction and operation of these three mills are.

MATHEWSON'S TABLE RECALCULATED PER CENT COPPER. SILVER NOT COMPUTED

Lot Number	A	B	Difference Per Cent.	A	C	Difference Per Cent.	B	C	Difference Per Cent.
547	5.10	4.91	3.7—	5.10	4.80	5.9—	4.91	4.80	2.1—
548	3.42	3.82	11.7+	3.42	3.70	8.0+	3.82	3.70	3.0—
549	3.75	3.69	1.6—	3.75	3.71	1.0—	3.69	3.70	0.0
550	6.13	6.03	1.6—	6.13	5.86	4.4—	6.03	5.86	2.8—
554	4.42	4.22	4.5—	4.42	4.07	8.0—	4.22	4.07	3.5—
552	4.01	4.57	13.6+	4.02	4.48	11.4+	4.57	4.48	1.9—
553	4.08	4.03	1.2—	4.08	4.01	1.7—	4.03	4.01	0.0
118	3.50	3.38	3.4—						

PER CENT. COPPER AND SILVER.

Lot Number	Copper		Difference Per Cent.	Silver.		Difference Per Cent.
	A	B		A	B	
38	7.03	6.95	0.0	6.9	7.8	1.3+
37	7.44	7.01	5.8—	6.6	6.9	0.0
40	9.11	9.32	2.3+	10.7	10.10	0.0
45	15.11	14.48	4.1—	53.20	53.20	0.0
46	6.91	5.98	13.4—	18.60	17.70	4.8—

It is remarkable that the silver should be altogether the most uniform, three out of five presenting no variation.

Questionable Progress

It cannot be denied that a difference of more than 10 per cent. in three samples out of 13 justifies my contention that the design and conduct of sampling mills need the careful attention of the profession. Such a discrepancy repeated so often cannot be ascribed to assaying in works that are conducted with the skill of the Washoe management, and when we find three other samples varying by more than 4 per cent., we are justified in wondering how Brunton obtained his agreement to 0.25 per cent.[1] Brunton also says, "No errors in sampling have ever occurred, even upon the richest ores." With such a record 20 years ago, improvement seems to have gone backward!

I reiterate that I believe these errors are real, that those who think that sampling has been, or is now really accurate, have failed to scan their results with care, and that the errors are due to removable causes, which the enlightened study of engineers can remove. We owe to Mr. Mathewson and Paul Johnson a very great debt for the full records they have published. Seven of Johnson's ores carried from 34.7 to 58.0 per cent. of insoluble and lime, and four had 63.7 to 93 per cent. of silica alone. I suppose Mr. Mathewson's ore came within the first of these classes and had about 55 per cent. silica.

Whenever we turn to the records of comparative sampling we find interesting and valuable hints. Vezin arranged samplers in pairs, one cutting between the cuts of the other, but the results were so uniformly equal that the differences were fairly chargeable to assay errors and he gave up the practice. I fancy Brunton's accurate results were obtained in the same way. In this method the ore is presented to the machines under like conditions and the samplers do their work with automatic accuracy. The conditions are different when the lot is reassembled after sampling and on a different day put through the same round of crushing and sampling, and still more different when it is sent to another mill, even if this contains precisely the same machines. Everything is exactly the same in the two trials except the run of the ore to the machines. This may vary in rapidity and constancy of the ore stream. If the lot is put through the first crusher in both trials there will be retardation there the first time due to the crushing of the large lumps. These will be absent the second time and a series of machines that are so strung together as to take their initiative from the first machine will act under different conditions in the two trials. If my view of the important effects of retardation are correct the second sampling ought to be better than the first and Mr. Mathewson's tests show that *B* and *C* mills tallied better than *A* and *B*.

Retardation and Representation

Professor Austin says, "That a portion of the ore sent to the final storage bin has been separated from its neighbor, need not interfere with the fact that it has been represented in the sample." That depends upon whether the retardation is synchronous with the revolution or half revolution of the sampler. If not and it drops between the cuts it is not represented. Professor Austin also expresses confidence in the corrective effects of taking 13,200 cuts in 10 hours, but both the Johnson and Mathewson records show that averaging by great repetition cannot be trusted. The time has come when this fact should be recognized and an effort made to put sampling on a more satisfactory basis.

The Journal's correspondents write with strong disapproval of the Cobar practice of taking every fifth car, but after all, the objections to the practice are that the "cut" is too large, two tons, and that the delivery is haphazard! Stevens' "Copper Hand Book," says that the ore is chalcopyrite and some pyrrhotite averaging about 4 per cent. copper and 0.5 oz. silver. The fifth-car practice is not so bad with such an ore as it would be with other kinds. It is 20 per cent., which is as much as can be afforded unless our mills are to be increased greatly in size. I call the attention of my critics to the fact that the real criticism upon the fifth car practice is not its proportion so much as the size of the cut. If the car were filled in 250-lb. doses taken from different bin spouts the conditions of the first automatic sampler would be repeated closely.

I have dealt with what may be called the theory of sampling rather than with details of construction, but these need to be considered also for they have a direct effect upon the application of whatever principles govern the work. For instance in the Cobar mill the second and third cuts are recrushed in 24x14-in. rolls with 144 r.p.m. As the second cut is 12 tons and the third cut only 3600 lb., it is evident that such heavy rolls at such a speed must dispose of their load almost instantly and the third and fourth samplers must run empty much of the time. Such variations cannot fail to be injurious to accuracy. Twelve inches is width enough for these machines, and their speed should

[1] *Trans.* A. I. M. E. XIII (1884-5) p. 645.

be reduced to what will just pass the ore in a continuous stream. It is not my intention to continue this subject, but to point out that the selection and operation of each machine in the mill has an important effect upon accuracy.

JOHN A. CHURCH.

New York, Aug. 19, 1908.

Note—I notice that two lines were dropped from my article in the Journal. On page [illegible] the sentence beginning on the fifteenth line below the table should read in full: "It contained 25.7 oz. in 1 and 26.1 oz. in [illegible], a difference of 2.65 per cent. Four of the [illegible] ores tallied. The mean of the remaining seven was 0.33 oz. and 0.31 oz., a difference of 6 per cent."
J. A. C.

Rocker for Washing Auriferous Gravel

A rocker for washing auriferous gravel should not be a difficult thing to construct, yet those that are made and are in use today are mostly constructed by practical men, and the dimensions that have been found by experience to be good as well as those that are bad are lost as far as others are concerned.

I once constructed a rocker and it was a failure. I have no doubt that if I had plenty of light lumber and several months' time in which to experiment and reconstruct I could eventually produce a satisfactory rocker, but this method has obvious disadvantages.

If among your readers there are some who have the dimensions of rockers that experience has shown to be efficient, I suggest that they make their knowledge public. The information will be sought, and if much variation is encountered between several designs an interesting investigation may follow.

A. R. TOWNSEND.

New York, Aug. 20, 1908.

Loading a Blast Hole

In view of the danger and annoyance caused by missed holes, it seems strange that more attention is not paid to the different methods of loading. Each machineman seems to have a method of his own, differing more or less from any other in use. In the following I shall describe some of the different methods and try to point out some of the good and bad points of each.

The first thing to consider is the condition of the cap and fuse. The fuse should be cut square across, not slanting, and about an inch of the exposed end of the coil should be cut off for it is likely to have absorbed moisture. The cap should be crimped by means of a crimper which has a stop to prevent its being closed too far. For wet or damp holes, the fuse should be soaped from end to end with miner's tar soap and especially thoroughly where it enters the cap.

There is a great difference of opinion among miners as to the best way of putting the cap in the powder. Probably the most common way is to make a hole in the end of the cartridge, and to push the cap in to about the middle of the powder, as shown in Fig. 1. This method has the advantage that the wrapping of the powder may be turned up around the fuse and tied, as shown in Fig. 2; if the fuse and wrapper are well soaped at this place there will be little danger of water getting to the cap. The disadvantage of this method is that neither the cartridge nor the one above it can be properly tamped without danger of breaking or kinking the fuse. If a slanting hole is made in the side of the cartridge and the cap inserted as shown in Fig. 3, the cartridge can be tamped without danger of injuring the fuse; but in this case the cap is, of course, not so well protected as it would be if inserted from the end.

In order to protect the fuse from being cut or pulled out by flying rocks, as much of it as possible should be in the hole; for this reason the cartridge containing the cap should be placed near the bottom. In order to get a greater length of fuse in the hob, some miners wrap it around the end of the cartridge as shown in Fig. 4. This is not good practice for it seriously kinks the fuse and is liable to cause a miss-fire.

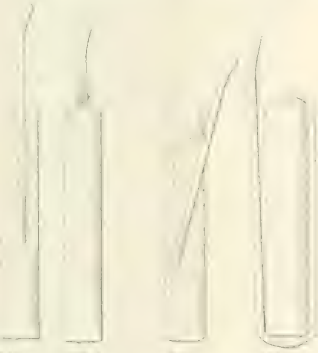


FIG. 1 FIG. 2 FIG. 3 FIG. 4

METHODS OF INSERTING THE FUSE

In tamping the powder should be pressed, not pounded into the hole, and tamping sticks of wood only should be used. Sometimes, pieces of iron pipe with wooden plugs in the ends are used for tamping rods. These are dangerous, because the plugs are likely to get broken and some miners are too careless to replace them.

Although the explosive gelatine now commonly used does not burn readily, it is probably best to throw a few handfuls of dirt on top of the powder to prevent sparks from getting at it, and also to exclude the air. If the dirt has been gathered from the bottom of the drift, it should not be tamped hard or it may injure the fuse.

H. L. TURNER.

Goldfield, Colo., July 24, 1908.

Over-balance Weight for Single Drum Hoist

Noticing the comments of John J. Smith in the JOURNAL of Aug. 1, and of Mr. Roelofs in the issue of August 15, I am impelled to add one or two remarks concerning the points discussed. The arrangement of two ropes on one drum, proposed by Mr. Smith, is useful only where the drum is large enough to carry the full length of rope in one winding across the face of the drum. The Findley rope, hoisting 1500 ft. makes 2½ laps on the drum. As to the patent, my statement, "patent is now pending," was correct. While it would be absurd to attempt to patent broadly a simple counterbalance, the particular and special form of overbalance weight which I recommend, taking very little room in the manway and using guides in the best possible location in the manway, is, I think, patentable. I had in mind counterweights and overbalance weights in use in this and several other States, but to my knowledge, none of these had the special advantages for use in vertical shaft work that my arrangement shows. By referring to the JOURNAL of March 2, 1905, Mr. Smith will find drawings and description of an overbalanced differential drum hoist, such as he suggests. This hoist was designed by me and is now in use at the Camp Bird mine, Ouray, Colo. I respectfully take issue with Mr. Roelofs on the point of the relative merits of long and short guide-shoes. While the long guide-shoe is a good mechanical construction which I use wherever the guides are straight, I yet insist that short shoes are much less likely to "hang up" than long ones, and I have found it necessary in more than one case to use short shoes on account of the crooked guides, on which long shoes would inevitably "hang up."

S. A. WORCESTER.

Victor, Colo., Aug. 19, 1908.

Phosphatic slags, according to R. McMurtrie (*Amer. Fertilizer*, June, 1908), are used in Europe to a considerable extent as fertilizers. By the Thomas Gilchrist process the slag from the basic converters can be made by proper regulation to contain about 17 per cent. phosphorus pentoxide. The phosphate in the slag is supposed to be a tetracalcic phosphate, insoluble in water, but slowly decomposed by air. To be used for fertilizer the slag must be ground so that 90 per cent. will pass a 100-mesh screen.

The Chilean mill, or *trapiche*, at Corocoro, Bolivia, has been developed to such a point that iron and sometimes chrome steel is used [illegible]

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely

Market for Graphite

Where can I dispose of flake graphite? How much of this material is imported yearly, and what is the average value per ton?

P. H. S.

Possible buyers of flake graphite are the Dixon Crucible Company, Jersey City, N. J., and Robt. Crooks & Co., 135 Front street, New York City. During 1907 there were imported into the United States 20,481 tons of unmanufactured graphite (plumbago), valued at $1,777,389, or 4.34c. per pound.

Locating on Railroad Ground

I want to prospect and work a vein carrying copper and silver on ground which was granted to the Union Pacific Railroad 35 years ago. Must I negotiate with the railroad, or can I locate as on public land?

S. W. F.

We have received from A. H. Ricketts, the author of "Short Talks on Mining Law," the following answer to your question: "Assuming that your correspondent means by the use of the word 'granted' that the land in question lies within the limits of the grant by Congress in aid of the construction of the railroad, I will say that if such land has been patented to the Union Pacific Railroad, or its grantee (irrespective of its true character—that is, as agricultural land), it is not open to the prospector or locator as mineral land, and no rights can be acquired therein by either without the consent of the patentee. If the land is still unpatented it is subject to location under the mining laws, notwithstanding it is within the limits of the grant. Generally speaking, no land which has passed into private ownership is subject to mineral location."

Magnesite in the United States

Is any of the magnesite produced in Greece imported into the United States? I should like to know the firms which handle these imports, the chemical composition of the magnesite and the price per ton f.o.b. cars New York. Is there no high-grade magnesite mined in the United States which could be used for magnesite cement instead of the imported magnesite?

T. B.

There are no workable deposits of magnesite in the United States except in California, and this State consumes all of its own production. The material cannot be profitably shipped East on account of the high freight rates and because of competition from abroad. The market in the Eastern States is supplied largely from Austria and Greece. The crude magnesite may be considered as worth about $3 per ton; the calcined is worth less than formerly, at the close of 1907 about $12 per ton.

Dealers in both crude and ground magnesite are: H. J. Baker & Co., 100 William street; Hammill & Gillespie, 240 Front street; and Fuerst Bros. & Co., 2-4 Stone street, all of New York. The Harbison-Walker Refractories Company, of Pittsburg, uses a great quantity of the imported magnesite. The principal supplies of magnesite in the world are obtained from Austria-Hungary, Germany and Greece, the United States and India producing relatively small amounts. In 1906 Greece produced 64,424 metric tons of magnesite, a large part of which was exported to the United States.

We cannot give the average analysis of the Grecian product, but the following is an analysis obtained from an average of several shipments: Magnesia, 44.90 per cent.; carbonic acid, 44.56; silica, 0.52; iron oxide, 0.80; lime, 1.50.

Potassium and Sodium Cyanide

Is better extraction obtained on silver ores by using potassium cyanide than by using sodium cyanide?

A. T. C.

While C. W. Merrill, at the Homestake mill, Lead, S. D., has found that he obtained somewhat better extraction by using potassium instead of sodium cyanide, at Pachuca, Guanajuato and El Oro, Mexico, sodium cyanide is used at all the cyanide mills, and the metallurgists at those camps say that by experiment they have been unable to find any difference in extraction; consequently, as it is more economical, they use sodium cyanide.

Chemicals Used for Gas Analysis

What chemicals are used in the Orsat apparatus for the determination of carbon dioxide and oxygen in a gas, and how are the solutions prepared?

B. K. C.

The chemicals used in an Orsat apparatus consist of a caustic potash solution (1.20 sp.gr.) for the absorption of CO_2 and an alkaline solution of pyrogallic acid for the absorption of oxygen. The potash solution should be made up as required and should contain 23 grams (1½ sticks) of pure KOH dissolved in 140 c.c. of distilled water.

The pyrogallic solution is made by dissolving 20 grams of pyrogallic acid in 150 c.c. of caustic potash solution such as is used for the determination of CO_2. This solution when cold is poured upon the pyrogallic acid.

In using the Orsat apparatus care should be taken not to allow the chemicals to become exhausted, so the solutions should be made up frequently and pure chemicals should be used.

Market for Crude Platinum

Who are the Eastern buyers and sellers of platinum? What form, or shape, of platinum is standard for price basis? What publication gives details of the platinum market?

F. A. V.

The names of the principal refiners of platinum will be found in the advertising pages of the Journal. Crude platinum is commonly bought on the quotation for scrap platinum. The platinum market is reported weekly in The Engineering and Mining Journal.

Florida Phosphates

What grades of phosphate are mined in Florida, and in what districts are the different grades found? On what basis is the material sold with regard to content of bone phosphate of lime? What was the production and value of the output in 1906 and 1907?

W. A. C.

Florida phosphates are classed under three heads: Hard rock, land pebble, and river pebble. The hard-rock deposits are included within an area approximately 100 miles long and from 8 to 10 miles wide, beginning at Fort White and extending in a southerly direction to Bay City. Florida hard-rock phosphate is sold under a guarantee of a minimum of 77 per cent. bone phosphate of lime, and a maximum of 3 per cent. oxides of iron and alumina and 3 per cent. moisture. In 1906, Florida produced 561,370 long tons of hard rock, valued at $3,312,083, as compared with 589,217 tons, valued at $3,714,767, in 1907.

Land-pebble phosphate is found in Polk, De Soto and Hillsborough counties. It is sold under a guarantee of 68 per cent. bone phosphate of lime, and a maximum of 4 per cent. oxides of iron and alumina and 3 per cent. moisture. This variety represents the medium-grade phosphate which is well adapted chemically to the manufacture of fertilizers. Approximately 60 per cent. of this product is consumed in the United States, the remainder being exported. In 1906 Florida produced 603,382 long tons of land pebble, valued at $1,810,146, as compared with 721,028 tons, valued at $2,523,598, in 1907.

River-pebble phosphate occurs in De Soto county, on Peace river, and is commonly known as Peace river pebble. This variety is sold under a guarantee of 60 per cent. bone phosphate of lime, 3 per cent. oxides of iron and alumina, and 3 per cent. moisture. There has been a steady decrease in the production of this class of phosphate since 1905. In 1906 the production was 41,742 long tons, valued at $116,878, as compared with 36,729 tons, valued at $139,570, in 1907.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COAL POCKET OR BIN. George W. Freeland, Moline, Ill., assignor to Williams, White & Co., a Corporation of Illinois. (U. S. No. 894,133; July 21, 1908.)

METHOD FOR COKING HYDROUS BITUMINOUS COMBUSTIBLES. Paul Hoering, Berlin, Germany, assignor to the firm of Torfkoks Gesellschaft mit beschränkter Haftpflicht, Berlin, Germany. (U. S. No. 894,647; July 28, 1908.)

WEIGHING MECHANISM FOR COAL-POCKETS. George W. Freeland, Moline, Ill., assignor to Williams, White and Company, a Corporation of Illinois. (U. S. No. 894,132; July 21, 1908.)

COPPER

METHOD OF RECOVERING COPPER FROM ORES. William B. Potter, St. Louis, Mo., assignor to Esmeralda Copper Precipitating Company, Chicago, Ill., a Corporation of Arizona. (U. S. No. 894,902; August 4, 1908.)

GOLD AND SILVER

CYANIDE BRIQUETS. Improvements in the Manufacture of Hard Cyanide Briquets. James Y. Johnson, London, E. C., Eng. (Communicated from the Chemische Fabrik Schlempe, Frankfurt-on-Main, Germany). (Brit. No. 18,096 of 1907.)

GOLD-FILTERING MACHINE. Thorstein Thordson, Oakland, Cal. (U. S. No. 895,598; August 11, 1908.)

GOLD SEPARATOR AND AMALGAMATOR. Charles H. Hall and John Eldridge, Astoria, Oreg. (U. S. No. 894,632; July 28, 1908.)

IRON AND STEEL

IMPROVEMENTS IN the Process of, and Apparatus for, Directly Reducing Iron Ore and Subsequently Treating Same for the Manufacture of Wrought Iron and Steel. Montague Moore, Melbourne, and Thomas J. Heskett, Brunswick, Victoria, Australia. (Brit. No. 26,131 of 1907.)

PURIFYING CAST-IRON in the Manufacture of Basic Open-hearth Steel. William Muirhead, Shettleston, Scotland. (U. S. No. 894,779; August 4, 1908.)

TIN

IMPROVEMENTS in the Process of Treating Tin Ores or Tin Slag. Communicated from Hermann Mühlinghaus, Wiesbaden, Germany. (Brit. No. 15,039 of 1907.)

ZINC

PROCESS OF REFINING ZINC. Richard Ziesing, Cleveland, Ohio, assignor of one-half to the Grasselli Chemical Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 893,415, July 14, 1908.)

APPARATUS FOR REFINING ZINC. Richard Ziesing, Cleveland, Ohio, assignor of one-half to the Grasselli Chemical Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 893,560; July 14, 1908.)

ORE DRESSING

APPARATUS for the Concentration of Ores, Minerals, etc. John C. Greenway, Coleraine, Minn. (U. S. No. 895,363; August, 4, 1908.)

CRUSHER for Ore and Other Materials. Henry Eggers, Denver, Colo., assignor to the Samson Manufacturing Company, Denver, Colo., a Corporation of Colorado. (U. S. No. 893,713; July 21, 1908.)

CYANIDE TANK. Ralph S. [illegible], Alameda, Cal. (U. S. No. [illegible]; July 28, 1908.)

GRAPHITE-SEPARATOR. William M. Fuller, Crown Point, N. Y., assignor to Walter C. [illegible], [illegible], N. Y., and one-third to Milo M. Winters, Crown Point, N. Y. (U. S. No. [illegible]; August 4, 1908.)

GYRATORY CRUSHER. Charles L. Hathaway, Denver, Colo., assignor to the C. L. Hathaway Rock Crusher Company, Denver, Colo., a Corporation of Colorado. (U. S. Nos. 895,633; 895,634; August 11, 1908.)

HAMMER-CRUSHER. Joseph L. Hiller, Mattapoisett, Mass., and George W. Borton, Haddonfield, N. J. (U. S. No. 896,019; August 11, 1908.)

MAGNETIC SEPARATOR. Charles G. Buchanan, Brooklyn, N. Y. (U. S. No. 893,606; July 21, 1908.)

MECHANISM for Agitating and Handling Ore or Other Substances. Joseph Smith, Salt Lake City, Utah, assignor of one-half to Edward P. Lynch, Salt Lake City, Utah; Isaac Smith, administrator of said Joseph Smith, deceased. (U. S. No. 894,174; July 21, 1908.)

MECHANISM FOR SPLITTING, Breaking, or Pulverizing Rocks or Ores. Alvin Gerstenhauer, Los Angeles, Cal., assignor of one-third to John A. Spencer and one-third to George R. Tucker, Los Angeles, Cal. (U. S. No. 895,850; August 11, 1908.)

METHOD of and Apparatus for Purifying Middlings and Other Materials. Herbert S. Jewell, Buffalo, N. Y. (U. S. No. 894,009; July 21, 1908.)

IMPROVED METHOD of, and Apparatus for, Concentration of Metallic Ores. Dudley H. Norris, New York City. (Brit. No. 14,806 of 1907.)

IMPROVEMENTS IN, or Relating to, the Concentration of Ores Containing Wolfram. Marcus Ruthenburg, London, E. C. (Brit. No. 26,810 of 1907.)

ORE CONCENTRATING TABLE. Emil Deister, Fort Wayne, Ind., assignor to the Deister Concentrator Company, a Corporation of Indiana. (U. S. No. 895,734; August 11, 1908.)

ORE-CONCENTRATOR. Emil Deister, Fort Wayne, Ind., assignor to the Deister Concentrator Company, a Corporation of Indiana. (U. S. Nos. 895,167, 895,168, 895,169, 895,170, August 4, 1908.)

ORE-CONCENTRATOR. Gilbert H. Davidson, Morenci, Ariz. (U. S. No. 893,985; July 21, 1908.)

ORE-JIGGER. Ephie Cohen, Joplin, Mo. (U. S. No. 894,604; July 28, 1908.)

ORE SEPARATING and Concentrating Machine. William P. Clifford, Moravia, Iowa. (U. S. No. 895,725; August 11, 1908.)

PROCESS of Extracting Precious Metals From Ores. Isidor Kitsee, Philadelphia, Penn. (U. S. No. 894,215; July 28, 1908.)

PROCESS OF SAVING the Values of Concentrates and Slimes. Stephen M. Smith, Boise, Idaho. (U. S. No. 895,509; August 11, 1908.)

PROCESS OF Treating Ore. James H. Reid, Cornwall, Ontario, Canada, assignor of one-half to Stephen Lemuel Tingley, Ottawa, Canada. (U. S. No. 895,196; August 4, 1908.)

PULP CLASSIFIER. Alfred C. Kirby, Goldfield, Nev. (U. S. No. [illegible]; August 4, 1908.)

TREATMENT OF ORES by Means of the Precipitation Process. Antoine H. Imbert, Grand-Montrouge, France, assignor to Imbert Process Company, New York, N. Y., a Corporation of New York. (U. S. No. 894,383; July 28, 1908.)

METALLURGY GENERAL

APPARATUS for Charging Furnaces. Herman A. Prosser, Salt Lake City, Utah, and James B. Ladd, Ardmore, Penn. (U. S. No. 894,392; July 28, 1908.)

METHOD of Preparing Pyrites Fines for Desulphurization. Pierre de Peyster Ricketts and Tom C. King, New York, N. Y., assignors to National Metallurgic Company, Jersey City, N. J., a Corporation of New Jersey. (U. S. No. 894,799; July 28, 1908.)

METHOD [illegible] galey, Pittsburg, Penn. (U. S. No. 895,939; [illegible])

PROCESS OF MAKING Pyrites Briquets. Pierre de Peyster Ricketts and Tom C. King, New York, N. Y., assignors to National Metal- [illegible] July 28, 1908.)

PROCESS OF Reducing Metallic Oxides. Edgar F. Price and Frederick M. Becket, Niagara Falls, N. Y., assignors, by mesne assignments, to Central Trust Company, of New York, trustee, a Corporation of New York. (U. S. No. [illegible])

SMELTING PROCESS. James H. Boyd, [illegible] (U. S. No. [illegible] 1908.)

MINING MACHINERY AND APPARATUS

CHAIN-LINK for Mining-Machines. David Buel, Columbus, Ohio. (U. S. No. 894,184; July 28, 1908.)

IMPROVED DEVICE for Igniting Miners' Safety Lamps and the Like. Carl Kock, Linden-on-the-Ruhr, Germany. (Brit. No. 8646 of 1908.)

IMPROVEMENTS IN Fluid-actuated Rock Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. Nos. 15,120; 15,121 of 1907.)

IMPROVEMENTS IN, or Connected with, Mine Hoists, or Hoisting Apparatus and the Like. Ernest Douglas, Highfield, Wigan, Eng. (Brit. No. 17,396 of 1907.)

IMPROVEMENTS IN, or Relating to Safety Electric Apparatus for Lighting Miners' Safety Lamps. John C. Bowie and John H. Phelps, Cardiff, Wales. (Brit. No. 16,145 of 1907.)

IMPROVEMENTS IN Detaching Devices for Mine Cars and the Like. Andrew Barna, Puritan, Penn. (Brit. No. 3895 of 1908.)

NEW OR IMPROVED Safety Appliance for Mine Cages, Lifts and the Like. Walter Buckeridge, Calne, Wiltshire, Eng. (Brit. No. 4825 of 1908.)

PNEUMATIC DRILL. Martin Hardsocg, Ottumwa, Iowa. (U. S. No. 890,978; June 16, 1908.)

COAL DUMPING [illegible] Pearce, Linton, Ind. (U. S. No. 894,528; July 24, 1908.)

COAL-MINING MACHINE. John P. Gilmour, Terre Haute, Ind. (U. S. No. 895,449; August 11, 1908.)

HOISTING-BUCKET. George Focht, Hoboken, N. J. (U. S. No. 894,128; July 21, 1908.)

MEANS FOR Ventilating and Expelling Water From Mines. Patrick H. Durack, El Paso, Tex. (U. S. No. 893,988; July 21, 1908.)

MINE-CAR WHEEL. James S. Woodcock, New Lexington, Ohio. (U. S. No. 895,826; August 11, 1908.)

MINER'S DRILL. Jacob Bleser, Springfield, Ill. (U. S. No. 894,808; August 4, 1908.)

ROCK-DRILL. Henry J. C. Keymer, Gorleston, Great Yarmouth, England. (U. S. No. 894,213; July 28, 1908.)

ROCK-DRILL. Robert H. Anderson, Germiston, Transvaal. (U. S. No. 893,596; July 21, 1908.)

ROCK DRILLING DEVICE. Eugene E. Messmore, Epworth, Iowa. (U. S. No. 895,877; August 11, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

IMPROVEMENTS RELATING to [illegible] Ltd., and Johannes Härden, London, E. C. (Brit. No. [illegible] of 1907.)

METALLURGICAL FURNACE. [illegible]

Opening the California Desert

Special Correspondence

The completion of 43 miles, or over one-third, of the new railroad from Mohave, Kern county, California, to Keeler, Inyo county, has had already the effect of bringing in a lot of prospectors in search of the mineral wealth in the desert region which this line traverses. It is expected that shortly a number of mining camps and towns will spring up along the line of this road. Some 23 miles of the new road are being operated, and the balance of that just completed will be opened soon. The road has entered the section of heavier construction work in the mountains, but it is expected to be entirely completed by the end of the year. The region traversed has been an isolated inland country with few inhabtants except the nomadic prospector or miner. There are large areas which are virtually unprospected, as they are distant from even the small towns, and the whole section is absolutely desert in character, very hot in the summer months, and an unpleasant place to follow the prospector's occupation at any time. Notwithstanding this, however, there are plenty of men who have a strong belief in the richness of these desert regions. The veins carrying gold are usually small, but quite rich, so that money may be made quickly when they are found. It is this character of veins which are most sought for.

Of late it has been found that large veins carrying silver-lead ores, zinc ores, etc., occur in parts of the desert region. Until now they have been of very little use, but these new railways bring to them transportation facilities which permit the mining of shipping ores and the hauling in of machinery and supplies. Doubtless numbers of these mines will be found within the next few years, now that they are being sought for. Tungsten ores have also been found lately in the desert regions of Kern add San Bernardino counties and other deposits may be found elsewhere in similar places.

Transvaal Mining Notes

Special Correspondence

The aggregate dividends declared by Transvaal gold mining companies for the half-year amount to $20,080,000, of which the Rand contributes 97.4 per cent. The following table of progress, covering the period since the recommencement of operations on a big scale at the close of the war, shows that the dividends have lately increased more rapidly than outputs:

Period	Yield.	Dividends
1902	$ 35,770,000	$10,490,000
1903	61,870,000	16,470,000
1904	78,530,000	19,240,000
1905	102,160,000	23,790,000
1906	120,610,000	28,100,000
1907	134,300,000	34,940,000
1908 (6 mos.)	70,760,000	20,080,000

The lack of advancement in the total distributions of the outside districts is a regretable feature. The Nigel, which has paid 25 dividends since 1889, and which accounts for about a third of the outside aggregate, is, moreover, really a Rand mine inasmuch as it is located upon Main Reef, at the southern lip of the Syncline. For the rest, Lydenburg is alone able to distribute profits. The Transvaal Gold Mining Estates and Glynn's Lydenburg companies, under Eckstein control, still remain the only stable profit-makers dealing with gold reefs, other than "banket," in the country. The former company, drawing its ore from seven mines served by the two treatment plants, is shown by the annual report just issued to have been placed in a stronger position by the augmentation of ore reserves to over 315,000 tons, averaging $17.61 over an average stoping width of 28 in. Owing to the wide distribution of the sources of yield and to the heavy transport rates ruling in the Lydenburg district, working costs ($6 to $6.50) are comparatively high. The Lydenburg goldfields, almost the oldest in the Transvaal, are largely in the hands of big corporations, but the open sections have lately come in for attention from small syndicates and working parties, equipped with a few stamps. After Rhodesia, this district is now the most attractive to the "small man" of any in South Africa.

The appearance of the Luipaardsvlei Estate upon the list of Rand dividend-payers is notable for several reasons. This West Rand mine was equipped with dry crushing plant before the war, but profits for distribution have only been made available by the establishment of a wet mill of the highest efficiency. The property can now claim, indeed, the highest stamp duty on the field—over 9 tons per stamp per day. The mesh employed is 275 per square inch. On ore yielding less than $6.50 per ton, a profit of $2.50 is recorded; yet the mine stands on the comparatively small crushing basis of 60 stamps.

The performance of the Luipaardsvlei Estate, at which the economy of heavy stamps, large mesh screening and auxiliary grinding has been so strikingly exemplified, strengthens the promise of success in the now nearly-completed mill of the Simmer Deep & Jupiter, also under Consolidated Goldfields control. This great plant, designed to treat an initial tonnage of 72.000 tons per month with every facility for extension on any scale, is equipped with stamps of 1670 lb. Ten stamps—comprising the unit driven by an independent 40-h.p. motor and countershaft—have already been operated, but the whole plant will not be ready for service before September next. Excepting floors and bins (7000 tons capacity), this 300-stamp mill is chiefly constructed of steel. Mortar-box foundations, which require unusual strength, are simply of concrete with easily accessible bolts, no anvil blocks being adopted. The magnitude of units is further illustrated in the cyanide works, where the sand-collecting vats are 50x8½ ft. and the treatment vats, 50x10 ft. The conical slime vats attain the dimensions, unequaled on the Rand, 70x12 ft. and 17½ ft. deep. Principles of general arrangement allow for ready extension in any section, without reorganization of the connecting system of belts and launders, and without any danger of cramped space. The probability that the Simmer Deep mill is now only in an initial stage of development is apparent when we consider the great reef-bearing area of 1500 claims it will be made to serve.

The report of J. S. Curtis, an engineer of long Rand experience, upon the Village Deep and Turf mines, in advocacy of their amalgamation, has been issued, and it appears certain that the new basis of consolidation evolved, will be accepted by shareholders. The delay of some years in the formulation of a scheme satisfactory to both companies has been essentially due to financial questions, the broad technical advantage of amalgamation having been mutually acknowledged. The greater part of the report deals with the relative valuation of assets, of interest to shareholders and to few else; but one section, discussing the oft debated question of impoverishment of Rand ore with depth, is of wide interest. In the light of the data now available from so many deep workings, up to 4000 ft. vertical and more, Mr. Curtis declares that, so far as he can judge, there does not seem to be at present enough evidence to prove that there is a general decrease in values as mines get deeper. The steady fall in yield of gold per ton crushed is, of course, demonstrated by the Chamber of Mines monthly analyses of output; Mr. Curtis apparently considers this to be fully accounted for by the policy of working poorer zones, made payable by cost reduction and by the greater employment of machine drills in stoping.

Lead Production in Germany

The production of lead in Germany in 1907 is reported as below by Julius Matton, in metric tons:

Company	Tons.
Stollberger Gesellschaft	15,358
Rheinische Nassauische Gesellschaft	15,296
Mechernicher Bergwerksverein	11,883
Bleihutte Call, G. m. b. H	10,980
Gesellschaft der Emser Blei-und Silberwerke	4.730
Blei-und Silberhutte Braubach	20,539
Walther-Croneckhutte bei Rodzin (Gleiche's Erben)	8.470
Königliche Huttenamt Friedrickshütte, bei Tarnowitz	24.467
Herbergamt Clausthal, Oberharz	9,247
Herbergamt Clausthal, Unterharz	5,038
Königliche Oberhüttenamt Freiberg	5,563
Anhaltische Blei-und Silberwerke	2.182
Mansfelder Gewerkschaft (silver-lead)	383
Total	134.136

The Rothenberger Hütte in Siegerland and the Norddeutsche Affinerie in Hamburg reported no lead during the year.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Robert T. Hill, of New York, has gone west on professional business.

Walter Harvey Weed, New York, has gone to Arizona on professional business.

C. A. Hamilton, Jr., of Oaxaca, Mexico, has returned from a business trip to California.

Geo. L. Widney, of the Tennessee Coal, Iron and Railway Company, is in Mexico on business.

George W. Maynard, of New York, has gone to Idaho Springs, Colo., on professional business.

Edward K. Judd returned to New York last week from Colorado, and has gone to Newfoundland to examine a mine there.

F. M. Currie, of Broken Bow, Neb., is in the Balsas district of Guerrero, Mexico, in connection with his mining interests.

E. F. Carter, manager of the Gold Hill mine at Quartzburg, Idaho, has been examining the Lucky Boy mine near Hailey.

Prof. James F. Kemp, of Columbia University, New York, has been in Guanajuato, Mexico, accompanied by Kingman Gould.

G. H. Barber, a prominent mining engineer of Wellington, New Zealand, was in Toronto recently on his way to England.

J. P. Hutchins recently returned to New York from an examination of mines in British Columbia. He has left again, for Colorado.

D. M. Shanks, general manager of the Rio de Plata mines, in Chihuahua, Mexico, is back at the mines after a business trip to New York.

James Macnaughton, general manager of the Calumet & Hecla mine, has been in Boston attending the annual meeting of the stockholders.

Hugh F. Marriott, of London, has been in New York on his way to Quebec, to join the summer excursion of the Canadian Mining Institute.

Donald B. Gillies has returned to Chihuahua from El Paso, Texas, where he was operated upon for appendecitis; he is now recovering rapidly.

H. S. Washington, of Washington & Lewis, mining geologists, New York, has sailed for South America, where he will spend several months in the gold mining districts of Brazil.

W. C. Franz, of Charleston, W. Va., who has been appointed general manager of the Lake Superior Corporation, will shortly arrive at Sault Ste. Marie, Ont., to take charge.

C. H. Richardson, head of the department of geology at Syracuse University, Syracuse, N. Y., is in Canada, examining mines near Belleville, Ont. From there he expects to go to Colorado to examine some mines.

F. H. Dodge, head of the safety department of the Tennessee Coal, Iron and Railroad Company, who was shot in the recent encounter with striking miners at Blocton, Ala., is improving, and the physicians say that he will recover.

Charles McDermid, secretary of the Institution of Mining and Metallurgy, London, was in New York last week and left for Quebec. He is one of the delegates representing the Institution on the summer excursion of the Canadian Mining Institute.

Edward L. Dufourq has returned to New York after an absence in Mexico, which was prolonged a number of weeks by very severe illness and consequent operation for appendicitis in the American Hospital, in the city of Mexico. Mr. Dufourq has now fully recovered his health and strength.

J. Foster, an English authority on submarine mining, arrived at Halifax, N. S., recently. He has been engaged by the Dominion Coal Company to examine its submarine areas and advise as to the best methods of operation. He will be assisted by Hugh Fletcher of the Canadian Geological Survey.

Edmund B. Kirby, manager of the Federal Lead Company, Flat River, Mo., will retire on Oct. 15 next, and devote his time thereafter to consulting work, with headquarters at 701 Security building, St. Louis, Mo. His successor in the management is to be H. A. Guess, who is at present milling superintendent of the American Smelters Securities Company.

Obituary

Ralph Johnson, a well known mining engineer, was drowned July 8, while making some explorations in the northwestern part of British Columbia. He was 32 years of age, and was a graduate of the University of Minnesota.

John Kerr, the discoverer of the Tilbury oilfield and also of natural gas near Chatham, Ont., died at Detroit Aug. 17, at the age of 45 years. He sank the first oil well in the district on his own farm and though at first he was unsuccessful and encountered many difficulties, persevered until he attained success.

William A. Dennis, for many years prominent as a mining engineer in California, died suddenly in Los Angeles recently. He settled in California in 1855 and was well known throughout the State. For a number of years he was superintendent of the New Almaden quicksilver mines. He leaves four sons, three of them mining engineers.

[illegible] 85 years. He was born at Nottingham, England, and came to Canada at the age of 23. He held the position of professor of geology and chemistry at Trinity University, [illegible] which period he was engaged in important [illegible] the interior of Labrador. He resigned his professorship in 1864, and two years later removed to Windsor, N. S. Among the more important investigations which he conducted were an examination of the Nova Scotia gold districts, and an exploration of the mineral lands of northeastern Newfoundland and the adjoining coasts of Labrador in 1876. Dr. Hind gave important scientific assistance to the Fisheries Commission, organized under the provisions of the Treaty of Washington, and was a prolific writer on geological, chemical and geographical topics. In 1860 he was elected a Fellow of the Royal Geographical Society of England.

Societies and Technical Schools

[illegible] Oklahoma Geological Commission, consisting of the Governor of the State, the State superintendent of public instruction and the president of the State University, met for organization, July 24. Governor C. N. Haskell was elected president of the Commission; State superintendent E. D. Cameron secretary and A. Grant Evans, president of the State University, was elected executive officer. Dr. Chas. N. Gould, professor of geology at the State University of Oklahoma, was elected director of the Survey and instructed to begin, at once, the preparation of reports dealing with the geologic structure and mineral resources of the State.

[illegible] This club has a membership of 500 and recently has had to secure larger quarters. It has leased the entire west wing of the 15th floor of the Waldorf-Astoria, where it has a large reception room in addition to a suite of 12 smaller rooms. The entertainment committee, of which Colvin B. Brown is chairman, announces that the regular Saturday night smokers will be resumed early in October and that upon each of these occasions the club will be addressed by a speaker familiar with some of the various sections of the West. Stereopticon views and moving pictures will be used to illustrate the lectures. Much interest in the West was created by this kind of entertainment given by the club last winter. After the lecture a lighter form of entertainment is provided for members and guests. The club was formed for the purpose of promoting good fellowship among its members and for furthering the interests of the West in the East and it is hoped that all Western commercial bodies will see to it that the club is supplied with all publications intended to call attention to the great country west of the Mississippi. John Hays Hammond is president of the club; A. J. Seligman, vice-president; W. B. Thomp- [illegible] tary.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Goldfield, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 17—The Superior Court of Yuba county has given judgment in favor of J. C. Campbell in his suit against Lang & Reams for possession of the Solano Wonder mine, near Brownsville. It was only a few months ago that the prospectors, Lang & Reams, located this mine and in a shaft only 18 ft. deep, came upon wonderfully rich ore. Not long after J. C. Campbell and wife, of Nevada City found that the mine was located on their patented ground, and they served an injunction prohibiting further work on the property. At that time some 60 sacks of ore were kept by the locators, supposed to be worth $1000 per sack. The injunction prevented the sale of this ore, and under the decision rendered, it goes to Campbell and wife instead of to Lang & Reams who mined it. The Campbells are now reopening the mine and will develop the property and install the necessary machinery to work it deeper. The locators supposed it to be on public land when they started work on the croppings.

In the desert regions of the southern portion of California, the heat this summer has been excessive, even for that hot region. Records of 120 deg. and even higher have been common. As a result numbers of prospectors and miners have been prostrated and some few deaths have occurred.

The capitalists who started the water and power project in the region of North San Juan, Nevada county, found some of the property owners willing to meet them on a fair basis, but others have held out for exorbitant prices, so little has been done of late.

Considerable ground must be acquired for lake and reservoir sites, as well as for rights of way. It is now thought that a few suits will be brought to determine property values in that section, after which it is expected that the original plans will be pushed to completion.

An exceptionally rich strike has been made in a new mine on the property of Wintering & Osgood, on the divide between Russian and Applesauce creeks in Siskiyou county. The group is composed of six claims and the orebody thus far found is wide and rich for a vein of the size. The property is very slightly developed, but already the owners have been offered large sums for it.

The Anti-Debris Association, through supervisors of certain valley counties, obtained an injunction against the Pennsylvania Dredging Company, of Oroville, Butte county, recently, and stopped it from carrying on further operations. Since then the company has "landlocked" its dredger and prevented any material entering the river. Upon this showing being made, the Superior Court has suspended the injunction temporarily, to be revived at any time should the work not be done to the satisfaction of the Anti-Debris Association. That is to say, the Anti-Debris Association, a private organization of anti-mining people, is to pass upon the work of an incorporated dredge-mining company, and say whether or not it is to continue operations.

San Diego has a new Chamber of Mines which is "booming" the mining interests of the county and it is now intended to have speakers address the public, twice a week, on the subject of the various county mining districts, to explain their merits. But what the county seems to need most is some good productive properties to attract attention to other claims needing capital. Since the stoppage of work at the mines at Hedges and the falling off of development work at Julian and Banner, the county seems to have come to depend on Escondido and Dulzura, the latter only a camp of a few months age, with its values mainly prospective.

At the Yellow Aster mine, Randsburg, Kern county, they are installing the most extensive cyanide plant in the State. There are upward of 1,000,000 tons of tailings to be handled by it. It is expected that this mine will before long have 500 stamps at its mill.

Goldfield, Nev.

Aug. 17—There are 161 mining camps in this State, of which about half have made or are making records, and it is conservatively estimated that since the discovery of ore in the State, Nevada has produced a billion dollars. The Comstock, which has turned out half a billion, will in another year have conditions adjusted so that the lower levels, now too hot for operating, will be fit for work, and the State production should be very largely increased. The camps of Goldfield and Tonopah have already produced more than $30,000,000, and with the new mills now under construction in operation, the output of these two camps should be doubled.

Salt Lake City

Aug. 15—At the United States Smelting, Refining and Mining Company's lead smelter four furnaces have been in operation under oxidized charges for the past two weeks, long enough to demonstrate the effectiveness of the company's new patented process for the condensation of fumes and elimination of the elements which deal death to vegetation. Although 800 tons of ore and fluxes are used up every day in these four furnaces scarcely a particle of smoke is seen to issue from the top of the high steel stack, so perfect is the process performing the work designed for it to do. At a distance the plant has every appearance of being idle. The roasting department will be in commission in a few days, when the company will take care of all the sulphide ore required to raise the daily capacity to 1600 tons. The lead mines of the United States company are supplying 200 tons per day, which is subjected to concentration in the mill near the smelter and which was placed in commission about Aug. 1.

The policy adopted by the mining companies controlled by Jesse Knight, of Provo, Utah, and associates, of issuing brief financial statements at the beginning of each month, is being faithfully carried out and the Aug. 1 statement, compared with the one issued July 1, makes the following exhibit:

	July.	August.
Colorado Mining—		
Cash on hand		$18,294
Bills payable	$38,369	......
Indian Queen—		
Cash	$ 6,620	$ 6,789
Stock in treasury	188,950	158,650
East Tintic Con.—		
Cash	$ 1,063	$ 1,068
Stock in treasury	163,090	163,090
Mountain Lake—		
Cash	$24,466	$20,223
Stock in treasury	122,435	122,435
Uintah Treas. Hill—		
Cash	$ 416	......
Bills payable	......	$ 1,023
Stock in treasury	8,500	8,500
Ibex Gold Mining		
Cash	$23,019	$16,009
Stock in treasury	53,300	53,300
Mineral Flat—		
Cash	$ 1,665	$ 1,338
Stock in treasury	123,125	122,125
Crown Point—		
Cash	$19,349	$13,868
Stock in treasury	122,900	122,900
Iron Blossom—		
Cash	$39,821	$34,357
Stock in treasury	100,790	100,790
Black Jack Con.—		
Cash	......	$ 2,622
Bills payable	$21 129	...
Beck Tunnel Con.—		
Cash	......	$19,264
Bills payable	$16,005	....
Big Hill—		
Cash	......	$ 1,121
Stock in treasury	......	38,231

Plans are maturing which will result in the erection of a 200-ton matte smelter at the Gold Hill mine of the Western Utah Copper Company, in the Deep Creek district. Practically all the equipment necessary will be purchased from either the Bingham Consolidated or Utah Consolidated, each of which owns an idle smelter which will be dismantled sooner or later.

Wallace, Idaho

Aug. 17—A contract for 300 ft. of tunnel work has been let on the property of the Gold Crag Mining Company, owned by Colonel Fuller and others. A shipment of 25 tons of ore has been made from the property of the Gray Copper Company, at Osburn. This is the first shipment from the property and is of significance to the large number of prospects being worked in that particular vicinity. Several feet of galena ore, varying from a good grade of shipping ore to a low-grade milling ore, have been exposed in the raise being driven in the Black Bear Fraction mine at Black Bear and adjoining the Frisco. There are several feet of ore strung through the top and sides of the vein and scattered throughout the whole face. A strike of lead-silver ore has been made in the shaft being sunk on the Full Moon property. The shaft has been sunk about 50 ft. and practically the whole face is in carbonate ore carrying stringers of high-grade ore. The management has decided to run a long tunnel to tap the orebody at depth.

Butte

Aug. 20—The South Butte Mining Company has instituted action in the district court against Peter and Mary Kriser and Mattie Doyl, alleging unlawful detainer by defendants of certain portions of plaintiff's mining claims. The company asks that it be restored to possession and be awarded damages in the sum of $500. Word has been received in Butte that the details of the reorganization of the Davis-Daly Estates Copper Company are about completed. A syndicate has been formed for the purpose of underwriting the stock and financing the company. The plan provides for the organization of a new company to be called the Davis-Daly Copper Company, with a capital of $6,000,000 and shares of the par value of $10. The new stock will be issued in exchange for the old upon payment of $2 per share. With the fund thus expected to be raised, amounting to $1,200,000, the company's debts will be liquidated and a working capital secured.

In the action of McIntyre et al. against the Montana Gold Mountain Mining Company et al., for the foreclosure of several mechanics' liens on the property of the company, situated in German gulch, south of Butte, a decision has been rendered, awarding the plaintiffs judgment for somewhat less than $3000 and a foreclosure of the lien.

Denver

Aug. 22—Arguments in the million dollar damage suit against the United Oil Company, the Inland Oil Company, and others, instituted by the minority stockholders of those concerns, are now being heard in the district court at Cañon City. The plaintiffs allege manipulation of the output of the United in favor of the Inland company, and other mismanagement, and ask for the appointment of a receiver for both companies. Testimony in the case was taken a month ago, and the trial continued pending a meeting between the minority stockholders and the directors of the companies in an endeavor to settle the controversy; but as an agreement was not reached at this meeting, the trial in court has been taken up again.

Reports from Creede are to the effect that lessees operating the Creede-Quintell have recently cut a 4-ft. vein carrying 100 oz. silver per ton across its entire width, while assays taken from a narrow streak in the vein yield at the rate of 6000 oz. silver per ton.

The driving of the Cripple Creek deep drainage tunnel for the first 16 days of August amounted to 130 ft., making the total distance from portal to breast a trifle over 3000 ft.

A force of men is at work excavating for the experimental cyanide mill to be erected to test that process on the low-grade ores of the Portland Gold Mining Company's mines and dumps. Laboratory experiments with this process were successful, and the method of treatment is now to be tried on a commercial scale.

Indianapolis

Aug. 24—The return of Indiana miners to their work in the bituminous field after a strike of two weeks, is a victory for T. L. Lewis, president of the Miners' national organization. President Van Horn, of District No. 11, ordered the men out in violation of the agreement with the operators that no strike should occur pending an investigation of any grievance. President Lewis would not condone this act and said that the rules of the organization would be enforced and the charter taken away from the district organization unless the men returned to work at once.

The resumption in the coalfields a few weeks ago gave 3000 men work who had been idle all summer. At the time the men were called out upwards of 10,000 men were employed at the different mines in the district. It is now believed that the end of the strike will occasion a general opening up of the coal mines and the 16,000 men of the district will be at work from now on. Mr. Lewis says there is little hope for an immediate adjustment of the cause of the strike, but so long as the effort is being made the miners are bound by agreement to remain at work. As the operators are behind with orders and the demand for coal is increasing, it is expected that there will be no more slack periods this year.

London

Aug. 8—The Dunderland Iron Ore Company, Ltd., is passing through evil times. The mines in Norway are to be closed down temporarily, owing to the small demand for iron ore and the low prices now ruling. Up to June 30 last the company produced 67,000 tons of briquettes, which were sold at prices ranging from $6.55 to $4.40 per ton. Some alterations to the plant were required, and the directors recommended the creation of further capital in the shape of £100,000 of pre-preference shares. Enormous sums have already been spent on this venture, but the directors are still sanguine that the company will pull through and reach the profit-earning stage.

At a meeting of the Central Mining and Investment Corporation, Ltd., held on July 31, Sir Julius Wernher, the chairman, made an interesting speech on the South African mining industry. Sir Julius spoke in an optimistic tone as regards the future of the goldfield, and said that, although a few of the older and smaller mines would disappear within the next 10 years, there were other mines coming on to take their place and that in his opinion the average production of gold for the next 20 years would, given normal conditions, be at least as good as, or better than the present annual output. Sir Julius gave a favorable review of the different factors that affect the situation, noticing in particular the friendly attitude of the Transvaal government toward the mining industry. As regards the labor problem, he stated that the supply of natives was at present sufficient for the wants of the mines, pointing out, however, at the same time, that, owing to the restriction of operations at the diamond mines and on public works, the supply was to some extent abnormal. He did not consider that the policy proposed by the majority of the Creswell commission of working the mines entirely by white labor a practical one. In order to make it so, it would be necessary for the white labor to become four times as efficient as it was at present and that, he thought, was asking too much. Sir Julius is not given to exaggeration and the hopeful view that he takes of the future ought to give confidence to Rand shareholders. The policy of amalgamating companies so as to reduce capital expenditure per claim, which has been a feature of recent years, is to be continued. With the reduction in working costs that such amalgamations are calculated to bring about, a larger tonnage, and consequently a longer life, will be obtained. While this policy of studying economy is to be commended, it is to be hoped that will be remembered that the profit earned is the main consideration and that to work low-grade ore and show low working costs is poor business, if there are no profits. The exact limit to which the grade of ore mined should be reduced is a moot point, and deserves greater attention than it seems to get. Big mills and low working costs, which are now the order of the day, do not necessarily mean good mining from the shareholder's point of view.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Tennessee Coal, Iron and Railroad Company—This company has decided to treat with preservatives all timbers used in its mines. A plant for this purpose will be erected near Birmingham. The Forest Service of the Government will coöperate with the company in the erection of the preserving station. The timbers will be treated with creosote, solutions of zinc chloride and common salt.

Arizona

YAVAPAI COUNTY

Congress Consolidated Mining Company—This company made a $2000 shipment of bullion last week. Its mines are at Congress.

Derby—These mines, situated six miles west of Prescott, are being operated by George U. Young and associates. The mines have produced some very high-grade gold ore in the past but lack development.

McKinley Mining and Development Company—This company is taking shipping ore from its Peacock shaft near Iron Springs. Regular shipments of ore will be made in a short time. The shaft has reached a depth of 300 ft., and the orebodies are showing a continued improvement. Copper is the chief value in the ores.

Humboldt-Arizona Copper Company—This company owns a group of five claims near Humboldt. It is preparing plans for the installation of machinery, and the further development of the property. At present the deepest workings is an 80-ft. shaft.

Mazatzal—It is reported that this company has opened a large body of good-grade copper ore in its mines near Jerome and that it will soon be on the producing list.

Peterson—This group of mines, adjoining Octave mine on the east and covering the extension of the same vein, has been bonded to Eastern men by the owner, Andrew Peterson. About 2000 ft. of development work has been done, and some very promising bodies of ore await stoping.

YUMA COUNTY

Clara Consolidated Gold and Copper Company—Consolidation has been consummated of the following properties in the Santa Maria mining district: The Signal Copper Company, capital stock, $5,000,000; Clara Gold and Copper Mining Company, capital, $2,000,000; Crown Princess Mining Company, capital, $1,500,000; Crown Queen Mining Company, capital, $1,000,000; also the Morro group of gold and copper-mining claims. The total properties comprising 132 full claims have been merged into the Clara Consolidated Gold and Copper Mining Company, which has a capital of $3,000,000. The company has marketable ore on the dumps and considerable ore blocked out in the mines, one gasolene hoist in operation, another in course of construction, with an additional steam hoist and plant good for 2000 ft., ordered and shipped. Geo. Mitchell is general manager of the new company

California

BUTTE COUNTY

United States Diamond Mining Company—At this property, near Oroville, where M. J. Cooney, manager, is prospecting for diamonds, a contract has been let to sink 100 ft. additional on the main shaft.

CALAVERAS COUNTY

Last Chance—This mine, near Murphy, now under bond to J. C. Spencer, has a new steam hoist and pump, and the shaft is being deepened.

Mountain King—Work has been resumed on this mine, near Hodson, and the 400-ft. shaft is to be sunk 500 ft. deeper. The mine has a 10-stamp mill, hoist, pumps, etc., and an air compressor is to be installed. W. R. Womble is superintendent.

HUMBOLDT COUNTY

Clover Flat—This mine has been compelied to close down for lack of water, the season being the shortest in years.

INYO COUNTY

Buckeye Mining Company—Unusually good ore has recently been found on one of the claims of this company at Fish Springs, which has caused something of a local mining excitement.

Skidoo Mines Company—This company at Skidoo is taking out high-grade ore daily, and is throwing some of the claims open to leasers. There are 50 men at work.

LAKE COUNTY

Helen—This quicksilver mine, owned by A. Rocca, near Middletown, is shipping about 75 flasks of quicksilver weekly of late

MARIPOSA COUNTY

Exchequer—At this mine the shaft is now down 140 ft., and drifting will soon commence. There is still plenty of water to operate the power plant.

NEVADA COUNTY

Calvert & Sharp—This gravel mine on Canada Hill, Nevada City, has been bonded to Murphy & Hanaan, of San Francisco, who will extend the tunnel to the channel.

Cold Spring—At this property, Washington Ridge, Thomas Coan, superintendent, retimbering is being done and drifts will be run to crosscut the gravel channel.

PLACER COUNTY

Lost Emigrant—This mine at Summit, under bond to F. S. Morgan and George Hothersoll, is being reopened, and as soon as the shaft is unwatered, sinking will be carried on. There is a mill, hoisting works etc. on the property.

Columbia—This mine at Iowa Hill is now owned by M. J. Fitzpatrick and L. J. Pierson, who are developing it.

Pupiter—The channel recently opened in this mine is paying well; the gold found is coarse.

Parmalee—The Pacific company is putting compressors and other machinery in this mine at Last Chance.

Power Plant—W. S. Fletcher is putting in an electric plant in the North Fork of the Middle Fork to run the mill at the Homestake mine at Last Chance, the Paragon at Bath and the Dardanelles near Forest Hill.

PLUMAS COUNTY

Bonded—H. H. Hunter has bonded the Edward Braze mine near Butte Valley, and the Kitchen mine at Cariboo, and both properties are being opened.

Piazzoni—This quartz mine near Seneca has been bonded to D. M. Harvey, Reno, Nev., who will shortly put a mill on it.

SAN BENITO COUNTY

Bradford Quicksilver Mine—J. A. Stewart, superintendent of this mine, has arranged with Robert Scott to build a furnace; and it is expected that another of still larger capacity will follow.

Harbor Group—At this property on the east end of the Avawatz range the 175-ft. shaft is to be sunk to 500 ft., and a new hoist has been purchased.

Long Range District—In this district, 20 miles from Barstow, Ferand & Rumohr have a Curtis dry-washing machine at work, and report it as being satisfactory.

Orange Blossom Extension Company—The new mill of this company, near Bagdad, has been completed and started in operation. J. A. Hodgman is manager.

Shasta County

Black [illegible]—This company has commenced active operations on the Niagara mine at French Gulch, formerly a heavy producer. A new 10-stamp mill will be erected. K. H. Siebel is superintendent.

Mammoth Copper Company—This company now employs 350 underground miners and 125 surface men, exclusive of employees at the smelter. The new gravity tram is found satisfactory and carries 1000 tons of ore daily from the mine to the smelter. Supplies are all handled by it also. Mr. Robert Hanley is now superintendent of the mine.

San Bernardino County

Dewey—At this mine near Barstow, owned by Sharp Brothers of Philadelphia, they are putting up a 60-stamp mill with cyanide plant.

San Diego County

Cleveland Pacific—At this mine, Escondido, W. F. Spieth, manager, they are putting in new settling tanks and as soon as these are completed the mill is to be started up again.

Sierra County

Steamboat—This mine at Balsam Flat has been bonded by F. A. De Lancey and others to a company of Sparks, Nevada. The Yankee tunnel will be used to gain access to the St. Elmo quartz ledge on the property.

Buttes Saddle—G. H. Chick and W. S. Aldrich have bonded this mine at Sierra City from Richard Phelan and have invited bids for 1000 ft. of tunnel. The tram and mill are to be put in order.

Siskiyou County

Garden & Reed—This hydraulic mine cleaned up $12,000 this season, and has closed down until some time in October.

Big Cliff—The new company which has bonded this mine from Wintering & Osgood has commenced operations with 12 men. The company is called the United States & British Columbia Mining Company of Boston, Mass. The mine is a new one but promising, the grade of ore being high.

Yellow Butte—Sufficient money has been raised by Manager L. D. Ball to further develop this copper mine near Weed by sinking the shaft 200 ft. deeper and running four levels to block out ore.

Colorado

CHAFFEE COUNTY

Florence—The first ore was taken away from the mine Aug. 17, and shipped to the smelter. Over 500 tons are on the dump.

Peerless—This mine, on Altman mountain, 18 miles from Salida, has begun to ship to the Salida smelter. The tunnel is now in 1000 ft., cutting the vein at a depth of 700 ft. H. F. Schuelke is president and manager of the company.

Garfield County

Elk Creek—Some mineral has been found at the head of Elk creek, 11 miles from the town of New Castle. Ore sent to Leadville for analysis gave returns of 3.45 oz. gold, 5 oz. silver and a trace of copper per ton. This ore was taken from a vein that is 4 ft. wide. The formation is quartzite and granite.

Hinsdale County

Wyoming—A new shaft on this mine, at a depth of 100 ft., has cut a vein running well in silver. The mine is on Engineer mountain, near the San Juan county line. E. W. Creel is superintendent.

Lake County

Christensen—On this claim, between Twin Lakes and Granite, work near the surface has opened a vein that runs well in gold and silver with 70 per cent. lead. The vein is small.

Columbine Tunnel—A vein of ore has been opened at the breast of this tunnel, Mt. Elbert, 10 ft. wide, which carries streaks of high-grade gold ore. It is said that the whole 10 ft. will hold up to $35 per ton. The vein was caught 100 ft. from the mouth of the bore.

Dinero Tunnel—The annual meeting of the stockholders of the company was held here recently and the old officers were re-elected. It is expected that the tunnel will cut the Dinero veins soon.

Tiger—In this mine, at the head of Iowa gulch, the strike made recently has widened out with development and the lessees have out another carload of ore.

Vinnie—On Breece hill, the Vinnie and the M. N. fraction are producing a heavy tonnage of sulphide ore and some silicious ore, all of which is passed through the Yak tunnel.

Yak Tunnel—During the last few days arrangements have been completed whereby this company has received the right of way from the breast of the tunnel through the intervening ground to the Dolly B claim in Big Evans gulch, a distance in a straight line of one mile. The tunnel is now in 15,000 ft. and the breast has cut the end-line of the New Year claim, South Evans, part of the Resurrection group. A lateral will be run from the tunnel to the Silent Friend, South Evans, several hundred feet, which will permit this property to be worked more successfully than at present. The breast of the tunnel is in granite and already several fissure veins have been cut that carry gold.

Empire Gulch—Lessees report a streak bearing silver in large quantities. In the center of the group, and near the surface, a small leader was discovered, which when followed out, developed into a good-sized vein with indications of opening into a large orebody. A grab sample assayed 90 oz. of silver and a good percentage of lead.

Fanny Rawlins—This mine, which has been a steady producer for a long time, continues to look as well as at any time in the past. Present indications point to the opening of a high-grade mineralized area.

Huckleberry—One of the most promising claims in the outlying portions of the district is the Huckleberry, in St. Kevin. While shipments have not been heavy, all the ore sent to the smelter is exceptionally high grade, over $20 per ton. The ore is chiefly gold, though it carries a small percentage of silver.

Margaret—A streak of telluride has been opened up in the Margaret, at a depth of 70 ft., which contains gold. Shipments are being made to a local smelter.

Progressive—Lessees operating on this mine have discovered a good body of ore, a carbonate, which besides carrying lead, also contains some silver. The shaft is now 300 ft. down.

Star of the West—This mine on Iron hill, which has been working all winter with heavy shipments of iron going to the local smelter, reports another strike. A vein of silver has been encountered which promises to develop into a large orebody. The ore carries lead.

San Juan County

Shipments of ore from Silverton in July were 2575 tons concentrates and 1850 tons crude ore. The larger shipments of concentrates were 1475 tons from the Silver Lake, and 800 tons from the Hercules; of crude ore, 725 tons from the San Antonio and 400 tons from the Shenandoah-Dives.

Champion—A test run on ore from this mine is being made at the Contention mill, under charge of T. C. Woodworth. The object is to determine the best type of mill for the mine.

Iowa-Tiger Leasing Company—This company, formed by Henry Sherman and others, has taken a lease of the Iowa and Tiger mines, and is putting them in order for operation.

[illegible]—The mine has been leased to Martin Honk and others, who have organized a leasing company. They will work the mine through the Trilby tunnel.

Idaho

Shoshone County

[illegible] *Company*—This company, which has just been formed at Wallace, with a capitalization of $1,000,000, will operate the [illegible] group of claims just across the line in Montana.

Stanley—Returns on the last shipment of concentrates show two grades of ore, ranging from $85 to $328 per ton and giving net receipts of $3600. The mine has been closed until litigation in which it is involved is settled, after which a mill will be erected and the ore concentrated.

Montana Standard—At the last meeting of the directors held a short time ago it was decided to run a 700-ft. tunnel on the lead in order to determine the size of the orebody. If satisfactory results are obtained a mill will be erected next year.

Black Horse—The Black Horse Mining Company has just been organized at Wallace, with a capital of $1,000,000, to work the Black Horse group near Murray.

Lucky Calumet—Sinking on a winze in the west drift has begun. High-grade galena ore was struck here a short time ago and after the drift had been pushed some distance beyond, it was determined to go down on the ore. The streak is small. If it proves large enough, a tunnel will be run from the foot of the hill to tap the orebody.

Indiana

Judge Francis E. Baker, of the Federal circuit court, has appointed John K. Siefert, of Terre Haute, general superintendent of the mines, receiver for the Indiana Southern Coal Company and the Southern Indiana Coal Company on complaint of the trustee for the bondholders. It was charged in the application for a receiver no interest had been paid on the bonds. The Southern Indiana Coal Company was the principal feeder for the Southern Indiana Railroad, which was placed in the hands of a receiver a few days ago. The action was brought in Indiana, as all the properties of the two coal companies are in this State. The coal companies' property consists of a dozen mines located along the line of the Southern Indiana Railroad.

Gibson County

While drilling for oil near Oakland City on the farm of Charles Cromer, the drill passed through a vein of coal 6 ft. thick. The coal is overlaid by a formation resembling iron ore and by 40 ft. of rock. Arrangements are being made to develop the territory.

Parke County

A vein of bituminous coal has been discovered a few miles southeast of Montezuma, on land recently purchased by the Wimmer Coal Company, which was recently organized. The vein was discovered at a depth of 125 ft. and is from 4 to 6 ft. thick. Machinery is now being installed for the opening of a new mine. The men backing this venture are Jesse Woods, John Wilhite, Harry White, Wallace Haworth and Robert Knox.

Sullivan County

Union Coal Mine—Fire broke out Aug. 22 in one of the levels of this mine and has continued to spread, despite efforts to check it.

Vigo County

A new geological survey of the coalfields of this county was begun Aug. 13 under the supervision of State Geologist W. S. Blatchley. The field work will be under the direction of Dr. George H. Ashley, assisted by E. F. Lyons, both of the United States Geolcgical Survey. The expense is being divided by the State and the United States surveys.

Michigan

Copper

Ahmeek—The company has begun excavating on the site of the two new shafts. As the company does not own the outcrop of ore along all its property these shafts will start with a common collar and then diverge from that point to develop the lodes in the northern and central portions of its land. The shafts will have three compartments and will be sunk at an angle of 80 degrees until the lode is reached; then the pitch of the lode will be followed. It is calculated that it will be necessary to sink about 1200 ft. before the lode is cut. The two producing shafts of the company are shipping about 1200 tons of ore daily.

Osceola—The South Kearsarge property is shipping about 2300 tons of ore daily to the mills. No sinking is being done in either of the shafts, all work being concentrated in stoping and drifting.

Wyandot—Diamond-drill explorations for the Lake lode have begun. In the exploratory shaft a crosscut from a depth of 700 ft. is being driven toward the east.

Bery County

Robert Gage Coal Company—This company has sunk a new shaft at Auburn, cutting a new vein of coal, which is 7 ft. thick at the shaft.

Hopkins County

Sunshine Coal Company—This company has been organized by W. D. Coil and G. R. Lynn, who recently bought the Royal coal mine at Madisonville. The property includes a mine in operation, and mineral rights over a large tract.

Missouri

Lead-zinc District

Criterion—F. P. Allen and associates will erect a 200-ton mill on their 12-acre lease on the Criterion land. Two shafts have a 6-ft. face of sheet ore.

Gold Dust—This company has incorporated with a capital stock of $15,000, equally divided between S. K. Ortt and A. L. Caulkins, of Webb City, and J. C. Hall, of Carthage.

J. C. Barr & Co.—This company has struck 14 ft. of sheet ore at 240 ft. on the Troupe land south of Webb City. Another shaft will be sunk and a mill erected.

Little Velma Mining Company—This company has been incorporated with a capital stock of $30,000 to buy and operate a lead and zinc mine located four miles southeast of Springfield. The stockholders are Richard Scharff, Hugo Mauch and W. A. Rathbun.

Sewickley—This company has been incorporated with a capital stock of $100,000. The shareholders are Chas. A. Strasburg and Samuel Strasburg, of Criderville, O.; M. P. Myers, W. A. Myers and T. L. Myers, of Joplin.

Grand Duke Consolidated—This company has been incorporated with a capital stock of $250,000. The shareholders are Sydney L. Wilkins, Frank S. Hamilton and W. F. Shannon, all of Joplin.

Illinois Zinc Company—This company, of La Salle, Ill., has filed papers of incorporation in Missouri with a capital stock of $2,000,000. Under the new charter the company can operate mines and buy and sell mining lands. The company already owns 160 acres of mining land near Granby.

Kalitan—This company, which has been developing the old Crawfish mines on Turkey creek, has made its first turn-in.

Osyka—This company has been incorporated with a capital stock of $150,000. The stockholders are F. A. Brown, R. K. Pitkin and John H. Robertson, all of Joplin.

Over Yonder Mining Company—This company has filed papers of incorporation with a capital stock of $50,000. The incorporators are A. E. Bendelari and F. S. Cook of Joplin; E. E. Payne, Morrison Clark and J. W. Durby of Carthage. The company has sub-leased the land and the 250-ton mill of the Glass Mining Company, west of Webb City.

Porter Land—The water has finally been beaten in the Porter mine, near Carthage, with a large centrifugal pump, and the ground is now ready for work.

Portage Lead and Zinc Company—This company has been incorporated with a capital stock of $150,000. The shareholders are J. L. Harris and Daniel Fisher of Houghton, Mich., and H. L. Culver of Joplin.

Montana

Butte District

Tuolumne—The station has been completed on the 800-ft. level and it is stated that the same vein which was recently cut on the 1000 has been cut in the back of the 800 station. Development work is being pushed with all possible haste on both the 1000- and 800-ft. levels.

Butte & Superior—Some time ago a vein was cut south of the shaft on the 1000-ft. level, but the flow of water encountered compelled a halt in operations before the width of the lead was determined. Work on the crosscut has been resumed recently and the vein will be thoroughly explored. From the 1200-ft. station crosscuts have been started both north and south.

Beaverhead County

New Departure—A lease has been given by the company to Fred. Randolph for the purpose of allowing him to locate a rich vein of gold supposed to exist in the mine.

Fergus County

Cone Butte Company—The management states that work on the new mill of the company will be begun shortly. Some months ago an issue of bonds was authorized and enough of them have since been sold to provide funds for the erection of the new mill.

Nevada

Esmeralda County—Goldfield

Production—This week's production amounted to 2544 tons, worth $245,190, as follows: The Kinkead mill treated 60 tons of concentrates by the new process, the Combination mill treated 630 tons of Consolidated ores; the Western Ore Purchasing handled from the Van Riper dump 18 tons; Little Florence, 77 tons; Rogers Syndicate, 6 tons; Truax lease, 17 tons; Mohawk Jumbo, 696 tons; the Nevada Goldfield Reduction works treated from the Combination Fraction 342 tons; Consolidated Red Top, 155 tons; Engineers lease, 227 tons; Mohawk Jumbo, 55 tons; Daisy, 16 tons; Frances Mohawk, 105 tons; Rogers Syndicate, 12 tons; Little Florence, 48 tons; Mohawk Combination, 60 tons.

Great Bend—The new shaft is down 220 ft. and it is expected that connection with the old workings will be made within ten days, when ore shipments will begin.

Florence—President Lockhart, in his annual report to stockholders, states that the revenue from royalties on ore extracted by leasers has enabled the company to pay three dividends of 10c. per share, or a total of $315,000, and also to pay for construction of the mill and the purchase and development of a water supply, which up to June 30, 1908, have cost $255,691. The company has no debt of any kind. The water supply has been developed by a gravity pipe line to about 100,000 gal. per day, more than sufficient for the present milling plant.

Chicago Goldfield—The Gold Medal lease is making good headway in crosscutting to get under the old Benedict shaft. This work has progressed 300 ft., with 60 more to go, when an upraise will be started.

Mohawk Ledge—Bids have been opened and contracts will be let in a day or two for sinking the shaft from the 475- to the 675-ft. level.

Oro—Captain Hooper, president of the Oro, is in receipt of several requests for leases on this property, which is beyond the known northern ore zone.

Atlanta—Blocks Nos. 4, 5 and 6 on the Union Jack claim of the Atlanta have been leased to a New York company.

Laguna—The favorable developments in the Mushett lease have excited considerable interest in the adjoining ground, and it is reported that a bonus of $40,000 has been offered for a lease in the No. 6 block of the Miss Jessie claim.

Esmeralda County—Cuprite

Sulphur Group—The group of claims at Cuprite known by this name have been sold to Los Angeles interests. Before the deal was consummated a shipment of sulphur from the property was made and the returns gave 93.7 per cent. sulphur. The sulphur deposit is 450 ft. wide and in places it protrudes above the ground in a well defined outcrop and in other places it is covered by rock. An 8-horse team and scraper will be put to work to uncover the deposit.

Humboldt County—Seven Troughs District

Mazuma Hills—Eighteen inches of shipping ore has been encountered in the face of the tunnel at a depth of 80 ft. in the Martin & Gourdier lease. The strike occurs in a big parallel vein, 600 ft. west of the famous Mazuma Hills vein, in entirely new ground and it doubles the known ore zone which extends across Seven Troughs camp.

Kindergarten Mill—The mill treating ores from the Kindergarten mine realized $18,000 from its July clean-up. During the month the mill ran only one shift in the 24 hours. The ore averaged around $80. A large run will be made this month on Therien ore taken from the Wihuja lease adjoining the Kindergarten mine.

Mazuma Hills Mill—A clean-up of nearly $18,000 was made from a 20-days' run. During the whole month of July the mill turned out $30,000. The last 10 days of the month were devoted to the rich ores from the Reagan-Hayes lease.

Lincoln County—Searchlight

Quartette—The new 150-ton cyanide mill has been started up for the first time.

Philadelphia Searchlight—Work on the Philadelphia has been resumed with a large force of men.

Lyon County—Yerington

Nevada Douglas—Sixty tons of high-grade copper ore derived from development work are being shipped weekly to the Salt Lake smelters.

Lyon County—Ramsey

Ramsey Ophir—Machinery has been installed on the Faby lease on the Ramsey-Ophir ground and more development work is about to begin.

Queen—Near the 50-ft. level in the Ramsey Queen shaft sulphides have been encountered.

New Comstock—Work has been resumed on the New Comstock property after a shut-down of several weeks. A pump has been installed large enough to handle the water.

[illegible]

National Bank—The lessees on the Sixty-Six have made one of the most sensational strikes ever made in Bullfrog. A streak of ore 8 in. wide has been encountered which assays $291.45. The vein itself is 4 ft. wide and this rich streak is near the hanging-wall side. The entire 4 ft. is shipping ore.

Pioneer—The 50-ton cyanide plant is expected to be ready to treat ore this week.

Homestake—The new Homestake King mill is treating 100 tons of ore per day and is working perfectly.

West Extension—A siding is being built to accommodate the West Extension, which has guaranteed a daily shipment of 30 tons to the new mill at Beatty. The west and south drifts are in milling ore running from $10 to $23 per ton.

Original Bullfrog—Arrangements have been made to ship a carload of ore from the Original Bullfrog to the Shoshone mill.

Tramp Consolidated—Sacking ore still goes on at the Tramp. It is expected that in a few days connection will be made between the tunnel and the shaft.

Nye County—Manhattan

Manhattan has four mills, with an aggregate capacity of 160 tons per day. Three of these mills are running full time, and the fourth, now being overhauled, will resume operations shortly. Since the settlement of the wage question, various companies now idle have been making preparations to resume operations.

A two-years' lease has been granted on the surface of the Big Chief, Toro Blanco, and Union Four properties to an Australian miner who has begun placering the old dumps. He has laid a pipe line from the Rose Nash shaft, has 12 men at work and his daily clean-up is averaging $250.

Cañon Mill—This mill has installed a new pump for its presses and has resumed full shifts.

Nye County—Rhyolite

Keane Wonder—This mine has this week shipped to the First National Bank of Rhyolite a gold brick weighing 700 oz. and worth $[illegible] per ounce.

Nye County—Tonopah

Production—The output of Tonopah for the week ending Aug. [illegible] amounted to 5995 tons worth $153,025, as follows: Tonopah Extension, 90 tons; Tonopah Mining, 3800 tons; Belmont, 700 tons; Montana Tonopah, 1015 tons; MacNamara, 150 tons; West End, 90 tons; North Star, 50 tons.

Belmont—The big vein encountered in the new drift from the No. 4 south crosscut on the 1000-ft. level has been opened up for 200 ft. in the drift and the stopes show an average width of 14 ft. of milling ore. A winze down from this level 37 ft. is all in ore.

Tonopah Extension—The work of blocking out ore between the 550- and 600-ft. level continues in this property. Two raises have made connection between these two levels. The average width of the vein is 5 ft.

MacNamara—Since the settling of the apex litigation with the West End, the MacNamara company has been busy getting ready to work the east end of its property. A new compressor has been ordered and several more machine drills will be put to work.

Tonopah—The Mizpah shaft is now down 1086 ft. and will go to the 1300-ft. level before any more crosscutting will be done.

Oklahoma

Ottawa County

An oil-pipe line is being laid from Miami to the mines where oil will be used for fuel.

Emma Gordon—This company is planning to install roasters to roast the ores. The ore has been running about 8 per cent. iron and 8 per cent. bitumen.

Miami-Yankee—This company, operating at Miami, has purchased a reduction of the royalty from 30 to 19 per cent.

Miami-Peoria Royalty Company—This company has been organized with a capital stock of $100,000, equally divided among E. M. Chapman, H. P. Hall, A. L. McCawley, C. S. Bahney and W. C. Thomas, all of Carthage, Missouri.

Oregon

Baker County

Blue Jacket—In this mine, near Sumpter, tunnel No. 2 has opened up a promising orebody. Prospecting work is to be continued by crosscuts from the tunnel.

Sandow Group—In this group, near Sumpter, a crosscut on the 240-ft. level has opened a vein running well in gold. The mine is worked by E. Shelton and associates.

Pennsylvania

Anthracite Coal

Coalbrook—At this colliery of the Delaware & Hudson Company, the breaker is being rebuilt, and a steel conveyer put in to carry coal from the mine to the breaker.

Delaware, Lackawanna & Western—This company's great central power plant at Hampton, in the Keyser valley, is now completed and in operation. This plant has a capacity of 10,000 h.p., and furnishes power to 20 collieries owned by the company.

Bituminous Coal

Jutte & Company—A suit has been brought to foreclose a mortgage for $1,600,000 on coal lands owned by this company in Pike Run township, Washington county.

Ivory Hill—This mine, at Nant-y-glo, has been leased to Estep Brothers, of Ebensburg, Penn. The mine has a capacity of 100,000 tons a year.

Catsburg Colliery—Work is in progress on two new tipples at these mines of the Monongahela River Consolidated Coal and Coke Company, one of which will be for rail and the other for river shipments. The old river tipple has been in constant use, but the rail tipple has been out of service for some years, the company having exhausted all the coal adapted for rail shipment. New acreage adjacent has been acquired, and it is for the mining of this that the new tipple and other improvements are being made.

Emerald Coal Company—This new company has bought a tract of 5228 acres of coking coal in Greene county from J. V. Thompson, of Uniontown, and others. The price is said to have been about $300 per acre. It is in Morgan township, and adjoins lands of the Bessemer Coke Company and the Pittsburg-Buffalo Coal Company. The land will be opened up, and an extension of the Pennsylvania railroad Marianna branch about 2½ miles will be built to reach it. The incorporators of the new company are Julian Kennedy and Reid Kennedy, Pittsburg; Thomas L. Daly, Bellevernon; R. C. Crawford and James Henderson, of McKeesport, Penn. The coal is said to average about 7 ft. thick, and to be a good coking coal.

South Dakota

Lawrence County

Golden Placer—The annual meeting will be held here Sept. 3, when it is planned to authorize the raising of $30,000 for the further development of the property and equipment of the mill, the only one of its kind in the Black Hills.

Pennsylvania—Work will probably be resumed after the annual meeting in Williamsport, Penn., on Sept. 5. The property in Deadwood gulch contains phonolite ore that has not been worked for more than four years.

Pennington County

Crown—A company has been organized by Rapid City men, capitalized at $500,000, and work on the ledge which extends 1500 ft. along the property, will be commenced at once. A large mill is to be erected, as the ore is well developed.

North Star—Frank Caughron is developing a high-grade gold property near Rochford, from which he hopes to ship this fall. He is constructing a small treatment plant on the ground.

Tennessee

Putnam County

Georgia-Tennessee Phosphate Company—This company's offices have been moved from Baxter to Boma. This company has just placed an order for an air compressor and drills to be used in the operation of mine No. 1, one-half mile from Boma.

Texas

The statistics collected by the *Oil Investors' Journal* show that petroleum production in the Gulf Coast region in July averaged 41,080 bbls. a day, indicating a daily surplus of 3844 bbl. and an increase in stock amounting to 119,175 bbl. for the month. The estimated output for the month just closed was 21,000 bbl. less than the June record, being put at 1,273,500 bbl. Southeast Texas is credited with 817,200 bbl. gross production, a daily average of 26,361 bbl., as compared with a daily average of 26,720 bbl. in June.

Forty-one wells were completed in the Gulf Coast region in July; 28 being producers with initial output of 9,225 bbl. and 13 being dry. The June record was 71 completions, of which 45 were producers, 25 were dry, and one at Humble a gasser. On July 31 there were 101 wells drilling and 10 rigs up in the Gulf Coast region, as compared with 94 wells drilling and rigs at the end of June.

Utah

Beaver County

King David—This company has ordered a large steam hoisting plant, capable of developing the mine to a depth of 2500 ft. A five-mile pipe-line is being laid to supply water. This company was organized about two weeks ago. It owns over 70 lode mining claims near the Horn Silver mine, and began active operations with $50,000 in the treasury for development purposes.

Newhouse Mines and Smelters Company—The first ore found on the 900-ft. level of the Cactus mine assays 4 per cent. copper.

Piute County

Gold Development—Resumption of development work at the properties of this corporation, controlled by Philadelphians, has been ordered.

Salt Lake County

Utah Apex—This company has closed a two-years' contract with the American Smelting and Refining Company, and is shipping 50 tons of lead ore per day.

Bingham Central Standard—Ore shipments are again being made from this property. One lot sold this week assayed 25 oz. silver, 4.5 per cent. copper and 30 per cent. lead. The indebtedness of the company will be paid off this month.

Emma—This famous old Alta producer has passed into the control of Jesse Knight and associates of Provo, Utah. Negotiations are being made to obtain adjoining ground.

Utah-Bingham—A new compressor is being installed at this property, which is controlled by an English syndicate. Engineers claim that there are 100,000 tons of ore blocked out in the mine.

Summit County

Park City Ore Shipments—Last week the Daly-Judge shipped 245 tons; Silver King, 686; Daly-West, 575; total, 1506 tons.

Grasselli Chemical Company—The capacity of the mill for zinc ore will be immediately doubled; E. Nesbit will be the engineer in charge of construction. The present capacity of the mill is 150 tons per day.

Little Bell—Work has been resumed at this property. It is controlled by the Daly-West Mining Company.

Canada

Ontario-Cobalt District

Ore Shipments Cobalt—Shipments of ore from Cobalt for the week ending Aug. 15 were as follows: Coniagas, 63,780 lb.; Cobalt Central, 46,170; Drummond, 185,480; La Rose, 339,170; McKinley-Darragh, 125,780; Nipissing, 174,360; O'Brien, 128,250; Silver Queen, 164,680; Hudson Bay, 194,500. Total, 1,422,170 pounds.

City of Cobalt—A vein of good ore has been discovered at a depth of 200 ft. in the drift being driven toward the main shaft from the bottom of the winze that has been sunk from the 143 ft.-level. This vein has already been developed on the 143 level, but where just cut it is richer and will assay about 4000 oz. silver per ton.

Little Nipissing—A vein of good ore, 13 in. wide, has been found on the 100-ft. level a few feet from the main shaft. In this vein free native silver and cobaltite occur along with calcite.

McKinley-Darragh — Work is being rushed on the new 20-stamp mill close to No. 1 shaft. It will have a daily capacity of from 60 to 75 tons. The company has on hand large dumps of low-grade ore ready for treatment. A crosscut, 150 ft. long, is being driven from the main workings through the right of way of the Temiskaming & Northern Ontario Railway and under Cobalt lake.

Muggley Concentrator—Last month the concentrator treated an average of 70 tons per day. The ore came from the dumps of the Townsite and Silver Queen mines. An automatic sampler is being installed.

Ontario-Chippewa

[illegible] The smelter building, 60x140 ft., has been completed, and operations will begin shortly. The smelter will handle ore from Cobalt and also foundry and jeweler's waste.

[illegible]

[illegible] made for the installation of a 10-stamp mill at this gold mine. The machinery was freighted to the mine ten years ago by the Reliance company, now defunct, and was never erected.

Ontario—Montreal River District

Cartwright Location—R. A. Cartwright, who some time ago discovered a vein carrying niccolite and native silver at Bloom lake about 30 miles west of Elk lake on the Montreal river, has organized a syndicate, including A. E. Barlow, H. E. T. Haultain, Clifford Smith, J. W. Evans and others, for developing the property.

Mexico

Chihuahua

Rio Plata—A recent shipment of 29 tons gave returns of more than 103,000 pesos. The concentrates ran 1212 oz. silver and the crude ore 2316 oz. silver to the ton. A late report of the mine superintendent states that there is 6 ft. of 212-oz. ore in the face of the tunnel in progress on the newly-opened orebody. The company's general manager, D. W. Shanks, accompanied by Mark R. Lamb, is at the mine superintending the installation of the Moore filter presses and other cyanide machinery.

Parral Production—The production of the Parral camp for the week ending August 8 amounted to 8150 tons, of which 5040 tons were treated at local milling plants and the balance sent to outside reduction works. This is an increase of about 1000 tons over the preceding week.

Almoloya—This company is carrying on extensive developments at its San Enrique property adjoining the Cigarrero mine in the vicinity of Baca. A three-compartment shaft is in progress to 1500-ft. depth. N. O. Bagge is the general manager and V. C. Joslyn is the superintendent in charge of mining operations.

Dios te Guie—The Earl Syndicate, of which Alexander Bonthrone is general manager, is systematically developing this property in the Sierra Madre section. Installations of machinery are planned.

Providencia—This property, adjacent to the Refugio and La Luz mines, in the Parral section, has lately been equipped with heavier hoisting machinery and other improved surface works. Considerable orebodies have been exposed ard plans are being formulated for a milling plant. W. W. Robinson, of Kansas City, is the owning operator.

[illegible]

[illegible] ajuato district for the week ending Aug. 8 increased over the previous weeks. The output of bullion reached $160,000. Concentrates amounted to $8?,000; total value of week's shipments, $24?,000. The market price of silver is now lower than at any other time during the past eight years and Guanajuato is maintaining a large output notwithstanding the light demand.

[illegible]

Burning Oil Well—The Pearson company has been using four large centrifugal pumps throwing great volumes of water, sand and gravel into the mouth of the burning oil well at Dos Bocas, and two more have been ordered. According to late reports the fire in the crater still continues but it is thought the latest method for smothering the fire is gaining control. As soon as the well is securely capped another will be sunk near the old one, every precaution being taken to control the flow.

Central America

Costa Rica

[illegible] to erect a 100-stamp mill, and the superintendent, A. M. Yonge, whose address is at San Mateo, Costa Rica, would like to receive catalogs from makers of mining machinery. The company's office is at 43 Exchange place, New York.

Europe

Germany

In an explosion of firedamp in the Dudweiler coal mine, at Saarbrucken, Rhenish Prussia, on August 11, 13 miners were killed and 30 injured. A number of the miners are also missing, and it is believed they are entombed in the workings, with little chance of their being rescued. The mine was one of the largest in Prussia, and the loss will be heavy.

Africa

West Africa

Gold production in July is reported by the South African Chamber of Mines at 24,587 oz. bullion. For the seven months ended July 31 the total was 169,359 oz. in 1907, and 174,206 oz. in 1908; an increase of 4847 oz. The bullion reported this year was equal to $3,276,008, or 158,520 oz. fine gold.

New Caledonia

[illegible] for May and the five months ended May 31 are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	May.	Four Mos.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Exports of nickel and chrome ore in [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 26—In the West the Indiana strike has been ended. The national authorities of the Mine Workers decided that the local officers had no right to order a strike, and that the miners must return to work, pending negotiations over the disputed clause in the agreement. The mines have started again, after a stoppage of two weeks. Otherwise the coal trade shows no change.

The strike in Alabama has developed much hard feeling and some violent outbreaks. The coal companies, however, continue firm in their refusal to treat with the union.

The Seaboard bituminous trade continues quiet, but there are signs of a better feeling. The Coastwise trade is improving. The anthracite trade remains dull.

The attorney-general of New York has brought suit against the anthracite railroads and their subsidiary coal companies, charging that, in violation of the so-called Donnelly anti-monopoly act they "have effected and are now carrying out an agreement which in effect constitutes a monopoly of the hard-coal business within the State, and that such an agreement restricts the production and regulates and fixes the prices at which coal can be sold in the State of New York." The court has issued an order directing the taking of testimony on the complaint, to begin Aug. 31, in Albany.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Aug. 15, in short tons:

	1907.	1908.	Changes
Anthracite......	3,532,117	3,178,254	D. 353,863
Bituminous . ..	23,969,254	20,162,724	D. 3,806,530
Coke	8,795,377	4,195,605	D. 4,599,772
Total..........	36,296,748	27,536,583	D. 8,760,165

Total decreases this year to date was 24.1 per cent.

Coastwise shipments of coal from Atlantic ports six months ended June 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	7,946,823	4,899,875	12,846,698	64.1
Philadelphia	1,131,564	2,241,933	3,373,497	16.8
Baltimore....	131,560	1,773,658	1,905,218	9.5
Newp't News	....	1,212,240	1,212,240	6.0
Norfolk......	....	715,686	715,686	3.6
Total......	9,209,947	10,843,392	20,053,339	100.0
Total, 1907.	9,820,817	11,347,683	21,168,500	.....

Total decrease this year, 1,115,161 tons, or 5.3 per cent. New York includes all the New York harbor shipping ports.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, six months ended June 30, short tons:

	Coal.	Coke.	Total.
Balt & Ohio..	9,950,185	1,276,186	11,226,371
Buff, Roch & Pitts	2,602,411	178,216	2,780,627
Penn lines N Y C.	3,043,107	32,392	3,075,499
Pitts. & L. Erie.....	3,193,820	1,242,627	4,436,447
Norfolk & Western.	4,785,870	905,645	5,691,515
Total..............	23,575,393	3,635,066	27,210,459
Total, 1907........	31,077,569	7,187,960	38,265,529

Decrease this year in coal, 24.1 per cent.; in coke, 49.4; total, 28.9 per cent. In addition to the above the Baltimore & Ohio carried 535,141 tons anthracite in 1907, and 397,656 in 1908; decrease, 137,485 tons.

New York

Anthracite

Aug. 26—The local market continues dull, and the approach of September, when discounts will cease, seems to have no effect. Both prepared and steam sizes are in plentiful supply.

Quotations by the large dealers are as follows: Broken, $4.65; egg, stove and chestnut, $4.90; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

There is some improvement in the Seaboard market, but it is of an uneven and spasmodic kind. Orders come from some quarters for a short time and then stop unexpectedly. Producers are working irregularly on this account, and it is difficult to gage the output. Car supply presents no difficulties; transportation from mines to tidewater is fair, cars taking about a week to come through.

In New York harbor business is still quiet. Ordinary grades of Clearfield are quoted about $2.40, with the best grades at $2.55.

Consumers in the shoalwater ports seem to have been taking advantage of low freight rates, and some of them have been putting in stock at an unusually early date. This will reduce the usual rush in October.

The Interstate Commerce Commission having upheld the claims of the producers, the Baltimore & Ohio has issued a new tariff, reducing the rate on "small-vein" Cumberland and George's Creek coal to tidewater 15c. below that charged on "big-vein" coal. This point has been in controversy some time. The reduction makes the rate on small-vein coal about the same as that on Clearfield to tidewater.

In the Coastwise trade, vessel rates are hardening, chiefly owing to an increase in rates in the lumber trade. There has been no increase in quoted rates, but owners are making no concessions. Rates are, for large vessels, from Philadelphia: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Portsmouth, 55@60c.; Newburyport, Gardner and Bangor, 70@75c.; Bath, 65@75c.; Saco, 90c.; to the Sound, 50 cents.

Birmingham

Aug. 24.—By degrees the coal production in Alabama is picking up and it will not belong before the new men, replacing the striking miners, will be sending out a steady supply. The military and deputies on duty throughout the mining district in Alabama have been vigilant of late and, barring bushwhacking and occasional throwing of dynamite, have held down conditions well. There is a heavy influx of new labor, but it will take some little time to get the men in shape for good results. All the larger corporations in the district have joined the Operators' Association and announce positively that there will be no recognition of the union. Some coal and coke is being brought into the Birmingham district and used at the furnaces.

Chicago

Aug. 24—There is little progress in the coal market. The increase in sales of Eastern coals is the only favorable sign. Steam consumption has not picked up generally yet.

The supply of light coals is small; of prepared sizes, heavy, compared with the demand.

Illinois and Indiana lump and egg are $1.75@2.25; run-of-mine is $1.60@1.75 and screenings $1.35@1.55.

Of Eastern coals Hocking and smokeless are strong. Hocking sells for $3.15; smokeless is at $3.15 for run-of-mine and $4.20@4.35 for lump and egg. Youghiogheny is quiet at $3.15@3.25 for ¾-in. lump.

Pittsburg

Aug. 25—Coal production in the Pittsburg district at the beginning of the week was at a rate of less than 60 per cent. It likely will drop to below 40 per cent. next week as the lake docks are congested with coal. The river coal mines are doing practically nothing, as almost every barge and coal boat in the pools is loaded. There was sufficient water to permit one or two tows of "empties" to come in, but there will be no haste in loading them as there is a stock of over 20,000,000 bush. ready to go out as soon as the rivers are navigable. Prices are firmly maintained on the basis of $1.15 for mine-run coal at mine. Slack continues to be a drug, and several sales were made during the week at 25c. a ton. Some operators are storing their slack and refuse to quote less than 75c. a ton.

Connellsville Coke—More ovens are being fired each week by the independents and the H. C. Frick Coke Company. While individual sales have not been large they aggregate over 30,000 tons. All coke sold on contract went at prices as follows: Furnace coke, $1.65@1.75, foundry coke, $2.10@2.25. For prompt shipment these prices can be shaded, a sale of 2000 tons of furnace coke being made at $1.50. The *Courier* in its summary for the week gives the production in both regions at 193,492 tons. Shipments, 7784 cars as follows: To Pittsburg, 3126; to points west of Connellsville, 4236; to points east of Connellsville, 422 cars.

Foreign Coal Trade

United States Coal Exports—The coal supplied to vessels engaged in foreign trade at United States ports, six months ended June 30, was 2,835,547 tons in 1907, and 3,024,793 in 1908; increase, 189,246 tons. Adding the exports, previously reported, makes the total coal sold for consumption beyond the limits of the United States for the six months 8,503,789 tons in 1907, and 8,324,683 in 1908; decrease, 179,106 tons, or 2.1 per cent.

Nova Scotia Coal Shipments—Shipments by companies from Nova Scotia mines, seven months ended July 31, long tons:

	1907.	1908	Changes
Dominion	1,745,195	1,898,467	I. 153,272
N. S. Steel ..	423,287	460,355	I. 37,068
Cumberland	213,413	222,865	I. 9,452
Acadia	172,974	187,355	I. 14,381
Intercolonial. .	155,816	153,769	D. 2,047
Inverness	130,997	152,666	I. 21,669
Total .. .	2,741,682	2,975,477	I. 233,795

All the companies but one show gains this year, the total increase being 8.5 per cent.

Iron Trade Review

New York, Aug. 26—The markets, as a rule, show little change. More inquiries for pig iron are reported, but comparatively few sales. Prices are still low, and consumers are not ready to pay any advance. Southern iron seems to be in the strongest position just now, and makers are not inclined to make concessions.

In finished material rail orders continue to be small. Some bridge work is reported, and there are inquiries for more. Some good building contracts have been let, but most structural work seems to be held up for future developments. Specifications on contracts are coming in a little more freely. On the whole, however, the volume of business seems to increase slowly.

Baltimore

Aug. 25—Exports from Baltimore for the week included 868,347 lb. scrap tin to Rotterdam; 1204 tons steel billets to Liverpool. Imports included 201 tons ferromanganese and 196 tons manganese ore from Rotterdam; 3400 tons cupriferous pyrites from Spain; 6200 tons iron ore from Cuba.

Birmingham

Aug. 24—Alabama manufacturers report the pig iron market still improving. There have been some inquiries received for immediate delivery iron and the $13 quotation given. Some inquiries have been received for iron delivery during the first quarter of next year but as far as can be learned none of this business has been booked as yet. The make in the South is holding up well. The general price now for iron is around $12.50 per ton, No. 2 foundry basis.

The feature of the past week was the resumption of operations at the rolling mills of the Tennessee Coal, Iron and Railroad Company at Bessemer. This plant rolls steel mostly and it is understood that 300 men will be given steady employment. The steel plant at Ensley is doing exceptionally well.

Nothing has been given out lately concerning the probable starting up of the plants of the Southern Steel Company.

Chicago

Aug. 24—The market for iron and steel continues to hold its own; little more can be said. In the pig-iron market there is a continued buying of small lots—a carload to 1000 tons—but no general advance to business for the future.

Southern No. 2 iron brings $12.50@13 Birmingham, or $16.85@17.35 Chicago. Northern iron of the same grade is obtainable at $17@17.50, with the result that most of the buying is of Southern. The consumer will not endure the difference. Lake Superior charcoal is obtainable at $19.50@20, with supplies scarce. These prices are on small lots for delivery in the last quarter of the year or sooner, the rule still obtaining that for early deliveries prices are light.

The average consumer, who makes the market, is still a bear. He will not buy more than he needs for quick consumption.

Coke is quiet, the supply being ample at $[illegible] for the best Connellsville.

Philadelphia

Aug. 26—A condensed view of the pig-iron market today is that so far as this territory is concerned there has been such a depletion of stocks, either by actual dealings or by selling for future delivery, as to make it possible to do some business for fourth-quarter delivery at an advance [illegible]

stronger. A better feeling prevails. But the sagging factor is the large idle capacity. All buying is conservative and most of it for early delivery. The dullest pig iron is forge. In basic pig, everything is talk. The foundry people show more activity, but their purchases are all for small lots. There is not a sign of speculative buying.

No. 2X is quoted at $16.50; basic, $15.50, and forge about the same.

Steel Billets—Inquiries are more numerous and some few orders were placed [illegible]

Bars—The only change in the situation is that there are more buyers snuffing around after fall iron.

Merchant Steel—Agents handling ordinary steel stocks are doing a fair business.

Nails—Hardware houses report an improved retail demand.

Wire Products—There has also developed quite a retail demand for wire products.

Pipes and Tubes—A larger amount of repair work into which tubes enter is coming along. In merchant pipe conditions are slightly better. In cast pipe the foundries are quite busy.

Plates—No large orders and the market is devoid of interest.

Structural Material—Present business is disappointing.

Scrap—Holders of heavy scrap have refused business this week. They want more money.

Pittsburg

Aug. 25—This week is a dull one as to new business, but there is no decline in the operation of the mills in the Pittsburg district. Specifications on old contracts are coming in freely. It is reported that the National Tube Company has taken an order for about 100 miles of line pipe, but the report was not confirmed. It was announced that business is improving and that about 60 per cent. of the capacity of the different plants is being turned out. The big Standard Oil Company contract has not been closed. The Spang-Chalfant Company is running its plant nearly to capacity and is reported to have a contract this week for 30 miles of line pipe. Merchant bars, wire products and sheets are the most important lines as to demand. The American Sheet and Tin Plate Company has added more sheet mills to its active list. The tinplate trade does not show any improvement. No change is noted in the plants of the Carnegie Steel Company in this district. It seems to be the impression here that there is considerable truth in the report that the railroads and the rail makers will get together some time next month and during October a heavy tonnage of rails will be placed for 1909 delivery.

Pig Iron—The Standard Sanitary Manufacturing Company, as reported recently, bought 9600 tons of Northern, Southern and Virginia iron for September and October delivery. It has decided to cover for part of its November and December requirements and closed yesterday for 3500 tons of Northern iron in the Pittsburg district and from an outside furnace which takes a freight rate of 75c. While the price on this iron, No. 2 foundry, was $15.40 at furnace, it is equivalent to a higher price at the Valley furnaces on account of the lower freight rate. Foundry iron continues strongest, being quoted this week at $14.75@15, Valley furnaces. Bessemer iron is is still declining, the lowest quotation, based on the last sale, being $15.25, Valley. Basic and malleable bessemer are quoted at $14.50@14.75 and gray forge at $13.75@14 at furnace.

Steel—The market is dull; prices unchanged for billets at $25, Pittsburg. Plates are quoted at 1.60c. and steel bars at 1.40c.

Sheets—The market continues to improve, and prices are firm at 2.50c. for black sheets and 3.55c. for galvanized, No. 28 gage.

Ferro-Manganese—Prices unchanged at $45@46, Pittsburg.

Foreign Iron Trade

German Steel Syndicate—The report of the Steel Syndicate for the year ended March 31, 1908, shows the following shipments, in metric tons:

	Domestic.	Export.	Total.
Billets, blooms, etc...	1,187,121	269,324	1,456,445
Rails and fastenings.	1,624,473	744,185	2,368,658
Shapes, plates, etc...	1,176,136	425,759	1,601,895
Total	3,987,730	1,439,268	5,426,998

The total shipments for the previous year were 5,756,797 tons, showing a decrease last year of 329,799 tons, or 5.7 per cent. The decrease was chiefly in shapes and plates, and in billets (half-finished material); rails showed an increase.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Aug. 26.

At all U. S. Ports in July and year

Metal	Exports.	Imports	Excess
Gold:			
July 1908..	$ 4,845,272	$ 2,916,408	Exp. $ 1,928,864
1907..	7,478,366	3,410,782	4,067,584
Year 1908..	58,363,247	29,324,304	" 29,038,943
" 1907..	43,779,098	24,879,429	" 18,899,669
Silver			
July 1908..	4,930,746	2,982,074	Exp. 1,948,672
" 1907..	5,955,042	3,387,225	" 2,567,817
Year 1908..	30,445,291	24,123,422	6,321,869
" 1907..	35,174,251	25,782,836	9,391,415

Exports of specie from New York, week ended Aug. 22: Gold, $8000, to Haiti; silver, $787,530, to London and Paris. Imports: Gold, $306,674, from South America and Australia; silver, $46,099, from the West Indies and Mexico.

Specie holdings of the leading banks of the world, Aug. 22, are reported, as below, in dollars:

	Gold	Silver	Total.
Ass'd New York	......	....	$331,266,700
England.......	$191,436,295	....	191,436,295
France.......	644,641,340	$181,327,070	825,968,410
Germany	200,510,000	83,100,000	283,610,000
Spain......	78,445,000	138,905,000	217,350,000
Netherlands..	38,525,500	20,870,500	59,396,000
Belgium.....	19,896,665	9,948,335	29,845,000
Italy.......	183,680,000	22,000,000	205,680,000
Russia.........	582,280,000	40,330,000	622,610,000
Aust.-Hungary.	235,285,000	66,180,000	301,465,000
Sweden......	20,150,000	....	20,150,000
Norway......	8,800,000	....	8,800,000
Switzerland...	23,080,000	......	23,080,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	August.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
20	4.8640	51⅜	23	24	4.8605	51½	23 11/16
21	4.8625	51½	23 11/16	25	4.8580	51¼	23 11/16
22	4.8615	51¼	23⅞	26	4.8580	51¼	23 11/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The Indian bazaars are still buying only in a moderate way, and the price of silver continues to rule low, with present quotation about the lowest for five years. The market is fairly steady, however, at the present low figure.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Aug. 13:

	1907.	1908.	Changes.
India.......	£7,705,924	£5,313,753	D. £2,392,171
China.......	......	516,400	I. 516,400
Straits......	544,012	90,510	D. 453,502
Total......	£8,249,936	£5,920,663	D. £2,329,273

Receipts for the week were £224,000 from New York. Exports, £2000 to Egypt, £128,000 coin to Singapore, and £138,200 to India; £268,200 in all.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

August.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
20	13½ @13¾	13⅜ @13½	59 11/16	29¼	4.57½ @4.60	4.65 @4.70	4.50 @4.55
21	13½ @13¾	13⅜ @13½	60	29¼	4.57½ @4.60	4.65 @4.70	4.50 @4.55
22	13½ @13¾	13⅜ @13½		29¼	4.57½ @4.60	4.65 @4.70	4.50 @4.55
24	13½ @13¾	13 @13½	60	29¼	4.57½ @4.60	4.65 @4.70	4.50 @4.55
25	13½ @13¾	13 @13½	60	28⅞	4.57½ @4.60	4.65 @4.70	4.50 @4.55
26	13½ @13¾	13⅜ @13½	60⅜	29	4.57½ @4.60	4.65 @4.70	4.50 @4.55

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The activity of speculators, to which reference was made in our last issue, continued throughout this week, but they did not succeed in depressing prices further. Consumers have been picking up the lots which came on the market, and it is now anticipated that the market will soon be free of this influence, which would certainly improve the outlook for an early betterment of conditions. In the meanwhile these speculative transactions have produced some extraordinary variations. One considerable sale of electrolytic copper was made during the last week at 13⅛c., while on the other hand a sale of several hundred thousand pounds of Lake copper for delivery late in September and in October was made at 13⅞c. Neither of these transactions is representative of the real market, which has ruled about the same as in the previous week. The close is steady at 13½@13¾c. for Lake copper; 13⅜@13½c. for electrolytic in ingots, cakes and wirebars; 13⅛@13¼c. for casting copper.

The standard market in London moved within narrow limits throughout the week. It seems that prices have reached their natural level as compared with refined sorts, and the quotations are cabled at £60 7s. 6d. for spot, £60 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.@64 10s.; best selected, £63 10s.@64 10s; strong sheets, £75 10s.@76 10s.

Exports of copper for the week from New York and Philadelphia, 9514 long tons. Exports from Baltimore, reported by our special correspondent, 406 tons of copper.

Manufactured Copper—Sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15¼c. base.

Tin—The London market has remained without special feature, moving between the high, £133 5s. for spot, £134 for three months, and the low, £131 15s. for spot, £132 for three months. The close is cabled as strong as £132 10s. for spot, £133 5s. for three months.

The domestic market has been very narrow and the fluctuations were insignificant. Consumers have not shown any interest and the small business that was done was among traders. At the close spot and future tin can be bought at about 29 cents.

Lead—The market is quiet and unchanged at 4.57½@4.60c. New York.

Large arrivals were pressed for sale in the London market and caused a rather weak tendency throughout the week, the close being lower at £13 6s. 3d. for Spanish lead, £13 8s. 9d. for English lead.

Spelter—This metal has been rather neglected, but in spite of the absence of a larger demand there is but little inclination on the part of smelters to meet [illegible] current prices, since the supply of ore is diminishing right along, and so is the margin between the ore and the refined metal. In fact, it is estimated that the present ore production is not adequate to supply the current requirements of spelter on the part of the consumers, and that the large accumulations which have been such a menace to the market, have been heavily drawn upon, so that they are now materially less than they were two months ago. The close is unchanged at 4.65@4.70c. New York, 4.50@4.55c. St. Louis.

The London market has declined further, quotations being cabled as £19 2s. 6d. per ton for good ordinaries, £19 7s. 6d. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market has been very quiet abroad, and in New York only a retail business has been done. Prices are unchanged at 8¼c. for Cookson's, 8@8[illegible]c. for Hallett's, 7⅝@7⅞c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $43 per flask for large lots, higher for jobbing orders. San Francisco is nominal at $42 for large orders, domestic delivery, and $40@40.50 for export. London, £17 7s. 6d. per flask, with 1s. 3d. less quoted, from second hands.

Platinum—While the large interests are holding prices at $20 per oz. for ordinary metal, and $22 for hard, there are said to be considerable stocks of refined platinum in New York, and offers have been made at $17.50@19 per oz. This price is the lowest reported in New York for nine years.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, seven months ended July 31, figures in long tons, except quicksilver, which is in pounds:

	Imports	Exports	Excess	
Copper	98,846	36,317	Imp.	62,529
Copper, 1907	65,229	41,926	Imp.	23,303
Tin	26,839	23,784	Imp.	3,055
Tin, 1907	25,272	21,777	Imp.	3,495
Lead	134,778	32,664	Imp.	102,114
Lead, 1907	113,637	28,954	Imp.	84,683
Spelter	61,666	4,757	Imp.	56,909
Spelter, 1907	64,594	3,125	Imp.	61,469
Quicksilver, lb.	3,021,528	926,701	Imp.	2,094,827
Quicksilver, '07	2,845,346	1,431,618	Imp.	1,413,728

Copper totals include metallic contents of ore and matte. Tin ore imports, not given above, 12,515 tons in 1907, and 15,559 in 1908. Imports of iron and copper pyrites, 459,289 tons in 1907, and 493,773 in 1908. Of the imports this year the United States furnished 3964 tons copper matte, 41,488 tons fine copper and 22,831 tons lead. Exports include re-exports of foreign material.

Missouri Ore Market

Joplin, Mo., Aug. 22—An apparent effort to lower the market early in the week was met by opposition from smelter agents, some of whom stepped in and took ore at prices current the previous week, causing the market to close firm on a base price of $37 per ton of 60 per cent. zinc, ranging down to $35. The highest price was $40.50, and the average, all grades, was $33.66. The highest bin price for lead was $61, or $61.50, delivered; medium grades sold at $59@60.50, and the average, all grades, was $60.48 per ton.

The shipment shows a net decrease of only 561 tons. The shipment approximates the output of the week, leaving the stock in bins about 5600 tons, over half of which is held for a material advance in price. The output has gradually increased until it is 1000 tons per week greater than six weeks ago. Following are the shipments of zinc and lead ore from the district for the week ending Aug. 22:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	3,801,190	580,540	$84,225
Joplin	2,009,040	192,560	41,988
Badger	774,550	22,440	14,615
Oronogo	571,840	65,360	12,390
Galena	361,640	110,510	9,644
Prosperity	199,370	181,050	9,009
Duenweg	488,130	14,250	8,744
Alba-Neck	466,840	......	8,102
Spurgeon	232,720	186,960	8,398
Granby	533,910	27,000	8,150
Miami	433,940		5,641
Aurora	414,910	10,030	4,[illegible]
Zincite	153,660	1,700	2,725
Sarcoxie	145,890	......	2,592
Quapaw-Baxter	124,840	6,250	2,[illegible]
Carthage	60,840	......	1,092
Carl Junction	30,960	5,590	725
Totals	10,802,270	1,406,220	$224,43[illegible]
34 weeks	318,463,910	49,623,030	$6,72[illegible]

Zinc value, the week, $181,894; 34 weeks, $5,356,11[illegible]

Lead value, the week, 42,543; 34 weeks, 1,368,058

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	[illegible]	January	83.58	46.88
February	47.11	34.92	February	84.58	[illegible]
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.[illegible]	52.47
May	45.98	33.39	May	79.[illegible]	[illegible]
June	44.82	32.07	June	73.66	60.48
July	45.79	31.67	July	58.18	[illegible]
August	43.[illegible]		August	59.54	...
September	40.11		September	53.52	
October	39.83		October	51.40	...
November	35.19		November	43.40	
December	30.87		December	37.71	
Year	43.68	...	Year	68.90	....

Wisconsin Ore Market

Platteville, Wis., Aug. 22—The highest price paid for zinc ore this week was $38 on a basis of $36@37 per ton of 60 per cent. zinc. For 80 per cent. lead ore $60@61 per ton was paid. Shipments from the district, week ended Aug. 22:

[illegible]	[illegible] ore, lb.	[illegible] ore, lb.	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
Total	2,461,620	[illegible]	
[illegible]	[illegible]	7,051,595	1,262,014

Hazel Green shipped last week, not then reported, 468,300 lb. zinc ore. In addition to the above there was shipped to the electrostatic separator, at Platteville, 264,780 lb.; to the Joplin Separator Works, at Galena, 66,000 lb.; to the Enterprise roaster, at Platteville, 234,000 lb. zinc ore.

Chemicals

[illegible] can be reported in the market. Spot business is moderate only, and inquiries are not numerous. There have been few changes in prices; none of importance.

Copper Sulphate—Prices are unchanged and firm at $4.65 per 100 lb. for carloads or over, and $4.90 for smaller lots.

[illegible] small lots for early delivery. Prices are about 2.30cs. for spot, and 2.25@2.35c. for futures.

Mining Stocks

New York, Aug. 26—The general stock markets have been in an exceedingly confused and uncertain condition. On Saturday, Aug. 22, there was a wild market with heavy trading, on what is usually a light day. The conditions were so unusual and manipulation so strongly in evidence, that the governors of the Exchange have ordered an investigation. Since then trading has been light and the course of prices irregular.

On the Curb market copper stocks were strongly in evidence, with heavy buying and advancing prices. Nevada Consolidated was the leader. Cobalt stocks were also in demand, and showed large dealings, and prices will hold. The market closed rather dull

Boston

[illegible] portant in this market the past week, and the trend of prices has been toward a slightly lower level. There has been no noticeable pressure, although profit-taking has been quite general, especially in stocks that have had the greatest advance. This has been noticeable in Amalgamated, North Butte, Butte Coalition, Adventure and a few others. Two stocks that have been traded in on the curb were taken over into the unlisted department of the exchange last week, namely, Lake Mining and Miami Copper, the former a Michigan property and the latter in Arizona. Nevada Consolidated showed a degree of strength. Since Miami's listing, announcement has been made that the company intends to issue 100,000 shares of treasury stock at $10 per share, thus bringing the total stock outstanding up to 600,000 shares. The issue has been underwritten. The declaration of a quarterly dividend of $1 by the Quincy Mining Company, the same as three months ago, and $1 by Calumet & Arizona, which is the same as the last payment, had a negative effect in both cases.

The late weakness in Mexico Consolidated is due to the fact that the company has had to borrow $50,000 for four months at 6 per cent., giving in lieu thereof an option upon 10,000 shares of treasury stock for the same period at $5 per share. The Davis-Daly reorganization plan has been modified. Instead of allowing an underwriting commission of 15 per cent., the $2 assessment will be underwritten without commission.

At the annual meeting of the Calumet & Hecla Mining Company A. S. Bigelow was represented by counsel, who voted Mr. Bigelow's 23 shares in opposition to all the other voters.

STOCK QUOTATIONS

NEW YORK Aug. 25		BOSTON Aug. 25	
Name of Comp.	Clg.	Name of Comp.	Clg
Alaska Mine	[illegible]	Adventure	10½
Amalgamated	77	Allouez	37
Anaconda	46¾	Am. Zinc	27
Balaklala	2	Arcadian	3
British Col. Cop.	7¼	Arizona Com	20¼
Butte & London	....	Atlantic	14¼
Butte Coalition	26	Bingham	.60
Colonial Silver	½	Boston Con	12½
Cum. Ely Mining	8⅛	Calumet & Ariz	118
Davis Daly	2½	Calumet & Hecla	‡680
Dominion Cop.	2¼	Centennial	33¼
Douglas Copper	4¼	Con. Mercur	.43
El Rayo	3	Copper Range	77
Florence	3⅝	Daly-West	9¼
Foster Cobalt	44	Franklin	12
Furnace Creek	17	Greene-Can	11¼
Giroux	4⅜	Isle Royal	23
Gold Hill		La Salle	14
Goldfield Con.	6[illegible]	Mass	7¾
Granby	‡102	Michigan	13⅝
Greene Gold	½	Mohawk	64¼
Greene G. & S.	1	Nevada	16¼
Greenw'r & D.Val.	75	North Butte	83
Guanajuato	2¼	Old Colony	50
Guggen. Exp.	177	Old Dominion	‡40¾
Hanapah	‡.20	Osceola	‡111
McKinley Dar	⅞	Parrot	26¾
Micmac	2½	Quincy	96
Mines Co. of Am.	1¼	Rhode Island	4
Mitchell Mining	¼	Santa Fe	1¼
Mont. Sho. C.	¾	Shannon	14⅝
Nev. Utah M. & S	3¼	Superior	24
Newhouse M. & S	6	Tamarack	70
Nipissing Mines	9	Trinity	18
Old Hundred	¼	United Cop., com.	11
Silver Queen	1.02	U. S. Oil	25¼
Stewart	1/16	U. S. Smg. & Ref.	41¾
Tennessee Cop'r.	36⅞	U.S.Sm. & Re.,pd.	45½
Tri-Bullion	1½	Utah Con	46¼
Union Copper	15/16	Victoria	5½
Utah Apex	4¼	Winona	6½
Utah Copper	‡44½	Wolverine	141
Yukon Gold	4 11/16	Wyandotte	2¾

*Ex. Div. †Ex. Rights. ‡Last quotation

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24½
Am. Smelt. & Ref.	94
Am. Sm. & Ref., pf.	‡107
Bethlehem Steel	‡22
Colo. Fuel & Iron	33¼
Federal M. & S., pf.	‡87
Inter. Salt	18¼
National Lead	83¼
National Lead, pf.	102
Pittsburg Coal	‡12
Republic I. & S.	23
Republic I. & S., pf.	77¾
Sloss-Sheffield	‡63
Standard Oil	635½
U. S. Red. & Ref.	‡15¼
U. S. Steel	45½
U. S. Steel, pf	107
Va. Car. Chem.	26⅝

BOSTON CURB	
Ahmeek	95
Black Mt.	3¾
East Butte	8
Hancock Con.	‡6½
Keweenaw	6½
Majestic	65
Raven	98
Shawmut	‡.30
Superior & Pitts.	11
Troy Man.	.45

ST. LOUIS Aug. 22

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.25	1.75
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	4.00	3.00
Con. Coal	19.00	17.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	13.00

LONDON Aug. 26

Name of Com.	Clg.		
Dolores	£1	7s	0d
Stratton's Ind.	0	1	0
Camp Bird	0	14	6
Esperanza	...	..	.
Tomboy	1	2	6
El Oro	1	7	0
Oroville	0	8	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug 26.
Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.18
Best & Belcher	.50
Caledonia	.20
Chollar	.17
Comstock	‡.26
Con. Cal. & Va.	.81
Crown Point	.26
Exchequer	.25
Gould & Curry	.12
Hale & Norcross	.22
Mexican	.73
Ophir	2.20
Overman	.10
Potosi	.10
Savage	.31
Sierra Nevada	.29
Union	.27
Utah	.05
Yellow Jacket	.54
TONOPAH STOCKS	
Belmont	1.12
Extension	.70
Golden Anchor	.02
Jim Butler	.27
MacNamara	.57
Midway	.40
Montana	1.40
North Star	.08
Tono'h Mine of N.	7.31¼
West End Con.	.62
GOLDFI'D STOCKS	
Adams	.04
Atlanta	.30
Booth	.48
Columbia Mt	.25
Comb. Frac	1.54
Cracker Jack	.06
Dia'dfield B. B. C.	.17
Goldfield Belmont	.15
Goldfield Daisy	.74
Great Bend	.35
Jumbo Extension	.47
Katherine	..
Kendall	.16
Lone Star	.10
May Queen	.06
Oro	.14
Red Hill	.30
Roanoke	..
Sandstorm	.26

Name of Comp.	Clg.
Silver Pick	.19
St. Ives	.32
Triangle	.06
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B.	.04
Gibraltar	.05
Gold Bar	.04
Homestake King	.29
Montgomery Mt.	.08
Mont. Shoshone C.	.81
Original Bullfrog	.01
Tramp Cons.	.17
MANHAT'N STOCKS	
Manhattan Cons.	.08
Manhat'n Dexter	.04
Jumping Jack	.03
Stray Dog	.04
MISCELLANEOUS	
Golden Boulder	.08
Bonnie Clare	.07
Lee Gold Grotto	...
Nevada Hills	1.50
Nevada Smelting	1.12
Pittsburgh S. Pk.	1.08
Round Mt. Sphinx	.15

COLO. SPRINGS Aug. 26

Name of Comp.	Clg.
Acacia	6½
Black Bell	....
C. C. Con.	3¼
Dante	‡6½
Doctor Jack Pot	7
Elkton	59¾
El Paso	38
Findlay	‡22
Gold Dollar	‡6½
Gold Sovereign	‡3
Isabella	27¼
Index	....
Jennie Sample	2½
Jerry Johnson	‡4
Mary McKinney	‡25
Pharmacist	‡3
Portland	‡98
Un. Gold Mines	3¾
Vindicator	84
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	July 17	Aug. 6	$0.02
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Chollar, Nev	July 8	July 30	0.10
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Helvetia, Ariz	....	July 20	0.50
Ingot, Utah	July 17	Aug. 5	0.01
Iowa Copper, Utah	July 13	July 30	0.05
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Lucky Calumet, Utah	July 3	Aug. 13	0.01
Maxfield, Utah	July 18	Aug. 17	0.02
Mexican, Nev	July 17	Aug. 17	0.10
Missoula Copper, Ida	July 25	Aug. 25	0.01
Oro Cobre, Cal	July 16	Aug. 3	0.02
Sierra Nevada	July 14	Aug. 4	0.10
Signal	Aug. 8	Oct. 6	0.01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Wabash, Utah	July 10	Aug. 1	0.10
Wheeler, Utah	July 16	Aug. 6	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	......	31.637	......
September	67.792	......	31.313	......
October	62.435	......	28.863	......
November	58.677	......	27.154	......
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	......	19.255	......	79.679	....
September	15.565	......	16.047	......	68.375	....
October	13.169	......	13.551	......	60.717	....
November	13.391	......	13.870	......	61.226	....
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	......
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	......	19.063	......
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	......	5.551	......	21.969	.....
September	5.236	......	5.086	......	21.050	.....
October	5.430	......	5.280	......	21.781	.....
November	4.925	......	4.775	......	21.438	.....
December	4.254	......	4.104	......	20.075	.....
Year	5.962	.....	5.812	......	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

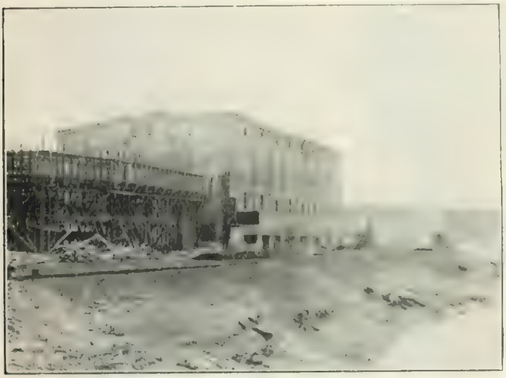
VOL. LXXXVI. NEW YORK, SEPTEMBER 5, 1908. NO. 10.

The Bag-house at Selby, California

A Detailed Description of the Bag-house for Large Lead Smelting Works. The Use of Reinforced Concrete Proved a Complete Success

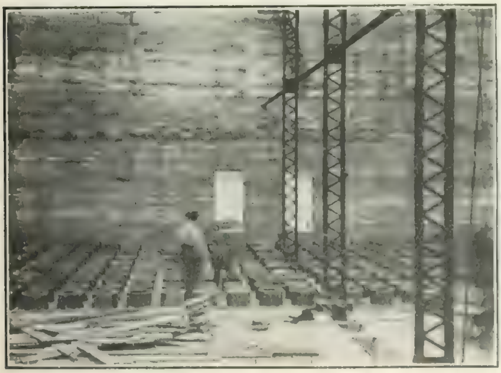
BY JAMES C. BENNETT

Though the design of the bag house at the Selby plant was partially governed by some conditions that are probably peculiar to this particular location, a presentation of them may be of interest and value to others.

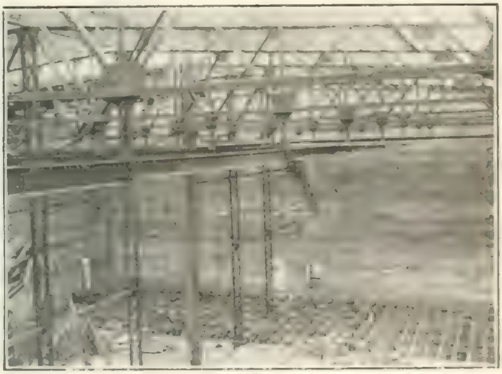


GENERAL VIEW OF BAG HOUSE

SOUTH END OF BAG HOUSE



INTERIOR VIEW, SHOWING BAG [illegible]



[illegible]

MATERIAL FOR BAG HOUSE

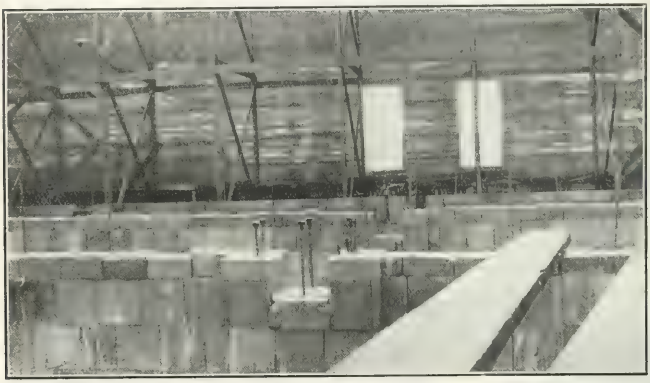
In the first place, brick was not considered a suitable material, owing to the liability of this section to earthquake. Then, too, the available ground was all made by dumping the molten slag into the waters of the bay. Owing to the great depth of the mud, a long time is required for the surface to reach the stage of final settlement. Further, the composition of the gases to be filtered is unusually severe on structural material, by reason of the uncommonly large amount of contained moisture.

Since the plans for the installation were undertaken some ten months prior to the seismic disturbances of April, 1906, the possibility of earthquake damage was considered too remote to afford the strong argument against brick buildings of this nature that it would now. After much discussion, however, a reinforced concrete building was decided upon as probably affording the most substantial structure in the event of earthquake, and as further affording greater security against damage from settlement of the filled ground. As the accompanying drawings and photographs give full information as to the structural features, it is unnecessary to dwell at great length upon this part of the subject.

To guard against damage to the concrete by the acids carried in the gases, the intake flue extending along the side of the building, and the dust chambers of the main building were lined with unglazed fireclay tiling which was locked into the concrete by the dovetailed ribs on the backs.

AN EARTHQUAKE TEST

That the belief in the strength and durability of reinforced concrete was well founded was very fully demonstrated by the manner in which the building weathered the storm of April 18, 1906. At the close of work on April 17 the walls had attained a hight of about 42 ft. above the ground, and were entirely without exterior support. On the inside they were supported only by the temporary wind bracing, there being still some 8 ft. to the final hight. Some three or four hours after the earthquake, I examined carefully the condition of the ground and of the building. The ground was considerably shattered on the shoreward side of the building, though there were no large cracks, and no apparent settling, the ground having been evidently forced upward sufficiently to overcome its resistance to shearing and then restored to its original position. The building showed no evidence whatever of ill effects—the tile lining on the lower part of the walls was absolutely intact. When examined with the aid of a level, there could be found no indication of any settlement, although a few days later a settlement of about 1 in. was found on one corner. There were no cracks in any part of the building; I was told, however, by one of the workmen that there was a very small horizontal crack running along near the top of one wall of the flue, which is built against the shore side of the building and is a part of the monolithic mass of the main building. On later examination this crack could not be found; but, granting that it did exist, its presence might very reasonably be attributed to the natural settlement and contraction of the concrete, and it may easily have existed before the time of the earthquake. Certainly it was of no importance structurally, as it could not possibly be more than a surface crack extending only to the reinforcing bars.



TRANSVERSE WALLS BELOW BAG FLOOR

LAYING FLOOR OF INLET FLUE

It seems unnecessary to say more than call attention to the probable effect on the structure had it been of brick, as was at first contemplated, for with the green condition in which the work must necessarily have been, there could have been but one result—the practically complete demolition of the entire work, for aside from the isolated chimneys on the plant, there was scarcely a chimney left standing intact. It is a curious incident, however, that throughout the 1500 or 2000 ft. of brick flue but one crack was discovered. This excellent result may be attributed probably to the quality of the work, as it was built entirely by day work, and under the supervision of a foreman who takes a remarkable pride in the character of his work.

CAPACITY OF PLANT

In determining the size and capacity of the plant the following data were secured. The gases to be filtered were those generated by two silver-lead blast furnaces, each 36x144 in. at the tuyere line, and smelting a total of about 360 tons of charge in 24 hours; three cupel furnaces and one sweating furnace. To these were to be added two 60-ton softening furnaces and two 60-ton refining furnaces. To this equipment was to be added provision for a third blast furnace of the same size and rated capacity as the two just described.

To provide a motive column for the filtered and cooled gases issuing from the bag house, the combustion gases from the zinc retorts were carried through an independent flue and delivered directly into the base of the stack. The following observations were made of the gases passing through the main flue:

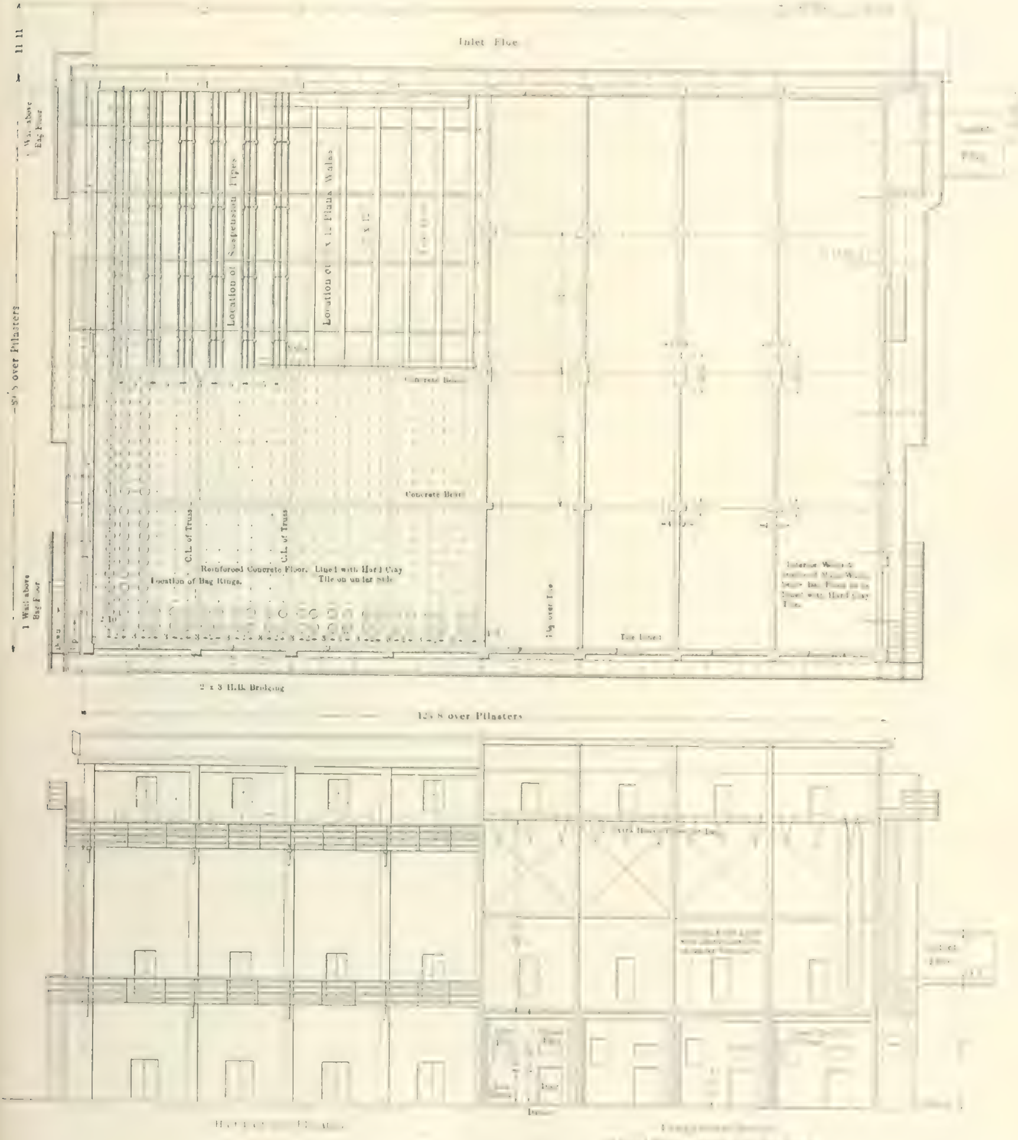
	Temperature Deg F.	Suction Oz
At base of the stack..	350	0.430
At 135 feet from base of stack..	184	0.362
At 530 feet from base of stack..	144	0.362

At about 145 ft. from the stack the cupel and sweating furnaces deliver their gases into the main flue, and at 125 ft. the zinc-retort gases enter.

The limiting temperature of the gases entering the bag-house was decided upon as 180 deg. F. This was considered as about the highest that could be maintained at the bags with reasonable security against fire. In view of the high temperature, even after the elimination of the zinc-retort gases, it was decided to use plate steel in the construction of that part of the flue between the main flue and the fan, thus reducing the temperatures by means of the radiating effect of the steel.

From the amount of suction and the dimensions of the main flue it was found that there were 45,234 cu.ft. of gas per minute passing through the flue. To this was added 50 per cent. as provision for the possible third blast furnace and the softening and refining furnaces, which were not then in commission, thus making a total ultimate volume of 67,851 cu.ft.

per minute to be handled, with a starting volume of 55,000. The volume of gases passing through the flue at the time of measurement was determined by the formula



PLAN, ELEVATION AND SECTION OF BAG HOUSE

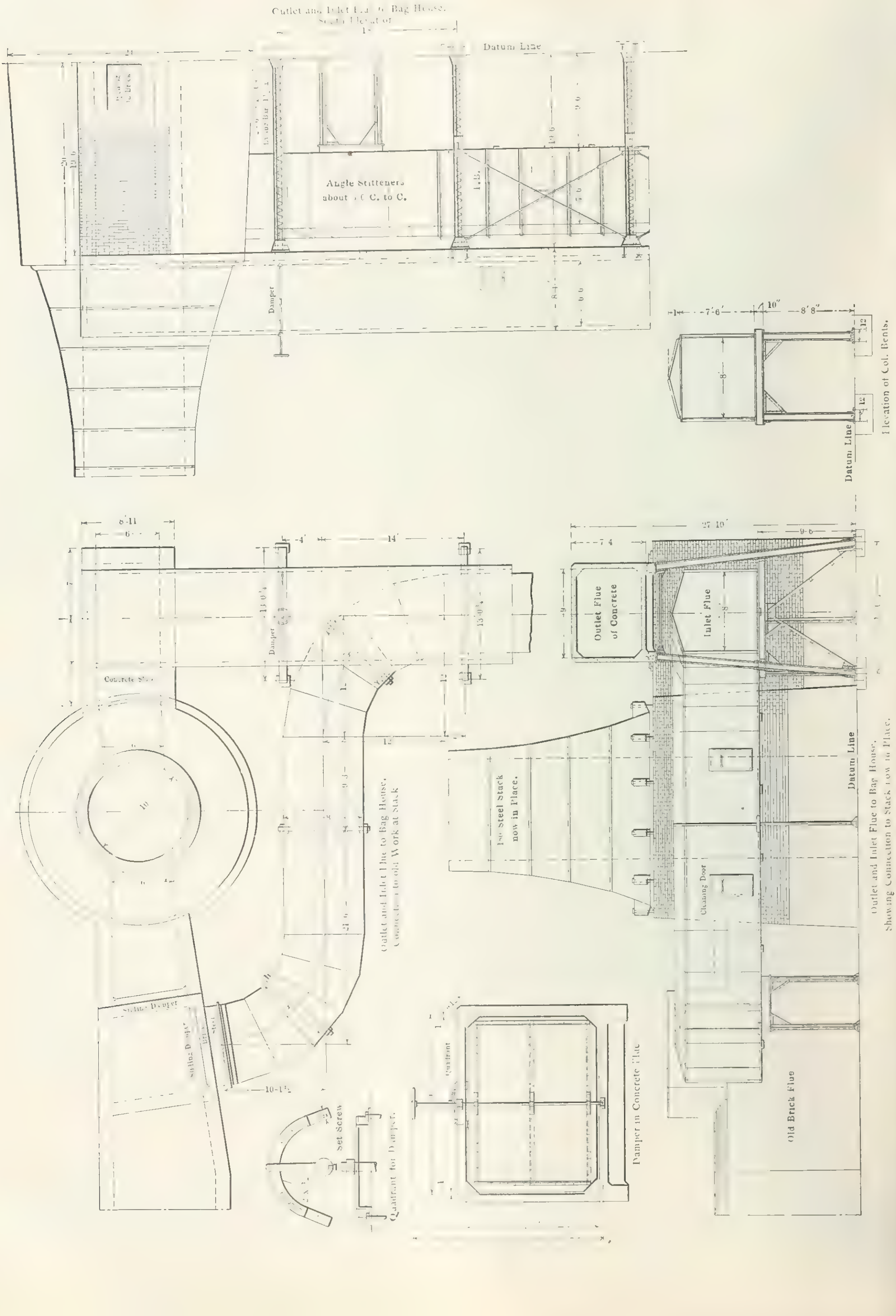
$$Q = \sqrt{\frac{p\,a}{k\,s}}\,;$$

in which Q = volume, p = pressure in pounds per sq.ft., a = area in sq.ft., k = coefficient of friction, and s = rubbing surface in sq.ft. Further computation showed that the velocity of the gases was 538.5 ft. per min., or 8.975 per second.

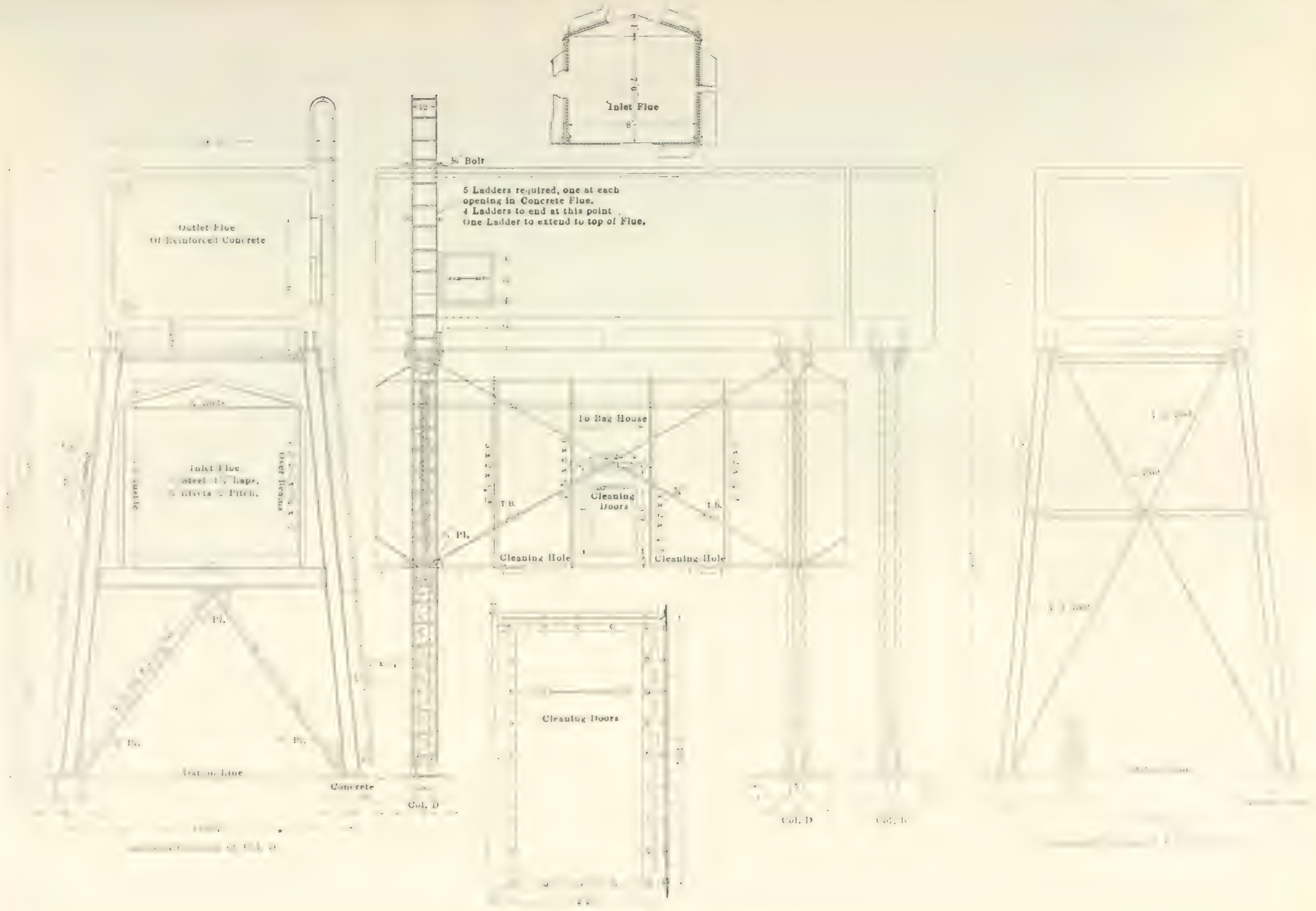
It may be thought that the provision for additional duty was somewhat arbitrary in its determination, and this is true. Having no special instrument for measuring the flow, there was at the time no other means available. Since the bag-house has been in commission, some more reliable data have been secured, though it is still not certainly known how correct it is. This will be referred to a little later.

The Fan and Motor Tower

A larger fan was installed than was act- [illegible] volume as estimated. When it is remembered that the consumption of power



BAG HOUSE FLUE CONNECTION AT BASE OF STACK



DETAILS OF CONCRETE AND STEEL FLUE TO BAG HOUSE varies directly as the cube of the speed at which the wheel is driven, it will be appreciated that the reduction in power would soon offset the additional cost of a larger fan. The fan is known by its manufacturers as a 220-in. machine, and has a wheel 11 ft. in diameter by 5 ft. 6 in. wide. Its rated capacity is 75,200 cu.ft. per minute at 60 deg. F., when running at a speed of 130 r.p.m., the difference in pressure between inlet and outlet being 0.75 oz. For this duty 35 h.p. would be required. From the higher temperature and the decreased volume, it was found that the wheel should be driven at a speed of 77 r.p.m., when it would deliver 55,000 cu.ft. per min. at a temperature of 180 deg. F., against a total difference of pressure of 0.75 oz. with a consumption of 7.28 horse-power.

Bag Capacity

There are 1920 bags in the building, each 18 in. diameter and 28 ft. 8 in. effective length, giving a filtering surface of 135.1 sq.ft. per bag, or a total of 259,392 sq.ft. Based on the original plans of three blast furnaces, having a combined capacity of 540 tons, an allowance of 410 sq.ft. of filtering surface per ton was made, to which was added 17 per cent. to care for the other furnaces which have already been enumerated. Reducing the whole to terms of blast-furnace capacity, a filtering area of 480.35 sq.ft. per ton of charge was provided.

It is difficult to find reliable data on which to base calculations for the amount of filtering surface, for there seems to have been little or no publication of such information. The only data which the writer was able to find was an article published some three or four years ago in the Engineering and Mining Journal, but even in that article the extremes were widely apart, and no suggestion was made as to what might be considered good practice. Mention may also be made of the chapter, in Hofman's "Metallurgy of Lead," on bag-houses for use in the manufacture of white lead, but this cannot be considered as of great value in the present problem. The unit allowance in the case under consideration may be called an arbitrary one, though it is within the two extremes given in the article cited.

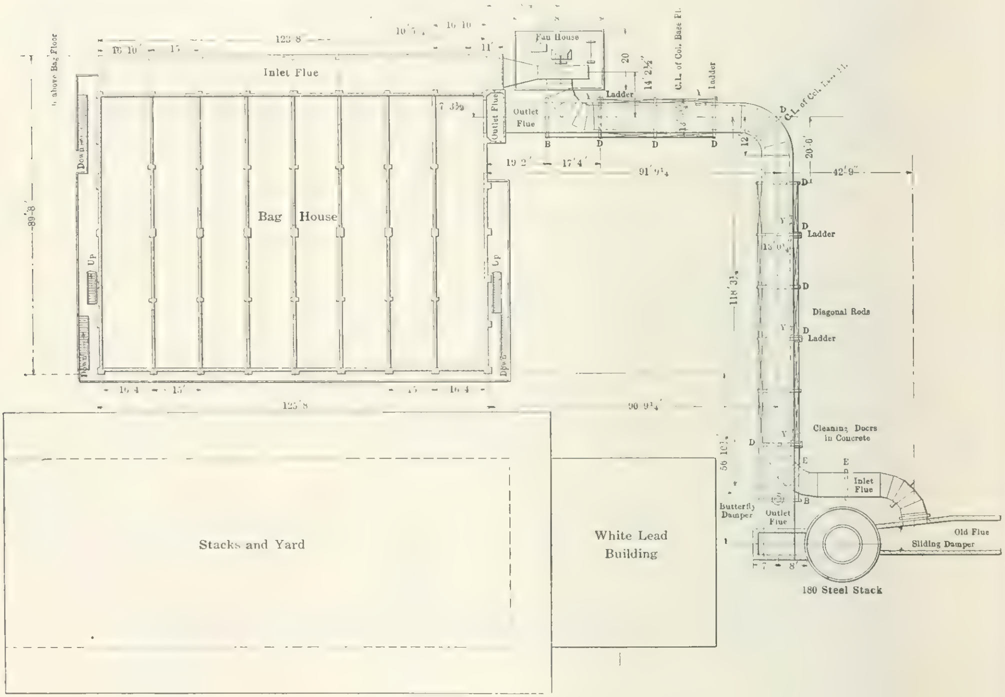
Calculating Filtering Surface

In my opinion, the most rational method of arriving at the requisite amount of filtering surface is to base calculations on the volume of gas to be treated. Depending on whether it is desired to collect all the dust in the bag-house or whether it seems preferable to settle as much of it as is possible in the flue system, the permissible velocity of the gases is known within fairly narrow limits. Having then the area of the flue, it is but a simple matter to determine the total volume of gas for which provision must be made. As at present treated, the basis for calculation—tonnage—is so flexible that it is of but little value for more than a rough approximation. In two furnaces of the same size and treating the same tonnage, the one may have a fine, tight and highly sulphurous charge, requiring a very large volume of air, while the other may be running on an ore which forms a loose charge low in sulphur, and requires a low blast pressure, with consequent smaller volume of air. Naturally the volume of gases delivered by the one furnace will be much greater than the second. On consideration it will be appreciated that there are many factors, all of which assist in making the tonnage basis an unreliable one.

Referring, then, to the volume of gas to be handled, the present bag-house provides an area of 3.823 sq.ft. per cu.ft. of the maximum volume of gas for which provision was made, and 4.716 sq.ft. per cu.ft. of the starting volume of 55,000 cu.ft. per minute.

Results of Operation

The remarks and data which follow are



LOCATION PLAN OF BAG HOUSE

the result of inquiry and observation at a time about a year after the bag-house was first placed in commission. The concrete of which the building and part of the flue system is constructed shows no sign of deterioration, and is apparently in a perfect state of preservation. The inlet flue, between the fan and the bag house, and the lower part of the main building are faced with the special tiling, which gives every promise of affording full protection to the building against any and all acid action to which it may be exposed. The steel doors provided for the lower part of the building were discarded in favor of brick stoppings, these affording a tighter doorway; being infrequently opened, the additional expense is negligible. The steel doors on the bag floor and at the top of the bag chamber were made each into one piece, and secured by bars wedged behind the hinge irons that were imbedded in the walls. The change in these doors was for the same reason that the change to brick was made on the ground floor. The prepared roofing which was used proved to be practically a failure. A reinforced concrete roof would, it is thought, prove most satisfactory, but the trusses are not sufficiently heavy to permit the change to be made. The arrangement of flues originally designed was not found to work satisfactorily, and was, therefore, subsequently modified. As built, the flue alongside the bag-house was divided into an upper (inlet) flue, and a lower (outlet) flue. The inlet flue was designed to carry the entire volume of gases discharging into the building, whereas the outlet flue was planned to receive only the gases generated in burning the fume or dust collected in the lower part of the building. To accomplish this, each flue was provided with openings connecting with the various transverse compartments into which the lower part of the building is divided. Experience has shown that this plan was impracticable for two principal reasons: First, the moisture contained in the gases gives rise to corrosive action, which soon renders the steel dampers useless, as it is impossible to close them. Second, the discharge of the gases arising from the combustion of the fume through the separate flue afforded no distinct advantage, as the bag chamber was inaccessible so long as there was any gas passing through any of the bags. It has been suggested that the bag chamber be divided into at least three compartments by introducing transverse walls extending to the top of the chamber. One compartment could then be used exclusively for the gases from the furnaces other than the blast furnaces, and the remaining two could be used alternately for the blast-furnace gases, thus permitting inspecting and repairing at any time without hindrance to the regular operation.

Capacity as Shown by Experience

In connection with this last statement the capacity of the plant may be further considered. Experience has demonstrated that the originally planned maximum temperature was too high for regular practice. For some time past the entering gases have been kept at from 112 to 114 deg. F. This has resulted in a somewhat longer life for the bags. The pressure produced by the fan has also been somewhat reduced, being now maintained at 0.625 oz. In lowering the temperature of the gases an additional burden has been imposed upon the fan by reason of the large volume of cold air that is introduced. The fan wheel is now driven at a speed of 116 r.p.m., at which, with the lower temperature, the volume of gases is 76,000 cu.ft. per minute, and the power consumption about 24.75 h.p. There is, therefore, a present provision of 3.413 sq.ft. of filtering area per cu.ft. of gas entering the chamber. Referring to the statement regarding the suggested division of the bag-chamber, it seems safe to say that an allowance of 1.14 sq.ft. of filtering surface per cu.ft. of gas is ample.

Small Cyanide Plants

Special Correspondence

In many mining districts small cyanide plants are owned and operated by working miners and tributors. In Australia and New Zealand such plants are very numerous and do effective work. In the Cotter country and in Victoria the owners of such plants refused to pay royalty to the owners of the cyanide patents and caused the governments to acquire the cyanide rights for their respective states. Similar plants are successfully worked in Rhodesia. Walter Broadbridge states[1] that the Lydia Glenorchy mine, situated in the Hartley district, Rhodesia, is furnished with a reduction plant consisting of four Huntington mills and eighteen 10x4-ft. direct-treatment cyanide tanks. Each mill crushes about 500 tons of ore per month. Four white men, including the manager, run the works. The total expenses average £750, while the profits for last June amounted to £550. It is a typical bush mill with crude methods, but the working costs are under 8s. per ton, which, considering the circumstances, is very creditable.

The Rouge mine in the same district has a five-stamp mill and galvanized-iron cyanide plant. It is working ore worth £2 per ton at a cost of 15s. 6d. per ton, which includes mining and development work.

A plant to cost £500 is being erected at the Yellow Jacket mine to treat ore valued at 32s. per ton.

Excellent results are obtained from these cheap, roughly made plants. They are generally in charge of men who have gained experience in cyaniding on well-equipped plants and who endeavor to follow the methods adopted in the large plants as closely as possible.

It is necessary to use a number of small vats instead of a few large ones for various reasons. Sometimes double treatment is found necessary, the sands being shoveled from one tank to another. Small tanks are also cheaper in first cost than large vats and are more easily transported. It is quite common in Rhodesia for the plants to be removed to different claims.

The general method used in building the tanks is as follows: The iron sheets are rolled in a shop and transported to the mine where they are built in position. The bottoms are generally laid on 2 to 3 in. of well-tamped tailings and built of slightly heavier gage than the sides. These and the bottoms are double-riveted and soldered inside and out. When above 4 ft. in hight they are strengthened on the outside by ½-in. round-iron bands with 18-in. spaces. Before being used they are either painted or tarred. The sands are discharged after treatment by shoveling over the sides into trucks.

---

[1] Bulletin No 40, Inst Min and Met.

Drift Mining in California

Special Correspondence

There has not been much activity of late, nor is there at present, in the mining sections of the Forest Hill and Iowa Hill divides in Placer county, Cal., best known for the extensive drift mines, of which the Hidden Treasure is the most important. Some of the larger mines have been worked out, and not many new ones have been opened in recent years. In fact, working gravel by drifting as well as by hydraulicking is by no means the important industry in California that it formerly was. In drift mining there is very large preliminary expense before there is any chance of profit. Expensive bedrock tunnels must generally be run under the lava-capped divides to reach the buried river channels which carry the gold, and there is a chance of loss if the gravel tapped happens to carry less gold than expected. The regular channels of the main buried rivers are usually rich enough to mine profitably, but sometimes poor sections are tapped by the tunnels. Again, the tunnels are sometimes run too high to tap the channel and drain it properly. The residents of the Forest Hill divide are somewhat encouraged just now, as new money is being applied to mines which have been partly opened up, but for want of capital or energy have been unworked for years. Of this number are the Dardanelles, Pond, Red Sea, Peckham Hill & Gray Eagle, Missouri and Vier. The Paragon and Grennel claims are also being equipped. Considerable money is needed in this class of mining which the local people are unable to supply, so there is abundant opportunity for the investment of outside capital.

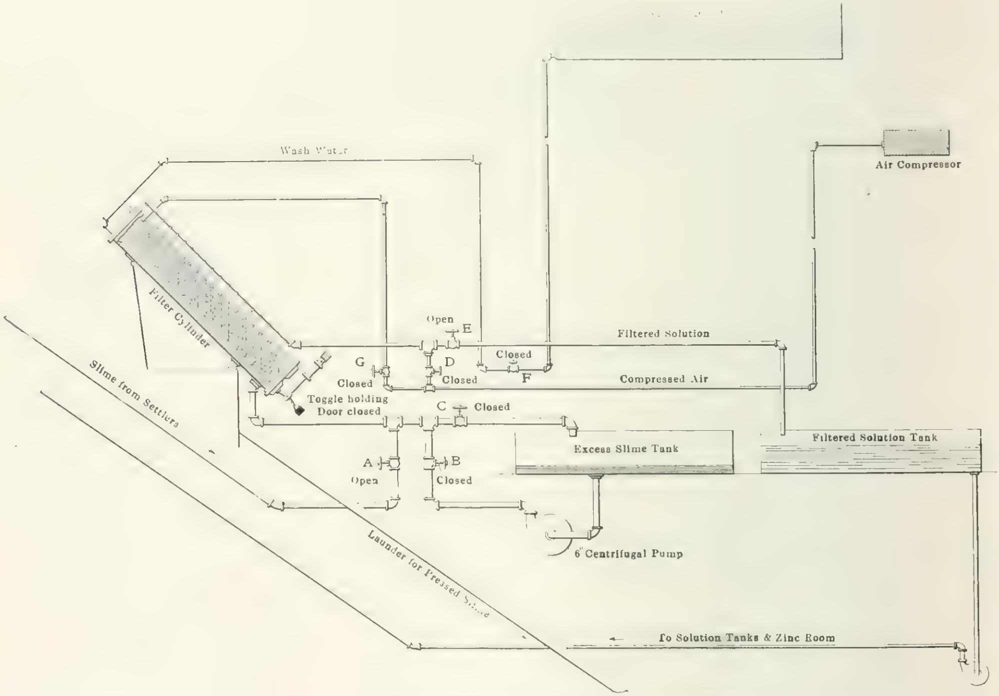
Filtration of Slimes at El Oro, Mexico

By D. L. H. Forbes[*]

A new idea in slime filtration has recently been developed and successfully put into operation at the plant of the El Oro Mining and Railway Company, Ltd., El Oro, Mexico. The credit for this belongs to Edwin Burt, superintendent of the El Oro company's cyanide department, who has patented the idea; and to the progressive management of the company which was quick to appreciate the value of the scheme, and to give Mr. Burt assistance in working it out.

Batteries of Burt filters similar to the one to be described are also in successful operation at the eight mills of the Dos Estrellas company and at the mill belonging to the Mexico Mines of El Oro Company.

The Burt filter employs a number of filter leaves suspended in a steel shell and so arranged that the operations of forming the slime cakes, washing the cakes and discharging them can be performed without manual labor and with only a small expenditure for power.



VERTICAL SECTION OF FILTER PLANT

Details of the Plant

The El Oro filter battery at present consists of five units. Each unit has 18 filter leaves suspended in a steel-plate cylinder, set at an angle of 45 deg., with a door at the lower end. The leaves are made by bending two lengths of ½-in. standard wrought-iron pipe and connecting them into a pear-shaped frame by means of a swiveling, water-tight T-joint at the upper end, and a 4-in. piece of ½-in. rod at the lower end. Holes ⅛ in. in diameter are drilled at intervals of 2 to 3 in. on the inside edge of the frame and a piece of cocoa matting is sandwiched between two pieces of heavy canvas filter-cloth, which are bound and sewed over the pipes. The pieces of canvas, with the matting between, are held firmly together by stitching them with a sewing machine. One man is kept constantly at work making new leaves and repairing old ones.

The swiveling T-joint of the leaf is connected through the top of the shell with a 4-in. pipe running above it and parallel with its axis. This serves as a solution header. Each filter leaf has its individual pet-cock and valve in front of the header so that the quality of its filtrate may be tested at any time, and it may be cut out for replacement with a new leaf if found unsatisfactory. The swiveling T-joint allows the leaves a certain movement when slime or wash water is in motion in the cylinder, and saves the connections from leaks that would otherwise be caused by bending strains. Counting both sides, each filter leaf has an effective filter surface of 13.5 sq.ft. One leaf at each end is somewhat smaller than the others in order to hang clear of the cylinder-head.

The steel cylinders are each 20 ft. long by about 42 in. inside diameter, and are built up of 5/16-in. tank-steel plates with cast-iron flanges at the ends, to which are bolted heavy heads of cast iron.

The head at the lower end consists of two pieces. The main frame of the head, which is bolted to the cylinder flange, has a semi-circular opening for a door which is hinged horizontally from it. This door has a bead projecting from its inner face all the way around it, and engaging in a corresponding groove packed with rubber in the main frame of the head. The door is opened and closed by means of a toggle mechanism operated by the piston-rod from a hydraulic cylinder hung above it.

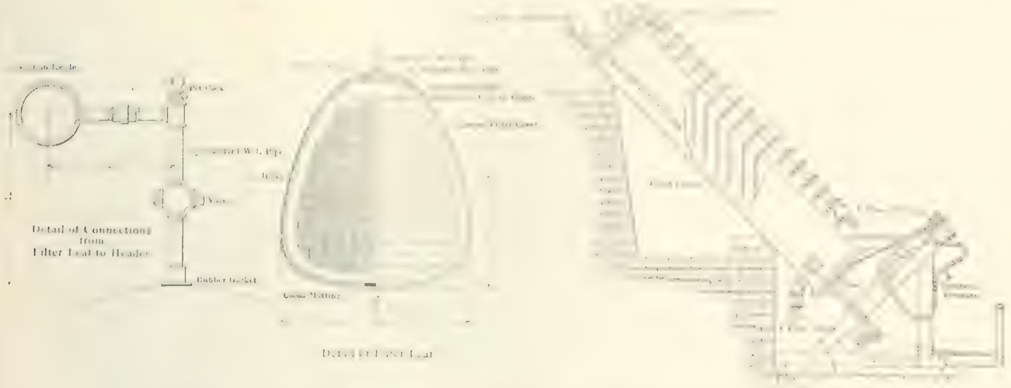
Method of Operation

The five filters are worked together in a battery, the valves, which are of the quick-opening type, being conveniently arranged in a little building at one side of the battery. The arrangement of the valves during the first stage of the filter operation is shown diagrammatically in the accompanying vertical section. The slime-settler tanks are at an elevation which gives an effective pressure of 60 lb. per sq.in. at the filters. After the doors have been closed by admitting water to the upper ends of the hydraulic cylinders, the valves *A* and *B*, slime and solution valves, respectively, are opened. The filter cylinders then fill with slime under pressure and the filtrate is forced through the solution pipes into a tank having a capacity of 6000 gal., from which it is pumped up to the zinc room.

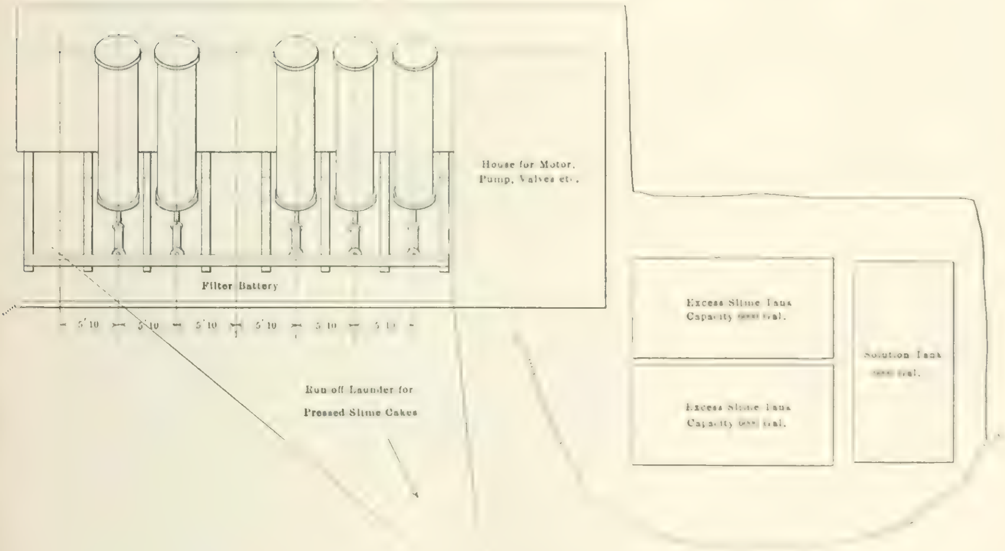
---

[*] Esperanza Mining Company, El Oro, Mexico.

After about nine minutes the valve *A* is closed and valves *C* and *G* opened. This forces the excess slime from the cylinders into the slime tanks, of which there are two, having a total capacity of 12,000 gal. At the same time the compressed air, which is under a pressure of 70 lb., aids in driving moisture from the cakes which have formed on the filter leaves and forces the last of the filtrate through to the solution tank. After about eight minutes the valves *G* and *E* are closed and valve *D* is opened. This admits compressed air to the inside of the filter leaves and knocks off the slime cakes, and the material runs out through the door at the bottom which has been opened in the meantime. A jet of wash water from the upper end of the filter, admitted by opening the valve *F* for a few seconds, clears out the last of the slime cakes and finishes the cycle. The doors are closed, the 15-h.p. motor, which drives the 6-in. centrifugal pump, is started, and the excess slime sent back to the filters. As soon as this has been done, the slime under pressure from the settlers is admitted and the cycle of operations, as described above, is repeated. Each cycle takes [illegible] minutes. The cakes formed are from [illegible] in. thick and carry about [illegible] per cent. moisture. The slime coming from the settlers is about 80 per cent. water.



SECTIONAL ELEVATION OF BURT FILTER, DETAILS OF FILTER LEAF AND HEADER CONNECTIONS


House for Motor, Pump, Valves etc.
Filter Battery
5'10"
5'10"
5'10"
5'10"
5'10"
5'10"
Run off Launder for Pressed Slime Cakes
Excess Slime Tank Capacity Gal.
Excess Slime Tank Capacity Gal.
Solution Tank Gal.

PLAN OF FILTER PLANT

COST AND EFFICIENCY

The filter leaves at the mill of the Mexico Mines company have to be cleaned occasionally by washing with dilute hydrochloric acid, but so far this has not been found necessary at the El Oro mill.

The five filters have a total effective filtering area of 1170 sq.ft., and treat from 600 to 650 tons of dry slime per 24 hours. From this the capacity per square foot of filter surface per 24 hours may be reckoned to be 0.53 tons.

It will be noticed that the slime cakes are not washed with water. This is owing to insufficient filter capacity at present. The length of time required for a complete cycle would be increased to 45 to 50 minutes if a water wash were given. A substantial saving from the material treated could easily be made in this way, however, as the slime cake going to waste at present assays around 0.57 pesos in gold and 0.7 oz. silver, or a total value of 1.36 pesos per ton, of which value I should estimate that 10 to 15 centavos is carried by the solution left in the cake, and consequently could be extracted by washing. To do this would require the addition of six filters to the battery.

The plant requires very little power, as the force of gravity does most of the work of filtration. The 15-h.p. motor is run only about one-quarter of the time, and electric power costs $0.00765 per kilowatt-hour. The total cost per day for treating 600 tons of dry slime is about as follows:

Labor, 2 operators at 2 pesos	4	pesos
2 helpers at 1 peso..........	2	"
1 filter maker at 2 pesos....	2	"
Total	8	"
Supplies and renewals..............	3.50	"
Compressed air and power..........	8.00	"
Total	19.50	"

Cost per ton 0.032 pesos, or about 1.5c. U. S. currency per ton of dry slime treated.

The total cost of the filter installation, including preparation of the site and erecting, was about 14,000 pesos, which is a remarkably low figure, considering that this was the first of its kind to be built, and that it had to stand all the extra costs incident to pioneer work.

Tungsten in California

SPECIAL CORRESPONDENCE

The representative of a foreign steel corporation has been some little time in the region of Randsburg and Johannesburg, in Kern county, California, examining various tungsten deposits which have been found there. Some of them, notably the Atolia, have been pretty well developed into productive mines, but most of the claims have not had any extensive work done upon them as yet. It is expected that upon the report of the expert some of the more prominent tungsten mines may be purchased by the foreigners.

Short Talks on Mining Law—IX

BY A. H. RICKETTS*

Until the passage of the law affecting mining claims in the Philippine Islands (1902), there was no legislation by Congress conferring a right upon a claimant to all the minerals that might be contained within a location, whether lode or placer. The Mining Act prevailing in the United States (1872) gives the exclusive right of possession to the surface and only to all veins or lodes, having their apices within a lode location, and to all placer deposits and unknown lodes or veins within a placer claim, without right to a "known vein" therein unless secured by separate location or included in an application for patent. Otherwise, the "known vein," together with 25 ft. on each side thereof, is subject to adverse location. The right to mine is limited to the exterior boundaries of the placer claim, except as to the "known vein," so appropriated. In the Philippine Islands the security of the mineral claimant seems to be greater than in the United States, for the law there does not qualify his ownership by providing possible rights to another in lode or placer claims under the "law of the apex" or of "known veins."

TRESPASS AT SURFACE

In the United States an intrusion upon the mining claim of another may be upon or underneath the surface. It may be the result of design or mistake, or possibly it may be sanctioned by the "law of the apex." While no one can initiate a right by means of a trespass, that is by an unlawful entry, still, the making of an overlapping or conflicting claim is not uncommon. If peaceably made, it may serve to secure sub-surface rights not otherwise obtainable, even to the prejudice of the senior location, for it is permissible under the law to include irregularly shaped ground, such as an isosceles or truncated triangular, or a many-sided piece to which no extra lateral rights would otherwise attach, within the surface lines of a parallelogram having parallel end lines, all the boundary marks of which are placed on other claims. It is immaterial whether or not one or more of such other claims are patented, or whether mineral or not in character. Of course, no right to the surface of the territory thus encroached upon, is thereby initiated, but, if the land outside of the senior location and within the lines of the junior location includes the apex of one or more veins that dip within the intruded premises, the owner of the younger title has the right to follow these veins and to mine the ore in them unless the surface is included in a senior agricultural patent.

In case the prior mineral claimant has previously extracted the mineral from such a vein, the subsequent locator has no legal redress, as it is an injury without damage to them. Such act, however, renders the senior locator liable to the Government in an action for trespass, as his right to remove mineral from a lode claim is limited to veins having their apices within his location. Thus it is possible that, strictly speaking, a mine owner may become a trespasser upon his own domain, whether it is held by location or under a patent. The presumption, however, always is that the latter has the title to all mineral within the exterior boundaries of his claim.

The junior locator does not acquire title to the surface within the overlap because of the subsequent abandonment or forfeiture of the elder claim, as in that sense the overlapping location was prematurely made, but whether these contingencies have happened or not he may obtain title thereto by including the same within the exterior limits of his claim as located in an application for patent therefor, provided it has not been previously patented, or there are no "adverse proceedings."

A trespass may be willful, as when the entry upon the land is with intentional disregard of another's right, or it may be innocent, as when it is unintentional and in the honest belief of a right. The action may be brought by anyone in the actual or constructive possession, at the time of the commission of the trespass, whether as the owner or as a lessee of the claim.

TRESPASS UNDERGROUND

An underground trespass may be open or secret. In the case of a secret trespass the courts are not in accord as to whether the statute of limitations begins to apply from the time of its occurrence or from the time of its discovery by the injured party. A trespass either upon or underneath the surface may consist of a single or continuous acts. When the trespass involves the removal of mineral, it has been held that when the trespass is willful the measure of damages is the full value of the mineral without deducting the cost of mining, reduction, etc., but that when the trespass is innocent in its nature the trespasser is entitled to such deduction. The question of damages, however, is never determined on the basis of profit and loss, and the fact that the value of the mineral extracted may be less than the expense of extracting it does not enter into the case. The trespass being proved the plaintiff is entitled to at least nominal damages.

The mineral when severed becomes personal property and the action for damages may be for its value and the "breaking of the close" or the damage may be limited to its value, or the action may be for the recovery of the mineral. If for its value, or for its recovery, the action may be brought wherever the defendant may reside or wherever the mineral may be, irrespective of the location of the property from which the mineral was extracted. It may be said that it is never possible to recover the true value of the mineral removed.

---

*Member of the San Francisco Bar, San Francisco, Cal.

Injunctions

In injunctional proceedings on the ground of alleged trespass, since the basis of the proceedings is the irreparable injury the plaintiff will sustain, the doubt should be resolved in favor of granting the writ. From the nature of the case the courts are more liberal in granting the writ in mining cases than in those affecting other real estate. The following are some of the instances in which the writ has issued: To restrain the extraction or removal of mineral; the deposition of material upon a claim, as tailings or debris; the working of a mining claim, as the sinking of shafts, the running of tunnels; intrusion on a mining claim; or to restrain work because a menace to navigation or the property rights of others, as in hydraulic mining where the tailings go into a river, or phosphate mining in a river. No injunction will issue against a person who is not committing an act or who has not threatened to do so.

Waste

"Waste" is the unlawful extraction of mineral and the conversion of the proceeds thereof, whether by mistake or by willful or fraudulent trespass. Its effect is to deprive the owner of the substance of his estate and may be enjoined. The draining of a property of another of its oils or gas by one working his claim more expeditiously than the other, does not constitute waste.

In the absence of a local statute or of an agreement between them, a co-owner of a mining claim may work the property without being charged with waste or being subject to an injunction. He is liable, however, to the non-assenting co-owners for their *pro rata* share of the net results. But he has no claim for contribution from them, except perhaps in a partition suit where the court may adjust the equities between them. As a rule, he must alone sustain any loss which results from his working of the claim, and, of course, the interests of the others not joining therein are not subject to the debts he may contract thereby.

Hostility of possession under claim of title exclusive of any other right may conclude the right of excluded co-tenants if continued for sufficient time without interruption, but "continuously" and "uninterruptedly" are not in law exactly synonymous. For instance, there may be a continuous adverse use of a property for a sufficient time under the law to comply with the statue of limitations, yet it may be interrupted by the bringing of an action in ejectment before the expiration of that period. This would not break the continuity of use until final judgment, although the running of the statute would be interrupted by the bringing of such action.

Co-tenancy arises from joint location, purchase or descent. It may be merged into a mining partnership when two or more of the co-owners jointly engage in the actual working of the mine, although there is no express agreement between them to that effect. It is not essential, however, that the partners shall be co-tenants. The main distinction between a mining and an ordinary partnership is that in a mining partnership the death or bankruptcy of a partner or the sale of an interest does not dissolve that relation between the survivors. The incidents of such a partnership are regulated by local statute.

"Grub-stake" Contracts

A "grub stake," or as it is less often termed a "prospecting contract" or a "joint adventure," is an agreement between two or more persons, not necessarily reduced to writing (except in the State of Nevada) by which one agrees to equip the other with such outfit as may be required by the other in the search for unclaimed valuable mineral deposits, in consideration of being given an interest in all claims located, or otherwise secured, by the latter during an agreed time. Such a contract is in the nature of a qualified partnership. To be enforceable the "grub stake" contract must show adequate consideration and be just and reasonable. It has been held that it is essential in order to have a right in property under such a contract that such property shall be acquired by means of the "grub stake" furnished and pursuant to the "grub-stake" contract. Parties to a "grub-stake" contract are trustees for each other but are not necessarily co-tenants, though they have been held to be such, nor are they necessarily mining partners, but those relationships, or either of them, may arise by the acquisition of property under such a contract and the joint working of the property. The contract may expire by limitation or be terminated by mutual consent or at the pleasure of either party, as its terms may permit. An agreement to pay wages to the searcher while looking for property and to give him an interest in the same when found, does not constitute a "grub-stake" contract nor a mining partnership. It has been held to be a pure contract of hiring. An agreement to the effect that a claim shall be located in the name of both parties thereto raises a resulting trust where the claim is afterward located by one to the exclusion of the other.

In the deep alluvial mines of Victoria trouble is experienced during periods of falling barometer from the escape of gas from the gravel. To obviate this, air locks are used; by blowing air behind the doors the pressure is increased so that the gas cannot flow from the gravel and so interfere with the work.

Asbestos in Quebec

By [illegible]*

The principal asbestos-producing districts in Quebec are the East Broughton and Black Lake districts. In the former locality the Boston Asbestos Company employs 35 men at its new 250-ton mill at East Broughton, and the Frontenac Asbestos Company is completing its 300-ton plant on the lot adjoining the village. The Eastern Townships Asbestos Company closed its new mill during the winter in order to make alterations. It is now producing from 12 to 15 tons of asbestos per day with a force of 40 men. The Quebec Asbestos Company has been working its force of 45 men double-shift in order to fill its contracts for delivery. After a shut-down of four months the Broughton Asbestos Fiber Company is preparing to work its mine and mill on a large scale, and expects to produce a carload of asbestos per day. About 60 men are employed.

There has been some activity on new properties recently. Lot 13, range 8, of Broughton, belonging to A. Taschereau and others of Quebec, has been acquired by a company now in course of organization. It is planned to build a large mill and to start extensive mining. The property adjoining the Broughton asbestos mines and known as the Tanguay property has been bought by M. Deschene, of Beauceville, who will erect a mill this summer. The Miller mine on lot 13, range 4, has been sold to M. T. Turgeon, of Beauceville.

The asbestos property forming part of lot A of Coleraine, situated at Black Lake and belonging to the Black Lake Chrome and Asbestos Company, was recently sold to Sheriff Langelier and Mr. Larue, of Quebec. This property is crossed by the Quebec Central railroad, and offers excellent transportation facilities. The Union asbestos mine, belonging to Calmon & Co., of Hamburg, Germany, has been started again, after a shut-down of three years. The mill has been thoroughly overhauled and is treating rock from the mines situated at the crest of the big Black Lake hill. The Dominion Asbestos Company, which has acquired a part of the holdings of the Standard Asbestos Company, is about to commence work in the mine and mill. The mill is reported to be the largest in the district and treats about 500 tons of asbestos rock per day. It is expected that the mine and mill will soon be in full operation. The Johnson Asbestos Company, of Thetford, has completed its new mill which has been building for more than a year.

Detailed cost systems enable a mine manager to quickly locate the waste.

---

*Mining engineer, [illegible] Montreal, Canada.

Pyritic Smelting in Tilt Cove, Newfoundland

Early Experiences in Producing Matte from Pyritous Ores without Fuel. Campaigns Were Short, Concentration Low and Costs Small

BY F. S. NICHOLLS*

During the years 1894-97, I was engaged in smelting a pyritous ore, without coke, at Tilt Cove, Newfoundland. Unfortunately, I have not the figures by me for the whole of that time, but, for the 12 months ending August 29, 1896, I have full particulars. During that year, in 294 days we smelted 40,133 tons of ore with a cold blast, and without coke or other fuel. Coke was required for the forehearths or settlers, to smelt foul slag, and to start the furnaces, which only worked six days a week. The total amount of coke used for these purposes for the 12 months was 806½ tons.

TILT COVE, NEWFOUNDLAND. MINE AND WORKS IN BACKGROUND

The ore at the Tilt Cove mines is a low-grade pyritous ore, the analysis of which is as follows: Copper, 3.69 per cent.; sulphur, 34.98; iron, 37.06; silica, 13.23; alumina, 2.47; lime, 0.55; magnesia, 0.0465; arsenic, 0.0107; antimony, 0.1163; nickel, 0.3927; cobalt, trace; oxygen and loss, 7.218 per cent.

Previous to 1895, the ore was crushed, roasted in piles and stalls, and afterward smelted in small brick cupola blast furnaces of about 50 tons daily capacity, the resulting matte being shipped to Swansea. It having been decided, owing to the high cost of coke at the plant, that this form of reduction was too expensive, experiments were conducted, in the same furnaces, with a view to reducing the ore without coke. These experiments were entirely successful, and the smelter was removed to a site near the mine, in order to save transport cost, and also to do away as far as possible with the smoke nuisance, which was so bad at times that people could not live near the works.

FURNACE AND METHOD OF OPERATION

On January 1, 1895, two furnaces were blown in, and later a third and fourth were started. The furnaces were exceedingly simple in construction, being merely a round shaft of firebrick with plates to support the stack. They differed from the furnaces formerly used to smelt roasted ore only in the number of tuyeres, and the distance between the ring and feed plate. The ordinary furnace had three tuyeres, and measured 72 in. between ring and feed plate, while the pyritic furnace had eight tuyeres, and measured 24 in. between ring and feed plate. The bustle pipe was of galvanized sheet iron, the tuyere pipes of painted canvas, and the nozzles were made of tin plate. The tuyere pipes and nozzles were made in the works. The tuyeres were of copper and were water jacketed.

The ore as it came from the mines was all passed through a crusher, and broken to about 4-in. cubes, but it did not matter if it sometimes came through larger; in fact, we used up a three-years' accumulation of worn out jaws that had been scrapped, these breaking the ore small enough for our purpose. The greater part of the fines was screened from the ore as it left the breaker, but about 8 per cent. of fines always found its way to the feed floor.

The forehearths or settlers used were made by tamping coke dust around a mold, set in an outer casing of cast-iron plates. These settlers would last from three to six days, or longer if repaired. They were renewed so easily that we seldom troubled to patch them.

Five men worked a furnace; one wheeled the ore to the charging door, another fed the ore into the furnace with a shovel, one man worked the furnace and made his settlers, while the remaining two kept the matte and slag clear. The furnaces were run from 6 a.m. Monday morning till 6 a.m. the following Sunday morning when they were blown down. We found it more economical to work in

*Metallurgist, Ausserfelden, Salzburg, Austria this way than to smelt continuously; it also gave the men a welcome respite from the smoke which was sometimes unbearable.

EFFICIENCY AND ECONOMY

To start the furnaces, a fire of cordwood was first made on the hearth; on top of this about 500 lb. of coke was dumped. When this was burning brightly, about a ton of ore would be shoveled in, and when hot the ore would be increased until the furnace was full to the feed plate. When the ore started burning, about 4 oz. of blast would be put on, and in about 30 min. the normal blast, 12 oz. The blast was supplied by two small Root blowers. When the operation was fairly under way, all that remained to be done was to keep on feeding ore, and to remove the matte and slag as the charge came down. The slag was basic and carried usually about 0.25 per cent. copper.

SMELTING WORKS, THE COVE. SLAG DUMP ON LEFT

As long as the ore in the furnace kept up a continuous cracking, and gave off dense volumes of smoke, the furnace was all right; but it was a sure sign that things were going wrong if that cracking stopped. The only time we had trouble was when considerable barren rock came down with the ore. This would happen sometimes, for it was extremely difficult to sort it all out on the crusher feed floor, the ore from some of the stopes being very wet and mucky. When this happened the rock would not melt, and we would have to cut down the mass in the shaft of the furnace with bars. Then some foul slag would be fed in with about 6 per cent. of coke and the furnace washed out. After this we continued smelting ore, but coke was never fed in with ore. As a matter of fact the ore would melt more easily without than with coke.

The concentration was low, not much more than two into one, but it was cheaply done. During the year ending August 29, 1896, in 294 days we smelted 40,133 long tons of ore. The ore averaged 3.41 per cent., while the matte averaged 7.06 per cent. copper. The total cost for breaking, transportation of the ore to the smelter, smelting, placing the matte in piles for shipment, including labor and materials, was $55,053, or $1.37 per ton of ore.

Matte was sometimes produced containing up to 18 per cent. copper, but this only occurred when we had a better grade of ore with quartz mixed through it. How far the addition of silica to the charge, or the use of hot blast, would have affected the grade of the matte I never ascertained. Experiments were conducted in South Wales in bessemerizing this low-grade matte, which were entirely successful. No difficulty was experienced in blowing the matte up to 50 per cent. copper in a converter made in the works, sand being blown in with the blast.

The original experiments in pyritic smelting and converting were carried out by my father, T. D. Nicholls, the inventor of the "direct refining process."

A Low-grade Rhodesian Gold Mine

[illegible]

The report of the Wanderer (Selukwe) Gold Mines, Ltd., owning a large mine in Rhodesia, is an example of profitable working of very low-grade ore. For the year ended April 30, 1908, there were 190,377 tons of ore treated, from which bullion to the value of £83,201 was recovered. The yield per ton was $2.0966, the working expenses $1.5540, and the profit $0.5426. The low costs are obtained owing to the mine being largely an open quarry. Since the commencement of operations there has been a constant reduction in working costs. For 1903 they were $2.94 per ton, and have now come down to $1.554. The bullion sales for the past year show a reduction compared with 1907. The principal causes of this reduction were continued heavy falls of ground and a consequent large quantity of overburden, which could not be separated from the ore, thereby lowering the grade of ore sent to the mill.

The ore reserves are estimated at 415,729 tons, but the value is not stated. Complete technical statistics are given. The working expenditure is analyzed as follows: Mining, $0.4656 per ton; tramming, $0.0948; milling, $0.3748; cyaniding, $0.4128; general charges, $0.2060; total, $1.5540 per ton. The assay of ore sent to the cyanide works was 0.1383 oz. gold per ton, and the assay of residues was 0.03595 oz., giving a theoretical extraction of 74.015 per cent.; the actual extraction, calculated on the difference between the gold called for by assay and the gold recovered, was 74.48 per cent.

The profit on working account was absorbed by charges under the heads of depreciation, mine development and London expenses, and an adverse balance of £1288 was carried to balance sheet; so that, in spite of the low costs of working, the stockholders got no dividend.

Improved Adair-Usher Process

The latest modification of the Adair- [illegible] pulp containing as much as 75 per cent. sand and only 25 per cent. slime. Its inability to treat sandy slimes was the cause of the abandonment of the process at Pachuca, Mexico.

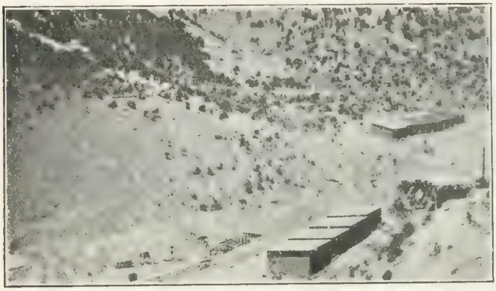
The improved plant consists of ordinary decantation vats having cone bottoms arranged in series, the bottom of the one above being 2 ft. higher than the bottom of the one next below. Each tank is provided with an outflow at the bottom and an overflow at the top. The entering sand and slime flows into the tank through a distributor near the top. The solution enters through the type of radial distributor, used in this process, placed about the midle of the vat. The number of vats used depends on the richness of the ore and the treatment period necessary.

In operation the necessary pulp slowly settles in the rising current of solution, while the enriched solution flows out from one vat to the solution distributor in the next vat below. The pulp, as it accumulates in the cone bottom, slowly feeds, by means of an injector, to the pulp distributor at the top of the next vat above. From the highest vat the pulp can be discharged either to a settling tank, or to a filtering plant. Thus the solution travels from one vat to another by gravity, while the sand travels upward in the opposite direction.

Ore Sorting at the Cabrestante Mine, Santa Barbara, Mexico

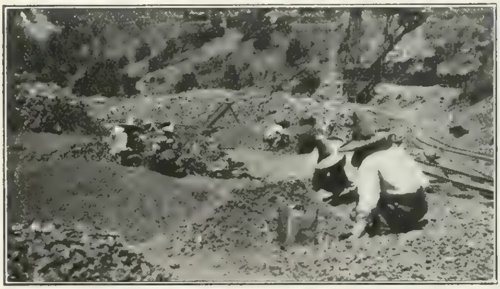
By Claude T. Rice

The ore in the Cabrestante and the adjacent mines belonging to the Montezuma Lead Company is, in the upper levels, mostly oxidized ore, carrying chiefly silver and lead, together with some gold and a small percentage of copper, but through some of the oxidized ore are scattered occasional patches of sulphide. In order to prepare this ore for shipment to the smelter it is necessary to hand-sort and also to hand-jig some of the ore. This hand-jigging and sorting is done on contract, and part of the ore is even mined and sorted on contract. The method of hand-sorting described later is quite typical of the un-modified Mexican procedure. It is the method that is used at the Palmilla mine, a relic of Pedro Alvarado, which has been retained by the new company, and also at Pachuca, Zacatecas and other camps in Mexico.

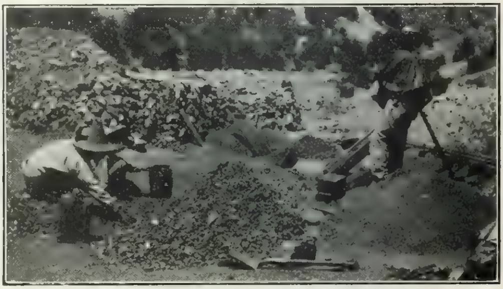


GENERAL VIEW OF HIDALGO PATIO

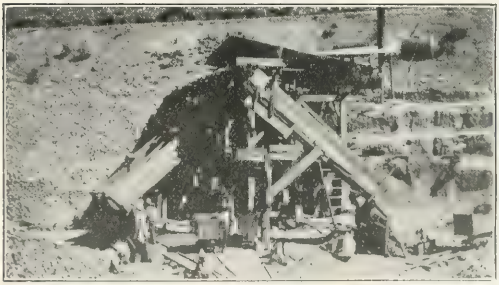
GENERAL VIEW OF CABRESTANTE PATIO



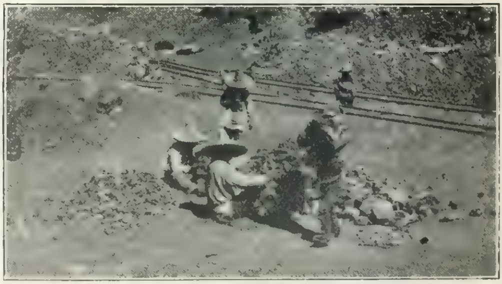
SORTING GRANZA IN FOREGROUND AND GRUESO IN BACKGROUND, CABRESTANTE PATIO



SORTING GRANZA AND SCREENING TIERRAS. BOYS AID IN THIS WORK. CABRESTANTE PATIO



CRUSHING PLANT, HIDALGO PATIO



SORTING GRUESO, CABRESTANTE PATIO

The Mexican prefers to sort on a level tract of ground or *patio*, and seems averse to tables or other devices. In truth a *patio* has many advantages when using Mexican labor, for such labor to be rendered efficient must be worked on contract. To render sorting on contract efficient the work of the different individuals must be kept separate and be easily subject to close inspection. This is easily done on a flat *patio*, but when tables, bins, etc., are used it is difficult to obtain as good an inspection of the finished work. It, therefore, appears that the Mexican mine owner was wise in his choice of a *patio*, and the American engineer will do well to retain this simple Mexican method when close sorting is required. When a large tonnage of roughly sorted material is desired, then a traveling belt or some form of picking table can be used to advantage.

Sorting at the Hidalgo Patio

Some ore as has been said is hand-sorted and hand-jigged, while ore containing much copper is only hand-sorted. At the Hidalgo *patio*, the ore to be hand-jigged is dumped over a double series of screens, one having a 1-in. and the other a ½-in. aperture. The oversize from the 1-in. is called *grueso,* the oversize from the ½-in., *granza,* and the undersize from the ½-in. screen *tierra.* These names are in general use throughout Mexico in speaking of the coarse, medium and fine sizes of ore. The ore sorters are called *pepeneros.*

The *grueso* is roughly hand-sorted into rich ore, second-class, and waste. The second-class ore s packed up to the crusher and, after passing through this crusher, joins the *granza* from the first set of screens and falls upon a ¼-in. screen, the undersize from which falls to the receiving bin below. The oversize from the ¼-in. screen goes to rolls, which crush it to ¼-in. size, and this together with the original *tierra* from the first screens goes to the receiving bin, whence the ore is trammed in cars to the hand jigs. These are square boxes having flat bottoms, in which a box having an 8- or 10-mesh screen on it is jigged up and down by means of a sweep 12 ft. long. A hutch product, called *lama,* and a screen product, called *granza,* are made. While apparently crude affairs, it is remarkable the efficient work that these Mexicans do with these hand jigs on this oxidized silver-lead ore, in which the lead occurs mainly as cerussite and the gangue is mainly quartz. It has been found by tests that a better saving can be obtained with these hand jigs than with a Harz jig. Although about a 4 to 1 concentration is made, the tailing from an ore assaying about 10 per cent. lead often assays as low as 2 per cent. lead; unfortunately the saving on the gold in the ore is not so high.

When cleaning the hutch the product is stirred up with water so as to get into suspension the lighter slime which is low-grade. This water used in cleaning the *lama* is then run over a stationary, inclined, riffled table, and thus considerable slime containing chiefly gold and lead is saved.

The company crushes the ore, but the hand jigging is done on contract, it being necessary to re-treat the concentrates if the jigging is not well done. The price paid for the *lamas* is 2.50 pesos per ton, while for the *granza* concentrates 4 pesos per ton is paid, so that the Mexicans working on the hand jigs make from 1.50 to 2 pesos per day.

[illegible]

The Cabrestante ore carries quite a little copper [illegible] cuprite, the red oxide; on account of this high copper content it cannot be hand-jigged like the ore from the Central mine which carries little copper, but is only sorted by hand in order to prepare it for shipment to the smelter at San Luis Potosi. At this property both the mining and the sorting are done on contract. In some cases individual Mexicans take a contract and hire their workmen, while in other cases several Mexicans band together to take a contract. In that case they alternately mine and sort the ore.

The ore from the mine is trammed to the *patio,* where it is divided into three sizes—the *grueso,* about 1½- or 2-in. size; the *granza,* from about 2 in. to ⅜ in.; and the *tierra,* below ⅜ in. The *grueso* is separated by picking it out from the pile, but the other two sizes are separated by screening through a ⅜-in. screen. The *grueso* is broken with single jacks to a size ranging from 2 to 4 in. according to the size necessary to obtain clean ore. The small pieces are held with the hand on a stone, but a large piece of ore is held between the sandaled feet of the sorter so as to prevent the fragments from flying when he hits it a double-hand blow with the single jack. The waste is thrown to one side behind the sorter, while the ore is piled on the other side.

The *granza,* ranging in size from about 1½ to ⅜ in. is hand picked, but in this case the waste is sorted out and the ore is left in the pile. During the sorting the *granzas* are spread out in a thin pile and turned over with a piece of iron held in the hand, thus exposing the different pieces of ore throughout the bed as the [illegible] the other. As much of the cerussite goes into the fines, the *tierra* passing through the ⅜-in. screen is sufficiently rich to ship. Old dumps are also being picked over on contract, but with dump ore only two sizes are made, *grueso* and *granza,* for little *tierra* is obtained except near the bottom of the dumps.

The waste from the *granza* is picked into *botes,* which, in this case, were old coal-oil cans, and as these were light they [illegible] are used for this work. The ore is meas- [illegible] lected *botes.* It is surprising how the first-class ore is likely to accumulate in the "average" *botes,* for the Mexican, who cannot get ahead of the *gringo* by loafing while working on contract, tries to outwit

BREAKING GRUESO

HAND JIGS, HIDALGO PATIO

[illegible]

him. Consequently the *botes* which are selected for weighing must be closely inspected. Before accepting the sorted ore it is also necessary to have the ore sorter "open" the pile so as to guard against poor sorting. In short, whether working on contract or on day's pay, the Mexican requires close watching. As has been said, the ore is mined and sorted on contract; the price paid is 3 pesos per ton for *tierras* and 7 pesos for *granza* and *grueso*. For ore sorted from the *resagas* (waste dumps) 6 pesos per ton is paid.

The Mexican is pre-eminently good at sorting ore. The number of small boys, some only 7 or 8 years old, that can be seen in the accompanying illustrations, show the reason, for the Mexican begins when a boy to sort ore and when too old to work in a mine he still can sort ore. The rapidity with which a Mexican on contract can sort ore ranging from 1½ to ⅜-in. size is surprising and, when one considers the coarseness at which ore sorting becomes uneconomical in other countries, he wonders whether finer sorting is not possible elsewhere.

In conclusion I wish to thank the Montezuma Lead Company for its kindness in allowing me to publish these prices and especially A. M. Tweedy, who, owing to accident to my own films, kindly took other pictures for me.

Mineral Production of the Philippine Islands

The following statement of the mineral production of the Philippine islands in 1907 has been compiled by Warren D. Smith, chief of the Division of Geology and Mines in the Bureau of Science. It is the first time such a compilation has been made. The figures presented are as follows:

MINERAL PRODUCTION OF THE PHILIPPINES, 1907.

Province	Gold. Oz.	Silver. Oz.	Iron. Sh. Tons.	Coal. Sh. T'ns.
Albay	.....	....	...	4,545
Ambos Camarines	100	7	....	....
Benguet	3,888	..	...	..
Bulacan	....	...	436	...
Sorsogon (Masbate)	552	76	.....	....
Total	4,540	83	436	4,545

The comments on the production are as follows: "For the first year this is as accurate a statement as can be made. We hope to include figures next year regarding a number of products such as guano, brick and tile, lime, etc. The scattered condition of these industries, largely native, makes it difficult to secure the information with any accuracy.

"Of the 4540 oz. gold which from actual figures and estimates make up the total, 2540 represent the amount taken out by Americans and New Zealanders; the remainder represents the quantity mined by hundreds of Igorots and sold in Baguio. The average fineness of the gold taken out by the American and New Zealand operators was 0.850. Some of the Igorot gold recovered as nuggets and stringers would doubtless be finer, but a certain proportion of their gold has been found to be alloyed with copper to such an extent that an ounce would not be worth over $10. It is to be regretted that our figures cannot be more definite, but this is our first attempt at compiling statistics in the Philippines.

"When it is remembered that the Igorots use no machinery and all the other gold excepting that which came from one dredge set up last May has come from two stamp mills of three and 10 stamps, respectively, which latter have been set up hardly more than a year, and when it is recalled that all the properties are as yet doing little more than development work, the outlook is encouraging.

"Silver is as yet practically a negligible quantity. All the iron produced comes from one furnace, owned and operated by a native, and the methods are of the crudest. The coal industry is still in the first stages, but to judge from the active exploration going on in two districts, next year's figures should show a material increase.

"The Igorots of Lepanto-Bontoc manufacture many domestic articles from the copper which they mine themselves. The amount is extremely variable and almost negligible.

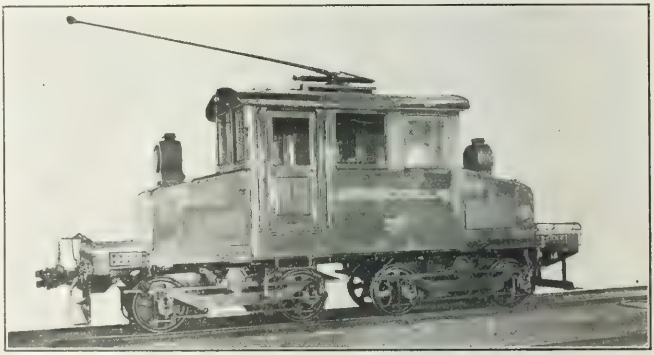
There are at present five stamp mills in the Islands—three in Benguet and two in Masbate. The largest has 10 stamps of 900 lb. each. One dredge is in operation in the Camarines and one temporarily shut down in Masbate.

"Up to June, 1907, a total of 1601 lode claims and 533 placer claims had been filed; of these, one lode claim has been patented, 14 have been surveyed and are now ready for patent, and six placer claims have been surveyed and are also ready for patent. In all, 338 coal claims have been filed up to the present time; of these three have been patented."

Electric Locomotive for the Dos Estrellas Mines

The accompanying illustration shows a Baldwin-Westinghouse locomotive for surface haulage, recently built for the Compañia Minera Las Dos Estrellas, of Mexico. This locomotive is of the double-truck type, designed for a track gage of 3 ft., and weighing approximately 60,000 lb. The over-all dimensions are: length, 24 ft.; width, 7 ft. 7 in.; hight to top of cab, 10 ft. 11 in.

The trucks are placed 11 ft. 6 in. between centers, and as each truck has a wheel base of 6 ft. 6 in., the total wheel base of the locomotive is 18 ft. The trucks are of the equalized pedestal type, with outside journals and rigid centers. The wheels are of cast iron with chilled treads. They have a diameter of 30 in., and the journals measure 4¼x8 in. Each axle is driven by one No. 102 *A* motor suitable for 1500 volts pressure. The motors are inside hung.


ELECTRIC LOCOMOTIVE FOR SURFACE HAULAGE AT LAS DOS ESTRELLAS MINE

The frame is built of steel channels and is fitted with cast-iron bumpers. Steps and automatic couplers are provided at each end of the locomotive. The cab is provided with side doors, and has large windows in the sides, front and back.

The equipment includes hand and automatic air brakes, with shoes on all wheels. The motor-driven air compressor is placed back of the cab, in a ventilated casing. The trolley wire is centrally located and the pole is mounted on the cab roof. There are two electric headlights, four cab lights, an air whistle, and four sandboxes, so placed as to sand in front of the wheels when running in either direction.

By crushing in the stamp batteries with coarse screens (200 to 250 holes per sq. in.), heavy stamps and back water service, the mill at the Luipaards Vlei Estate on the Rand is crushing nine tons of "banket" per stamp.

The Goldfield Consolidated 600-ton Mill

The Ore Will Be Crushed by Stamps and Tube Mills, Concentrated on Deister Tables and the Pulp Cyanided in Pachuca Agitation Tanks

BY PERCY E. BARBOUR

The Goldfield Consolidated [illegible] Company, under the management of [illegible] Mackenzie, has in process of construction a 600-ton mill which will begin treating ore during the latter part of 1908. The mill embodies the very latest practice in gold milling, not only in this country, but also in Mexico, West Australia, and South Africa.

The treatment of Goldfield ores [illegible] presented a rather difficult problem [illegible] metallurgically and financially; so that when shipped to outside points no ore running less than $50 per ton could stand the charges imposed. It is expected that this mill now under construction will start up on $50 ore, and that the grade will soon be reduced to $30 ore, which is the grade of ore now being treated in the Combination mill owned by the same company. Eventually the grade of the ore will be reduced to between $10 and $15. When this point is reached, practically everything between walls in the company's mines will be broken down and sent to the mill.

It is expected that the mill will be running by Nov. 1, and that 25 men will be sufficient to put through 600 tons of ore per day at a total estimated cost of $[illegible] per ton.

The design of the mill was carried out by Mr. Mackenzie and his staff. Francis L. Bosqui, metallurgical engineer for the company, is responsible for the cyanide end, and Grant B. Shipley, engineer for the Allis-Chalmers Company, which is furnishing the machinery, is responsible for the design of the mechanical details of the entire plant.

The mill site lies on the west slope of [illegible] mountain, on the Sandstorm ground, which was the first mining claim located in the Goldfield camp. The company's mines are about a mile and a half southeast of the mill.

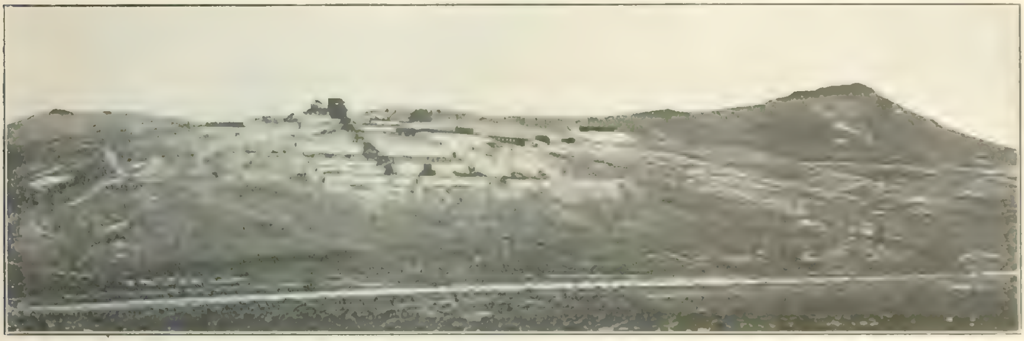
[illegible]

On the very top of the hill, at the millsite, was placed the rock-crushing plant for concrete to be used in the construction of the mill. This plant consists of a No. 3 D Gates gyratory crusher, from which the rock is carried by a steel flight-bucket elevator to a 48x84-in. revolving screen, which runs 21 r.p.m., and is set with a pitch of 1¾ in. per ft. The oversize from this screen goes directly to the bin below, [illegible] discharges to a set of 26x15-in. style A Allis-Chalmers rolls set directly underneath. The fine product from these rolls goes to a second compartment of the storage bin. This rock-crushing plant is driven by a 75-h.p. Bullock motor.

The rock for the concrete work is quarried from the ledges outcropping nearby, and is largely a silicified rhyolite and a fine-grained granite, both of which are extremely hard and sharp and make excellent rock for the purpose. The product from the crusher will pass a 2¼-in. ring. The fine product from the rolls is used as sand in the mixture.

The screen is without a housing and, as there is always a strong wind on the hill, the fine dust which would otherwise be a serious detriment to the concrete, is blown out and away. The dust flies to such an extent that the men on this job nearly all wear automobile goggles and many wear respirators.

The rock and sand is drawn from the bin through standard rack-and-pinion, ore-bin gates into Sterling concrete buggies on the mixing platform, which dump into the hopper of the half-yard No. 2 Ransome concrete mixer. This mixer is driven by a 10-h.p. Bullock motor. Buggies receive the mixture from the mixer and dump into a chute a few feet directly in front, where it falls into a skip car just underneath the platform. This skip, which is one of two on an inclined gravity tram, lowers the concrete to the wall which is being poured. The gravity tram is on the center line of the mill, the shortest wall of which, at the battery terrace, is 210 ft. long, and the longest wall, in the cyanide department, is 294 ft. long. In all there are 12 walls and rows of foundation piers exclusive of the piers for machinery.



[illegible] OF THE GOLDFIELD CONSOLIDATED [illegible]

In mixing the concrete a full buggy of rock is dumped into the mixer, then two sacks of Ideal portland cement, then a full buggy of sand, and last, six buckets of water. In a climate so dry as this, considerable water has to be used, and the poured walls are covered with sacks and [illegible]

[illegible]

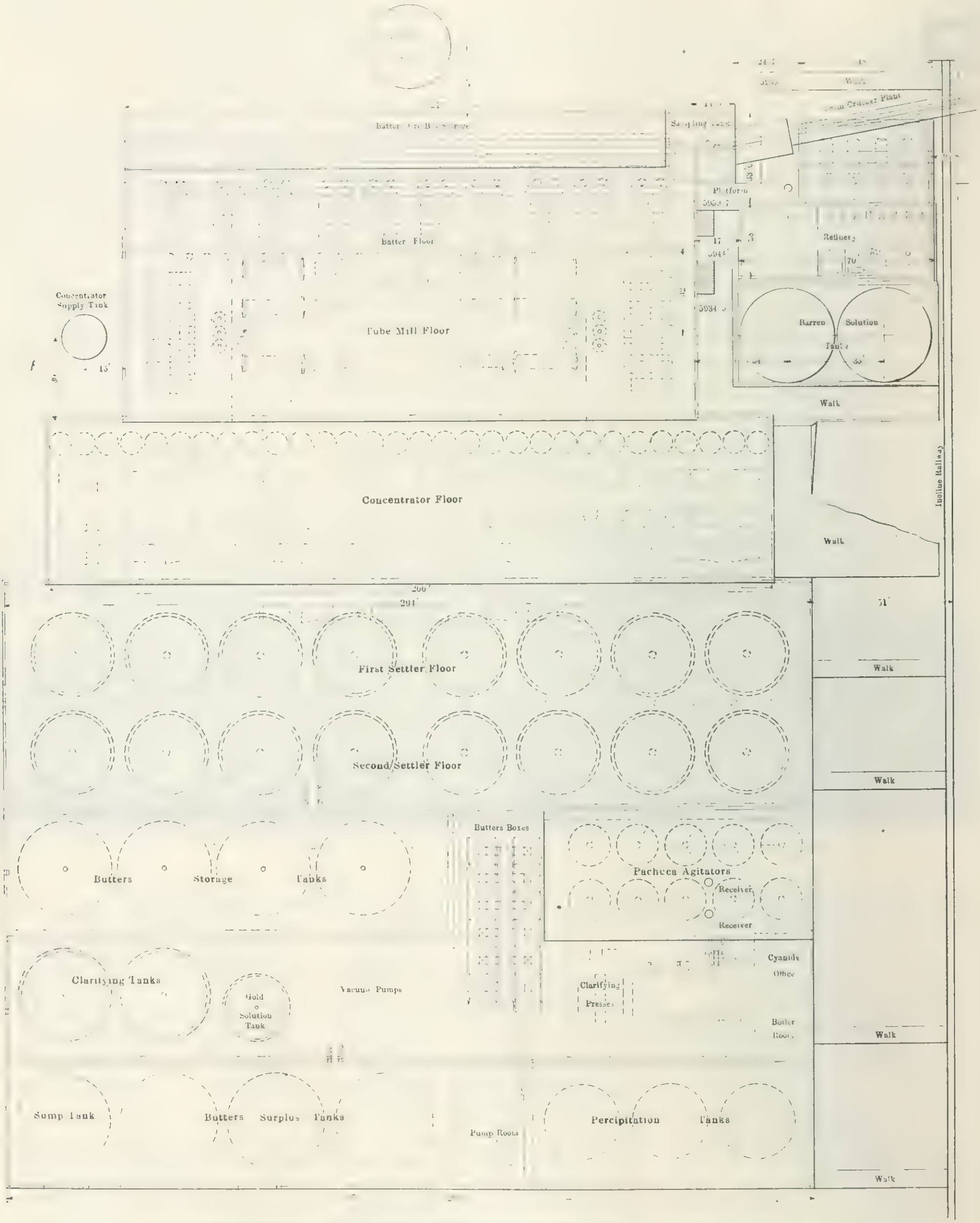
The ore from the mines will be brought in a train of four 50-ton, hopper-bottom, dump cars and dumped into the bin directly underneath the track. This bin is 9 ft. 10 in. wide, 20 ft. high and 44 ft. 2 in. long; it has an approximate capacity [illegible] resting upon concrete foundations. The [illegible] standard rack-and-pinion, ore-bin gates on the front side, into three large shaking

---

*Mining engineer, Goldfield, Nevada.

feeders, each with a variable stroke from zero to 6 in., making 100 to 125 r.p.m. Each will have a separate clutch, so that they can be operated independently. These feeders are driven by a 12-in. five-ply Giant rubber belt from the main crusher shaft.

The ore feeds into a 7½ style K Gates gyratory crusher which runs 350 r.p.m., and makes a product all of which will pass a 2½ in. ring. This product falls directly into a No. 5 revolving screen 45 in. in diameter and 14 ft. long. The screen plate, which is of manganese steel ¾ in. thick, has 1½-in. round holes. The product through the screen, which will be 1¼ in. and smaller, falls directly into a hopper feeding upon the inclined belt conveyer below. The oversize goes to two No. 4 special short-head, style K, Gates gyratory crushers, the product from which also



GROUND PLAN OF THE NEW GOLDFIELD CONSOLIDATED STAMP AND CYANIDE MILL.

falls upon the inclined belt conveyer underneath.

The crusher plant is driven by a 150 h.p. Bullock motor running 570 r.p.m. The main line shaft is 5 15/16 in. and 4 7/16 in. in diameter, and the motor belt is a 26-in. endless double leather belt. All other belting is Giant rubber belt.

The crusher building is entirely of timber construction on concrete foundations, and is closed in and roofed with asbestos-covered corrugated metal. The crusher plant has a capacity of 600 tons in eight hours.

The ore from the three gyratory crushers falls upon the belt of a 26-in. troughed-inclined belt conveyer, and is thus carried to the top of the sampling mill. The belt is 370 ft. long and travels with a speed of 350 ft. per minute. The total rise is 125 ft. This belt is a Stephens-Adamson six-ply, rubber, carrier belt with a 3/16-in. coating of rubber.

At the top of the incline is a No. 8 Blake-Denison automatic and continuous weighing and recording machine. Power for driving this elevator is taken from the main line shaft in the sampling mill.

SAMPLING MILL

The ore from the inclined conveyer discharges into the feed hopper of a No. 3 Vezin sampler, which can handle 2-in. material. This sampler will take a 5-per cent. cut, but is arranged so that a 10-per cent. cut can be taken if desired. The reject drops upon a 26-in. horizontal belt conveyer which runs over the battery storage bins.

The sample goes to a set of 20x15 in. style A rolls set for a ⅜-in. product, and discharges directly into a No. 2 Vezin sampler arranged like the No. 3 for a 5-per cent. sample, but capable of taking a 10-per cent. cut if desired. The reject from this sampler goes to the bucket elevator and the sample goes to a six-ton sample storage bin on the floor below.

Up to this point the plant runs eight hours per day and will handle 600 tons of ore during that time.

Once a day the sample is drawn from the six-ton bin by a style H, Allis-Chalmers 16-in. wall feeder into a No. 1 Vezin sampler, also arranged for a 5-per cent. cut. The reject goes to the bucket elevator and the sample to a small shaking feeder, which feeds it into a style A sample grinder, which makes a 50-per cent. cut. The reject goes to the bucket elevator and the sample drops directly into a style B sample grinder, also arranged for a 50-per cent. cut. The reject from this grinder is shoveled into the boot of the bucket elevator and the sample which goes into a sample bucket is again put through the style B grinder to be reduced again to one-half. This gives the final sample in which one pound is equivalent to 64,000 lb. of ore.

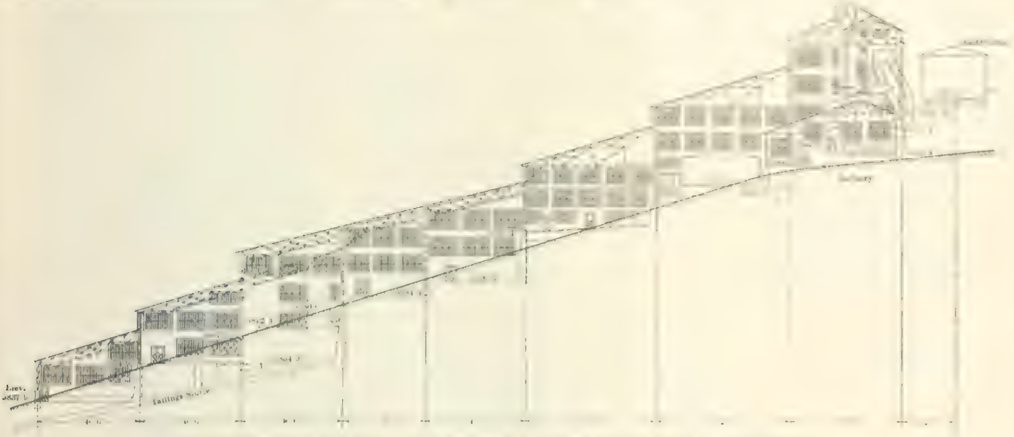
The bucket elevator is 51 ft. between centers, with 6x4-in. buckets spaced 12 in. apart and runs with a belt speed of 300 ft. per minute. The boot is a standard steel boot, and the head has a geared drive, both of the Allis-Chalmers type. This elevator has a double discharge, delivering either directly into the battery ore bin or upon the horizontal troughed belt conveyer on the top of the bin. This conveyer has a 26-in. six-ply rubber belt exactly like the inclined conveyer belt and it runs the entire length of the bin. It is equipped with a Stephens-Adamson, self-propelling, automatic distributor. Power for driving this conveyer is furnished by an independent 15-h.p. motor running at 1130 r.p.m., and placed at the far end of the bin.

Power for the sampling mill is furnished by a 75-h.p. Bullock motor running at 680 r.p.m. The main line shaft is 3 5/16 in. in diameter and the upper and lower countershafts are 2 7/16 in. and 2 15/16 in. in diameter, respectively. Three- to six-ply Giant rubber belts are used on all [illegible] in. endless double leather belt.

The sampling mill is a steel structure and adjoins the main mill building.

MAIN MILL BUILDING

The mill building, built on the side hill, is of the usual terraced construction and has four departments, all in one structure. The batteries occupy a section 50 ft. 6 in. wide by 210 ft. long; the tube mills a section 62 ft. wide by 210 ft. long; the concentrator section is 60 ft. wide by 266 ft. long and the cyanide department is 222 ft. 6 in. wide by 294 ft. long. The difference in elevation between the first wall and the last wall is 132 ft. 1 in. Below this last level is sufficient fall to carry the tailings to the tailings dam in the desert below.



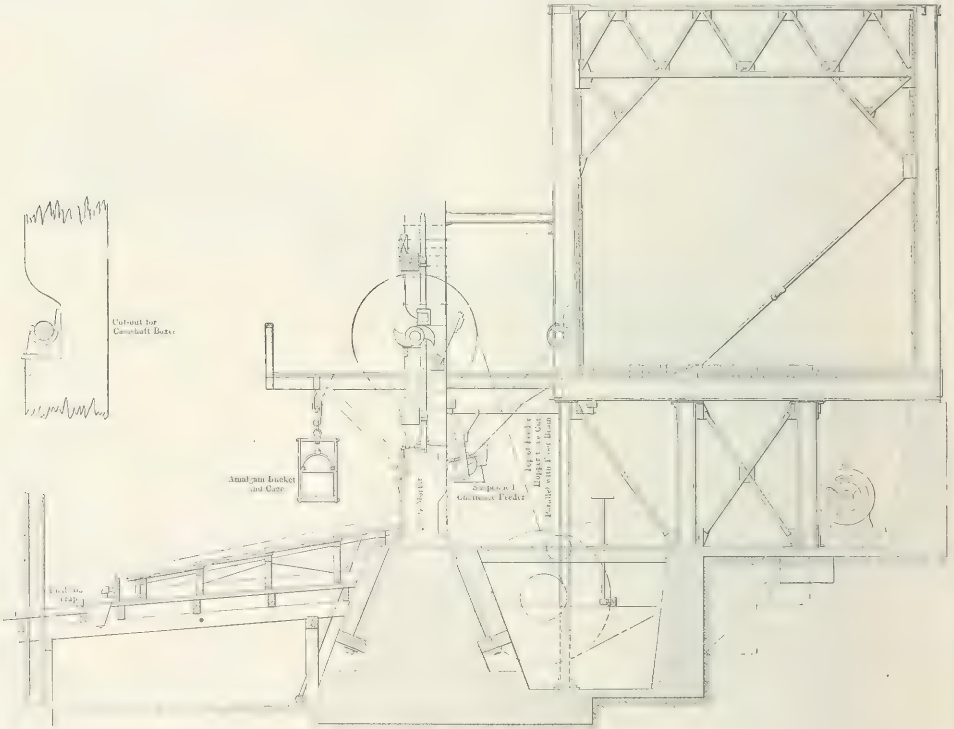
END ELEVATION OF THE MILL. ONE 100,000-GAL. WATER SUPPLY TANK IS NOT SHOWN

The mill building is entirely of steel construction and will be furnished and erected by the American Bridge Company, of New York. There will be between 500 and 600 tons of structural steel in the building exclusive of the roofing and siding which will be of asbestos-protected corrugated metal. On the first three terraces of the building, Fink trusses are used with spans of 50 ft. 6 in., 62 ft. and 60 ft., respectively. In the other five sections, girder trusses 5 ft. deep are used. The foundations in the mill building alone, not including the crusher plant and sampling mill, contain about 7000 yards of concrete. About 30,000 yards of rock were excavated for the foundations. All walls and piers for building columns are 24 in. wide at the top and all have a standard batter of 1½ in. per foot.

MORTAR BLOCK AND BATTERY BINS

The mortar block, which is entirely of [illegible] wide at the top and has a cross sectional area of 96 ft. The anchor bolts are 1½-in. rods set in 2-in. pipe on an incline, with [illegible] being to facilitate dropping the bolts sufficiently to remove a mortar in case one should break. The webs between these apertures are each reinforced with two ¾-in. steel bars. 3 ft. long.

The ore bins behind the batteries are of structural steel and are an integral part of the mill building. They are 18 ft. 8 in. wide, 20 ft. 6 in. deep, and 187 ft. long. They are lined on the bottom, which is flat, with one layer of 4x8-in. timbers on edge and on the sides with one layer of 2x12-in. and one layer of 3x12-in. planks for half the hight and two layers of 2x12-in. plank the remaining hight. When full, these bins will hold 4000 tons of ore weighing not to exceed 125 lb. per cubic foot.


Cut-out for Camshaft Boxes
Amalgam Bucket and Cage
Mortar
Suspended Challenge Feeder
Top of Feeder Hopper to Cut Parallel with Floor Beam
Amalgam trap

ARRANGEMENT OF ORE BINS AND STAMP BATTERIES

The first ores mined in Goldfield were in an oxidized gangue, were free milling, and presented no special difficulty in extraction. The sulphide ores which appear a short distance below the surface, present considerable metallurgical difficulty, and these are the ores which the new mill has been designed to treat. F. L. Bosqui, as metallurgical engineer, and A. G. Kirby, as mill superintendent, have studied the problem in the Combination mill owned and operated by this same company, where detailed and comprehensive mill-run tests have been made for more than a year. From these results and the experience gained during the entire existence of the Combination mill running on Combination and Mohawk ores, the following process has been evolved.

Stamp Batteries

The ore from the battery ore bins feeds through twenty 18x24-in. ore-bin gates into suspended Challenge feeders and thence into No. 120 G mortars. These mortars are of the modified Homestake type, with large opening for quick discharge, and weigh 10,500 lb. each without liners; they are fitted with false bottoms made in halves. The screens are 16-mesh made of No. 21 steel wire. Each stamp weighs 1050 lb. and will make 108 drops per minute. The battery drive shaft is 3 15/16 in. in diameter, and each cam shaft is 6½ in. in diameter and 15 ft. 6 in. long. The drive pulleys are of wood 84 in. in diameter with a 17-in. face; like the cams they are keyed to the shaft by Blanton patent fasteners.

There are 100 stamps in all, arranged in batteries of 10, with five stamps per mortar as usual. Every 20 stamps are driven by a 50-h.p. Bullock motor running 850 r.p.m., placed under the ore bin and driving the drive shaft by means of a 13-in. endless double leather belt. The belts from the battery drive shaft to the cam shaft are 16-in. 8-ply Giant rubber belts.

Each mortar, into which is fed six tons of water to each ton of ore, discharges upon a 5x16-ft. copper-plate table sloping 1⅞ in. per foot. There are four plates per table, each 5x4 ft. x ⅛ in. thick coated with one ounce of silver per square foot. In front of each plate is a cast-iron amalgam trap. The pulp from these plates goes to twenty 24-in. double-cone hydraulic classifiers, 1.2 gal. of water per minute being added at each of these classifiers. Of the pulp going to these cones, 35 per cent. will overflow and will run between 150 and 200 mesh. The balance or 65 per cent., which will run from 16 to 150 mesh, goes to six Dorr classifiers. This spigot product will contain 1.5 tons of water to one ton of dry slime, while the overflow will contain 15 tons of water to one ton of slime.

The Dorr classifiers, or more properly pulp thickeners, are of the improved type with the rocker motion on top and are arranged so that each feeds directly into a tube mill. The classifiers are sheet-steel tanks 16 ft. long by 4 ft. 6 in. wide and 18 to 30 in. deep, set on a slope of 2 in.

per foot. Inside are a series of rakes made of angle iron set transversely, which move back and forth, pushing the pulp toward the top at each stroke and lifting clear of the pulp for the return motion, by means of a cam and rocker arm. The surplus water overflows at the lower edge of the tank. These classifiers will furnish to the tube mills a pulp which contains 46 per cent. moisture. This machine, which is said to be furnishing a product, in several mills, carrying only 25 to 30 percent. moisture, is the invention of J. N. V. Dorr, of the Mogul Mining Company, of Pluma, South Dakota, and is also used in Colorado and Mexico. The overflow from these classifiers goes to the clarifying tanks.

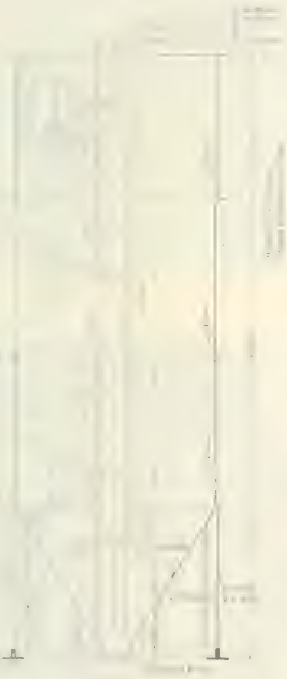
TUBE MILL AND CONCENTRATORS

The product from the Dorr classifiers drops into a steel hopper and is there picked up by a spiral feed on the trunnion of the tube mill; the pebbles will also be fed by dropping them into this hopper to be picked up and fed automatically by the spiral feed. There are six tube mills of Allis-Chalmers make, 5 ft. in diameter by 22 ft. long, placed three in each end of the building. Each group of three mills is driven by a 150-h.p. Bullock motor running 570 r.p.m. It will require 80 h.p. to start a mill, but only 40 h.p. to keep it in motion. The motor belts are 25-in. endless double-leather belts, and all other belting in the tube-mill department is 3- to 16-in. Giant rubber belt 3- to 6-ply.

The product from the six tube mills will go to six 48-in. double-cone, hydraulic classifiers. Here six gallons of water per minute are added and in addition sufficient overflow from the 24-in. cones to make the 48-in. cones classify properly. The spigot product from these, which will amount to 10 per cent. of the feed, is returned to the Dorr classifiers by four 10x54-in. Frenier sand pumps, running 187 r.p.m., to be returned and reground in the tube mills. The overflow from these 48-in. cones, which will run from 150 to 200 mesh and will contain five tons of water to one ton of dry slime, goes over fourteen 5x16-ft. secondary copper-plate tables sloping 2 in. per foot. Each table has four 5x4-ft. plates coated with two ounces of silver per square foot. Seven of these tables are at each end of the mill and each seven discharge through a large amalgam trap made of [illegible] in. pipe.

All the overflow from the 48-in. cones, which has pased over the secondary plates, meets the overflow from the 24-in. cones and goes to thirty 8-ft. Callow tanks set next to the wall on [illegible]. These tanks are large sheet-steel, conical pulp thickeners and each tank will make 6 to 10 gal. of clear water per minute, which runs off the top and goes to the clarifying tanks below. The spigot product from each Callow goes to two Deister concentrators. There are 70 No. 3 Deister concentrating tables in the mill, 10 of which will treat the middlings from the other 60. These 60 concentrators are arranged in three rows on the concentrator terrace and are driven by three 30-h.p. motors running 850 r.p.m. The power is transmitted to the tables by line shafting equipped with friction-clutch pulleys and friction-clutch cut-off couplings so that the various groups of tables are independent of each other. The table pulleys will run 300 r.p.m. The ten tables for treating the middlings are placed on a platform extending over the first row of settlers in the terrace below, and are driven by an independent 30-h.p. motor like the others.

Of the ore which comes to the mill, 3 to 5 per cent. goes out as concentrates; these concentrates will not be shipped to the smelter, but will be treated here by a process now being worked out. This [illegible] to the settling tanks.



[illegible]

[illegible]

There are five terraces in the cyanide department; the first two contain 16 settling tanks 29 ft. 6 in. in diameter and 12 ft. high, with overflow rims and false conical bottoms. These settlers, and all the other tanks in the plant except the agitators, are of redwood and are supported [illegible]. The slimes from the Deister tables flow by gravity into the settlers, which are arranged in sets of four, one set being in process of filling all the time. The filling will require six hours and decanting and discharging will occupy the other 18 hours of the 24. These settlers will give a one to one pulp, one ton of water to one ton of dry slime, which goes partly by gravity and partly by pumps to the Pachuca agitators. The overflow from the settlers passes to two clarifying tanks, 34 ft. in diameter by 10 ft. high with overflow rims and false conical bottoms similar in every way to the settlers. These two tanks are set one 3 ft. below the other in order to get drop for the overflow, and the clear water flows by gravity to the water sump tank. From the sump the water is pumped by 10x12-in. Aldrich triplex direct-gear motor-driven pumps to the mill water supply tanks at the top of the hill. These three tanks have 6-in. discharge nozzles in the bottom, for drawing off the slime which will be returned to the Pachuca tanks to be cyanided.

PACHUCA AGITATORS

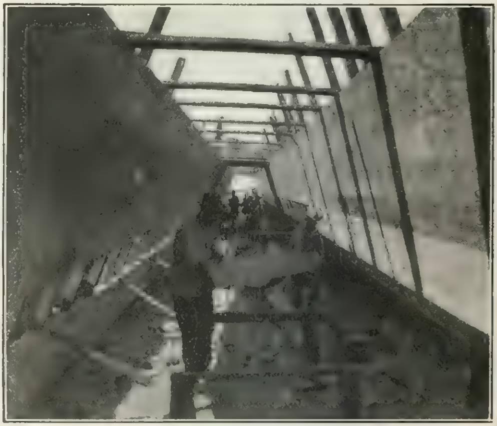
There are ten Pachuca agitators each 15 ft. in diameter by 45 ft. high built of sheet steel and supported on concrete foundations. The foundations are octagonal in plan to carry the circular bottom of the tank, with a 3-ft. square pier in the center to carry the small base plate. Cyanide is added to the pulp while in these tanks, and the solution is brought up to the required strength. The pulp in the tanks, which contains about 2½ tons of water to one ton of dry slime, is agitated by compressed air at 22-lb. pressure for 20 hours.

The Pachuca tanks which are adopted from Mexican practice have never been used in this country prior to this installation. They consist of a steel shell made of plate 3/16, 7/32 and ¼ in. thick and have a conical bottom. The lap joints are reinforced with angle iron and each tank is braced with nine triangular braces of angle iron from the center to the sides. In the center of a tank is an 18-in. tube extending from within 18-in. of the bottom to about 23 in. of the top. A 1½-in. pipe for compressed air extends inside the 18-in. tube down from the top of the tank to the bottom where it is open for the air to escape. The air from this pipe rushing up inside the 18-in. tube carries the solution up and over the top into the main tank, in which the level of the solution is kept continually a foot or more below the top of the 18-in. tube. This continuous air circulation provides both agitation and aeration. A one-inch pipe extends down the side of the 18-in. tube to the discharge at the bottom and a 2-in. pipe on the other side of the tube connects with an annular ring from which eight pipes radiate to the sloping sides of the conical bottom. These pipes are flushing pipes to [illegible]

POURING TUBE-MILL FOUNDATIONS

FOUNDATIONS FOR PACHUCA AGITATORS

FORMS FOR TUBE-MILL FOUNDATIONS



INSIDE THE FORM FOR CONCRETE-MORTAR BLOCK

sides or bottom of the tank. Air at 50-lb. pressure may also be used, and the piping is properly arranged for this purpose. When the agitation is completed after 20 hours, the pulp is discharged through a 5-in. pipe at the bottom into an 8-in. main running between the two rows of agitators and thence to 8-in. Morris manganese-steel-lined, belt-driven, centrifugal pumps. Each tank has a 5-in. quick-opening iron gate valve close to the discharge connection. About 3½ h.p. per agitator is required for furnishing the compressed air. Each tank weighs 17¼ tons and when full of pulp about 200 tons. The tanks were manufactured for this installation by the Hammond Iron Works, of Warren, Penn.

Butters Gravity Vacuum Filter

The pulp from the Pachuca tanks is pumped by two 8-in. Morris centrifugal pumps to two tanks, which act as storage and supply tanks for the Butters boxes below. These tanks are 34 ft. inside diameter by 15 ft. high and are equipped with mechanical agitators operated by bevel gears from a common shaft driven by a 20-h.p. Bullock motor.

There are two sets of Butters filter boxes each containing six sections of 28 leaves each, a total of 336 leaves. Each leaf is 5x10 feet. A 14x14 Gould vacuum pump with direct-connected motor draws the gold solution through the filter frames and discharges it into the gold solution tank. A spare vacuum pump, a duplicate of the other, is provided for emergencies. These pumps are each driven by a 15-h.p. Bullock motor.

When a cake ¾ in. thick has formed, containing per frame 360 lb. of dry slime, the surplus pulp is drawn off into the surplus pulp tank. This tank is 36 ft. inside diameter by 10 ft. high and is also equipped with a mechanical agitator driven by a 10-h.p. Bullock motor. Between cycles the pulp is pumped back into the pulp storage tanks by two 5-in. manganese-steel-lined, Morris centrifugal pumps, which are set on opposite sides of a single 30-h.p. Bullock motor connected by clutch, cut-off couplings; only one pump will be run at a time.

While the surplus pulp is being drawn from the boxes, the vacuum will be maintained at 10 in. in order to hold the cake on the frame. The filter boxes are then filled with weak solution. The vacuum pump draws this weak solution through the cake and thus washes it, and then discharges the solution into the gold-solution tank. The remainder of the weak solution in the boxes drops by gravity into the surplus weak solution tank which is 36 feet in diameter by 11 ft. deep and between cycles it is pumped back to the solution storage tank by 4-in. Morris centrifugal pumps, each direct-connected with a

FLOW SHEET, GOLDFIELD CONSOLIDATED [illegible]

20-h.p. Bullock motor. Water from the water storage tank will now be drawn through the cake, and this solution which is practically barren will be pumped into the gold-solution tank. The surplus water in the boxes is drawn off by gravity into the surplus water tank 36 ft. in diameter by 11 ft. high and between cycles this is [illegible] pumps back into the water storage tank. An extra pump exactly like the other two is provided with by-passes and auxiliary piping to be used in case of accident.

Air or water pressure is now applied on the inside of the leaves in order to break off the cake. This drops into the steel hopper bottoms of the boxes and is discharged into the tailings flume directly underneath, which tunnels under the last terrace of the mill and discharges on the hillside to the tailings dam. These tailings will contain one ton of water to one ton of dry slime.

The leaves are then lifted from the boxes, are washed in the acid wash boxes at the end of the filter boxes and are replaced ready for another charge. The leaves are handled by two crawls running on two 7-in. I-beam tracks overhead. Seven to eight charges per day will be put through the Butters filter. During filtering the pulp is circulated through the boxes by an 8-in. Morris manganese-steel-lined centrifugal pump direct-connected with a 30-h.p. Bullock motor.

Clarifying Presses

The first solution from the acid solution tank is forced by a 4-in. centrifugal pump directly behind the presses, through three 36-in. square 60-frame Perrin clarifying presses which remove all slime. The strong solution then drops by gravity into two precipitation tanks. The weak solution from the Butters boxes to the gold-solution tank is forced by the same pump through these clarifying presses and is drawn back into the weak solution precipitation tank. These three tanks are 28 ft. in diameter by 8 ft. high.

A 12x14-in. duplex Ingersoll compressor in the south end of the terrace will furnish air to two air receivers having a capacity [illegible] the Butters boxes. The compressor is driven from a countershaft which also drives the two 8-in. centrifugal pumps which handle the pulp to and from the Pachuca tanks. Power for this is furnished by a 75-h.p. motor.

The south end of this terrace next to the motor and compressor is divided into two rooms, one for a boiler room for heating the mill in winter and the other for a cyanide office.

[illegible]

The clarified rich solutions from the tanks are pumped by two 7x9-in. direct-gear motor-driven, Aldrich triplex pumps to filter presses in the refinery, situated on the hill at the south end of the mill. As [illegible] precipitation tanks, zinc dust is fed automatically and continuously from two 25-in. zinc-dust cones between the tanks.

The filter presses, of which there are four, each containing thirty 48-in. triangular frames, are of a type devised and used by C. W. Merrill, of Deadwood, S. Dak. When a clean-up from the presses is made, the zinc cake carrying the gold is put in pans and treated in a double muffle furnace where all the moisture is driven off and the material is partially roasted. The solution from the presses goes to two barren solution tanks 34 ft. in diameter by 12 ft. high, just outside the refinery building, one for weak and one for strong solutions, which are returned to the mill, the weak going to the Butters storage tank, and the strong being used for flushing out the settlers or passing directly to the Pachuca tanks.

The roasted material from the muffles is ground in a 24x48-in. revolving barrel together with the necessary fluxes and the fine product resulting is treated in four Faber du Faure furnaces. These furnaces are equipped with oil burners, but can also use coke. The product from these furnaces is bullion and slag, the former ready for the mint and the latter to be sent to the smelters.

Amalgam from the primary and secondary plates is put through an amalgam press and as much quicksilver squeezed out as possible. The amalgam balls from this press are placed in semi-circular trays which are then transferred to a retort furnace where the mercury is retorted and recovered. The bullion from the retorts is refined in a No. 60 Steele-Harvey refining crucible, and the bullion product is ready for the mint. A 24x48-in. clean-up barrel is provided to grind the foul amalgam carrying sand, sulphides, etc., from the traps and mortars, and this ground product is then retorted and refined.

The retort and muffle furnaces are built together and will require for construction 9000 red brick, 3000 firebrick and 2000 lb. of fireclay. The red brick will be set in mortar. This compound furnace is equipped for burning crude oil, but is so arranged that it can also burn coke in case of need.

I-beam trolley tracks and crawls are provided in front of the Faber du Faure furnaces, and the muffle furnaces for handling crucibles, pans, and heavy material. A reinforced concrete vault is provided in the refinery for storing bullion and other valuable material. A 10-h.p. Bullock motor will furnish all the power required. The refinery will have two stacks, one for the Faber du Faure furnaces 24 in. in diameter and 60 ft. high and one for the retort and muffle furnace 20 in. in diameter and 30 ft. high.

Power

All the motors in the plant will be three-phase, 440-volt, 60-cycle machines, and will receive current from the transformer house on the hill behind the mill building where three Bullock transformers step down a 6600-volt current derived from the long-distance line of the California & Nevada Power Company at Bishop, Cal., 150 miles away. There will be 1305 h.p. of motors in the plant as follows:

	Number.	Horse-power.
Crusher plant	1	150
Sampling mill	1	75
Horizontal belt conveyor	1	15
Stamp batteries	[illegible]	50
Tube mills	[illegible]	150
Concentrators	1	30
Compressor and belted pumps	1	75
Butters tank agitators	11 11	10 20
Direct-connected Pumps.		
Morris centrifugal pump	1	30
Morris centrifugal pump	3	[illegible]
Morris centrifugal pump	1	20
Gould vacuum pump	2	15
Aldrich triplex pump	[illegible]	15
Aldrich triplex pump	2	[illegible]
Refiner	1	10
Shop	1	10
Tramway	1	20
Total		1305

Water

The water supply is obtained from the Goldfield Water Company's mains and is a pure spring water brought from Lida 38 miles to the south. From the water company's mains to the reservoir a 5-in. wire-bound redwood pipe is used. The reservoir is situated on the westerly side of Columbia mountain about ¼ mile from the mill site, at a slightly greater elevation, and consists of eight 30x20-ft. redwood tanks having a total capacity of 800,000 gal. The water from the reservoir flows to a clear-water tank of the same dimensions on the mill-site hill, and thence to a mill-water tank of the same dimensions just below the former tank, and just above the battery ore bin. From this tank the water flows to the main in the mill.

An incline tramway, 30-in. gauge, operated by a 20-h.p. motor will reach from the lowest level of the mill to the top of the hill for handling supplies and material. The motor will be placed in a small addition to the shop building just south of the refinery. A 10-h.p. motor will run the shop, which is a small one, and intended only for small repairs, as the company has an extensive machine-shop equipment at the mines.

To Test Protective Paints for Iron Surfaces

The Paint Manufacturers Association has undertaken a series of experiments to test the protective properties of various pigments when applied in oil to iron and steel surfaces. Experiments by Alliston S. Cushman, of the U. S. Agricultural Department, have proved the electrolytic theory of corrosion and showed that bichromates of the alkaline earth metals when in solution offer a perfect protection for iron surfaces. Chrome pigments did not, however, give positive results when placed in contact with iron surfaces, some even serving as "rust stimulants."

The tests inaugurated by the association will determine by practical application which pigments are actually protective and which are destructive when applied to iron surfaces. The place selected for the test is Atlantic City, N. J., where a fence 300 ft. long will be erected. The fence will have accommodation for 300 steel plates which will rest upon girders 24 in. from the ground. The plates are to be rolled from three classes of metal, bessemer low-carbon steel, open-hearth structural steel and pure ingot iron. The plates are to be 24 in. wide and 36 in. high, approximately ⅛ in. thick. Four plates of each metal are to be used for each paint formula. Two of these plates are to be painted in the condition as received after previously scratch-brushing the surface, thus following out the ordinary methods of painting structural iron. The balance of the plates are to be pickled in sulphuric acid in order to completely remove the scale, subsequently neutralizing the sulphuric acid with lime. The plates are to be painted under cover so as to secure equal conditions. A uniform spreading rate is to be used and a series of unpainted plates will be placed upon the fence with the painted plates so that the rapidity of corrosion of the various metals may be watched. At proper times the various committees will make inspection of the fence to note the wearing qualities of the different formulas.

Railroad Patents to Mineral Land

Special Correspondence

A hearing of considerable importance to California miners has been before the Sacramento land office recently. The matter in question is that of Claus Erich and others against the Central Pacific Railway Company and involves a dispute over about 80 acres of mineral land known as the Spanish Dry Diggings, near Georgetown, El Dorado county. Erich, with 18 others, are protesting the claim of the railroad—virtually the Southern Pacific—to the property. Not long after the Government issued a patent for the land to the Central Pacific Railway Company, Erich and others located claims on it, claiming that it was mineral in character and that the railroad company had deceived the Government as to its character, thus violating the law. This the company denies and refuses to surrender the land. The hearing is to ascertain whether or not the patent to the railroad company should be cancelled. After the testimony is gone over by the Federal officials, if it is determined that the Central Pacific was guilty of fraud, the case will be taken to the United States courts to throw the land open to entry.

Coal Mining in Southern Anthracite Field

Methods in Use Where Seams Are Gaseous, Unusually Warm, Lie at Every Pitch, and Bottom Has Been Known to Heave 1 ft. in 10 Hours

BY THOMAS F. DOWNING[1]

It is often asked, "What is the differ[illegible] between the Northern and Southern anthracite coalfields of Pennsylvania?" Why is it that a miner considered competent and skilful in the Northern basin finds himself embarrassed by new conditions in the Southern field? Is not the coal practically of the same quality? Are not the same general mining problems to be met with in both sections? It is in answer to these questions that I have prepared this article.

For the benefit of those unfamiliar with the anthracite coalfields of Pennsylvania, it may be said that they extend, roughly speaking, from the western extremity of Wayne county in a southwest direction, to the eastern part of Perry county. They are bounded on the north by the Wyoming and Shickshinny mountains, on the south by the Orwigsburg valley, on the east by the Moosic mountains and the headwaters of the Lehigh river, and on the west by the Susquehanna river; the territory therefore comprises about 1680 square miles. This is by no means all coal territory. In fact the coal-bearing lands are estimated at about 300 square miles, increasing from year to year as more seams are discovered.

Naturally, so large a section of land is split up into various basins more or less independent of one another. For purposes of greater clearness, we may collect these basins into four districts, viz.: The Northern Wyoming and Lackawanna [illegible] the Upper Lehigh, [illegible] and the Southern or Pottsville field. The section which is now under consideration is that lying immediately north and south [illegible] all mining men of the last two divisions. This is what is meant in this part of the great anthracite coalfields, as the tracts lying above or north of the mountain, and below or south of the mountain.

[illegible]

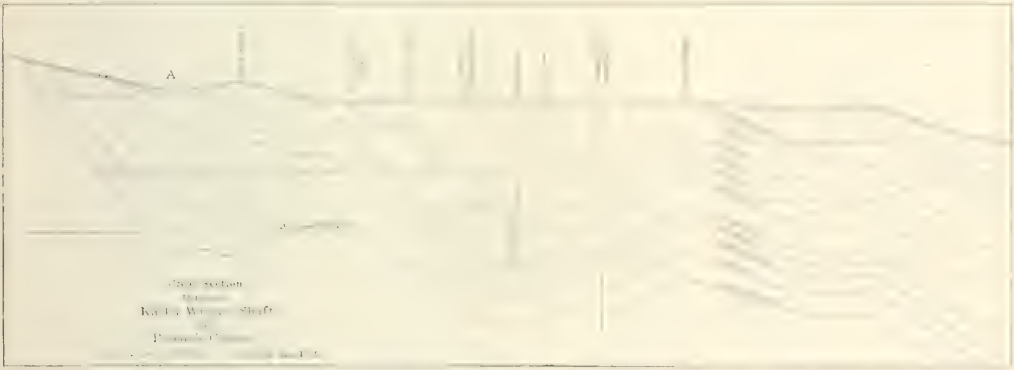
As we descend from the most northerly region to the more southerly ones, we find that the comparative flatness and symmetry of the coal seams gradually develop in complexity until we reach a climax of irregularity in the Pottsville basin; it is here shown that different geologic conditions existed in these two regions. I do not intend to assert that there are no sharp pitches or irregularities in the northern fields, but the great difference lies in the extreme intricacy of the lower basins and the simplicity of the northern ones.

I will assume that the Buck mountain is the lowest bed worked, although it is well known that the Lykens measures are below and have not yet been worked in this section.

Following are the various seams, starting from the Buck mountain as the lowest: Seven Foot, Skidmore, Bottom Split, Middle Split and Top Split of the great Mammoth bed, the Four Foot, showing in places, Holmes, Primrose, the Orchards, the Diamonds and the Traceys. There are several seams above the Traceys, but they are not found in the section under consideration.

Let me illustrate by a cross-section of the Kaska William colliery situated about 8 miles west of Tamaqua. This section was made in January, 1904, yet subsequent [illegible] shown the seams to lie in a different position. Understand that the utmost skill and care available were employed in making this cross-section, nevertheless, when the beds were opened, discrepancies were found. In many instances, miniature saddles and basins have been discovered, not expected nor thought of when making the section.

The section shown in the accompanying illustration was made on the line of the shaft. If two other sections were made of this same colliery, one east and the other west, the seams would be seen to lie in a totally different position. Observe in the northern basin there are no north dips, the beds being inverted. The same thing occurs in the southern basin.



[illegible]

THE ST. CLAIR SECTION

The Pottsville shaft is sunk to a depth of 1600 ft. and is bottomed only on the Primrose seam. If it had been sunk to the Bottom Split of the Mammoth seam, its depth would have been possibly 2,000 ft. Yet this is not the deepest part of the basin. If a shaft were sunk farther south or in the basin itself, its depth would possibly be over 3,000 ft. to the lowest bed. Farther south we approach the Sharp mountain where we find the seams standing on end; in fact, more than perpendicular, as they are inverted. Much could be written on the seams, conditions, etc. of the Sharp mountain, but the field is too large for a short article and I will consider the St. Clair section or that por[illegible] Kaska William colliery [illegible]

---

[1]Superintendent, [illegible] Company, Kaska, Penn.

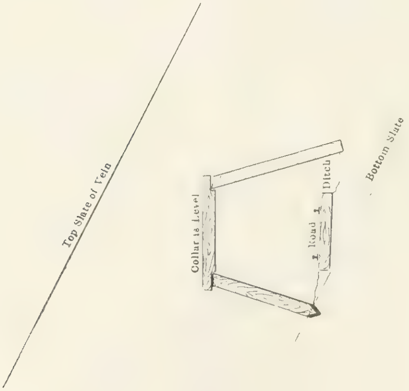


FIG. 1

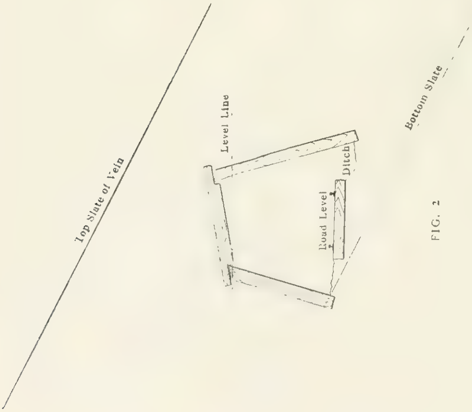


FIG. 2

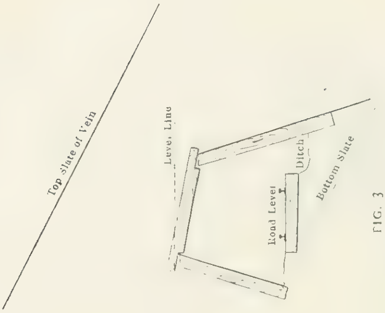
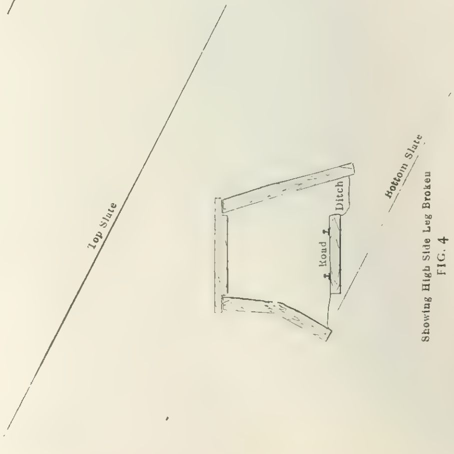
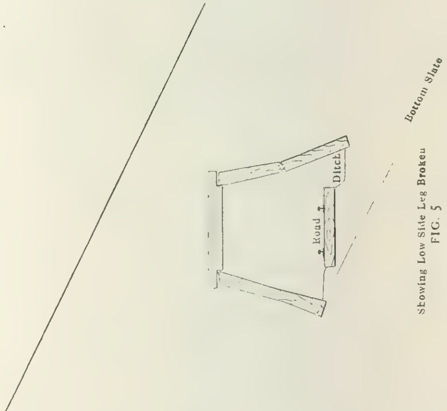


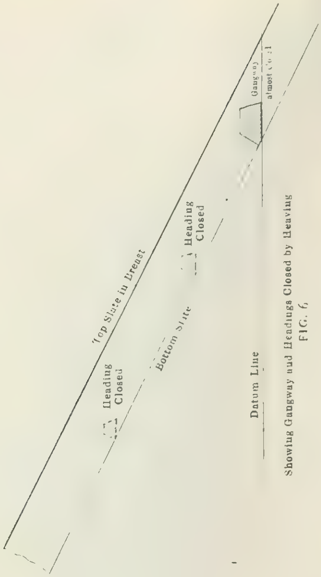
FIG. 3



Showing High Side Leg Broken
FIG. 4



Showing Low Side Leg Broken
FIG. 5



Showing Gangway and Headings Closed by Heaving
FIG. 6

miles north of Pottsville was abandoned about 13 years ago. Wadesville colliery is now working this territory and the breasts from these gangways are now holing into the old Beechwood workings, from the plane-level workings. The seams worked are the Buck mountain, Seven Foot, Skidmore, Top Split, Bottom Split, Holmes, Primrose, Big and Little Orchards, and Big and Little Diamonds. Why was Beechwood colliery abandoned? They had the Top Split seam from 7 ft. to 16 ft. thick, and the Bottom Split was from 8 to 20 ft. thick.

Better or cleaner coal was never taken out of the earth. Imagine a colliery with seams of the above thickness, and averaging 15 ft., which must be abandoned because they were not profitable. Yet in the Upper Lehigh region, seams from 2 to 3 ft. thick are worked. Why is this? Allow me to present some of the difficulties we have to contend with

Difficulties Met With

I will first speak of the Top Split or upper member of the Mammoth seam. In this bed, the pitch is from 15 to 30 deg. and the seam gives off a great quantity of gas. The difficulty of working this coal is augmented by the bottom member of the Mammoth, which is separated from the Top Split by a layer of slate from 4 to 7 ft. thick. We drive the gangway on the bottom slate with a 7 ft. collar, 12 ft. spread, and a hight from 7½ to 8 feet. A stump heading is driven parallel to the gangway, 36 ft. up the pitch. Chutes are driven with 50 ft. centers. From these chutes, breasts are opened and are driven up from 6 to 8 yd. wide when the top will permit. Two manways are used, juggled and coupled, and having the gob carried in the center. It often happens after driving the breast for a distance of 20 to 30 ft. that the work must stand idle on account of the great volume of gas arising from the bottom. The face may be entirely free from gas because of the air passing through, about 15 to 20,000 cu.ft. per minute. The gas becomes diluted with air and passes away, but the safety lamp cannot be carried within 3 ft. of the bottom, as it is filled and quenched, so great is the outpour of gas from the bottom slate. After two or three days, this gas drains off and the work may then proceed for another 20 ft. more or less, when like conditions again compel a cessation of operations.

Placing Mine Timbers

Sometimes chutes are driven to the required distance with a 7 ft. collar and an 8 ft. leg; the coal is then mined from the top and sides until the opening reaches the required width, the work beginning at the face, and the miners retreating as the top rock falls, until a distance of about 50 ft. from the stump heading is reached. This coal is left to support the stump heading and gangway.

The gangway, as already stated, is driven on the bottom slate as represented in Fig. 1. It will be noticed that the high side leg is butted or sharpened to almost a pencil point; if the leg was placed, as shown on the low side, the stick would be broken, probably in less than a day, as shown in Fig. 4, due to the pressure from the bottom slate. The high side leg being pointed, offers a minimum of resistance to the heaving bottom slate, which rises around it and breaks, leaving in numerous instances cracks as large as a man's leg. This disturbance throws up the rail perhaps 6 in. on the high side, so that in a few days the mine wagons strike the timber on the low side.

Frequently, 50 ft. of gangway is driven and the work must stop on account of the heaving of the road and the breaking of the timber. The men must then return and lower the road and retimber the gangway to the face. They then drive possibly another 50 ft. and come back and lower the road again. More than 60 names may be seen on the pay rolls, of men employed in lowering roads, and this number is augmented every idle day, Sunday included. Many of these men are employed at night, cutting down the roads; they work on until near the morning quitting time, then connect the new road with the old one, so that the work may go on next day.

At the point where the two roads are connected, the men block up the connection on an incline, and a runner accompanies the driver of the day's trips, and puts sprags in the wheels of the last two or three wagons to keep the trip stretched while going down the incline; the object being to prevent the mine cars from bumping and injuring the unfinished road. With precaution, the roadbed remains comparatively firm and the work proceeds night by night. It often happens, however, that before the first gang of men has reached the face of the gangway, a second gang is obliged to follow them up to cut down still lower, the gangway which has already been lowered.

Heaving of the Bottom

The question naturally arises, "When does this heaving cease?" It does not cease at all. The force of the gases in these measures is so great, that foot after foot of roadbed is removed until the slate is entirely gone, and the coal of the Bottom Split itself is reached. Then, although the heaving still continues, the conditions become more manageable, owing to the diminished force of the gas.

What follows may seem incredible, but nevertheless is true, as I know from actual observations. In the Beechwood colliery, one section of the gangway heaved 1 ft. in ten hours, and on the turnout of the west third level of the same colliery, where the slate was from 4 to 5 ft. thick between the Top and Bottom Split, in four years it had all been removed and the [illegible] of the [illegible] heaved to the bottom slate of the Bottom Split, so that in less than 4 years the strata had lifted a distance of 20 ft. in the center of the turnout.

It is by no means an unusual occurrence that the driver brings out his first trip in the morning, and returning with the second, finds that during the brief space of time which elapsed while loading this second trip, the roadbed has suddenly heaved so that the wagons strike the timbers and either knock them down or they themselves become so jammed that it is necessary to mine under them to relieve the trip.

Mining the Bottom Split of the Mammoth

The above concerns chiefly the Top Split. Now, as to the Bottom Split gangway of the Mammoth. It has always been said that the slate between these two sections or splits ranges from 4 to 7 ft. in thickness. We drive crosscuts from the Top Split to the Bottom Split gangway at about 500 ft. intervals, and we find the same difficulties here as before, viz: heaving of the bottom and sides with additional enormous pressure from above. We try to get this crosscut, when driving, under a Top Split breast to turn our curve in, because in driving our Bottom Split gangway, the moment it gets under a pillar of the Top Split, we are aware of the fact by a new kind of difficulty that we have to contend with; namely, additional pressure, which we meet by what is known as forepoling.

Forepoling

Forepoles are oak timbers from 4 in. to 7 in. in diameter, and from 12 to 14 ft. long; the small end of the pole is sharpened to a point to facilitate driving. We start to take out a portion of the coal at the hight of the last collar, then insert poles on the top of the same collar and drive them ahead for about 6 ft. After the poles are in place, if they do not touch each other, inch boards are used to stop up all spaces between them. The miner calls this process forepoling and shingling. [illegible] the high side and pole behind the leg, cutting the coal for a space about 2 ft. wide; a pole is then driven in the bottom slate and is spragged and lashed to the last set standing. We then start on the low side and forepole again, before cutting another opening 2 ft. wide to get in the low side leg. We are now ready to put on the collar, and it will be noticed that we have not removed any coal excepting that necessary to stand the legs and collar; the main body is left until the timbers are in place to hold the face. Even with these precautions, it often happens that the coal in the face will start to burst out. It is then necessary to get planks and sprag the face before we can put on the collar.

I have often seen more than 500 cu.ft. of loose coal force itself through a hole not larger than a man's hand before we were able to control it. Miners who are not familiar with these conditions may think this statement incredible. They will also say that a lump of coal ought to close so small an orifice. The pressure from the sides and top has powdered this coal until you would not be able to pick up a piece from the heap discharged much larger than a walnut. Fortunately there is a band of slate in this Bottom Split and after this force has diminished, either a lump of coal shuts it up, or a band of slate serves the same purpose. It usually takes three shifts' work to stand a set of timber and I have known three days to be consumed in doing it. All this coal has been taken out without firing one shot. This repeats itself until the Top Split pillar is passed, then crossing the next breast we are able, with a few poles on top and sides, to get up the next set an so on.

After these timbers are stood, our troubles are not yet over, because the pressure still remains. We stand our timber as represented in Fig. 2. The collar is not stood horizontally, but is about 6 in. higher on the low side. In a few days the set looks as in Fig. 1, after a few more days, as in Fig. 3, if not broken. I have often seen a set of timber stood at night and found it split and broken in the morning. The timber in use in this gangway ranges from 14 in. to 20 in. in diameter.

General System of Working

We drive chutes here every 50 ft. as in the Top Split, and also a stump heading 36 ft. up the pitch parallel with the gangway connecting the chutes. This last is driven with a 7-ft. collar and an 8 ft. leg until within 30 ft. of the upper gangway, or until the limit is determined. We then drive this chute on a heavy pitch until we reach the top slate and there open headings from breast to breast to insure the carrying off of the gas. We proceed to rob the chutes back, and at 30 ft. intervals, drive slant chutes from breast to breast to rob out the pillars. We have tried to work this section of coal breast-fashion, say about 6 yd. wide with two manways coupled, but the pillars, despite all our cares, would run, and rock would fall before the breast was half way up. Sometimes even the chutes run away and we have to resort to the old system of forepoling as described above. Pillar headings are driven 50 to 60 ft. apart on the bottom slate with a 4-ft. collar and a 6-ft. leg, and every heading, before it is holed into the next breast, must be lined because of the timber breaking. What is meant by "lining," is to stand sets of timber between the original sets which were 5 ft. apart, to strengthen the opening; these openings are often retimbered four times while driving up the chute and robbing back.

An Attempt to Solve the Problem

Mining men will ask whether there is no remedy for this state of affairs. Every miner who has confronted these problems has exercised all the ingenuity at his command to solve them, but up to the present time in vain. One expedient tried was as follows:

The gangway was opened the usual width, then on each side behind the legs, a foot of solid coal was removed, a partition of 2 in. mining plank was used instead of lagging and this foot of space was filled with loose coal to act as a cushion or buffer against the pressure. The plan, however, was a failure because the pressure did not exert itself evenly.

Possibly the pressure would come from the high side, thus forcing the timber to the low side, and 20 ft. away the condition would be reversed, the timbers being forced to the high side, thus throwing them out of line; within one month the gangway had to be closed down and new sets of timber stood, this time with a new collar long enough to cover the excavated additional 2 ft. behind the old legs. Holes have been drilled in both coal and slate in order to allow the gas to escape. This answered very well for an area of about 1 ft. from the hole, but 5 ft. away the old forces were at work. Any miner can see that to drill holes 1 ft. apart each way is simply impossible on account of the expense.

Many Experiments Failed

It will be noticed from Fig. 3, how the leg on the low side which has been placed without any butting, has been forced through the coal, sometimes a distance of 3 ft. The low side is often forced down so far that the top of an empty wagon with a hight of 5 ft. catches the collar. We have tried to overcome this by sinking a deep hole and filling it with hay, straw and manure before inserting the leg. This was a failure. Another experiment that failed was to fill the hole with hard rock. The only thing of benefit, found up to the present time is, when relieving timbers, to dig around the leg, place a chain around it, get a long lever with a short fulcrum and pull it out so that the surrounding coal may not be disturbed. The cavity is then filled with 2-in. plank to within 6 in. of the top of the hole, and the new leg is placed on top of the plank. These pieces of plank being placed at right angles to each other, seem to hold the particles of coal together and form a kind of foundation or pedestal for the leg. This is the most successful expedient thus far tried to keep the legs from sinking as far as before.

Where the top slate is sufficiently strong to permit the coal to be mined in breast fashion, that is, 16 ft. to 20 ft. wide, the headings are driven on the bottom slate as described before, and the last heading against the top slate with a prop on the high side.

The miner from above the mountain may think this heading will stand, being against the top slate, but such is not the case, a gang of men must be constantly removing the bottom coal which continually heaves, in order to keep the required area open for ventilation.

In traveling through these finished breasts, I have frequently tried to find where the old headings were formerly driven; but so enormous has been the shove of coal, and the headings have been so solidly filled, that they furnished little evidence by which they could be located, an apparently solid front of undisturbed coal being seen as shown in Fig. 6.

Again at the Beechwood colliery in the west third level slant, a breast was driven which holed into the gangway above. For some unknown reason, the rails at this point had not been taken up from the old gangway, and they were found pressed into the form of waves, and the gangway itself was closed so tight that it was impossible to crawl through it. This gangway has been abandoned possibly for four or five years. Contrast this with the recent pumping out of a colliery above the mountain where the gangways stood almost intact after having been abandoned for 25 years.

Many Tunnels Necessary

Another illustration of difficulties and expenses which are constant in this complex southern field lies in the number of tunnels necessary. As is evident from the section submitted, the constant succession of saddles and basins and also their peculiarities of rising and falling in such short distances cause innumerable tunnels to be driven, bringing up the cost of coal.

I have in mind at the present time a colliery that ships 3 times the coal that the Kaska William mine produces, and yet has not driven nearly as many tunnels as the latter. Oftentimes in this field the seam of coal does not lie where expected, and as a consequence the tunnel must be driven 100 ft. or more in unprofitable rock before the bed is reached.

Mines are Unusually Warm

Another novelty to the northern miner visiting our southern field is the extremely high temperature encountered, the heat being generated in the old workings. A stranger passing through one of our mines might believe there was a fire, so great is the heat. I remember one instance among many in which 40,000 cu.ft. of air per min. passed through one section of a mine, and at its exit was 20 deg. higher in temperature than when it entered.

The question will arise in the minds of those who have not worked under these conditions, how air is conducted to the face of the gangway when the presence of such vast quantities of gas is manifested by the breakage of heavy timbers and the upheaval of the strata. When the pitch is light, the old gangway timbers are used to form a cribbing which is placed against the plank battery as soon as the breast is finished. While building the cribbing, all spaces are filled with silt or fine coal dirt, and since the pressure is exerted on all sides, this silt is packed so close that it forms an air-tight battery. Where the pitch is heavy, a double battery is built in the chute between the stump heading and the gangway, having two center props under the collars. The remainder of the chute from the battery to the stump heading is filled with coal dirt from the old breast.

TIMBERING IS GREATEST EXPENSE

All this expense mentioned above is but small, compared with the enormous expenditures incurred in timbering our mines. There has been such an amount of discussion in the periodicals of the day as to our rapidly diminishing forests that the question of the great consumption of timber in the mines is not new. It is a pleasure to be able to state that W. J. Richards, general manager and second vice-president of the Philadelphia & Reading Coal & Iron Company, is giving to the problem of the preservation of mine timber, his personal attention, and is erecting a large plant where timber is subjected to various tests looking toward a reduction of expense to the miner.

Let the fortunate miner from the Northern fields who mines his coal with an expense of 10c. per ton for timber owing to his reliable top slate, imagine being obliged to mine every foot only by the help of timber, running his expenses for this one item anywhere from 20 to 30, 40, or even 50c. per ton. He will with difficulty understand the necessity for this, since his own mine is so safe with but little timber; however, we operators below the mountain must use greater and greater skill in mining and preparing our coal, in order to overcome this heavy handicap upon our production, so that in the market we may be able to compete with other fields.

Space will not permit a detailed discussion of the methods of preparing our coal; however, a description of the Orchard seam with a dip of 70 deg., which bed we are now working at the Kaska William colliery may be of interest. Following is a section of this seam beginning with the bottom slate:

Coal	1 ft.	7 in.
Slate	0 ft.	10 in.
Coal	1 ft.	6 in.
Slate	2 ft.	5 in.
Coal	1 ft.	0 in.
Dirt	0 ft.	5 in.
Falling top	1 ft.	3 in.

This makes a total bed 9 ft. 0 in. thick, of which 4 ft. 11 in. is refuse. All this must be handled in the breaker, so further words to mining men are unnecessary.

In conclusion, a few remarks concerning the above statements may not be out of place. Some of the figures given will be startling to those not conversant with the Southern coalfields and may appear exaggerated. To such persons, I would say that any questions or doubts will meet with ready consideration if presented, for I have endeavored throughout to undercolor and understate the peculiarities mentioned. I will be glad to hear from my fellow-miners on a subject of so much mutual interest.

A Practical Test for Coking Coals *

By [illegible]

While engaged recently in studying the physical properties of coal, especially with reference to the color of the streak and powder, I observed that some coals adhered much more strongly to the mortar while being pulverized than others, and that the best coking coals were the ones which adhered most, while the non-coking coals adhered but slightly, or not at all.

This gave promise of affording a simple and inexpensive method of distinguishing coking from non-coking coals without the necessity of a trial in an improvised rick, or the better but more expensive way of sending the coal to a coking plant for a test in a regulation oven. For a long time, geologists, chemists, and practical coal miners generally have been searching for [illegible] without success.

In view of these facts the adherence test seemed to be promising, and I began experimenting systematically with all coals available in the study collection of the United States Geological Survey. Fortunately this collection comprises a large number of samples of all kinds of coal from lignite to anthracite, and includes some of the best known coking coals of the country.

In all 150 samples of coal were tested, and the results seemed to be of sufficient economic importance to warrant publication. I therefore take this opportunity of presenting in brief form a statement of the method of conducting the test, and the results obtained on the samples referred to above. I do not regard my conclusions as final, but merely give the facts for what they are worth, hoping that others will make application of the test and thereby determine its value as a practical test.

The method of conducting the test is as follows: Pulverize in an agate mortar a small quantity of the coal to be tested until it will pass through a 100-mesh sieve. Pour out the pulverized coal and observe the condition of the mortar and pestle. With some coals the mortar and pestle will be deeply covered with a coating of coal dust which adheres so strongly to the agate surface that it is removed with difficulty; with other coals there will be only [illegible] clean after the coal is pulverized as they were before the operation began.

The degree of adhesion seems to coincide with the coking qualities of the coal. If it adheres strongly the coal will probably make excellent coke. If it adheres [illegible] qualities to only a slight extent, if at all, and if the mortar shows no coating of [illegible] coking. The intensity of adhesion is noticeable especially when one tries to clean the mortar, for it requires considerable rubbing to entirely remove the coal.

In addition to the adhesion of the fine particles to the mortar, some coals show a tendency to pack together or cohere. Although this phenomenon appears to be limited to coking coal, it is thought to depend more on the moisture content in the coal than on its coking quality, but sufficient work has not been done to determine this point.

To make the tests satisfactory, the sample should be as carefully prepared as one taken for chemical analysis, and it should be taken in the same manner, i.e., by cutting a channel from roof to floor so as to include all merchantable coal. In sampling for coking tests each bench of coal should be sampled separately, and in case well developed benches do not occur, the bed may be sampled one foot at a time, keeping each sample separate from the others and properly labeled. Each sample should be pulverized so as [illegible] quartered down to a convenient size for handling and transporting.

Sufficient work has not yet been done to determine the effect of moisture and ash on the adhesion of the coal, but it seems probable that they affect the result, especially when they are present in exceptionally large amounts. Until this is determined, it is better to have the samples in approximately the same conditions as regards their moisture content. If the ash is above 10 per cent., it will probably interfere with the adhesion of the fine coal, and this would indicate a poorer grade of coal than actually exists.

[illegible] and mining engineer engaged in coal work to apply this test as occasion permits, keeping careful notes of the results, and if it fails or appears to fail, to publish the results. If the test is as successful as now anticipated, it should be used by all persons engaged in coal work, for its extreme simplicity puts it within the reach of all.

One method recently proposed to lessen [illegible] in extremely gaseous mines, is to have an 8-hour coal-getting shift, then shot-firing [illegible]

---

* Abstract of article published in [illegible] 1908, issue of *Economic Geology*.

Colliery Notes

Concrete mine props, which are expected partially to replace timber in collieries, are being tested in the Burnside colliery at Shamokin.

Concrete has proved effective when used for heavy piers built at the intersection of gangways as a support to the ends of the steel framing used to support the roof.

Spruce or hemlock timber is the best for recribbing purposes. Use timbers of the same size, and after the framing is done creosote or char them to prevent decay.

Boiler tests run at odd intervals not only keep the master mechanic on the lookout for good work, but are of great educational value to the firemen, who are often anxious to learn the best methods, but frequently have no one well enough posted in boiler economy to teach them.

Where gas is found in small spaces or fissures, if the colliery is fairly damp, the best way of disposing of this dangerous element is to fill up the space with clay from the surface. If found in a hole, the bottom may be timbered across by wedging against the strata, using chips of wood for lagging and filling the space above with clay.

The United States Geological Survey has just published the best map yet produced showing the distribution and the nature of our coal resources. A considerable number of new fields have recently been discovered and are now mapped. The most important feature of the map is the distinction made between the various grades of coal.

The following precautions have been found of benefit in the prevention of miners' consumption: Mine air should be kept free from dust. Dust caused by a shot should be allowed to settle before the miner returns to work. When drilling upward or downward water should be used to prevent the escape of the dust. Dampen all broken rock before moving it.

The average time required to draw a coke oven by hand is about three hours, the average by existing machines is well within 15 min. There is thus a saving of 2¾ hours, which, if utilized, can be made to produce about 5 per cent. more coke. Much of this saving of time may be lost by antiquated methods of watering and delay in recharging the oven. The principal objection to coke-drawing machinery is that it breaks up the coal more or less in extraction.

The effect of gavanizing "plough"-steel wire has been found to be: 1. The ultimate tensile strength is not lowered while the elongation is doubled; 2 The capacity to resist bending is decreased 25 per cent.; 3. The capacity to resist torsion is reduced 20 per cent. Galvanized winding ropes are not advisable under all conditions. They give good results in wet upcast shafts where the water is not aciduous, but if the water is acid, brittleness may result owing to galvanic action and the formation of hydrogen.

A good dynamite thawer with a capacity of a case of dynamite at a time, can be made by burying a box in a pit filled with green manure which should be rammed hard. An iron pipe is used for a ventilator as well as a handle for lifting the cover. Such an arrangement will thaw dynamite in the coldest weather. Dynamite should not be stored in it longer than necessary for thawing, as the dampness from the ground and manure would in time injure the explosive.

When men are being hoisted, the use of detaching hooks, catches, rod-grips and gates to cages should be made compulsory, also when men are being raised or lowered, the cage should not be loaded with any other material, and should contain no greater weight than the men themselves. The hoisting of men should be done at a reduced speed; when the cage is within 20 yd. of the landing place, it should not be hoisted at a rate of more than three miles an hour, also when two cages pass each other the speed should be reduced.

Mine flushing has been largely adopted in Germany. Sand mixed with more or less dirt or clay is used. This material is dumped on a grid at the mouth of the shaft where it is thoroughly mixed with water. Cast-iron, wrought-iron or steel piping, 13 ft. in section, and 6 to 8 in. long is used for this work. The method as there used allows the filling of 90 per cent. of the volume of space, which so greatly reduces the strata pressure as to materially reduce the cost of timbering and permit the seam to be completely worked out.

The constant provision of suitable timber at the working face would go far in reducing the number of fatal accidents from falls of rock. Timber is sometimes hundreds of yards from the face and has to be conveyed along roads where it cannot be carried on top of the cars, in which case the props have to be dragged the whole distance; this tends to cause undue negligence on the part of the miners. A plentiful supply of caps should also be provided as their use adds to the supporting power and life of the timbering, as well as to the general safety of the mine.

The new Chinese mining law, which was issued the beginning of last November, in Pekin, does not permit foreign capital to be employed directly in mining in China. If this law continues, it will be a long time before the mining industries of China will flourish. For in spite of the excellent natural advantages of an abundant supply of good raw materials and easy shipping facilities, essential changes in the Chinese methods of accounting will become necessary before the investment of money in Chinese mines will assume a promising aspect to the foreign capitalist.

When the bottom on which a compressed-air plant is to be located is unsatisfactory, as often occurs when on filled-ground, or quicksand, a good bottom may be made by driving stones into the soft ground until the desired firmness is secured, and then building a sub-base of concrete over the whole bottom of the excavation. The best foundation for compressed-air plants is reinforced concrete, although stone or brick laid in cement are excellent but more expensive. To prevent the disintegration of a concrete foundation caused by oil that often gets upon it, coat the top several times with hot pitch.

Hose used on rock drills are likely to become cut by being dragged over rough stones. To prevent this, wind the hose with marline, which not only affords a protection against cuts but gives additional strength to the hose. Woven hose jackets of marline or cotton also give good results, although a jacket of this character stiffens the hose and makes it more difficult to handle, at the same time, it prevents kinking. The use of hose bound with soft round wire should be avoided as the wire if cut or broken unwinds easily and is apt to catch and render handling difficult. Hard, flat steel-wire winding when broken clings to the hose instead of unwinding. Elliptical wire winding imbedded in the cover affords protection and gives added strength to the hose. If too much oil is used in the air-compressor cylinder, it is apt to be carried through the pipes to the hose where it rots the inner lining. This danger may be eliminated by a more careful use of air receivers and reheaters.

One of the best devices for the detection of fire damp is the Alcohol Flame Tester which is able to detect as little as 0.5 per cent. of the gas. This device is used with the ordinary Gray safety lamp which is able to detect gas above 3 per cent. One-third of the inside of the lamp glass is painted black to afford a good background for the detection of the gas caps. When measuring the percentage of gas by the oil flame, the wick is lowered until it loses its bright tip and the gas cap, if present, can then be detected against the black background of the glass. If no cap is seen, this may indicate that less than 3 per cent. of gas is present. In order to test for this lower percentage of gas, remove the brass plug in the bottom of the lamp and attach the tester in its place; the heat from the oil flame will draw the alcohol up and light it from the oil flame. Then the oil wick should be lowered and its flame extinguished. The gas caps detected by the tester will be as follows:

Percentage of Gas.	Inch Gas Cap.	
0.5	0.60	very pale, not clearly seen.
0.1	1.00	pale blue, clearly seen.
1.5	1.44	pale blue, clearly defined.
2.0	1.68	clear blue cone.
2.5	2.00	distinctly defined gas cap.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl Street, New York
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address [illegible] N. Y.

Subscription, payable in advance, [illegible] a year [illegible] numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines [illegible] Canada.

To Foreign Countries, including postage [illegible] or its equivalent, 33 shillings, 33 marks, or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for August, 1908, was 50,000 copies.

September 5........... 12,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
  End of Alabama Strike.............. 481
  Australian Gold Mining in 1908....... 481
  George's Creek Small Vein Coal...... 482
  A Colliery Engineer for Gold Mines... 482
  Pyritic Smelting.................... 482
*The Bag house at Selby, California. *James C. Bennett* 451
Small Cyanide Plants. *Special Correspondence* 457
Drift Mining in California. *Special Correspondence* 457
*Filtration of Slimes at El Oro, Mexico. *D. L. H. Forbes* 458
Tungsten in California. *Special Correspondence* 460
Short Talks on Mining Law IX. *A. H. Ricketts* 460
Asbestos in Quebec.........*Fritz Cirkel* 461
*Pyritic Smelting in Tilt Cove, Newfoundland............*C. S. Nicholls* 462
A Low grade Rhodesian Gold Mine. *Special Correspondence* 463
Improved Adair-Usher Process......... 463
*Ore Sorting at the Cabrestante Mine, Santa Barbara, Mexico. *Claude T. Rice* 464
Mineral Production of the Philippine Islands 466
*Electric Locomotive for the Dos Estrellas Mines........................ 466
*The Goldfield Consolidated 600 Ton Mill..............*Percy E. Barbour* 467
To Test Protective Paints for Iron Surfaces 474
Railroad Patents to Mineral Land. *Special Correspondence* 474
*Coal Mining in Southern Anthracite Field..........*Thomas F. Downing* 475
A Practical Test for Coking Coals. *Max A. Pishel* 479
Colliery Notes..................... 480
Correspondence:
  Alumina in Copper Blast Furnace Slags..............*S. F. Brotherton* 483
  Machine Drills for Stoping. *F. M. Weston* 484
  Manufacturers' Catalogs. *Geo. H. Gibson* 484
  Ethics of the Proposed Mexican Mining Law.......... *David Wallace* 484
Chronology of Mining August 485
Republic Iron and Steel Company 485
Metal Production of North Carolina. *H. D. McCaskey* 485
Personals, Obituaries, Societies and Technical Schools 486
Special Correspondence 487
Mining News...................... 490
Markets, etc...................... 495
Prices Current, Chemicals, Minerals, Rare Earths, etc................ 500
Mining Index 501
  **Illustrated*

End of the Alabama Strike

The strike of the union coal miners in Alabama is ended, through the intervention of President Lewis, of the United Mine Workers. His reasons, as given in the despatches, are that the pressure exerted by the State and local authorities has prevented the strikers from consulting together and has stopped concerted action; and that it would not be for the interest of the miners to remain out longer. This is an apparent present victory for the operators; but, on the other hand, it leaves the union men free to secure work, to strengthen their organization and to increase their numbers in preparation for another contest. The operators will, without doubt, adhere to their announced determination to operate the mines on the open-shop plan entirely, not recognizing the union at all.

The cause of the strikers was greatly weakened by their resort to violence, which gave occasion for the exercise of the police powers of the State in their strictest form, and also served to turn public opinion strongly against them, and in favor of the operators. The fact that a large proportion of the miners are negroes also had its influence on public opinion in a Southern State. In justice to this class, however, it may be said that they seem, from all accounts, to have been led by the white element, which was responsible for most of the violent outbreaks. This element is largely composed of foreigners, many of whom were brought in as strike-breakers three years ago.

The demand for coal and coke in Alabama is on the increase, and the open shop will have a full opportunity there. Probably a number of the strikers will return to work, now that they have the opportunity, though the operators will hardly take on the more conspicuous offenders against law and order.

Australian Gold Mining in 1908

Gold mining in the Commonwealth of Australia during the present year has continued to decline gradually, still showing the tendency which has been apparent for two or three years past. The partial exhaustion of some of the older mines, the abandonment of placer mining for more settled industrial occupations, and the ab- [illegible] have all had a share in the decline. To these may be added the diversion of capital and labor to the mining of copper and other metals, which appeared to offer a greater present return.

For the half-year ended June 30 the official returns give the gold production as below, in fine ounces, South Australia being estimated:

[illegible]
[illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total value.....	$37,052,153	$36,073,139	D. $979,014

The total for the Australian Commonwealth shows a decrease of 4.5 per cent. The gain in New Zealand reduces the decrease for all Australasia to 2.6 per cent.

The small decline in Western Australia gives some prospect of better returns for the remainder of the year. In fact, there was an increase in mining activity, and the returns for the second quarter of the year showed a marked improvement. Developments at the large mines of the Kalgoorlie district have been favorable. As last year the decline in production was due chiefly to the working of lower grades of ore, the recent improvement is attributed to the finding of better ore at Kalgoorlie as greater depth was reached.

In Victoria the decrease was due largely to smaller returns from alluvial mining. Ballarat, the most important quartz-mining district, showed a decrease in production, which was hardly offset by a gain in Bendigo, which is nearly as important. In Queensland there were reduced returns from nearly all the larger mines. In the Mount Morgan, the largest mine in the State, copper is steadily becoming a more important product than gold.

[illegible] been a declining industry for some time, and shows no present signs of improvement. Almost the same can be said of Tasmania, though the copper and tin mines of that State show no decrease of activity.

The gain in New Zealand was partly due to favorable returns from the great Waihi mine, which continues to improve with development. Operations in the Auckland district also gave favorable results. Dredging returns were well maintained, and this important branch of the New Zealand gold industry continues to be successful.

No progress has been made in the exploration of the Northern Territory, and though reports come of discoveries there occasionally, they have not been substantiated. The territory is still in large part an unknown land.

A Colliery Engineer for Gold Mines

A notable appointment just announced is that of H. Stuart Martin, one of the more prominent colliery engineers and managers of South Wales, to be consulting engineer for the mining house of H. Eckstein & Co., of Johannesburg. At first sight it seems remarkable that a firm controlling and managing a group of large gold mines should select a colliery engineer to advise them; but a little consideration suggests some reasons for this action.

Many of the important problems that face the mining community on the Rand are those associated with rapid haulage, ventilation and mechanical transport, and to deal with these problems an experienced colliery engineer is well fitted. The practice is now to form companies to work larger areas than formerly. By working on a larger scale economy in power costs and in management expenditure is obtained. The reduction of working costs carries with it a great increase in the quantity of ore that it will pay to mine. At the same time a reduction in the profit per ton is involved and if past profits are to be maintained, a corresponding increase in the output must be made.

The margin between profit and loss is constantly being reduced on the Rand, and the mining conditions are coming more and more to resemble those of a colliery. If the limit for vertical shafts is to be about 4000 ft. and the ground below that is to be developed by long inclines from the bottom of these vertical shafts, the exploitation of the deep ground will still more resemble colliery work. The direction of these large companies demands men who have had wide experience in handling labor and who are capable of introducing mechanical appliances for dealing with large tonnages at a minimum of cost.

The ventilation of these deep mines will also be a serious question and one which colliery engineers will be best fitted to solve. Some of these considerations may have influenced Eckstein & Co. in selecting Stuart Martin as their chief engineer. At any rate the selection indicates that the best method of opening up the deep level ground is to be carefully considered by an engineer familiar with the best colliery practice in England.

George's Creek Small Vein Coal

The differential of 15c. per ton, charged by the Baltimore & Ohio railroad for carrying small vein coal from the George's Creek field to Eastern points, was ordered removed by the Interstate Commerce Commission on Aug. 15. The fight for this reduction was made by the small local operators, who found it difficult to compete with the West Virginia and Pennsylvania shippers.

As a result of this new ruling, the George's Creek region will be greatly benefited, and many of the thinner seams which have not been actively developed, will now be worked with renewed vigor. The George's Creek district was one of the earliest of the Eastern fields to ship coal, and the "Big Vein," which has produced nearly the entire tonnage, is not far from exhaustion. This worked-out condition of the thicker seam has compelled the mining companies to give attention to the development of the smaller beds.

There is no good reason why the differential on the "Big Vein" coal should not also be removed and it is likely that if the operators should specifically ask for it, that discrimination also will be abolished.

Pyritic Smelting

We publish this week a particularly interesting metallurgical article in Mr. Nicholls' contribution upon pyritic smelting at Tilt Cove, Newfoundland; which was the practical birthplace of the art. Of course we are aware of the experiments, arguments and discussions that antedated the work at Tilt Cove, but it was there, we believe, that a blast furnace was first run continuously on pyritous ore with no addition of carbonaceous fuel. Even so, the process had the great drawback of a low concentration, and we used to think that although it had been amply proved that a furnace could be so run, there was unlikely to be any wide application of the process or much prospect of commercial success. Indeed, the Tilt Cove process was in mind when about 12 years ago we made the remark that "pyritic smelting is an irridescent dream," which evoked the first great discussion upon this important subject. The history of the last 10 years has been a constant refutation of our former cynicism, in which no one has exulted more than ourselves; indeed, the discussion of that time, in which many well-known metallurgists took part was a great stimulus to attention to this branch of smelting and directly contributed to the advancement in knowledge and practice. Yet in spite of the multiplicity of technical papers published then and later, strange to say there has been nothing giving the details of the prototype of the method. Consequently, Mr. Nicholls' present contribution will be welcomed as a record of early experience, that is both of metallurgical and historical interest.

ATTENTION SHOULD be directed to a note on another page to the effect that in the deep alluvial mines of Victoria trouble is experienced from the escape of gas from the gravel during periods of falling barometer. We have repeatedly called attention to the probability that the flow of gas into collieries increases under similar conditions and have urged the observation of barometrical changes and the exercise of additional caution at dangerous times. Our campaign of education in this particular has had its effect. Many more mines are now provided with barometers than formerly and the superintendents and bosses note their readings and act accordingly.

THE GREAT STRIDES that have been made by the suction-gas producer in combination with the gas engine are evidenced by the report that the British naval authorities are going to give the combination a trial on shipboard, and great things are expected of it. This is heralded as a new discovery, but it has been in the minds of naval engineers for a long time. As long ago as the St. Louis exposition, Admiral Melville in private conversation expressed the belief that some day the gas producer might displace the boiler afloat as well as ashore. At that time this appeared like a remote possibility, yet now the beginning seems to be right at hand.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Alumina in Copper Blast Fnrnace Slags

Charles F. Shelby, in his exhaustive article on alumina, in the JOURNAL of Aug. 8, classing it as an acid in the formation of slags, opens up an interesting subject. I was pleased to see that he placed Al_2O_3 where it belongs. I was surprised, as Mr. Shelby evidently was, that Dr. Edward D. Peters and Prof. L. S. Austin should remain in doubt as to whether this substance should be classed as an acid or a base.

Without reference to any authority on the subject, as I know of none at that time classing Al_2O_3 properly,[1] I classed alumina as an acid in my contribution to the JOURNAL of Nov. [illegible], 1901, as follows:

"I wish to call your attention to a little experience we had with alumina in the matting furnace at Silverton, Colo., when I was acting as consulting metallurgist. The ore we had to smelt contained, on an average, about 20 per cent. Al_2O_3, 30 per cent. SiO_2, and 18 per cent. Fe in the form of an iron pyrite, and no other iron was available except some iron-sulphide concentrates containing a small percentage of zinc and lead. The question naturally arose: could we oxidize and force sufficient of the iron into the slag, and where should we class the alumina, as a base or an acid? My experience in lead smelting led me to believe that Al_2O_3 could be classed as an acid in the ordinary lead furnace, and that it would be useless to class it otherwise in a shallow matting furnace; and E. W. Walter, the superintendent and metallurgist in charge, agreed with me.

"We then decided to make a bi-silicate slag, classing the alumina as silica, and we obtained fairly satisfactory results. The slag made was very clean, but treacherous, which was attributed to two reasons: (1) that it required more heat to keep the alumina slag liquid enough to flow than it does a nearly straight silica slag; and (2) that we were running so close to the formulas of a bi-silicate and aluminate slag (about 31.5 per cent. SiO_2, 27 per cent. FeO, 20 per cent. CaO and 18 per cent. Al_2O_3, or 49.5 per cent. acid) that a few charges thrown into the furnace containing more silica or alumina than usual would thicken the slag so that it would then require some extra coke and flux to save the furnace. At times the combined SiO_2 and Al_2O_3 did reach 55 and 56 per cent. in the slag, which did not [illegible] the furnace for [illegible] trouble."

[illegible]

Again, in my article appearing in the JOURNAL, April 10, 1905: "Alumina for convenience, can be classed as silica, and I prefer to limit its use to 12 per cent. in the slag. To be exact, when figuring a bi-silicate slag for copper smelting, the formula would be:

[illegible]

that is, two oxygen in the acid to one oxygen in the base, classing the Al_2O_3 as an acid, which corresponds to the FeO + SiO_2 slag containing 45.6 per cent. SiO_2; or a CaO + SiO_2 slag with 51.9 per cent. SiO_2. As the proportion of Al_2O_3 in the slag increases, the amount of SiO_2 should be reduced. To allow the SiO_2 and Al_2O_3 together to get above the bi-silicate limit will eventually cause trouble."

T. A. Rickard's work on "Pyrite Smelting," published in 1905, contains the following on the same subject, taken from an article of mine: "Of course, where parties are anxious to smelt as much silica as possible with as little flux as possible, and magnesium limerock is available, one would naturally think it would be a very desirable flux, as magnesia has nearly twice the combining power with silica that iron has, and nearly half as much again the combining power of lime, that is, for a bi-silicate where 1 per cent. CaO is equal to 1.07 per cent. SiO_2, 1 per cent. MgO would be equal to 1.5 per cent. SiO_2; but we well know what an infusible slag we would get from a bi-silicate of magnesia. As a rule, I have found a bi-silicate slag, classing the alumina as an acid containing anywhere from 22 to 30 per cent. iron, that is, 28.3 per cent. to 38.6 per cent. FeO, respectively, to give excellent results, the balance being CaO, ZnO, etc. On several occasions I have endeavored to make a slag high in silica and alumina, in order to force the alumina to act as a base, and found that some of the silica would soon show on the surface [illegible] and the slag would scarcely run. At other times I have been able to make slags extremely low in silica, on account of its alumina [illegible] have successfully made slags extremely clean, containing over 20 per cent. alumina."

Mr. Shelby hits the nail squarely on the head when he says, "When it goes up the silica must go down, and there is no getting around it without more fuel and another type of slag."

It was in 1879 or 1880, when I was assayer and chemist at one of the smelters in Leadville, Colo., that another chemist and myself were discussing our different methods for making iron determinations. I explained that I titrated with a standard bichromate of potash solution; his method, which he considered quicker, was to precipitate the iron from an ammoniacal solution and weigh as sesquioxide of iron. When I remonstrated with him, claiming that most of the Al_2O_3 would be weighed up at the same time for iron, he claimed that it would make no difference since iron and alumina acted the same in the blast furnace. Up to within the last ten years, I have proofs that the same method of determining iron was employed at some of the smelters in Butte, Mont.; which goes to show how persistent a few of the old metallurgists are in classing Al_2O_3 as a base. With clean ore to smelt and low silica slags they did not realize that the Al_2O_3 was acting as an acid, and that their slags were near the form of a bi-silicate, including the Al_2O_3 with the SiO_2.

[illegible]

Mr. Shelby, in his article on alumina, also refers to zinc, and seems to be in doubt as to where to class it. I am not so sure of the condition in which it enters the slag as I am in regard to alumina.

At the time I wrote my articles on "Pyrite Smelting," I thought perhaps it entered the slag as an oxide, forming a silicate. I took a similar view in the case of barium oxide (BaO) except that it is almost neutral on account of its low oxygen ratio. Since then, for several years, I have had to smelt ore containing a high percentage of both zinc and barium with considerable alumina, and found that the SiO_2 and Al_2O_3 had to be lowered and raised whenever the ZnO and BaO was lowered and raised, and that the safest way to class both ZnO and BaO was to consider them neutral. Referring to W. B Bretherton's article on "Matte Smelting at Ingot, Cal.," in the JOURNAL of Feb. 20, the average composition of the slag was:

---

[1] Prof. H. O. Hofman in his work "The Metallurgy of Lead," published in 1899, page 287, says: "From the composition of the typical lead slags it will be seen that the place alumina occupies in lead smelting is generally a subordinate one. When it is present in large quantities it becomes a question whether it acts as an acid or a base. It is known in a general way that with a high percentage of silica alumina acts as a base; with a low percentage it acts as an acid."

ZnO	12.00	
BaO	9.80	
		21.80
FeO	18.40	
CaO	19.50	
Cu	0.20	
		38.10
SiO_2	28.60	
Al_2O_3	10.00	
		38.60
		1.00[2]
		99.50

The small percentage of copper no doubt exists in the slag as a sulphide, mechanically carried over. We found that if the SiO_2 were lowered 2 or 3 per cent. below that required by the formula, the slag would be too thin, and did not seem to be homogeneous; but the SiO_2 could be raised 4 to 5 per cent. higher with no serious effect, except a slower running of the furnace.

S. E. Bretherton

San Francisco, Cal., Aug. 17, 1908.

Machine Drills for Stoping

My attention has been called to a letter by J. A. Farwell, secretary-treasurer of the J. G. Leyner Engineering Works Company, correcting two alleged misstatements made by me in an abstract of a paper of mine published under the above title in the Journal of May 16, 1908. Had Mr. Farwell read my paper in the original he might have saved himself some trouble. The first statement taken exception to was: "In eight hours 40 ft. is drilled by a 2-in. Murphy drill against 25 ft. by a 2¼-in. piston drill, even though it does not drill as rapidly while running." I stated in the original paper that I got my information from technical literature regarding Cripple Creek. If Mr. Farwell wishes to correct anyone he should have corrected a similar statement made by G. E. Wolcott in the Journal of July 20, 1907; the paragraph begins: "It is a mistake to assume that the value of the hammer drill lies in the fact that it will drill faster than the piston machine; for in most cases it will not." As it happens, Mr. Wolcott is probably right, and in any case Mr. Farwell's statement that a 1½-in. hammer drill will outdrill a 2¼-in. piston drill, taking out only the time of setting up, has nothing to do with my statement, which obviously referred to drilling speed in actual drilling time. I will deal with this matter more fully in a future article. Mr. Farwell next takes exception to my remark that any success which the Leyner and certain other drills may have had is due to the aid thus given to speed of drilling—referring to water and air injection in removing rock. This statement on the face of it meant only that the Leyner machine could not have been a success without water injection for the work it does. I had no idea of drawing comparisons between drilling speeds with air injected, or with water and air, or with water only. Emphasis is everywhere laid, both in the original paper and in the abstract, as well, in a reply to the discussion of the original paper, on the fact that such injection tends to remove rock as soon as chipped, whereas the solid steel ordinarily used in piston drills does not do so in flat or down holes. Surely the reason for greater drilling speed with air does not require a long scientific explanation (fortunately spared to us), but lies in the fact that dry particles under air pressure, being more mobile, are more rapidly removed from the cutting face.

E. M. Weston.

Brakpan, Transvaal, July 26, 1908

Manufacturers' Catalogs

Advertising in the technical journals brings inquiries of various sorts, some from people who are interested in the purchase of apparatus, others from persons who wish to inform themselves about the subject in question, and still others from persons who appear to apply merely through curiosity, or the desire to get something for nothing. Now, the majority of manufacturers, while they often spend considerable amounts in the preparation and printing of their catalogs and other trade literature, the bare cost of printing alone often running up to 50 or 60c. per volume, do not, as a rule, object to filling the requests of all three classes.

However, the publication of advertising literature is only one step in the selling campaign, and once the prospect has been opened, the organization of selling forces is such that other steps should follow, as it were, automatically. The next thing, therefore, for the salesman to do after receiving an inquiry and sending the literature requested, is to call upon or write to the inquirer to find out what his needs may be. This frequently leads to much waste of time and money. The man who asks for a catalog may not, as suggested above, be in the market, and if he is located in some out-of-the-way place, it costs a good deal to find this out by means of a personal call.

The point I wish to bring out is that persons who ask for catalogs should at the least acknowledge receipt of the printed matter, and of the letter which usually accompanies it, stating whether or not they expect to purchase in the near future. They rarely ever do this, thereby putting not only the manufacturer, but often themselves also, to some inconvenience and annoyance. Inasmuch as the manufacturer has gone to the expense of printing this matter and of mailing it, a simple acknowledgment would seem to be in order, especially since many manufacturers now inclose return postal cards, oftentimes stamped, for this very purpose.

Geo. H. Gibson.

New York, Aug. 22, 1908.

Ethics of the Proposed Mexican Mining Law

Art. 144—"Foreign corporate bodies are incapable of denouncing and acquiring henceforth, by any process, either mining properties or liens thereon, within the territory of the Mexican Republic."

This clause in the proposed new mining code has aroused considerable acrimonious discussion among the mining fraternity in Mexico. Everyone, apparently, who questions the desirability or expediency of the measure, concedes the *right* to legislators to promulgate and enforce such a law.

What is meant by *right?* Doubtless, it is not intended by the framers of the much-debated clause that it shall effect present holders of mining property, or be prejudicial to legitimate mining interests. If it shall prove unjust and confiscatory in its action, where does the *right* come in?

Three foreign residents, not capitalists, but just ordinary workmen, have subscribed 5000 pesos each (practically all their hard-earned wages) in the purchase and development of a small mining property under existing laws, with the view, when values are in sight, to place the property on the market for sale. Apply the proposed clause to the case and where are the life savings of the workmen? Has any government the right to act in such an arbitrary manner?

A foreign merchant placed orders abroad for merchandise, consisting of ready-made clothing, hardware and groceries, amounting to several thousand dollars. Article 144 goes into effect, resulting in the stoppage of development, throwing hundreds of miners out of work, and the merchant is ruined. Is this right? Many things have been done by individuals and by nations from expediency or from fear, but by no stretch of the imagination could they be called right. Let us clear the moral atmosphere a little and see where we stand.

David Wallace.

Mexico, Aug. 18, 1908.

The stamp duty at the Village Main Reef mill during 1907 was 6.095 tons per 24 hr.; in 1906 it was 5.526 tons. The extraction was increased from 91.9 per cent. in 1906, to 95.3 per cent. in 1907.

---

[2] We will assume that there is one per cent. more base, making 99.5 per cent. (there is usually some little sulphur in the slag, but seldom 0.5 per cent.); now if we take this 99.5 per cent. and deduct the 21.8 per cent. of ZnO and BaO, we may consider the remaining 77.7 per cent. of the slag approximating a true bi-silicate of the following composition:

FeO	23.68	
CaO	25.09	
Unknown base	1.29	
		50.06
SiO_2	36.80	
Al_2O_3	12.87	
		49.67

Chronology of Mining, August

Aug. 1—The Heinze interest in the Ohio Copper Company property in Bingham Cañon, Utah, is taken over by a syndicate.

Aug. 2—Forest fires in the territory about Fernie and Crows Nest Pass, B. C., destroy large quantities of timber, coal, coke, rolling stock and mining property.

Aug. 9—Striking miners of the Tennessee Coal, Iron and Railroad Company fire upon a train carrying deputies and strike breakers and kill three men and wound two.

Aug. 11—Explosion of firedamp in the Dodweiler colliery at Saarbrucken, Germany, kills 12 men and seriously injures eight others. The price of silver touches another low point, the lowest in seven years.

Aug. 17—Indiana coal miners' strike affects 10,000 men. Strikes in Ohio affect 28 mines. Low water in the Ohio river closes the coal mines along the Monongahela river.

Aug. 18—Explosion in the Maypole colliery at Wigan, England, destroys head frame and fans and kills 76 miners.

Aug. 26—Fire in the Hailey Ola coal mine No. 1, near Haileyville, Okla., kills 30 miners.

Aug. 27—The Alvarado Consolidated Mines Company, a Maine corporation, with $10,000,000 capital, takes over the lease of the Palmillo mine at Parral, Chihuahua, from the Coram syndicate of Boston.

Aug. 28—Five men were killed and six seriously injured in a runaway-car accident at the Warren Run colliery of the Lehigh Valley Coal Company, near Wilkesbarre, Penn.

Republic Iron and Steel Company

This company owns a number of plants, including blast furnaces, steel works, puddling and rolling mills; also coal and iron mines and limestone quarries. It is the largest producer of bar iron in the country. Its latest report is for the year ended June 30, 1908.

The capital account shows $27,191,000 common stock; $20,416,900 preferred stock; $8,891,000 bonds. The surplus of quick assets over current liabilities at the end of the year was $6,713,821, constituting the working capital. The reserves of raw material owned in the various mining properties are estimated as follows: Coal unmined, 108,815,135 tons; iron ore, 124,113,235 tons; limestone, 31,540,800 tons. Of the iron ore reserves 88,685,430 tons are in the South, the remaining 34,427,706 tons mainly in the Lake Superior region.

The report shows the extent of the depression in the iron trade. The gross volume of business done decreased from $31,227,423 in 1906-7 to $18,093,881 in 1907-8. The income account was as follows, [illegible] after paying [illegible] general expenses and all maintenance charges:

	1908	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] total surplus June 30, 1908, was $4,699,527, a decrease of $733,818 during the year. Expenditures for new construction during the year were $837,143 and for property bought, $298,992; against these is $230,099 for property sold, making a net expenditure of $906,036.

At the close of the year there was $357,296 due on preferred dividends. One dividend was passed during the year.

The production statement is as follows, in [illegible] tons:

	1907	1908	Changes
Iron ore mined	[illegible]	[illegible]	I. [illegible]
Coke made	[illegible]	426,[illegible]	D. [illegible]
Pig iron made	614,954	494,676	D. 120,278
Steel made	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
Finished products	[illegible]	[illegible]	D. [illegible]

Unfilled orders on hand at the close of the year included 59,196 tons of pig iron and 283,743 tons of finished products; decreases of 15,304 and 164,884 tons, respectively, as compared with the previous year.

The company owns 538 coke ovens in the Northern and 1010 in the Southern district; 1548 in all.

The report says: "The total expenditure for labor in the year was $5,832,631, as compared with $[illegible] in the preceding year and $7,735,903 in the year ending June 30, 1906. The average number of men employed at Northern works was 5895 in the fiscal year, as against 10,679 and 9065, respectively, in the two preceding years. The average number employed at Southern works was 2652, as against 3216 and 2600, respectively. The average number at all works was 8547, as against 13,895 and 11,665, respectively, in the preceding years.

"With reduced demand for iron and steel, the market values of products suffered declines, and to assist in bringing about lower costs to meet the change in business conditions, labor schedules were generally revised. Your committee is gratified to say that reduced labor rates were put into effect without disturbance to your amicable relations with labor, except at the Alabama mines, where a part of the miners are out on a strike, but no serious interference to operations has resulted, and full operation South is anticipated in a short time. * * *

"Your income figures for the year show severe declines as compared with the high mark of earnings recorded during the previous year. While normal earnings were realized during the first quarter of the fiscal year ending June 30, [illegible] by the October panic, which caused com[illegible] for approximately two months. This condition was followed by a slow business recovery, beginning in January with a volume of shipments approximately 25 per cent. of normal, the succeeding months showing a slow gain in volume to June, which recorded a maximum tonnage 52 per cent. of normal. * * *

"Notwithstanding the reduced volume of business, your manufacturing costs have not only been maintained, but show reductions as compared with periods of normal operations. This favorable showing has been influenced somewhat by the greater efficiency of labor and by general retrenchment, but is more largely due to the better physical condition of your properties and to a more nearly self-contained [illegible]

Metal Production of North Carolina

[illegible]

The following table shows the production of gold, silver, and copper in North Carolina, by counties, in 1907. The figures have been obtained by the United States Geological Survey directly from the mines:

Counties	[illegible]	[illegible]	[illegible]	Total Value
Burke	[illegible]	[illegible]		$ [illegible]
Cabarrus	[illegible]	2		[illegible]
[illegible]ton	[illegible]	[illegible]		[illegible]
Davidson and [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Franklin	[illegible]	[illegible]		[illegible]
Guilford	[illegible]			[illegible]
Granville and Person	[illegible]	[illegible]	[illegible]	[illegible]
McDowell and [illegible]	[illegible]	[illegible]		[illegible]
M[illegible]	[illegible]			[illegible]
M[illegible]	[illegible]	[illegible]		[illegible]
M[illegible]	[illegible]	[illegible]		[illegible]
R[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]
Total	[illegible]	[illegible]	[illegible]	$[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Some copper from Guilford is included in Davidson county. The chief decrease in the output of the State, as compared with 1906, results from the greatly curtailed production of copper [illegible] the close of the year, which was due to unfavorable industrial conditions. Notwithstanding the financial depression, however, [illegible] North Carolina, and the State maintained her rank as first in quantity of gold production among the Eastern States.

A 0.5-per cent. grade is generally satisfactory in mine drifts where the tram[illegible]

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of of their movements and appointments.

R. H. Toll, of Denver, is examining mines in the Montezuma district, Colo.

M. L. Allen, of New York, is in Goldfield, Nev., looking after mining interests there.

Edward S. Wiard will return from Cobalt, Ont., to Denver, Colo., early in September.

L. L. Hutchinson has been appointed assistant director of the Geological Survey of Oklahoma.

A. E. May lately returned to the Inde camp of Durango, Mexico, to direct operations at the Guadalupe mine, of which he is manager.

W. A. Pomeroy has succeeded R. W. Bissell, as manager of the properties of the Lustre Mining and Smelting Company, Santa Maria del Oro, Durango, Mexico.

Lee Fraser, formerly engineer for the Consolidated Coal Company, Saginaw, Mich., has accepted a position as engineer with the Aguacate Mines, Inc., at San Mateo, Costa Rica, Central America.

Norval J. Welsh has returned to San Antonio, Tex., after six weeks spent in the western part of the State of Chihuahua, Mexico; he will shortly be at the Engineers' Club, New York, for an indefinite stay.

E. E. Ellis, recently assistant geologist for the Oliver Iron Mining Company, at Duluth, Minn., has assumed his new duties as geologist of the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Alabama.

George E. Howard, manager of the Sahuayacan Mining Company, has returned to the properties in western Chihuahua, after an extended trip to the United States. He was accompanied by two Pittsburg stockholders, P. A. Shaner and C. W. Smith.

Carl F. Dietz, mining engineer, has returned from Norway where he has been engaged professionally for the last 10 months. He is now going to visit Santa Barbara, Mexico, and Salt Lake City, Utah. His permanent address is Melrose Highlands, Massachusetts.

Victor Watteyne, chief of the Bureau of Mines, of Belgium, arrived in New York Aug. 25, and at once proceeded to Pittsburg. Mr. Watteyne, who is one of the best known coal-mining experts in Europe, comes to this country on invitation of the United States Government to consult with the officers of the Geological Survey on mining conditions and measures for securing safety in mines.

Dr. Franklin R. Carpenter has completed a full survey of the Uinta oilfield of Wyoming, and later an examination of the Asmus Boysen Concession in the Big Horn cañon, and is now in the Seven Troughs mining section of Nevada, where he is examining property for Eastern investors. He is there with a view of putting up a free-milling gold plant followed by a cyanide mill, something after the plan of the Homestake mill in South Dakota. Doctor Carpenter will return to his Denver office about Sept. 10 next.

Obituary

William Weihe, who died in Pittsburg, Aug. 24, was known to all iron and steel manufacturers, having been for over 10 years president of the Amalgamated Association of Iron, Steel and Tin Workers, the oldest and one of the largest labor unions in the country. He was in office at the time of the great Homestead strike in 1892. He retired some years ago, and had since been in the employ of the Government.

Recent advices from Tonquin state that George R. Fearby, the well-known Australian mining engineer, and his colleague, a Mr. Campbell, also an Australian engineer, have been murdered on a gold mine near Tonquin, Indo-China, by Chinese robbers. Mr. Fearby was as well known in the Orient as in Australia. He developed the Raub mine, in the Malay States, for an Australian company, and for many years has resided in the Orient, where he held the management of large gold and tin mines. At the time of his death he was managing several important mining operations for English and French mining companies. Mr. Fearby was 60 years of age. He was a miner of long experience, and a man of sterling character, who possessed an extraordinary aptitude in managing native labor.

Societies and Technical Schools

Columbia University—This institution in New York will offer at night during the year 1908-09 twenty evening courses specially adapted to the needs of technical and professional workers. This includes work in applied mechanics, applied physics, architecture, electricity, fine arts, industrial chemistry, mathematics, surveying and structures. The work will begin Oct. 26, and continue for 25 weeks.

Oklahoma Geological Survey—This survey, the organization of which was noted recently, has already five parties in the field, under the supervision of Charles N. Gould, director, and L. L. Hutchinson, assistant director. One party in the western part of the State is examining salt and gypsum deposits. Two parties are in the oilfields, one near Deming and the other east of Tulsa. Another party is in the southeast part of the State, examining building-stone beds. The fifth is in the Arbuckle mountains. The work of mapping and describing the natural resources of the State will be pushed as fast as possible.

Virginia Polytechnic Institute—Arrangements are being made to open the new mining department of this institution at Blacksburg, Va. Courses have been arranged, and the work for the coming year laid out under the direction of Prof. O. C. Burkhart, who is at the head of the department. A building is under construction, which will contain the mining laboratory, assay office, lecture room and offices. The situation of the school is excellent, being near extensive coalfields, so that practical examples of mining work are within easy reach.

Nova Scotia Technical College—On Aug. 20 the cornerstone of the Nova Scotia Technical College, Halifax, was laid by Lieut.-Gov. Fraser of that Province in the presence of a large gathering. Premier Murray spoke of the work done by the provincial government for technical education and regarded the establishment of the new college as a great step in advance. President Falconer, of Toronto University, said that the question was of such national importance that the assistance given by the Province would have to be supplemented by Federal action. Other speakers were A. H. MacKay, provincial superintendent of education; Dr. Allison, president of Mount Allison College; Dr. Hutcheson, president of Acadia College, Wolfville, N. S.; Dr. Boulden, president of Kings College, Windsor, N. S.; and Dr. Eben MacKay, of Dalhousie College, Halifax.

Canadian Mining Institute—The summer excursion arrived at Glace Bay, N. S., on Aug. 26. The party, numbering upward of 50, included a number of prominent European mining and metallurgical experts. At Glace Bay they visited the collieries of the Dominion Coal Company, as the guests of the company and were accompanied by President James Ross, General Manager G. A. Duggan, Superintendent Charles Fergie, Lieutenant-Governor Fraser, C. J. Coll, president of the Nova Scotia Mining Society, and others. They were entertained at luncheon in the technical school building, and in the evening were the guests of the Nova Scotia Mining Society at an informal smoker at the Sydney Hotel.

On Aug. 27 the plant of the Dominion Iron and Steel Company, Sydney, was visited. The German and Belgian metallurgists were greatly impressed with the magnitude of the works and their equipment. The visitors were the guests of the company at luncheon. They left Sydney for the Acadia Coal Company's colliery at Stellarton, Nova Scotia.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Goldfield, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 28—In the Old China tunnel on the west side of the mountain, where no work has been done for a year or more, the owners of the Brown Bear mine at Deadwood, Trinity county, have found 4 to 6 ft. of gold ore. The Brown Bear was for years a steady producer and was extensively developed, mainly by long tunnels, of which the China tunnel is one. In this latter the ledge was lost while leasers were working it, and it was only a few weeks ago that the company began work there on its own account.

The Jumper mine of Tuolumne county, for many years a large producer of gold during the time it was owned by the Scotch syndicate, has lately been transferred to new interests who have set a number of men at work and regularly resumed operations.

The arrangements being made for extensive development work on the Idaho-Maryland mine at Grass Valley, Nevada county, are such that in the reopening of the mine prospecting can be carried into new territory. The developments beyond and in the footwall of the east end of the old 500 level give assurance of the existence of ore-shoots in unexplored portions of the company's holdings. Three shifts will be put at work in the shaft and three in the 700 level. The shaft has been retimbered to the 800 level, and by employing three shifts it will not be long before the 1000 station is reached. The pump at the 1000 station will be recovered and set at work and then a drift will be run back into the Eureka ground. The new ledge on the 500 level carries 8 ft. of quartz of good average value, and some rich specimen ore is also found.

The smelting plant of the Mammoth Copper Company at Kennett, Shasta county, is now making its maximum output and for the first time in its history, four furnaces are reducing full charges daily. The cars on the new gravity tram bring from the Mammoth mine to the smelter 100 tons of ore daily. The company, through its new mine superintendent, Robert F. Hanley, has lately issued orders that no liquors be allowed on the premises. At Coram, in the same county, where the Balaklala Consolidated Copper Company has its 1250-ton smelter, with reverberatories, roasters, etc., machinery for the converter plant is now arriving, and additional bunkers are being built. A shipload of coke is being received, as well as carloads of lime rock, which with quartz ore from Old Diggings district will be used as flux. The Balaklala smelter is expected to be blown in within two months.

The concentrating machinery formerly at the Bonanza King mine, Trinity Center, Trinity county, is now being delivered for use at the Midas mine, Harrison gulch, Shasta county. It was hauled by team 145 miles.

In Siskiyou county, Mr. Holmes of Tacoma, principal owner in the Giant Mining Company, of Greenview, has secured the interests of the other partners and has returned with funds to liquidate all the indebtedness against the property, so mine and mill will shortly be started up again.

Bishop, Inyo county, advices report that within the past three or four weeks the sections tributary to Bishop have displayed greater activity than ever before in their history. Important discoveries at the Black Cañon, Red Rose, Southern Belle, Bishop Creek, Casa Diablo and other prominent properties, as well as at other mines, have brought the mines of Inyo prominently to the front. The comparatively new camp of Skidoo, notwithstanding the drawbacks of lack of water, withdrawal of the Nevada stage line, financial depression, etc., continues active, and the letting of leases in various properties continues.

The mine of the Santa Ana Tin Mining Company, in Trabuco cañon, on the border of Orange and Riverside counties, seems to be no longer considered as a "tin prospect," as the mill is being prepared for a run on the "black ore" for its supposed gold content.

In response to an invitation from attorneys representing the Selby Smelting Company, the board of supervisors of Solano county will at the end of the week visit the works for further inspection of the work being done in the way of installing and maintaining appliances to handle the fumes. Pending a settlement, the smelting plant is closed down, and shipments of California and Nevada lead ores, formerly sent to Selby's, are being consigned to the United States Smelting Company, Bingham Junction, Utah. This [illegible] for a modern smelting plant in the vicinity of that city. Arrangements are being made in Los Angeles to incorporate a company to erect a smelting plant within [illegible]

The Salt Lake & California Copper Company has purchased [illegible] per claims in the Low Divide district of Del Norte county, and has been cleaning out and retimbering tunnels, and doing some prospecting work on the claims. It has now made a test shipment (by sea) of 100 tons of the ore. Thirty or 40 years ago these mines used to ship copper ore to Baltimore and to Swansea, but they have long been idle. It will depend upon the recent test shipment whether or not the mines will continue to be worked at present.

Goldfield

Aug. 25—Thomas G. Lockhart, who is in control of the Florence Goldfield Mining Company, is in contempt of court as a result of the litigation between the company and the company that owns the famous Little Florence lease. Lockhart sued the leasing company for damages, alleging that the method of doing underground work was a breach of the leasing contract, and withheld $167,000 due the leasing company for ore extracted and shipped. The district court has ordered the $167,000 impounded pending the decision of the suits. Lockhart refused to pay this money into the court, and instead appealed the case to the Supreme Court. That court sustains the district court's contempt order.

Loftus & Davis of Goldfield, have filed an attachment suit for $36,300 against the Bullfrog Gold Bar mine. The property was considered one of the biggest in the Bullfrog district, and the failure of its mill was a grievous disappointment. There is a feeling among the minority stockholders that the object of this move is one to throw the property into the hands of the president and general manager, who are the largest stockholders.

The lease of the Elk Consolidated Company on the Yellow Tiger mine, is [illegible] 720-ft. level. No visitors are allowed underground, but the miners are buying the stock. The shaft is the deepest in Goldfield, and has the only steel headframe in the camp. Ever since the quartz dike was cut, good assays have been obtained, the small streaks giving high assays. If this strike develops into a commercial orebody, the limits of the orezone will be extended more than a mile. At present the Florence mine is the shipper nearest to the Yellow Tiger.

A four-cornered legal battle is being waged for the 487,500 shares of stock of the Keane Wonder Mining Company, held by the State Bank and Trust Company, [illegible] for the Frances-Mohawk Mining and Leasing Company, and T. B. Rickey for the State Bank and Trust Company. Wedekind's answer just filed with the court puts a new and interesting light on the case. He asks for half of the 975,000 shares standing in the name of Homer Wilson. He claims that he secured the option on the Keane Wonder and that Wilson claimed to be able to finance the deal. Wilson owed the State bank $10,000, and to protect this loan he got the bank to finance his Keane Wonder deal and take the stock for security. Wilson drew drafts on the bank sufficient to pay for the 975,000 shares of stock which was made out in Wilson's name and held by the bank as collateral. The answer of Wedekind further declares that Wilson drew on the bank for more than $100,000, which was converted in part to Wilson's own use and benefit. Wedekind alleges that the Keane Wonder is a going concern and is producing considerable money each month, and that in proper hands it would pay any indebtedness and release all liens, and his answer prays the court to award him 487,500 shares of the stock, being his undivided half interest according to his original contract with Wilson.

The Florence ground is the center of activity and interest of the camp at present. The dike extending from the old Zinn workings in the Jumbo ground is traceable across the flat to the heart of the Florence property, and actual work is being done on its entire length. This dike outcrops in one place in the flat near the track of the Bullfrog railroad, where three years ago a lucky prospector took out a wagon load of rich ore from practically surface workings. Next to the old Zinn Jumbo lease is the Zinn Florence, which has a good underground showing. This lease was formerly the Queen lease and under former management a shaft was sunk 500 ft. and four levels were driven. It has now been sub-leased. On the 185-ft. level a drift is being pushed to catch the Baby Florence lead further south.

The Florence Consolidated adjoins the Zinn on the west and has shipping ore in small quantities. It has been a shipper intermittently for 18 months. The Florence Jumbo lease, familiarly known as the Polenz lease, managed by Von Polenz, a German count, has a shaft down 273 ft., and three shifts are sinking as rapidly as possible to the 400-ft. level. Ore was found on the 250-ft. level and it is the intention of the management to get under the ore and mine it to the best advantage.

The Winston lease has resumed work after a long period of idleness. Farther south is the Baby Florence, where the high-grade ledge has been encountered and the indications now are that it will be one of the rich producers of the camp. The Gem Florence is shipping high grade in small quantities, and still farther south is the Engineers lease, which has paid $275,000 dividends within 60 days after the ore was encountered. On the south end of the property the Pollard Florence has attained a depth of 500 ft., and has struck spots of very rich ore.

Wallace, Idaho

Aug. 28—Three and one-half feet of good concentrating ore has been unexpectedly encountered in the property of the Black Horse mine near Wardner. This ore was encountered at a point about 50 ft. from where the adit is being run to tap the main lead. This is about 760 ft. from the portal of the tunnel, and at an approximate depth of about 1000 ft. The men will continue to drive for the main lead, and the new strike will not be explored until this has been encountered.

The stockholders of the Mineral Farm property near Mullan have been asked to vote on an assessment about to be levied by the company. This assessment will be at the rate of either three or five mills a share, according to the voice of the majority. Accompanying the ballot sent to each stockholder is a full report of the workings of the mine. The principal purpose for which the assessment will be levied will be the driving of an 1100-ft. tunnel and the sinking of a 250-ft. shaft.

A report which appears to be well founded on fact is in circulation throughout the district to the effect that the Lacasse placer property on Cedar creek has been purchased by a syndicate of Kansas City capitalists. Bids are being asked for mining and dredging machinery to be put on the ground.

F. Cushing Moore, of Wallace, has been selected by the Republican party to make the race on the State ticket for nomination to the office of State mining inspector. A keen fight for the endorsement of the Shoshone county delegation developed in the convention held at Burke. The names of W. H. North and F. Cushing Moore were both placed in nomination and on a ballot being taken the endorsement went to the latter by a vote of 47 to 51. No effort will be spared to secure this office for Shoshone county at the State convention to be held in Boise. Practically all the large mining interests of Idaho are located here and the operators believe that they are entitled to the office.

A strike of three ft. of rich lead carbonate ore, carrying some gray copper and native silver, has been made on the property of the Coeur d'Alene Vulcan property, about 2½ miles west of Wallace and adjoining the old Argentine mine. Two feet of good copper ore has been encountered in the drift being run west on the main lead in the Copper Crown property. A contract for 300 ft. of work has been let on the property of the Gold Crag Mining Company, owned by Colonel Fuller, of Wallace. The vein in the Comstock property at Burke' has widened out in the last 50 ft. of drifting from 3 to 15 ft. The tunnel is now in 250 ft. and the company proposes to extend it 500 ft. more this season.

An announcement has been made in the Coeur d'Alene to the effect that a company will be formed at once to merge the interests of the Amador Gold and Copper Mining and Milling Company, the Amador Railroad Company and the Amador Smelting Company. The Amador mine is near the Montana-Idaho divide. A syndicate of Wallace business men has taken a two years' lease of the property of the Josephine Copper Mining Company, near Stark, Mont., together with an option to purchase within two years from Aug. 10.

Manager H. Nordquist has a force of 13 men employed in building a wagon road from the county road to the Imperial mine, in Saw Mill gulch, about one mile east of Burke. A compressor building is being erected and by the middle of September it is expected that work of driving the 2700-ft. adit will be started. An assessment of five mills a share has been levied on the stock of the Alameda Mining Company, payable Sept. 20 and delinquent 30 days after that date. The money raised will be used to prosecute work on the property.

The recent strike on the property of the Great Western Mining Company, near Burke, has now widened out to about 24 ft. of milling ore at a depth from the surface of about 75 ft. Another adit is being driven to tap the vein.

Salt Lake City

Aug. 28—Considerable interest is manifested in the negotiations pending between the Utah Consolidated Company and the Garfield Smelting Company regarding a smelting contract. Upon the outcome depends whether the Utah Consolidated company will build a large smelting plant of its own in Tooele county or not. Under the provisions of a two-years' contract the Utah Consolidated is shipping an average of 800 tons of ore per day to Garfield. A five-year contract as favorable to the shipper as the one now in existence is sought, but the smelter management hesitates about granting such a contract until further determinations are made as to the metallurgical efficiency of the Garfield smeltery. However, according to an official of the smelting company, the matter will soon be decided, at least before the end of September. The Utah Consolidated, soon after its Murray plant was closed last January through an injunction resulting from the adverse decision in the smelter-smoke cases, purchased lands and water rights near Tooele City, Tooele county, and began to plan the erection of a plant to cost from $1,000,000 to $1,500,000, but the contract with the smelting company has delayed, temporarily at least, further work in this matter.

Samuel Newhouse has donated to the Salt Lake Stock and Mining Exchange a lot valued at $50,000, upon which an exchange building will be erected. The building is to cost at least $100,000. The money has been practically all pledged.

Negotiations for a merger of the Talisman and Cedar mines in Beaver county are practically concluded. Both mines have shipped considerable lead-silver ore.

The Utah Mine Company, operating at Fish Springs, has declared the usual monthly dividend of 3c. a share, or $3000, payable Aug. 25. The directors have also purchased the Last Chance claim, a valuable adjoining property.

The lead smelter of the United States Company is still operating four furnaces on oxidized ore, and this week began the treatment of sulphide ore in two of the new converter roasters. This company is actively seeking custom ores, and when the Selby plant near San Francisco was closed recently through the operation of an injunction, a representative was despatched to the Pacific Coast to hunt for business. It is said that he has met with considerable success in buying ore.

Butte

Aug. 29—At a meeting of the directors of the Davis-Daly Estates Copper Company, held in Boston last week, the first definite action toward a reorganization of the company was taken. An agreement was entered into between the company, first party; J. A. Coram, F. A. Heinze and Charles Leonard, second parties; and T. M. T. Roberg, third party, representing the syndicate which has offered to underwrite the stock of the new company to be formed. This agreement provides that the directors shall call a special meeting of stockholders for the purpose of laying before them the offer of the syndicate and that a favorable vote of 65 per cent of the stock shall be necessary to accept the offer. The directors have already called a meeting of stockholders for September 5. In the circular letter, notifying stockholders of the meeting, the proposal made by the syndicate, and to be acted upon by the stockholders, is set forth as follows: The syndicate is to form a new corporation, capitalized at $6,700,000 with 670,000 shares of stock. The old company is to transfer all of its property of whatsoever nature to the new corporation. The new corporation, in consideration of the transfer, is (1) to pay to the old company $300,000; (2) to pay off the old company's indebtedness to an amount not to exceed $85,000; (3) to give each shareholder in the present company an option to purchase shares in the new company for $2 per share, said $2 to be paid in four installments of 50c. each; (4) to make payments, not exceeding $445,000 on the options held by the present company as such options may become due. The syndicate is to receive 15 per cent. commission for the flotation

Indianapolis

Sept. 1—A number of miners were caught in the Summit mine, near Linton, Aug. 27, by a fall of several hundred tons of slate. By rapid work from outside and inside by the men a small hole was cut through the fall and the men came through one at a time. The men were almost suffocated when rescued.

The coal mines of Indiana are being praised by W. F. Harrison, an expert in the employ of the Geological Survey of the United States. Mr. Harrison is investigating the quality of Indiana coal from the point of view of coke-making and gas-making, and has been in practically every mine of importance in the State. In all cases he has been favorably impressed with the manner of handling coal in this district. "The Indiana mines," Mr. Harrison said, "are without exception the best soft-coal mines I have ever examined during 12 years of employment in the examination of mines in this country, for uniformly modern methods of handling coal with safety to miners and with salvage of coal mined. The Indiana operators are more uptodate in machinery used. There are more electrically-operated mines, more modern drilling, more modern hoisting and ventilating plants."

Mr. Harrison, however, is not optimistic relative to the quality of Indiana coal for coke-making. "It is excellent steam coal, gaining friends rapidly, but I do not think it is a first-class gas-producing and coke-producing coal. The coal is not hard enough to make first-class coke. It will make coke, but it will be second, not first."

Toronto, Ont.

Sept. 1—A parliamentary return of Canadian bounties paid on iron and steel for the fiscal year ended March 31, 1908, shows $863,816 on pig iron, $1,092,200 on steel and $347,134 on iron rods. Bounties on lead amounted to $51,001, and on petroleum to $391,217.

The Temiskaming & Northern Ontario Railway Commission is advertising for tenders for mining leases of several properties at Cobalt, including the Cobalt station grounds, with rights-of-way adjoining amounting in all to about 17 acres; the westerly portion of lot 44 in Cobalt townsite, 4½ acres; and three other townsite lots including mining rights under adjoining streets. The leases will, as in the cases of Cobalt lake, be subject to a royalty of 25 per cent. of the gross value of the output. Tenders will be received up to Sept. 16.

A meeting of the directors of the Crow's Nest Pass Coal Company was held in Toronto on Aug. 7, at which President Lindsey, now at Fernie, B. C., was authorized to rebuild those portions of the plant which were destroyed by the recent forest fire. These include the hospital and the coke-oven plant. The net cost to the company is estimated at about $50,000, as the insurance of $150,000 will cover the balance of the loss, the total being about $200,000. Coal mining has been resumed and it is expected that the normal output will be attained this week.

London

[illegible] the Central Mining and Investment Corporation, Ltd., was carried at an extraordinary general meeting held on Aug. 10. The capital of £6,000,000, in £20 shares, is now reduced to £3,600,000, in shares of £12 each, by canceling £4 per share and paying off £4 per share in the shape of a debenture. Wernher, Beit & Co., the promoters of the company, are to receive 20 per cent. of the profits after 5 per cent. on the capital has been paid instead of 25 per cent., which was the figure originally agreed upon, but the undertaking of the firm to offer the Central Mining and Investment Company a 30-per cent. interest in their future gold mining business in South Africa was to continue unchanged.

The chairman referred to some remarks he had made at a previous meeting about disappointing results obtained in some of the very deep level mines, and said that he had not perhaps made it sufficiently clear that so far very little development work had been done. He pointed out that until further work was done, it would be unfair to condemn these mines, because the earlier development was disappointing. He quoted the Brakpan and City Deep mines as instances of companies which had had pleasant surprises as work progressed. In both of these mines important strikes have recently been made.

The directors of the Camp Bird, Ltd., have issued their report for the year ended April 30, 1908. The company owns the well known gold mine, high up in the mountains of Ouray, Colo., a situation that has its drawbacks; for it was not long ago that the mill was swept away by a snow-slide. The past year has been a successful one, and profits amounting to £267,700 have been earned, out of which the shareholders have been paid, in four quarterly dividends, £164,000, and T. F. Walsh, the original vendor of the mine, has received £69,853, being 25 per cent. of the net proceeds for the year.

The most important portion of the report is that which discusses the development, and in this respect it is not of a favorable character. The deepest workings have not opened up ore similar to that in the upper levels, and it looks as if the life of the mine must be a short one unless fresh orebodies are met with. In order that the subject should be scientifically treated, the directors have instructed J. E. Spurr, formerly of the United States Geological Survey, to make a complete geological report on the company's property, a measure which other mines, where the geology is complicated, might well follow.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Cahaba Coal Company—This company has bought 10,000 acres of coal land in Jefferson, Shelby, Tuscaloosa, and Bibb counties, and will develop the acquired properties on a large scale. This company already has a mine at Coalmont, with a daily output of 300 tons, which, in a few months, will have been increased to 550 tons. This mine is being fitted with compressed air and a new Montgomery coal washer is being erected.

Arizona

YAVAPAI COUNTY

Arizona Power Company—This company has been considerably delayed in its construction work during the past month on account of the high waters in the Verde river. About 300 men are employed at present.

Emporia Mines Company—This company, operating six miles south of Prescott, has its new shaft down 200 ft. on the lode. The whole shaft is in ore of a good milling grade. About 200 tons, taken out in sinking the shaft, are on the dump.

Verde River Power Company—This company owns water rights on the Verde river below Fossil creek; measurements and determinations for a period of eight years give the minimum power to be obtained from the flow of waters at this point to be 2500 h.p. The company will begin work on the diversion dam and canals, and it is expected that the electric machinery will be running within 18 months.

Monica—The mines near Kirkland shipped two bars of bullion to the Prescott National Bank, the result of the July run, the assayed value being about $16,000. The mines have been producing steadily for the past four months.

Big Stick Mining Company—It is reported that this company has made a discovery of high-grade ore in its mines near Hillside, but the extent has not been determined. The new mill will not be ready for operation before Jan. 1.

McCabe & Gladstone—These mines at McCabe have been leased and operations will be resumed within a short time. Engineers and mechanics are busy making needed repairs.

New England Arizona Gold and Copper Company—This company has resumed operation at its mines near McCabe. The mines are opened by a 300-ft. shaft and considerable ore has been exposed. The operations are under the supervision of J. H. Farrell.

Octave—The company has had shipped to Wickenburg, the site of its new power plant, a 24x42-in. Hamilton Corliss engine, and other machinery will arrive shortly. The plant is to be in operation by January next.

California

AMADOR COUNTY

Central Eureka—Men have been put at work in this mine, Sutter Creek, repairing the shaft.

South Eureka Mining Company—This property, at Sutter Creek is yielding more rock than can be crushed in its 20-stamp mill, and is building a cable tramway to take the ore to the 20-stamp mill of the Central Eureka until the latter mine needs it for itself.

CALAVERAS COUNTY

Billy Williams—This mine at West Point, idle for 25 years, is being reopened by Thos. Jenkins, one of the owners.

Mohawk—J. F. Buyck is cleaning out the shaft of this mine, near Railroad Flat, and will sink it deeper.

Newman—Levaggi & Co. have two shifts at work on this mine, near West Point, opening it up and cleaning up the shafts and tunnels. There is a 10-stamp mill on the mine.

Reiner Gravel—The gallows frame at this mine, near Angels, has been completed and the hoist installed, so that sinking on the three-compartment shaft will shortly begin.

EL DORADO COUNTY

Alpine—At this mine, on the Georgetown divide, the new steam-hoisting and pumping plant is nearly completed. The water-power compressor is furnishing air for the drills in the shaft.

Sherman—The installation of the new 10-stamp mill on this mine, near Placerville, Thos. Clark, manager, is virtually completed.

INYO COUNTY

Four Metals Mining Company—This company has been notified by the forest ranger that work on the power-house in Lone Pine creek can be commenced, so the machinery will be installed as soon as possible.

MARIPOSA COUNTY

Bancroft—This mine at Hornitos is having an electric-power plant installed, the power coming from Merced Falls.

Belladona Mining and Milling Company This company has been organized to work mines in the Sweetwater creek in Jerseydale district. B. L. Richards is president.

Egenhoff—This property has passed into the hands of C. L. Morrell and R. L. King, of Merced. There is a group of 10 claims between the Hites Cove and Ferguson mines. The best ore thus far found is the Clearing House claim.

NEVADA COUNTY

South Yuba—This company, T. M. Chase, superintendent, is now operating the South Yuba, Eagle Bird and Gray Eagle mines at Washington. Additional equipment is being installed, and a new flume has been built to bring water to the Eagle Bird and Yuba mines. The 30-stamp mill of the South Yuba is running day and night. Both the South Yuba and Eagle Bird were formerly producers.

PLACER COUNTY

Bellevue—P. Lozano has bonded the mine at Ophir and will run it on royalty. About 15 men will be interested in working the mine.

Piazzoni—D. M. Harvey is working this mine at Seneca, and recently discovered high-grade ore in a wide ledge in the shaft which is being sunk.

SAN BERNARDINO COUNTY

Orange Blossom Extension—The new mill on this property, nine miles from Barstow, owned by San Diego men, has been started up on ore averaging $16 per ton.

SAN DIEGO COUNTY

E. C. Silhite, of Riverside, is forming a company to work a new mining property east of Descanso, and a few miles south of the Noble mines. There is plenty of water near the mine.

Escondido Mine Development Company—This company has acquired the claims of the Asmus company, near Escondido, and will develop them.

SHASTA COUNTY

Black Tom—The Niagara mine, at French Gulch, now being operated by this company, was recently equipped with a new mill.

Mammoth—At this copper property, Kennett, the big compressor has a capacity to furnish power to 120 three-inch drills, but about 30 machines are now in operation. This mine is now consuming about 1000 h.p. in electrical energy. The company is about to prospect with a diamond drill the Rainbow mine, near Sisson, to learn the size of the orebody.

Sierra County

Alleghany—A San Jose company has an option on part of this property, and F. G. Frymire has been appointed superintendent in place of W. W. [illegible], who has resigned.

Dreadnaught—In cleaning out the old works of this mine on Kanaka ridge, F. B. McLaughlin has encountered high-grade quartz.

Alaska Mining Company—This company, at Pike City, has let a contract to sink the shaft 300 ft. deeper, the water being for the present under control.

Croesus—This company has about 60 men at work on surface improvements and underground development. N. W. Mather is manager.

Siskiyou County

Big Cliff Group—The deal between Wintering & Osgood and the U. S. & B. C. Mining Company for the purchase of this property on Russian creek, has been declared off, but other parties stand ready to take the mine on the same terms.

Stirling—The Rose City company has purchased this mine on Hungry creek, near Hornbrook, and men have been set at work. The mill and cyanide plant are almost completed.

Tehama County

Rustler and Oom Paul—Coleman & Kuchner, of Red Bluff, have purchased three quartz mines in the Flat Creek district. They have been under bond and development for a year past.

Tulare County

Arc Light Mining Company—There has been a recent change of ownership and management in this company, whose mines are near the headquarters of Kings river, and shaft sinking has been resumed, preparatory to putting in machinery.

Tuolumne County

Altadena—Deeds have passed transferring this property from the old company to W. T. Turner of Santa Clara.

Dreisam—This mine, recently bonded to the Parlin Mining Company of Los Angeles, is to have its shaft deepened 300 ft., to 700 ft. in all. An air compressor is being installed. Ten stamps are to be added to the mill.

[illegible] have sold to Pray & Coburn 280 acres of mining ground near the Keltz mine for $15,000, to be paid in installments.

Confidence—At this mine a new electric motor is being installed to run the compressor and hoist, and the mine will shortly be started up again.

Colorado

[illegible]

Green Cañon Coal Company—This company is pushing development work on the tract of 280 acres of land which it recently purchased. The land is on Ohio creek, 19 miles northeast of Gunnison, and is close to railroad transportation.

[illegible]

Several mine managers are experimenting with cement supports to take the place of timber. Wood is becoming so scarce in this section that the managers have to do something. So far, the cement has proved satisfactory.

Big Six—This property, Breece hill, is shipping 30 tons daily of a good grade of lead ore which carries fair values in gold and silver. The body of ore is now well developed and shipments are regular.

Dinero Tunnel—The bore has reached to within a few feet of the veins, but as they dip to the west, the tunnel will probably have to be driven another 50 ft. before they are cut. The breast of the tunnel is in a mineralized formation.

Fanny Rawlings—The lessees on this property, Breece hill, are carrying on considerable development, in addition to shipping 30 tons daily of high-grade ore. The old shaft is being sunk deeper.

Iron Silver Mining Company—It is very likely that work will be resumed on the Tucson and Moyer mines at an early date. A contract has been let for the erection of a $12,000 ore-house at the Tucson. All of the mines are now equipped with electrical power.

Long & Derry—In this mine, on the hill of the same name, a good body of ore has been cut on the tunnel level, and shipments, it is said, will be started within a few days. The ore carries gold and silver.

Ruby—A. S. Sharp has secured a lease on this property, Weston pass, and is making preparations to resume operations and keep at work during the coming winter. In the lower workings of the mine, there is a large body of lead ore carrying fair values in silver.

South Mosquito—A great deal of attention is being paid to this section of the district and a number of properties are being worked in the neighborhood of Corinne mountain. Among them are the Oil City, Genevieve, Mohawk and Maumee. The principal value in all of these properties is gold.

[illegible]

Camp Bird, Ltd.—The report sent out from the London office for the month of July, shows that the mill ran 30 days, crushing 6810 dry tons of ore, and producing 7404 oz. bullion and 461 tons of concentrates. Receipts from bullion and concentrates sold were $165,546; expenses, $46,849; net earnings, $118,697. London expenses were $1500, leaving $117,197 net. Expenditures on construction were $730. There was 137 ft. development work done.

Idaho

[illegible]

Napias Placer Mining Company—Control of about four miles of the upper part of Napias creek has been secured. Most of this stretch is almost level; only enough work has been done to demonstrate the richness of the ground. After having thoroughly tested the property, the company is now taking steps toward the installation of a dredge. The gravel is easy to handle, being practically free from clay and other unfavorable properties. One dredge, that of a private concern on Moose creek, three miles north of Napias creek, is already in operation in this district.

[illegible]

[illegible] on this property at Burke, on which the recent sensational strike of silver ore was made. The mine was closed down temporarily pending the installation of electric power for the compressor, which had previously been driven by steam. It is intended to sink the present shaft to a greater depth and then to drift on the lead.

West Hecla—A contract for 300 ft. of tunnel work has been let to James Backlund. The adit has already been driven about 1000 ft., but it is calculated that it will have to be carried from 150 to 200 ft. farther to tap the main lead. Arrangements will be made in the near future for the installation of six drills

Clearwater—Excellent reports continue to come in regarding this property in the Clearwater district. A large amount of machinery has been installed, and work [illegible] partment winze to be sunk from the lowest tunnel. This property has been developed by means of three tunnels, in all of which a good showing of ore has been made.

[illegible] has been doubled. For some time past the company has been paying at the rate of a cent a share, but the dividend just de- [illegible] rate of two cents, and involves the disbursement of $20,000. The total disbursement for this year is $90,000, and the grand total paid by the company, $1,010,000.

Stewart—E. J. Carter, one of the heaviest stockholders, has made the announcement that the affairs of the company, which have been tangled by legal complications, are about to be straightened out and operation of the mill and mine resumed in the near future. The mill is practically new, and has a capacity of about 150 tons a day. Big bodies of ore have been opened in the property, and just after the completion of the mill several shipments were made to the East Helena smelter of the American Smelting and Refining Company.

Indiana

Blackford County

Montpelier Mining Company—This company has been incorporated for the purpose of mining gold, silver, zinc, lead and other minerals or ores in the United States. A branch office will be maintained in Montpelier and the principal office in Joplin, Mo., where mining operations will first be begun. H. P. Malone, W. H. Martin, B. F. McClain and C. E Hart, directors.

Clark County

Apex Mining Company—This company has been incorporated with headquarters in Jeffersonville. The company will do a general mining business in Indiana and other States. James H. Duffey, R. E. Cook, and J. A. McKee, directors.

Greene County

Enterprise Coal Mining Company—This is the name of a new company incorporated Aug. 26. The company will carry on the business of mining coal in Greene and adjacent counties. The directors are Frank Ivy, Sr., Chas. Vaughn, Henry A. Maddox and W. R. Abrams.

Maryland

Alleghany County

Consolidation Coal Company—This company is working all of its mines in the George's creek region on full time. The output at present averages over 5000 tons daily. Although some of the other companies are not yet working full time, late reports from the region show a decided increase in output during the past few weeks.

Missouri

Stoddard County

Puxico Mining Company—This company is preparing to open up and develop an iron-ore property at Puxico, on the line of the St. Louis & San Francisco railroad. A crushing and washing plant has been erected, and work is in progress on the mine. Otto Riesenweber, of Menasha, Wis., is at the head of the company.

Montana

Butte District

Butte-Montana—Word has been received from New York that the option, secured by F. E. Slump about two months ago on the controlling interest in the stock of the Butte-Montana company, has been taken up. It is expected that work on the company's property will be resumed within a few weeks.

British-Butte—A pit 150x150x9 ft. has been completed and is ready for the installation of the new $70,000 Risdon gold dredge. Three dams have been completed capable of storing 10,000,000 gal. of water. From the lowest of these dams a 1600-ft. wooden flume runs to the pit. The company has this week closed a contract with the Butte Electric Company for power supply for five years. Each dredge will require 300 h.p. for operation, and will have a capacity of 2500 cu.yd. per day. Five carloads of lumber and one of machinery have arrived this week and construction work is progressing rapidly.

Boston & Montana—Officials of the company expect the Great Falls smelter to resume operations on Sept. 1. When the smelter is opened, the Boston & Montana mines, some of which have been shut down completely and all of which have been producing at a reduced scale, will be operated to their full capacity.

Red Metal—At the Belmont mine the shaft is being enlarged to standard three-compartment size and is also being retimbered. When the retimbering has been completed a large engine and boiler plant will be installed. The Belmont has been connected with the Anaconda mine by crosscut, and much of the ore now hoisted at the latter shaft will be taken out through the new Belmont shaft.

Farrell—The National Mining and Investment Company, of Butte, has secured an option on a controlling interest in the stock of the Farrell Copper Company. The company's properties are situated in the southern part of the Butte copper district.

Jefferson County

Boston-Corbin—Development work is being carried on in the 500-ft. level at this property.

Robert Emmet—A new 125-h.p. electric hoist and a new 125-h.p. electrically-driven compressor have been installed. Drifting on the vein on the 250-ft. level is now in progress. Several encouraging ore shipments from the upper levels have been made by leasers.

Comet—The old Comet mine, situated two miles from Basin, belongs to the Montana Consolidated Mining Company. A 150-ton mill is operated at the property. The ore carries gold, copper, silver, lead and some zinc, and it is with the idea of making a complete separation of the several minerals that experiments are now being carried on in the mill.

Fergus County

Barnes-King—The operations of the company for the month of July resulted in a net earning of $5000.

Nevada

Esmeralda County—Goldfield

The week's production, valued at $231,520, was 2941 tons. The Combination mill treated 630 tons from the Consolidated mines. The Nevada Goldfield Reduction company treated 370 tons from Engineers Lease; 82 from Mohawk Jumbo; 372 from the Combination Fraction; 235 from Frances Mohawk; 15 from New Western; 71 from Little Florence; 75 from Mohawk Combination; 280 from Consolidated Red Top; 90 tons from Hayes lease. The Western Ore Purchasing Company handled from the Mohawk Jumbo, 563 tons; Baby Florence, 100 tons; Engineers Lease, 41 tons; Florence Consolidated, 17 tons.

Milltown Fraction—A new 20-h.p. hoist has been installed; the double-compartment shaft is 125 ft. deep. On account of the reported strike at the Yellow Tiger mine, a crosscut will be started toward the Tiger vein.

Combination Fraction—The output is about 55 tons per day. Owing to the amount of waste coming from the development work, this is all the ore that the hoist can handle. The ore hoisted averages $80 per ton.

Little Florence Mining Company—In its lease on the Combination Fraction, this company has driven crosscuts, both east and west, for 520 ft., and has almost reached both sidelines. Several strong veins have been cut, which will now be prospected. On the 200-ft. level a drift has developed the main vein as far as the end-line of the Florence ground.

Consolidated Red Top—This company has supplied 280 tons of ore this week that averaged between $60 and $70 per ton.

Mohawk Jumbo—This lease is shipping daily 125 tons of ore assaying $60 per ton; within two weeks this will be increased to 200 tons per day.

Esmeralda County—Rawhide

There are 39 leases at Rawhide that have commercially valuable ore developed; 21 of these mines are shipping. The capacity of the local mills is too small to handle all milling ore being mined in the district. The plant of the Gates Tyrer people is being increased to a daily capacity of 120 tons. The Watt mill, having a capacity of 80 tons, will be running this month. The promoters of the camp's water-system are planning to erect a large custom mill; a mill is to be erected by Polachecy and associates, of Milwaukee, who own the rich Murray lease and the I. X. L. group of claims. The Rawhide Mining Company is preparing to erect a mill to treat its own ores and ores from the St. Ives lease on the property of the Rawhide Queen Mines Company. Two carloads of machinery for the 50-ton Truitt mill, which is to be erected on Walker river, have arrived at Schurz.

Esmeralda County—Mina

Blue Light Copper Company—The shaft

at the mine is 700 ft. deep. The company has ordered a 100-h.p. hoist; this has already been shipped. R. S. Chalmers, who has been engaged in copper mining in Spain for several years will be in charge of the underground work.

NYE COUNTY—TONOPAH

The total output of the Tonopah mines for the week amounted to 6300 tons, worth $165,550. Tonopah Extension mined 130 tons; MacNamara, 400; Tonopah Mining Company, 3430; Belmont, 1000; Montana-Tonopah, 950; Midway, 100; West End, 250; Jim Butler, 40 tons.

Tonopah Mining Company—The Mizpah shaft was sunk 16 ft. during the past week. It is now 1123½ ft. deep. The core drill hole from the bottom of the Red Plume shaft is now 65 ft. below the 500-ft. level. The cores show that the rock passed through by the drill is a sulphide-bearing porphyry. Development work, amounting to 286 ft. was done during the week.

Jim Butler—This mine is again shipping ore; while the shipment will not be large, the company expects to make them regularly.

Tonopah Extension—The work of sampling the Tonopah Extension mine by Henry Krumb and his six assistants is progressing rapidly and will be finished within two weeks. The report will be ready for the stockholders at their adjourned meeting to be held in September. The regular mine work is not interrupted.

MacNamara—Work preparatory to opening up the ground just released from litigation is being pushed, and the pipeline for the three extra air-drills is being laid from the compressor of the Tonopah Extension Company. This week's shipment consisted of eight 50-ton cars, six cars to the company's mill and two cars to the smelter. Since Feb. 1 the MacNamara mine has shipped seventy-two 50-ton cars from a portion of the vein about 200 ft. long on the 300-ft. level.

West End—This week's shipment was the largest in the history of the mine. Most of this ore came from the new find in the Corkill shaft.

Midway—On the 335-ft. level the face exposes a seam in the vein 1½ ft. wide, which shows much ruby and brittle silver.

Belmont—The work along the north side of the Mizpah fault is growing more encouraging. The face of the drift exposes 1½x2 ft. of good ore, and seems to be widening. The underhand stope from this level shows a vein 4 ft. wide of good sulphide ore.

Montana—The production of the mill was interfered with last week by electrical storms, which put the long-distance power line out of commission. The tonnage was 950 tons against an average of 1100 tons.

Tonopah Mining—Sinking continues in the Mizpah shaft, the bottom of which is [illegible] 1107 ft. below the collar. It [illegible] down at the rate of 3 ft. per day.

Ohio

[illegible]—This company operates coal mines in several counties on the line of the Hocking Valley railroad. The report for the year ended March 31, 1908, shows coal sales, $4,465,432; coke sales, $384,819; royalties, rentals, etc., $258,008; total, $5,108,359. Expenses were $4,348,417; net earnings, $759,942. Interest and other charges, including improvements, were $1,013,657, showing a deficit of $253,715 for the year. Coal sales were 3,933,286 tons, the average price realized being $1.14, and the average cost $0.95 per ton. Coke sales were 149,332 tons, at an average price of $2.58; average cost, $1.81 per ton.

Oklahoma

Hailey-Ola—About 30 miners were suffocated in mine No. 1, near Haileyville, 14 miles east of McAlester, on Aug. 26, when fire destroyed the hoisting and air shafts, cutting off all air from the men below. Exploration in the various chambers shows that none of the men met death by burning, but that all were suffocated.

Pennsylvania

ANTHRACITE

Lehigh Valley Coal Company—On Aug. 28, five men were killed and many injured by a runaway mine car which dashed down the slope at the Warrior Run colliery. The car collided with a car full of miners who were being pulled up the 2000-ft. incline.

Philadelphia & Reading Coal and Iron Company—This company's statement for July, the first month of its fiscal year, is as follows:

	1907	1908	Changes
Earnings	[illegible]	$1,954,764	[illegible]
Expenses	[illegible]	1,894,942	[illegible]
Net earnings..	$ [illegible]	$ 59,822	[illegible]

The tonnage and earnings in July were the lightest in a number of months.

Reading Coal and Iron—After several years of carefully conducted surveys and the location and putting down of an exact system of bore holes, the company has completed a thorough examination of the coal seams in the southern anthracite field, showing that the Mammoth bed, as well as all the other seams, so far worked in the vicinity of Pottsville and Shamokin, continue with undiminished thickness to the southern extremity of the field. This proves that the companies now operating have a solid seam of coal about 50 miles long and of uniform thickness and quality.

South Dakota

LAWRENCE COUNTY

[illegible]—[illegible] President [illegible] [illegible] for a resumption of work. It is planned to increase the capacity of the present 10-stamp mill as the orebodies are well opened up.

Gold Eagle—At the annual meeting the following officers were elected: President, A. M. Masters; vice-president, John S. Sheppard, secretary; G. M. Luttrell, all of Jacksonville, Ill. The company has just let contracts for more development work, and will put on a larger force of men.

Homestake—The new regrinding plant is now in commission and is crushing 200 tons daily, or less than half its total capacity. The plant regrinds the pulp as it comes from the stamp mills by means of a tube mill and Wheeler pans.

Reliance—The officers elected at the annual meeting are: President, S. F. Olson, Minneapolis, Minn.; vice-president, V. C. Wass, Dell Rapids, S. D.; secretary, F. W. Medbery; treasurer, E. Bennett, Lincoln, Neb. The new mill is now treating 175 tons daily.

[illegible]

Black Tom—Work is being pushed in the drifts from the bottom of the 75-ft. shaft, where a fair grade orebody is being opened up.

Montezuma—A strike of free-milling gold ore has just been made in a drift and is being followed up. The ledge is 2 ft [illegible]

Tennessee

[illegible]

[illegible]—The company has elected officers as follows: President, Edward A Turner; treasurer, William E. Pierce; secretary, Edwin Nicodemus. The offices are in the Monadnock block, Chicago.

Virginia

LEE COUNTY

Kenvir Coal Company—This new company has bought the mine formerly operated by the Pennington Coal Company, and is planning to increase the output from 150 to 500 tons daily. James R. Callison, Pennington Gap, Va., is manager.

STAFFORD COUNTY

[illegible]—The company is preparing to put in a power plant at its pyrites mine near Brooke, with steam hoist, air compressors and drills. The company's office is at 507 Harrison [illegible]

West Virginia

[illegible]

Judge Dayton, of the Federal Court, has appointed A. C. Fulmer, of Morgantown, receiver for the Janelew Coal and Coke Company at Janelew, on application of the original owners in Pennsylvania, who claim that the company owes them over $8000. Circuit Judge E. C. Lynch has also issued an injunction restraining the Janelew company from mining or removing any coal. Failure to satisfy a vendor's loan of $30,000 is charged, and is responsible for the action of Judge Lynch.

OHIO COUNTY

The Riverside department of the National Tube Company has made arrangements to commence at once extensive improvements at the Semet-Solvay coke works, on which about $50,000 are to be expended. The coal-crushing department is the principal feature of the improvements and will be an innovation at the plant.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ended Aug. 22 were: Crown Reserve, 54,000 lb.; Drummond, 61,400; La Rose, 244,000; Nipissing, 63,700; O'Brien, 192,180; Right of Way, 124,080; Silver Queen, 80,000; Hudson Bay, 62,000; Trethewey, 125,870; Watt, 60,100; total, 1,007,330 pounds.

Gates—At this mine, Montreal river, a promising lode of silver has been struck near the surface. The shaft is now down 86 ft., and 100 ft. of drifting has been done. Ore of shipping quality is being taken out.

ONTARIO—MANITOU LAKE DISTRICT

Laurentian—At this mine, Manitou lake, the vein has been cut on the 400-ft. level, showing free gold.

ONTARIO—HALDIMAND COUNTY

The Lawlor company, the Erie company, and several smaller concerns interested in the Selkirk natural-gas district, have sold their interests for $150,000 to the Consumers' Gas Company, of Hamilton, Ontario.

ONTARIO—TILBURY OILFIELD

Boston & International Oil Company—This company, one of the largest operating in the Tilbury oilfield, the head office of which is in Boston, has made an assignment to G. W. Sulman for the benefit of creditors.

YUKON TERRITORY

Yukon Basin Gold Dredging Company—William Ogilvie, president of this company, has arrived in the Yukon and started with the first dredge up the Stewart river where it will go into operation. A second large dredge is expected to be put in commission later, and a third is projected for next season. The company is largely backed by Kansas City capitalists, and has secured 110 miles of dredging ground.

Mexico

CHIHUAHUA

Bullion Shipments—The Chihuahua branch of the Banco Minero acknowledges receipt of the following bulletin product for the week ending August 23: Batopilas Mining Company, 89 bars silver, value 98,500 pesos; Watterson Gold Mining Company, 11 bars gold-silver, value 28,600 pesos; Lluvio de Oro, gold-silver, 6000 pesos. The Rio de Plata also marketed through this same institution 397 sacks of concentrates valued at 49,000 pesos. There were also several other small shipments of bullion and high-grade concentrates, the exact amount of which is not recorded.

Parral Output—The production of the Parral camp for the week ending August 15, amounted to 8420 tons, of which 5040 tons were locally treated and the remainder sent to outside smelters.

Minas Tecolotes y Anexas—These properties, owned by the American Smelters' Securities Company, in the Parral camp, are making a good record. About 600 tons are being put through the remodeled milling plant daily, and about 100 tons of gold- and silver-carrying lead concentrates is the output. In addition, 50 tons of crude ore is shipped daily. The large gas-producer plant is giving satisfaction. It is stated that installations of zinc works and an aërial tram are planned. W. Maynard Drury is the manager in charge.

Sahuayacan Mining Company—Mining and milling operations are to be increased at this company's properties in the Ocampo section. The general manager, Geo. E. Howard, accompanied by P. A. Shanor and C. W. Smith, Pittsburg stockholders, is now at the mine.

San Patricio—This property in the Parral camp, operated by F. S. & A. E. Robertson is on the producing list in a small way. A continuous and increased output is assured.

Mexican Midland—This company, of which D. M. Evans is general manager, has begun grading for a 25-m. railroad from a point on the Orient railroad, east of Chihuahua, to its developing properties in the Choreros mountains.

San Martin—This company with property in the Uruachic section is building a roaster for treating the concentrates before delivery to the wood-burning reverberatories. The mill lately completed, has been put in successful operation by Thomas Caine. The company's general manager is temporarily at Chihuahua.

Greene Gold-Silver—It is reported that this company has finally paid almost in full all of its labor claims at Concheña and Ocampo, and that, with the early return of Col. W. C. Greene from Japan, the rumored reorganization of its affairs will be carried through. The reorganization of the Sierra Madre Land and Lumber Company, is also said to be under way.

San Toy—This company is sending out daily from its Santa Eulalia mines about 150 tons, but it is the plan to increase this output shortly.

GUANAJUATO

Production—There was a decided increase in shipments of bullion and concentrates from this district for the week ending Aug. 22. The bullion production showed an increase of $12,000, and concentrates $6,500. The total value of the week's shipments was $275,000, the largest week's output thus far this year. The bullion went to the refinery at Mexico, and the Government mint, and the concentrates to the smelter at Aguascalientes.

Peregrina—This company has purchased from the Westinghouse Electric and Manufacturing Company, an electric locomotive, which will be used to haul its ores between the mine and mill, a distance of about one mile. With this locomotive will be supplied a complete equipment consisting of a motor-generator set to convert the alternating current supplied by the Guanajuato Power and Electric Company, to a direct current, and controlling apparatus.

VERA CRUZ

Gusher Fire Quenched—Late press despatches from Mexico announce that the firm of S. Pearson & Sons has gained control of the burning oil well at Dos Bocas, near Tampico. It is estimated that fully 3,000,000 bbl. of oil has been destroyed. The oil is still flowing and is being stored in a great reservoir.

Europe

ENGLAND

Colliery Disaster—An explosion and fire, in which it is feared 76 men have lost their lives, occurred on Aug. 18, at the Maypole colliery, at Abram, near Wigan, Lancashire. The explosion wrecked the upcast shaft, and only three men were brought out alive. The pit took fire and the officials decided to flood the mine. About 500 men and boys had come up at the end of their shift a few hours before the accident.

Africa

PORTUGUESE EAST AFRICA

Some mining work is reported in the Missale goldfield, where three companies are operating, two Portuguese and one British. The British company has advanced far enough to put up a small mill. The results have not been reported. A wagon road is being built from Tete to Missale, 230 miles. In the Chifumbase goldfield a German company is operating, and has recently put up a five-stamp mill. A Portuguese company recently began work on a copper vein discovered some time ago near Tete, and has shipped some ore to Swansea.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial
Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 2—Coal trade in the West shows no appreciable change [illegible] last reports. The demand for steam coal increases slowly, and a few more mines are reported at work. The growth is slow, however, and only the fact that some gain is going on can be considered favorable. Lake trade has been somewhat interrupted by congestion at the receiving ports, but this will probably soon disappear.

In the South the Alabama strike has been declared off. The reason given by the officers of the miners' union is, substantially, that there is no hope of success under present conditions of compulsion by the State authorities. The facts seem to be that the strikers had so alienated public opinion by their violence, that almost the whole community had turned against them. The operators seem to have secured a complete victory for the present.

In the East the Seaboard bituminous trade is reviving a little, and prospects are better than for some time past. The anthracite trade is dull and quiet.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Aug. 22, in short tons:

	1907	1908	Changes
Anthracite....	3,640,086	3,263,180	D. 376,906
Bituminous...	24,711,096	20,7[illegible]	D. 3,9[illegible]
Coke........	9,040,493	4,340,301	D. 4,700,192
Total	37,391,675	28,357,511	D. [illegible]

Total decrease this year to date was 24.2 per cent.

Coal and coke tonnage of Chesapeake & Ohio Railway, year ended June 30, short tons:

	Coal	Coke.	Total.
New River ...	5,659,408	198,735	5,858,143
Kanawha............	4,427,420	80,[illegible]	4,507,989
Kentucky .	267,058		267,058
Connecting lines ...	171,516	51,587	223,103
Total ..	10,525,382	330,891	10,856,273
Total, 1907.. ..	9,929,583	328,760	10,258,343

Deliveries for the past year: Points west of mines, 5,054,916 tons coal and 203,471 coke; points east, 1,543,604 tons coal and 127,420 coke; tidewater, 3,822,910 tons coal; anthracite to line points, 22,404 tons. Increase last year in total tonnage, 597,930 tons, or 5.8 per cent.

Coal receipts at St. Louis, six months ended June 30, were 3,668,022 short tons in 1907, and 3,113,227 in 1908; decrease, 554,795 tons.

Coal tonnage of roads in Ohio, Coal [illegible] June 30, short tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The total decrease shown this year is 32.2 per cent.

Coastwise shipments of coal from Seattle and Tacoma, Wash., six months ended June 30, were 350,889 short tons in [illegible] tons.

New York

[illegible]

[illegible] and the companies are generally curtailing production. A number of collieries are reported as running only three days [illegible] for an indefinite period. Prepared sizes are in good supply, but steam sizes are a little scarce, owing to decreased production.

The summer discounts came to an end Sept. 1. Prices are now $4.75 for broken, and $5 for egg, stove and chestnut. Steam [illegible] 3.50; buckwheat, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@ [illegible]

[illegible]

The Seaboard bituminous trade is still irregular, improvement coming in spots, to be followed by dullness. Eastern shipments show some improvement, and more [illegible] in supplies grows shorter. Some inquiries have been coming from Sound points, where no business has been done for some time.

New York harbor trade is dull. Ordinary grades of Clearfield are selling for $2.40; better grades at $2.50@2.60. All-rail trade is quiet. Cars are in good supply [illegible] schedule.

Coastwise trade shows an improvement and vessel-owners are asking in some [illegible] from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; [illegible] Sound, 50c. From New York harbor ports 50c. is asked to Boston and Portland.

Birmingham

[illegible] show a decided falling off this year as compared to last. The strike of the union miners has had its effect. Some of the commercial coal mines have done nothing since July 1. The larger corporations have been experiencing much trouble in bringing new men in and protecting them from the intimidation of the strikers. The coke supplies in this State have been off considerably. There is a good market for coal. When the operations in this State once more become normal, all the business wanted can be secured by producers.

[illegible] been called off.

Chicago

[illegible] depressed, but there are a few minor features of improvement—the beginning of the domestic trade to the far-sighted ele[illegible] Eastern coals through better demand and better regulated shipments, and the turning of the steam trade toward run-of-mine in the market for Western coals. Steam sales are no better as a whole.

Illinois and Indiana lump and egg sell for $1.75@2.35, the demand being light; run-of-mine brings $1.65@1.75 and screenings sell for $1.35@1.55, these prices being for car lots.

[illegible] are firmer, the circular quotation of $3.30 on run-of-mine being shaded but slightly. Hocking is firm, with supplies not in ex[illegible] Youghiogheny moves chiefly on contracts, [illegible] gas. Anthracite is not yet active but sales increase slightly.

Indianapolis

[illegible] throughout the mining districts among miners and operators except at the Hudson mine, where the miners have been [illegible] cause they refused to return to work [illegible] the strike. President Lewis is highly com[illegible] the agreements between the miners and [illegible] while pending difficulties are being adjusted.

The Vandalia Coal Company has reopened No. 9 Mine, giving employment to 300 men. By the end of the month all the mines of the State will be opened and a general resumption of business will be commenced.

Pittsburg

Sept. 1—As predicted last week a number of coal mines in the Pittsburg district have been forced to close owing to the congested condition at Lake docks. It is estimated today that the railroad mines are not operating to more than 50 per cent. of the capacity and most of the river mines are down. Despite this condition large operators continue to quote prices on the basis of $1.15 a ton for mine-run coal at mine.

Connellsville Coke—Additional contracts for coke continue to be placed, but not in large tonnages. Most of the business booked on contract ranged from 2000 to 5000 tons and prices are firm on the quotations made during the past month, $1.65@1.75 for furnace and $2.10@2.25 for foundry at ovens. For spot shipment some low prices are reported. The *Courier* in its summary for the week gives the production in both Connellsville fields at 196,144 tons. Shipments, 7641 cars as follows: To Pittsburg, 3142; to points west of Connellsville, 4059; to points east of Connellsville, 440 cars.

Foreign Coal Trade

French Coal Trade—Imports and exports of coal in France, six months ended June 30, metric tons:

Imports	1907	1908.	Changes.	
Coal..	7 333,710	7.321.410	D.	12,300
Coke	1.066.790	941.280	D	125,51
Briquets.....	324,340	462.890	I.	138,65
Exports:				
Coal......	593,800	545.440	D.	48.360
Coke.....	70,600	58.380	D	12.220
Briquets....	44.190	59,250	I	15.060

Exports this year included 50,930 tons coal and 26,980 tons briquets furnished to steamships in foreign trade.

British Coal Exports—Exports of coal from Great Britain, with coal supplied to steamers in foreign trade, seven months ended July 31, long tons:

	1907.	1908.	Changes.	
Coal	35.774.437	35.899,500	I	125,063
Coke..... ..	505,968	595.429	I.	89,461
Briquets.. .	850,565	912,448	I.	61,883
Total exports...	37,130,970	37,407,377	I.	276,407
Steamer coal....	10.755,349	11.141 974	I	386,625
Total	47,886.319	48,549.351	I	663,032

The larger exports were to France, Germany, Russia, Italy and Sweden.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Aug. 22: Best Welsh steam, $3.96; seconds, $3.78; thirds, $3.48; dry coals, $3.72; best Monmouthshire, $3.54; seconds, $3.30; best small steam, $2.28; seconds, $2.98. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 2—A moderate increase in activity is apparent in the iron and steel markets. In pig iron there have been considerable sales of foundry iron in the East, with some basic. Furnaces seem less inclined to make concessions, though the large idle capacity is a weight on the market. Southern iron continues firm

In finished material a few railroad orders for cars and bridges are coming forward. Otherwise railroad orders are still small. The car orders will make some demand for plates. Negotiations for structural contracts are more in evidence, and it seems probable that a number of orders will be placed before long. This number would be largely increased if the price question were settled, but that is still a factor against activity.

There are increasing reports of concessions in prices made to secure orders. It is not easy to follow these up, but there is no doubt that such concessions have been made. In light rails, for which there is quite a demand, cuts have been openly made, and most of the business is going to the outside mills.

Steel bars and sheets show a better trade than for some time. The demand for pipe is also reported on the increase.

Baltimore

Sept. 1—Exports for the week included 1,706,843 lb. tin scrap to Rotterdam and 1002 tons steel rails to Glasgow. Imports included 246 tons ferromanganese from Germany and 5800 tons iron ore from Cuba

Birmingham

Aug. The month of August has been a satisfactory one with the Southern pig iron and steel producers. The aggregate business transacted has been good and quotations have been taking on strength. The quotations are now between $12 and $13 per ton, No. 2 foundry, with the latter price common. The make is holding up well. The accumulated iron in yards has been worked down well. The home consumption is good. The trouble in the coalfields during the past two weeks retarded improvement. There have been some few sales made for delivery during the first quarter of 1909.

The demand for steel, in all shapes, continues good and the plant of the Tennessee Coal, Iron & Railroad Company at Ensley, is losing no time. The month's record is the best since the plant was established. The improvements made this year have been showing results.

Chicago

Sept. 1—Sales of pig iron continue to be of small lots, with no great aggregate tonnage. Furnace agents are making an effort to hold to $13, Birmingham, for No. 2 ($17.35, Chicago), but the price runs down to $12.50 on the more favorable sales. Northern holds well to $17 minimum because of restricted output. Lake Superior charcoal is steady at $19.50@20.

These prices apply on third- and fourth-quarter business, with many furnaces sold out for the third quarter. Selling agents are reluctant to enter into contracts for 1909 delivery to any extent. Foundries are still running light on their requirements, hand-to-mouth buying being favored by most melters.

Coke is in fair demand, with a good regulation of supply and $4.90 standard for first-class Connellsville.

Philadelphia

Sept. 2—A better tone of the pig-iron market has developed within a few days, particularly in foundry irons, growing out of second or supplemental order from buyers who made overcautious purchases a month ago. There are also more inquiries, some of which relate to deliveries early next year, but no orders for such delivery have, so far as known, been definitely placed. Consumption of pig is heavier and more foundry work is coming in. Forge does not participate and negotiations for basic pig drag. For No. 2X $16 is the prevailing price; gray forge is quoted today at $16; basic nominally $16.

Steel Billets—A resumption of work calling for billets is promised in a short time.

Bars—Some mills are getting business that will necessitate a larger output. Manufacturers take a discouraging view as to better prices.

Merchant Steel—A further improvement is claimed this past week. Small shops are more active.

Pipes and Tubes—Pipe work is promised, though no inquiries have reached the mills. Cast pipe is active and many small orders have been booked. Tubes are dull.

Structural Material—Our local business is unimportant. Recent building permits point to late autumn and winter construction which will probably absorb some material.

Old Material—All railway scrap of every description is held high. Very little scrap of any kind is selling. The yard men are not buying any more than they can turn over for cash.

Pittsburg

Sept. 1—The pig-iron market is extremely dull. In finished steel products there is a continuance of the moderate scattered buying, which has characterized July and August, and which enables the mills to run at between 50 and 60 per cent. of their capacity, on an average. Most of the steel interests find that their

August business was slightly in excess of July. It seems to be accepted now, however, that there is no probability of any great increase in business this year.

The pipe mills have increased more in activity since July 1 than have any other class of mills, and are now reported to be operating, in each instance, at between 65 and 75 per cent. of full. Tinplate operations are steadily decreasing. Tinplate production in July and August broke all records for these months, when ordinarily most of the mills close. This was not due to heavy demand, but to the fact that the tinplate was bought and made late, the mills running very light early in the year.

Pig Iron—Transactions have been very light. A sale of 200 tons of No. 2 foundry was made this week to a Ford City interest, the Valley price of $14.50, furnace, being beaten as the seller has a lower freight than the Valleys. While Bessemer is still quoted at $15.25, Valley, there is an inquiry for 1000 tons from a new Pittsburg consumer, and it is possible that $15 will be done. Basic is still quoted at $14.50, Valley, and forge at $13.75. The settlement of the Southern coal strike this week forestalls a demand for Northern iron, which was expected if the Southern strike continued much longer.

Steel—The market continues quiet, the regular price of billets remaining at $25, Pittsburg. The Republic Iron and Steel Company is operating its bessemer steel plant at Youngstown this week. Plates are 1.60c. and steel bars 1.40c.

Sheets—The market remains at 2.50c. for black and 3.55c. for galvanized, No. 28 gage.

Ferro-Manganese—The market is dull. A single carload went at $43, seaboard, or $44.95, Pittsburg. Forward delivery is $1 lower.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports pig-iron production in Germany in July at 1,010,770 metric tons, being 54,345 tons more than in June. For the seven months ended July 31 the make was, in metric tons:

	1907	1908	Changes	
Foundry iron	1,278,874	1,308,453	I.	29,579
Forge iron..	461,016	407,519	D.	53,497
Steel pig ..	593,903	570,807	D.	23,096
Bessemer pig	277,669	241,213	D.	36,456
Thomas(basic)pig	4,868,457	4,532,499	D.	335,958
Total	7,479,919	7,060,491	D.	419,428

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The total decrease this year was 5.6 per cent.

Belgian Iron Production—The production of pig iron in Belgium in July was 102,800 metric tons, a decrease of 17,040 tons from last year. There were 31 furnaces in blast this year.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 2.

At all U. S. Ports in July and year

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1908..	$ 4,816,272	$ 2,916,408	[illegible] 1,[illegible]
" 1907..	[illegible]	[illegible]	[illegible]
Year 1908..	[illegible]	[illegible]	29,038,943
" 1907..	[illegible]	21,[illegible]	[illegible]
Silver:			
July 1908..	[illegible]	2,982,074	[illegible]
" 1907..	[illegible]	3,387,225	[illegible]
Year 1908..	[illegible]	[illegible]	[illegible]
" 1907..	[illegible]	25,782,836	[illegible]

Exports of specie from New York, week ended Aug. 29: Gold, none; silver, $7[illegible], chiefly to London and Paris. Imports: Gold, $1[illegible]; silver, $97,6[illegible], all from the West Indies, Central and South America.

Specie holdings of the leading banks of the world, Aug. 29, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$334,1[illegible]
England..	$1[illegible]	.....	1[illegible]
France..	645,214,4[illegible]	$1[illegible]	$[illegible]
Germany	207,140,000	[illegible]	292,[illegible]
Spain	78,150,000	1[illegible]	[illegible]
Netherlands..	38,528,000	20,821,000	[illegible]
Belgium	20,2[illegible]	10,1[illegible]	[illegible]
Italy..	183,265,000	22,100,000	[illegible]
Russia..	581,280,000	40,330,000	621,610,000
Aust.-Hungary	236,040,000	66,925,000	302,965,000
Sweden..	20,325,000	.....	20,325,000
Norway..	8,255,000		8,255,000
Switzerland....	23,160,000		23,160,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in Great Britain, seven months ended July 31:

	Imports.	Exports.	Excess.	
Gold..	£27,801,277	£25,847,038	Imp. £	1,954,239
Gold, 1907..	27,158,812	19,759,643	Imp.	7,399,169
Silver....	6,106,868	7,700,536	Exp.	1,593,668
Silver, 1907.	9,562,262	10,700,236	Exp.	1,137,974

Silver Market

SILVER AND STERLING EXCHANGE.

August.	Sterling Exchange.	Silver New York, Cents.	Silver London, Pence.	Aug.–Sept.	Sterling Exchange.	Silver New York, Cents.	Silver London, Pence.
27	4.8600	51½	23[illegible]	31	4.8570	51	23[illegible]
28	4.8585	51[illegible]	23[illegible]	1	4.8585	51[illegible]	23[illegible]
29	4.8580	51[illegible]	23	2	4.8590	51	23[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market still continues to show a slightly declining tendency. There appears to be some congestion of silver in the China commercial centers, and this helps to prevent firmness in the bullion demand.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Aug. 20:

	1907	1908	Changes	
India	£7,808,424	£6,143,164	D.	£1,[illegible]
China		516,400	I.	516,400
Straits	658,700	90,510	D.	568,190
Total	£8,467,124	£6,750,074	D.	£1,717,050

Imports for the week were £15,000 from New Zealand and £169,000 from New York; £184,000 in all. Exports were £[illegible] to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS

	Copper			Tin	Lead	Spelter	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.70	[illegible]
31	[illegible]	[illegible]	[illegible]	[illegible]	4.57½	4.70	4.55
1	[illegible]	[illegible]	[illegible]	[illegible]	4.55	4.70	[illegible]
2	13[illegible]	13[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

American Smelting and Refining Company—At the annual meeting in New York, Sept. 2, the old board of directors was re-elected, Mr. Page, superintendent of the Omaha works, being added to fill a vacancy. At the directors' meeting the old officers were re-elected. The usual quarterly dividends were declared, the statements submitted showing that they were fully earned. We understand that the Standard Oil interest voted a large number of shares at the meeting.

Copper—The market has been quiet throughout the week. The pressure on the part of second hands to liquidate has been relaxed, and as a result there was some semblance of strength, which, however, did not hold out very long, as the business forthcoming from legitimate sources is very small. The market closes [illegible] for Lake copper; 13⅜@13⅝ for electrolytic in ingots, cakes and wirebars; 13⅛@13⅜ for casting copper.

The standard market in London has been an uninteresting affair. Fluctuations are narrow, with a strong undertone. The increase in the visible supplies for the second half of August of only 300 tons is a most encouraging sign. The close [illegible] for three months.

Refined and manufactured sellers quote: English tough, £63 10s.@64 10s.; best selected, £63 10s.@64 10s.; strong sheets, £75 10s.@76 10s.

Exports of copper for the week from New York and Philadelphia were [illegible] tons. Exports from Baltimore, reported by our special correspondent, [illegible] copper.

Manufactured copper—Sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15¼c.

Tin—Notwithstanding the comparatively unfavorable statistical position of tin, which was disclosed at the end of last month, the visible supplies at that time showing an increase of 300 tons, making the same about 5400 tons larger than they were last year, this had no material effect upon the London market. The latter closes firm at £132 10s. for spot, £133 10s. for three months.

The domestic market remains exceedingly dull, consumptive demand being almost nil. Spot metal can be had at the close at about 29c. per pound.

Visible stocks of tin Sept. 1, are reported as follows, in long tons:

	In Store.	Afloat.	Total.
Great Britain	5,569	6,691	12,260
Holland	827	183	1,010
U. S., exc. Pacific ports	2,092	1,895	3,987
Total	8,488	8,769	17,257

The total shows an increase of 1295 tons during August.

Shipment of tin from the Straits in August are reported by cable as follows: United States, 765; Great Britain, 4890; other Europe, 400; total, 6055 long tons, an increase of 1004 tons over last year.

Lead—There has been some pressure from the West, which has weakened the tone of the market. The close is quoted 4.55@4.60c. New York.

London is again lower, closing at £13 3s. 9d. for Spanish lead, £13 6s. 3d. for English lead.

Production of lead in Australia in 1907 is reported as follows: Broken Hill Proprietary Company, 54,164 long tons; Sulphide Corporation, 22,394; Tasmanian Smelting Company, 10,100; Queensland Smelting Works, 3747; Freemantle Smelting Works, 400; total, 90,805 long tons.

Spelter—Galvanizers in the Middle West have placed fair-sized orders, and though the business was not large, prices have stiffened, due to the sensitive condition of the market. The close is firmer at 4.55@4.57½c. St. Louis, 4.70@4.72½c. New York.

The London market is also somewhat higher, quotations being cabled at £19 7s. 6d. for good ordinaries, £19 12s. 6d. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market has been quiet, with only small business. Prices are slightly weaker at 8⅛@8¼c. for Cookson's; 7⅞@8⅛c. for Hallett's; 7⅝@7¾c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $43 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $42.50 for domestic orders, and $41 for export. London higher, at £8 2s. 6d. per flask, with £8 quoted from second hands.

Platinum—This metal continues to be offered at $17.50@19 per oz. for refined platinum. Dealers quote $15@15.50 for scrap metal.

Wisconsin Ore Market

Platteville, Wis., Aug. 29—The highest prices paid for zinc ore was $37 on a basis of $36 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $60 per ton was paid. Shipments for week ended Aug. 29 were:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	924,750	197,980	.....
Platteville	583,200	....	....
Hazel Green	418,000	....	....
Cuba City	215,870	88,590	
Livingston	170,000		......
Galena	159,300	....	......
Total	2,471,120	286,570	....
Year to Aug. 29	62,006,701	7,338,165	1,262,014

Mineral Point, Linden, Highland and Harker are not reported but will be included next week. In addition to the above there was shipped to the Joplin Separator Works, at Galena, from Hazel Green, 158,500 lb. and from Rewey, 124,000 lb. zinc concentrates; also to the Enterprise roaster, at Platteville, from Strawbridge, 154,000 lb. zinc concentrates.

Missouri Ore Market

Joplin, Mo. Aug. 29—The highest price reported paid for zinc ore was $40 per ton, on a base price of $37. Some ore, however, sold as high as $37.50 per ton of 60 per cent. zinc. Silicate sold as high as $26,50 base, bringing $20@24 per ton. The average price, all grades, was $33.78 per ton. The highest price paid for lead ore was $59.50 per ton, medium grades bringing $58@59 and the average price, all grades, was $58.46 per ton.

The week's market was generally quiet on a $36.50 base for zinc up to Thursday noon, but in the afternoon one purchasing agent played havoc with the level of prices all other purchasing agents had decided upon, and with the prospect of a $36 base for next week. The market is in such an unsettled condition that prices could easily be manipulated up to a $40 base price. But for the determined stand of sellers to hold the market up it would be as easy to dump the price $2 to $3 per ton, but it seems impossible to secure concerted action.

Following are the shipments for the week ending Aug. 29:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,508,870	795,820	$84,180
Joplin	2,179,180	307,190	48,213
Galena	718,080	158,310	16,707
Alba-Neck	714,900	......	12,868
Duenweg	417,060	122,690	10,885
Granby	562,670	62,320	9,700
Spurgeon	386,450	82,900	7,829
Oronogo	340,730	300	6,195
Prosperity	223,920	69,770	5,958
Carthage	290,000	......	5,220
Badger	212,590	30,390	4,723
Miami	358,460	......	4,300
Aurora	225,400	9,480	3,251
Quapaw	204,830	1,490	2,911
Zincite	151,800	.....	2,580
Sarcoxie	79,570	.....	1,432
Peoria	37,380	......	336
Stott City	17,070	......	290
Totals	10,629,260	1,640,660	$227,578
Eight months	329,093,170	51,264,590	$6,951,735

Zinc value, the week, $179,613; 8 months, $5,535,732
Lead value, the week, 47,965; 8 months, 1,416,003

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

	ZINC ORE.				LEAD ORE.	
Month.	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.94	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.07
June	47.00	33.06	44.82	32.07	73.68	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.54
September	41.00	....	40.11	....	53.52	
October	41.75	....	39.83	......	51.40	
November	38.60	.....	35.19	......	43.40	
December	31.50	..	30.87	......	37.71	..
Year	$44.36	......	$43.68	......	$68.90	......

Note.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Sept. 2—There is little change in the market, and prices remain generally steady. Little is said yet about contract business, and spot trade is only fair. A little more inquiry is reported, but has not resulted in actual business so far.

Copper Sulphate—Business is a little better. Prices are unchanged and firm at $4.65 per 100 lb. for carload lots or over, and $4.90 for smaller parcels. An advance is not unexpected.

Nitrate of Soda—Trade at present is chiefly on a small scale, and prices are unchanged.

Mining Stocks

New York, Sept. 2—The market on the Stock Exchange has shown advances during the week, with some reactions, but on the whole a stronger tendency than in the previous week. It is still largely a professional market, with only moderate outside dealing.

On the Curb market, trading was dull, on the whole, though some of the copper stocks showed strength and fair activity. There was a generally improved tone, and the close is rather firm.

Boston

Sept. 1—There has been a gradual hardening tendency in mining shares the past week, and some stocks are materially higher. Amalgamated rose $5 to $82 during the week, but sold a trifle below this today. Copper Range and North Butte have also done better. The former rose $3 to $80.75, and the latter on large trading sold up $6.50 to $89.50, both receiving some setbacks. Copper Range directors have declared the regular quarterly dividend of $1 per share. Arizona Commercial has given a good account of itself, rising $7.25 to $27.50. This company's $500,000 new 6-per cent. convertible bonds were successfully placed with stockholders, and the issue has been put on the unlisted sheet. They have risen from $103 to $117. The forthcoming North Butte dividend will be mailed to some 4300 stockholders, which is an increase of 33 per cent. over a year ago. Old Dominion rose $5.50 to $43.50. The petition of A. S. Bigelow to have the recent injunction modified has been denied by the Massachusetts Supreme Court. Utah Consolidated rose $1.50 to $47.50.

On the Curb, Ahmeek touched $100. East Butte, now traded on the Curb around $5, is likely to go onto the unlisted sheet of the Exchange shortly, as well as shares of the North Lake Mining Company.

STOCK QUOTATIONS

NEW YORK Sept. 1		BOSTON Sept. 1	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	3/16	Adventure	9⅛
Amalgamated	80	Allouez	37½
Anaconda	48	Am. Zinc	‡27½
Balaklala	2 1/16	Arcadian	4
British Col. Cop.	8	Arizona Com	27
Butte & London	....	Atlantic	15½
Butte Coalition	27⅛	Bingham	.40
Colonial Silver	⅛	Boston Con	13
Cum. Ely Mining	8¼	Calumet & Ariz	124
Davis Daly	2⅞	Calumet & Hecla	670
Dominion Cop	2¼	Centennial	34
Douglas Copper	4	Con. Mercur	43
El Rayo	2	Copper Range	80
Florence	3½	*Daly West	9
Foster Cobalt	.46	Franklin	14½
Furnace Creek	.20	Greene Can	11¼
Giroux	4½	Isle Royal	24¾
Gold Hill	¼	La Salle	14¼
Goldfield Con.	6 3/16	Mass	7
Granby	105	Michigan	14
Greene Gold	¼	Mohawk	67
Greene G. & S	¼	Nevada	16⅞
Greenw'r & D Val.	‡1.75	North Butte	88
Guanajuato	2¼	Old Colony	55
Guggen. Exp.	177½	Old Dominion	42
Hanapah	‡.20	Osceola	114
McKinley Dar.	75	Parrot	27¼
Micmac	2½	Quincy	95
Mines Co. of Am.	1 1/16	Rhode Island	4⅛
Mitchell Mining	¼	Santa Fe	2
Mont. Sho. C.	⅛	Shannon	15
Nev. Utah M. & S	3⅛	Superior	24½
Newhouse M. & S	6	Tamarack	76
Nipissing Mines	8¼	Trinity	19¼
Old Hundred	⅜	United Cop. com.	11
Silver Queen	1.06	U. S. Oil	26
Stewart	13/16	U. S. Smg. & Ref	41
Tennessee Cop'r.	37⅞	U. S. Sm. & Re. pd	45
Tri-Bullion	1¼	Utah Con	47
Union Copper	1	Victoria	5
Utah Apex	4¼	Winona	16½
Utah Copper	45½	Wolverine	145
Yukon Gold	4⅛	Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem	29½
Am. Smelt. & Ref.	89
Am. Sm. & Ref., pf.	100
Bethlehem Steel	22
Colo. Fuel & Iron	37
Federal M. & S., pf	85
Inter. Salt	18
National Lead	85
National Lead, pf	102
Pittsburg Coal	‡12
Republic I. & S.	24
Republic I. & S., pf	81
Sloss-Sheffield	64
Standard Oil	635
U. S. Red. & Ref.	11
U. S. Steel	46¾
U. S. Steel, pf	111
Va. Car. Chem	29

BOSTON CURB	
Ahmeek	99
Black Mt.	½
East Butte	8
Hancock Con.	[illegible]
Keweenaw	[illegible]
Majestic	.65
Raven	95
Shawmut	.31
Superior & Pitts.	14½
Troy Man.	35

ST. LOUIS Aug. 29		
N. of Com.	High	Low
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	67.00	66.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	[illegible]	4.00
Con. Coal	19.00	17.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe	15.00	12.50

LONDON Sept. 2	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 [illegible]
Esperanza	[illegible]
Tomboy	1 3 [illegible]
El Oro	1 7 0
Oroville	[illegible]

Cabled through Wm. P. Bonbright & Co. N. Y.

NEVADA STOCKS Sept. 2
Furnished by Weir Bros. & Co. New York

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	19
Belcher	19	St. Ives	20
Best & Belcher	48	Triangle	06
Caledonia	14	BULLFROG STOCKS	
Chollar	17	Bullfrog Mining	[illegible]
Comstock	20	Bullfrog Nat. B.	04
Con. Cal. & Va.	85	Gibraltar	04
Crown Point	28	Gold Bar	04
Exchequer	26	Homestake King	24
Gould & Curry	.10	Montgomery Mt.	.10
Hale & Norcross	.31	Mont. Shoshone C.	87
Mexican	72	Original Bullfrog	01
Ophir	2.20	Tramps Cons.	.17
Overman	11	MANHATTAN STOCKS	
Potosi	20		
Savage	29	Manhattan Cons.	08
Sierra Nevada	27	Manhat'n Dexter.	.07
Union	22	Jumping Jack	.03
Utah	05	Stray Dog	.03
Yellow Jacket	50	MISCELLANEOUS	
TONOPAH STOCKS		Golden Boulder	07
Belmont	1.06	Bonnie Clare	08
Extension	.75	Lee Gold Grotto	[illegible]
Golden Anchor	02	Nevada Hills	1.31¼
Jim Butler	26	Nevada Smelting	1.12½
MacNamara	52	Pittsburgh S. Pk.	1.02
Midway	34	Round Mt. Sphinx	.14
Montana	1.37½		
North Star	08		
Tonopah Mine of N.	7.37½		
West End Con	60		
GOLDFIELD STOCKS			
Adams	04		
Atlanta	30		
Booth	15		
Columbia Mt.	20		
Comb. Frac.	1.53		
Cracker Jack	09		
Dia'dfield B. B. C.	17		
Goldfield Daisy	1		
Goldfield Dexter	7		
Great Bend	34		
Jumbo Extension	17		
Katherine			
Kendall	16		
Lone Star	10		
May Queen	06		
Oro	14		
Red Hill	30		
Roanoke			
Sandstorm	2		

COLO. SPRINGS Sept. 2	
Name of Comp.	Clg.
Acacia	[illegible]
Black Bell	
C. C. Con	3½
Dante	[illegible]
Doctor Jack Pot	7
Elkton	[illegible]
El Paso	[illegible]
Findlay	22
Gold Dollar	[illegible]
Gold Sovereign	
Isabella	28
Index	
Jennie Sample	2
Jerry Johnson	4
Mary McKinney	.40
Pharmacist	
Portland	1.01
Un. Gold Mines	4
Vindicator	84
Work	[illegible]

Assessments

Company.	Delinq.	Sale.	Amt.
Alta, Nev	Aug. 2	Sept. [illegible]	$[illegible]
Belcher, Nev	Sept. 1	Oct. 6	0.1[illegible]
Caledonia, Nev	Aug. 12	Sept. [illegible]	0.05
Challenge Con., Nev	Aug. 31	Sept. [illegible]	0.05
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Hale & Norcross, Nev	Sept. [illegible]	Sept. 24	0.10
Julia, Nev	Aug. 21	Sept. 14	0.03
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Potosi, Nev	Sept. 4	Sept. 29	0.10
Savage, Nev	Aug. 27	Sept. 18	0.10
[illegible], Nev	Aug. 11	[illegible]	[illegible]
Signet	[illegible]	[illegible]	[illegible]
[illegible]	Aug. 1	Aug. 18	[illegible]
[illegible], Nev	July 10	Aug. 12	0.01
Union Con., Nev	Sept. 15	[illegible]	0.10
Utah, Nev	Aug. 12	Sept. [illegible]	[illegible]
[illegible], Utah	July 16	Aug. 6	0.01
Yellow Jacket, Nev	Aug. 1	Sept. [illegible]	[illegible]

Monthly Average Prices of Metals

SILVER

Month.	New York 1907	New York 1908	London 1907	London 1908
January	[illegible]	[illegible]	[illegible]	[illegible]
February	68.[illegible]	[illegible]	[illegible]	[illegible]
March	67.51[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]
September	67.792	......	31.313	
October	[illegible]		[illegible]	
November	58.677	......	[illegible]	
December	[illegible]		[illegible]	
Year	[illegible]		[illegible]	

[illegible]

COPPER

	NEW YORK				LONDON	
	Electrolytic		Lake			
	1907	1908	1907	1908	1907	1908
January	24.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	25.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	18.356	13.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	15.565		[illegible]		[illegible]	
October	[illegible]		[illegible]	......	[illegible]	......
November	13.391		13.870	......	61.226	......
December	13.163		13.393		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

New York, cents per pound. Electrolytic is [illegible] sterling, [illegible]

TIN AT NEW YORK

Month.	1907	1908	Month.	1907	1908
January	41.548	27.380	July	[illegible]	[illegible]
February	[illegible]	[illegible]	August	[illegible]	[illegible]
March	[illegible]	[illegible]	September	[illegible]	
April	[illegible]	[illegible]	October	[illegible]	
May	43.149	30.015	November	[illegible]	
June	42.120	28.024	December	[illegible]	
			Av. year	38.1[illegible]	

Prices are in cents per pound.

LEAD

Month.	New York 1907	New York 1908	London 1907	London 1908
January	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]
September	4.81[illegible]		[illegible]	
October	4.750	......	[illegible]	
November	[illegible]		[illegible]	
December	[illegible]		[illegible]	
Year	[illegible]		[illegible]	

New York, [illegible] pounds sterling per long ton.

SPELTER

Month.	New York 1907	New York 1908	St. Louis 1907	St. Louis 1908	London 1907	London 1908
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]		[illegible]		[illegible]	
October	[illegible]		[illegible]		[illegible]	
November	[illegible]		[illegible]		[illegible]	
December	[illegible]		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible]

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, good drill quality, carat		$85.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	08
Grains	"	10@.17
Corundum	"	07@ 10
Crushed Steel, f.o.b. Pittsburg	"	05¼@.06
Emery, in kegs: Turkish flour	"	01¾@.02½
Grains	"	03½@.04½
Naxos flour	"	01¾@ 02½
Grains	"	03½@ 04½
Chester flour	"	01½
Grains	"	03½@ 04½
Peekskill, f.o.b. New York, flour	"	01¼@ 01½
Grains, in kegs	"	02¼@ 02½
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. powd	100 lb.	1.60@2.00
Italian, powdered	"	.01¼@.01½
Lump, per quality	"	03@ 20
Rottenstone, ground	"	.02@.04
Lump, per quality	"	05@ 25
Rouge, per quality	"	05@ 30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb	.026@.03
Boric	"	08@.08¼
Hydrofluoric, 30%	"	.02¾@.03
" 48%		.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 38°	per lb	4.25@4 62½c.
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.25
66°, bulk, ton		18 00
Oxalic	"	06½@.06¾
ALCOHOL—Grain 95%	gal.	2.63
Denatured	"	.43@.49
Refined wood, 95@97%	"	.47@.53
ALUM—Lump	100 lb.	$1 75
Ground		1.85
Chrome Alum	lb.	.05@.05¼
ALUMINUM—Sulphate, com'l.	lb	1.10@1.75
AMMONIA—24 deg.	lb	.04½@.05½
" 26 deg.	lb	.04¾@.05¾
AMMONIUM—		
Bromide	lb	23
Carbonate	"	07¾@ 08
Muriate grain		.05¾@.06⅛
Lump		09¼@.09½
Sulphate, 100 lb.		3.05@3.10
Sulphocyanide com		30
" " chem. pure		40
ANTIMONY—needle, lump.	"	03⅜@ 04
ARSENIC—White		.03⅜@.03⅝
Red		.07½@.07¾
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.10@.11
Gilsonite, Utah, ordinary	per ton.	32.00
Trinidad	"	22 50@30 00
California	"	21.00@27.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%		36.00@40.00
Powdered, 80@90%	lb.	.02@.02¼
Chloride com'l	ton.	39.00@41.00
Nitrate powdered, in casks	lb	.05½@.06
Blanc Fixe	per lb.	.02¼
BARYTES—		
Am. Ground	sh. ton.	14 00@21 00
Floated	"	22 00
Foreign floated	"	19.50@22.50
BISMUTH—Sub-nitrate	lb.	1 50
BLEACHING POWDER—35%, 100 lb.		1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4 65
BONE ASH	lb.	.02¾@.04
BORAX	"	.04½@.05¼
CALCIUM—Acetate, gray, 100 lb.		2 00@2.05
Acetate, brown	lb.	1.25@1.30
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J	sh. ton.	65 00
Chloride, f.o.b. N. Y	"	11 00@11 00
CEMENT—		
Portland, Am. 500 lb	bbl.	1 55@1 60
Foreign	"	2 25@2 90
"Rosendale," 300 lb	"	85
" (in sacks)		65
Slag cement	"	75@1 25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y	per lg. ton.	17 50@20 00
Bricks, f.o.b. Pittsburg	M ton.	175 00
CLAY, CHINA—Am. common ex-dock, N. Y	ton.	8 00@9 00
Foreign	"	10 00@17 50
COBALT—Oxide	lb.	1 45

COPPERAS—Bulk	100 lb.	$0 55
In bbls		65@ 75
In bags		.60@.70
CRYOLITE	lb.	06¼@.06¾
FELDSPAR—Ground best	sh. ton.	10.50@15.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported		30 00@45 00
St. Louis No. 1		18.00
" No. 2		15.00
Extra	"	20.00@23.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton	5 00
" ordinary	"	2 50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8 00@10 00
Ground	"	11 50@13 50
Foreign crude ex. dock		8 00@10 00
FULLER'S EARTH—Lump	100 lb.	.75@.85
Powdered	"	.75@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.01@.04
Dust	"	01¾@ 05
Chip	"	02¾@.07½
Lump	"	04@.10
Large lump	"	07@.10
GYPSUM—		
Fertilizer	sh. ton	5 00
Ground	"	4 00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb	01¼
French	lg. ton	56 00
German	lb	02¼@ 02¾
LEAD—Acetate (sugar of) brown	lb.	07¾
Nitrate, com'l	"	08¼@ 08½
MAGNESITE—Greece		
Crude (95%)	lg. ton.	8 00@10 00
Calcined, powdered	sh. ton.	26 00@35 00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	80@1 00
Sulphate (Epsom salt)	100 lb	85@1 00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb	01@ 01¼
75@85% binoxide	"	01¼@.01½
85@90% binoxide	"	01½@.05
90@95% binoxide	"	06½
Ore, 80%-85%	sh. ton.	16 00@32.50
MARBLE—Flour	sh. ton	8 50@10 00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19 00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected		40 00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb	08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		47
Sulphate, single	lb.	09@ 11
Sulphate, double	"	06½@.08
NITRATE OF SODA—100 lb. 95% for '08		2 25
95% for 1909		2 25
95% for 1910		2 22½
96% is 5c. higher per 100 lb		
OZOKERITE—best	lb	14@ 17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb	06¼@ 06¾
English glassmakers'	"	08¼@ 08½
Lithopone	"	.03¾@ 07
Metallic, brown	sh. ton	16 50@22 00
Red	"	14 00@18.00
Ocher, Am. common	"	8 50@9 00
Best	"	16 00
Dutch, washed	lb	02½@.03
French, washed	"	01½@ 02½
Paris green, pure, bulk	"	26
Red lead, American		06½@ 06¾
Foreign		08¼@.08½
Turpentine, spirits bbl., per gal		42½
White lead, Am. dry	lb	05⅝@ 06
American in oil		06½@ 06¾
Foreign in oil	"	10⅛@ 10⅜
Zinc white, Am. extra dry		05½@.05⅝
French, red seal, dry		08¼@ 08¾
French, Green seal, dry		10½@.10¾
PHOSPHATES—Acid		60c. per unit
*Fla. hard rock		10 00@10 25
" land pebble 68%		4 25@4 50
†Tenn., 78@80%		6 00@6 50
" 75%		5 00@5 50
" 68@72%		4 00@4 50
‡So. Car. land rock		6 75@7 00
" " river rock		5 00@5 50

*F.o.b. Fernandina or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb	$ 08½@.09
Powdered or granulated		09@ 09½
Bichromate, Am.		.08⅝@.09
Scotch		10¾
Bromide		.15@.17
Carbonate (80@85%)		03¾@.04
Caustic, ordinary		04½@.05¾
Elect. (90%)		.05½@.06
Chloride (muriate), 100 lb		1.90
Chlorate, powdered		.09¼@.09¾
Crystals		.09@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)		18c.
5-ton lots		18½c.
Less than 5 tons	"	19c.
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	09½@ 10
Prussiate, yellow	"	14@ 14½
Red	"	.32@.36
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported non-arsenical, furnace size, per unit		12½@.13
Imported, arsenical, furnace size, per unit		12@.12½
Imported fines, arsenical, per unit.		08½@.09
Imported fines, non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N Y. com. fine 280 lb.	bbl.	.72@1 13
N. Y. agricultural	sh. ton.	3 80@4 50
SALTPETER—Crude	100 lb.	4.50@5.00
Refined, crystals	"	5 50@6.00
SILICA—		
Ground quartz, ord'ry	lg. ton.	10 00@15 00
Silex	"	13 00@40 00
Lump quartz	"	5.00@6.00
Glass sand		2.75
SILVER—Nitrate, crystals	oz.	.37½@.4
SODIUM—		
Acetate	lb	.04¼@.04½
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.10@1.40c.
Soda, caustic, per 100 lb., 76/60		1.75@1.85
Soda, caustic, powdered		.02¾@.03¼
Salt cake, per 100 lb., bulk		.40
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb.		1.4@1.75c.
Bichromate	lb	.07⅛@.07½
Bromide	"	.15@.17
Chlorate, com'l		09@ 09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)		18c.
5-ton lots		18½c.
Less than 5 tons		19c.
Hyposulphite, Am		1.35 up
German	"	1 60@1 70
Phosphate	100 lb.	2 10@2 30
Prussiate	"	08¾@.09¼
Sal soda, f o b N. Y.	100 lb.	.65@.70
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.80@1 15
Sulphate, com'l (Glauber's salt)	100 lb.	60@ 75
Sulphate, com'l, calcined		65@ 85
STRONTIUM—Nitrate	lb.	.07¾@.8½
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton	22 00
To Philadelphia or Baltimore	"	22 00
Roll	100 lb.	1.85@2.15
Flour	"	2 00@2 40
Flowers, sublimed	"	2.20@2 60
TERRA ALBA—French & Eng.	100 lb.	.65@1 00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	16 00@25 00
Italian, best	"	35 00@40 00
TIN—Bi-chloride. 50%	lb.	09 up
Crystals	"	19⅜ up
Oxide, lb	"	33@ 35
URANIUM—Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02¼
Chloride granular		.04½@.05
Dust		04¾@ 05¼
Sulphate	"	02@.02¼

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

7102 CASTINGS Method of Making Aluminum Castings in a Connecticut Foundry. (Brass World, July, 1908; 1½ pp.) Describes the methods of casting aluminum and points out the precautions necessary. 20c.

7103 METALLURGICAL CALCULATIONS. J. W. Richards. (Electrochem. and Met. Ind., August, 1908; 1¾ pp.) In this instalment the metallurgy of aluminum is briefly discussed and a problem in electrical heating is given and solved. 40c.

ANTIMONY

7104 SMELTING The Herrenschmidt's Process of Antimony Smelting. C. Y. Wang. (Min. Journ., July 25, 1908; 1¾ pp.) Describes the apparatus, process and the results of the experiments. Illustrated. 40c.

ASPHALT

7105 TRINIDAD'S FAMOUS PITCH LAKE. A. Beeby Thompson. (Petrol. Rev., Aug. 1, 1908; 2½ pp.) Describes the location, methods of extraction, physical and chemical characteristics of the asphalt from this district. Illustrated. 40c.

CEMENT

7106 CEMENT WORKS at Irthlingborough. (Engineer, Lond., July 10, 1908; 2 pp.) Describes the plant of the Premier Portland Cement Company, Ltd., and gives analyses of the raw materials and a description of the machinery used. Illustrated. 40c.

7107 PLANT The Hydro-Electric Plant and Mill of the Superior Portland Cement Co., Superior, Wash. G. H. Moore. (Eng. Rec., Aug. 22, 1908; 1½ pp.) The construction of this cement plant is described. Much reinforced concrete is used about the plant. 20c.

COAL AND COKE

7108 ANALYSIS Determination of the Value of Coal for Steaming Purposes. R. K. Meade. (Min. Sci., Aug. 20, 1908; 2 pp.) Continuation of article previously indexed, discussing in the present instalment the approximate analysis of coal and the apparatus used in the combustion method of determining carbon and hydrogen. 20c.

7109 AUSTRALIA Coalfields and Collieries of Australia. F. D. Power. (Aust. Min. Stand., May 27, June 3, 10, 17, 24, July 1 and 8; 7 pp.) Continuation of article previously mentioned in this index. $2.

7110 BRIQUETS Fuel Briquets on French Railways. Frank H. Mason. (New Zealand Mines Rec., May 16, 1908; ½ p.) The French railways use large quantities of coal in the form of briquets and find that they give satisfactory service. The cost is stated to be from $3.03 to $4.25 per metric ton. 40c.

7111 BRIQUETTED COAL in Brooklyn. C. D. Meeker. (Eng. Rec., Aug. [illegible], 1908; [illegible] pp.) Describes the operation of a briquetting plant located on the Gowanus Canal, which has proved successful. Illustrated. 20c.

7112 BRIQUETTING Selecting a Binder for Briquet Manufacturing. J. J. Mills. (Black Diamond, Aug. 22, 1908; 1½ pp.) The kind of binder to use, characteristics of briquets, the density desired in and the absorptive qualities of briquets are discussed. 20c.

7113 BRITISH COAL MINERS The Mortality of. (Coll. Guard., Aug. 14, 1908; 1 p.) Abstract of a report of the Registrar-General of Births, Deaths and Marriages in England and Wales. To be continued. 40c.

7114 BRITISH COLUMBIA Nicola Mining Division. (Brit. Col. Min. Rec., May, 1908; 5 pp.) Describes the mineral prospects and the deposits of coal in this British Columbia mining district, and includes analyses of coke made from the coal. Illustrated. 20c.

7115 COAL CUTTING MACHINES Electrical Coal-Cutting Machines. F. W. Hurd. (Electrician, July 10, 1908; 1¾ pp.) Describes the principal features of mining coal by means of electrical coal cutters. 40c.

7116 COAL HANDLING PLANT Inclined Retort Coal and Coke-Handling Plant at Bristol. William Stagg. (Engineering, July 31, 1908; 4½ pp.) Describes the method of handling coal at a large English gas plant. Illustrated. 40c.

7117 COKE BY-PRODUCTS Recovery of Coke By-Products in Rhenish-Westphalia. (Iron and Coal Tr. Rev., July 31, 1908; ½ p.) By-product ovens increased from 538 in 1893 to 2964 in 1900. Gives figures of production of sulphate of ammonia, coal tar and other products. 40c.

7118 COKE OVENS—A New System of Modern Coke Ovens. F. Fieschi. (Eng. and Min. Journ., Aug. 22, 1908; 4½ pp.) Details of construction and operation which permits saving by-products and excess gases. Discussion of horizontal and vertical flues. Illustrated. 20c.

7119 COLLIERY VILLAGE—A Model Colliery Village. (Coll. Guard., Aug. 14, 1908; 1½ pp.) The manner of laying out the village at the Brodsworth colliery near Doncaster, England, is described in detail. 40c.

7120 COMBUSTION OF COAL upon Grates. E. G. Bailey. (Eng. and Min. Journ., July 25, 1908; 1½ pp.) Describes the distribution of heat, air excess, unburned gases, unburned coal, and rate of combustion in boilers. 20c.

7121 CONVEYER—The Gibb Underground Conveyer. (Coll. Guard., Aug. 7, 1908; 2½ pp.) Briefly mentions two types of conveyers for clearing away under-cut coal from the face, which have not proved satisfactory, and describes the Gibb conveyer which, it is claimed, will solve the problem of conveying coal in the working of thin seams. 40c.

7122 ELECTRICAL INSTALLATION at the [illegible] Collieries. (Iron and Coal Tr. Rev., July 31, 1908; 3 pp.) Describes the power plant, electric hoisting engines and other equipment of these English collieries. Illustrated. 40c.

7123 EXPLOSIONS Effect of Humidity on Mine Explosions. [illegible] (Paper to be read before the A. I. M. E., Oct., 1908; 8 pp.) This paper is the result of several years' observation of conditions in various coal mines and coalfields in the United States. It is pointed out that temperature, altitude and moisture each has its effect upon mine explosions.

7124 EXPLOSIONS Notes on Recent Mine Disasters. James Ashworth. (Eng. and Min. Journ., Aug. 15, 1908; 1½ pp.) Discusses various causes of disaster in mines and suggests certain precautions which should be taken. 20c.

7125 EXPLOSIONS Preventing Mine Explosions. George H. Ashley. (Mines and Minerals, August, 1908; 2 pp.) A method of working and ventilating is suggested, by which explosions may be prevented or their effects greatly minimized. [illegible]

7126 EXPLOSIVES The Use of Explosives in Collieries. W[illegible] M[illegible] [illegible] in explosives, the determining factors in the ignition of fire damp, blasting in the presence of [illegible] tion of accidents in collieries. 40c.

7127 FIRE Report on the Hamstead Colliery Fire. (Coll. Guard., Aug. 14, 1908; 4 pp.) Reprint of the report of R. A. S. Redmayne on the causes and circumstances attending the underground fire at this colliery near Birmingham, England, March 4, 1908. The rescue [illegible] conditions prior and subsequent to the disaster. 40c.

7128 FIRE The Lessons of the Hamstead Disaster. (Coll. Guard., Aug. 14, 1908; [illegible]) This editorial comments on the method of ventilation used, and discusses the subject of reversing the fan and the importance of providing breathing appliances. 40c.

7129 FUEL INVESTIGATION The Investigation of Fuels and Structural Materials by the Technologic Branch of the United States Geological Survey. Joseph A. Holmes. (Paper read before the A. I. M. E., February, 1908, 20 pp.) Outlines the work that has already been done, and the plans for the future in the investigation of fuels and structural materials by the United States Geological Survey.

7130 —GREAT BRITAIN—Coal Mines Inspection in 1907. (Coll. Guardian, Aug. 7, 1908; 27 pp.) Annual supplements that deals with the reports of mine inspectors, production, accidents and other data relating to the coal mines of the United Kingdom. [illegible]

7131—HAULAGE—A Discussion of Mine Curve Problems. J. E. Tiffany. (Eng. and Min. Journ., Aug. 1, 1908; 5½ pp.) The output of a coal mine is often limited by a haulage load having steep grades and abrupt turns. The [illegible] is discussed fully. Illustrated. 20c.

7132 HAULAGE Some Practical Benefits from Rope Haulage. (Black Diamond, Aug. 22, 1908; 2½ pp.) The advantages of rope haulage compared to mule haulage are discussed and the costs of the two compared. Methods of diminishing friction in rope haulage systems is described. 20c.

7133 HOISTING Energy Calculations in Coal Winding. R. Livingsto[illegible] July 10, 1908; 5 pp.) The [illegible] particularly to the Thury system, where the [illegible] calculating horse-power required are applicable to [illegible]

7134 MEXICO Coal Mines of Mexico. Manuel Schwarz. (Mines and Minerals, August, 1908; 1½ pp.) Describes the location of the different coal basins, the railroad connections, extent of development and output. Illustrated. 20c.

7135 MINING METHOD [illegible] the subject of ventilating by various methods. Relation of open-work area to working costs. The proper arrangements of grades. Illustrated. [illegible]

7136 MINING METHOD [illegible]ing Method for Pittsburg Seam. R. Y. Williams. [illegible] A new plan for mining the Pittsburg No. 8 bed [illegible] 20c.

7137—NEW SOUTH WALES—Geology and Mineral Resources of the Western Coalfield. J. E. Carne. (Memoirs Geol. Sur. New South Wales, Geology, No. 6, 264 pp. with maps and sections.) This memoir, with the accompanying maps and sections dealing with the Western coalfield, is the first instalment of a systematic geological survey of the productive coal measures of New South Wales. The geology of the field is taken up in great detail and the book is illustrated by many photographs and cuts.

7138—PEAT COAL. (Iron and Coal Tr. Rev., July 17, 1908; 1¾ pp.) Describes the experimental plant at Stafsjo, Sweden, for carbonizing peat by the Ekenberg wet process. Illustrated. 40c.

7139—POWER PLANT—A Large South Wales Colliery Power Plant. (Electrician, July 31, 1908; 4¾ pp.) Describes the installation of a power plant which furnishes current to operate nine collieries in South Wales. Illustrated. 40c.

7140—POWER PLANT—The Yatesboro Power Plant. C. M. Means. (Mines and Minerals, August, 1908; 3¾ pp.) Describes the power plant of the Cowanshannock Coal and Coke Company, including the turbo-generators and motors using a high voltage current. Illustrated. 20c.

7141—POWER STATIONS—The Employment of Storage Batteries in Colliery Power Stations. William Maurice. (Electrician, July 10, 1908; 3½ pp.) The load on a colliery power plant varies continually, and to off-set this, storage batteries have been found to be economical. Illustrated. 40c.

7142—PURCHASE AND USE—Some Things a Power User Should Know About Coal. E. G. Bailey. (Can. Engr., Aug. 7, 1908; 2½ pp.) Points out that the maufacturerer dependent upon coal should know where he can always obtain it, the source of suitable coal, the most economical coal and how to use fuel properly. Under these heads the author discusses consumption of fuels. 20c.

7143—SAFETY IN COAL MINES. Mel. Butler. (Eng. and Min. Journ., Aug 15, 1908; 1¼ pp.) Discusses the questions of examination for miners; apprenticeship for miners; clearance or service letters and improvement in the camp living conditions. 20c.

7144—SAFETY IN COAL MINES—The Protection of Coal Miners. (Eng. and Min. Journ., Aug. 1, 1908; ¾ p.) Gives 18 rules and regulations employed by the United States Coal and Oil Company, of West Virginia, in order to protect its miners from accidents while at work in the mines. 20c.

7145—SHOT FIRING BY ELECTRICITY. D. Harrington. (Mines and Minerals, August, 1908; 2½ pp.) Describes the method used at the mines of the Utah Fuel Company of firing all shots from the surface. Illustrated. 20c.

7146—SWITCHGEAR for Mines. H. W. Clothier. (Electrician, July 10, 1908; 6½ pp.) Describes the switches and other electrical apparatus used in the transmission of electrical power to coal cutters and other machinery in coal mines. Illustrated. 40c.

7147—SWITCHGEAR—Some Examples of Switchgear for Mines. (Electrician, July 10, 1908; 8 pp.) Describes high-tension switchboards, switches and various pieces of electrical apparatus used in and around coal mines in England. 40c.

7148—TIPPLES—Steel Tipples and Bins. W. R. Elliott. (Mines and Minerals, August, 1908; 2¼ pp.) Precautions advisable in design to insure the preservation of tipples at bituminous coal mines. Causes of deterioration. Illustrated. 20c.

7149—WASHERY—A Modern Coal Washery in New Mexico. (Eng. and Min. Journ., July 25, 1908; 2⅓ pp.) Describes the installation, equipment and general methods of operation of the large coal-washing plant of the Dawson Fuel Co., recently completed at Dawson, N. M. 20c.

7150—WYOMING—The Union Pacific Coal Mine at Rock Springs, Wyoming. Benedict Shubart. (Min. and Met. Journ., July 10, 1908; 3⅔ pp.) Output, equipment, present operations, etc., of one of the foremost coal mines in the West. 20c.

COPPER

7151—ALASKA—The Copper Deposits of Kasaan Peninsula, Alaska. C. W. Wright. (Econ. Geol., July-Aug., 1908; 7 pp.) The geology of this peninsula, which is composed of stratified and igneous rocks, is outlined, and the general characteristics of the different deposits, in which chalcopyrite is the main copper-bearing mineral, are described. 60c.

7152—BLAST FURNACE SLAG—Alumina in Copper Blast-Furnace Slags. Charles F. Shelby. (Eng. and Min. Journ., Aug. 8, 1908; 6 pp.) A study of a variety of slags with evidence to show that alumina invariably acts as an acid combining with more basic oxides. 20c.

7153—BRASS WASTE—The Treatment of Ashes, Skimmings, Sweeps, Slags and Other Refuse by the Brass Rolling Mills in the United States. Erwin S. Sperry. (Brass Wld., August, 1908; 2¾ pp.) Describes the method for disposing of waste material and for the recovery of useful metals therefrom. Illustrated. 20c.

7154—CONSUMPTION of Copper in the United States in 1907. (Eng. and Min. Journ., July 25, 1908; ½ p.) Gives the consumption of refined copper in the United States, and contains a detailed discussion of the consumption of various classes of copper during the year 1907. 20c.

7155—COPPER IN SANDSTONE. W. Jenks. (Min. Sci., Aug. 20, 1908; 1 p.) In the first article of the series some of the earlier contributions to the study of this subiect are stated; then the characteristics of such occurrences in the Nacimento mountains of New Mexico, and the genesis of these deposits are discussed. 20c.

7156—COST of Producing the World's Supply of Copper. James Ralph Finlay. (Eng. and Min. Journ., July 25, 1908; 3¼ pp.) The great producing mines are divided into three classes and the costs per pound of metal for each class are compared. 20c.

7157—MANUFACTURING—The Direct Production of Copper Tubes, Sheets and Wire. Sherard O. Cowper-Coles. (Iron and Coal Tr. Rev., July 31, 1908, 1 pp.) Describes the Wilde, Dumoulin and other processes for the direct manufacture of copper tubes, sheets and wire by electrical deposition. Illustrated. 40c.

7158—NEVADA—Mining and Reduction of Ely Ores. R. L. Herrick. (Mines and Minerals, August, 1908; 4 pp.) A description of the ores, geological conditions, methods of mining, and transportation facilities of this Nevada camp. To be continued; illustrated. 20c.

7159—STEAM SHOVEL in Copper Mining, Ely, Nevada. F. S. Pheby. (Min. and Sci. Press, Aug. 1, 1908; ½ p.) Gives brief notes on steam-shovel practice at the Nevada Consolidated Copper Company's property. 20c.

CORUNDUM AND EMERY

7160—MANUFACTURE OF EMERY WHEELS. (Iron Tr. Rev., Aug. 13, 1908; 2⅓ pp.) Describes the recently completed plant of the Pittsburg Emery Wheel Company at Rochester, Penn. Illustrated. 20c.

FLUORSPAR

7161—OCCURRENCE AND USES of Fluorspar. W. M. Egglestone. (Trans. North of Eng. Inst. Min. and Mechan. Eng., Vol. LVIII, Part 4, May, 1908; 32 pp.) Describes the occurrence of fluorspar in England, its use for ornamental purposes, and as a flux for lead and iron smelting.

GOLD AND SILVER

7162—BOLIVIA—Through the Bolivian Highlands. E. P. Mathewson. (Min. and Sci. Press, Aug. 15, 1908; 2 pp.) Gives a series of notes upon the mining industry and general conditions in Bolivia. To be continued. 20c.

7163—CAMP BIRD MINE—Discovery of the Camp Bird Mine. Thomas F. Walsh. (Eng. and Min. Journ., Aug. 1, 1908; 1⅓ pp.) Describes the peculiar conditions under which a number of mines in Colorado were discovered, including the discovery of a mine from samples taken from the roof of a cabin.

7164—COLORADO—Primary Gold in a Colorado Granite. John B. Hastings. (Paper read before the A. I. M. E., Feb. 1908; 6½ pp.) Discusses the occurrence of gold in the lacustrine sands in Park county, Colo. Sketch map of test shafts.

7165—COLORADO—The Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., Aug. 13, 1908; 2½ pp.) This is the fifth article of the series and briefly describes the Portland, Elkton, Vindicator, El Paso, Mary McKinney, Granite and Findley mines. To be continued, illustrated, 20c.

7166—CYANIDE SAND HANDLING at the Robinson Mine. Albert F. Crank. (Min. Journ., July 25, 1908; 1⅓ pp.) Describes the methods used to handle large tonnages of sand and slime with the least amount of manual labor. Illustrated. 40c.

7167—CYANIDATION in Mexico. F. J. Hobson. (Min. and Sci. Press, Aug. 1 and 8, 1908; 5 pp.) Gives valuable data on cyanide practice in Mexico. The second instalment deals with the chemistry of the cyanide process applied to silver sulphide ores in Mexico. Illustrated. 40c.

7168—CYANIDATION in the Malay States. H. F. Lofts. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1908; 1½ pp.) A description of the plant at the only working gold mine in the Malay States. Contains assays of the tailings and the results of concentration by means of Wilfley tables, and the treatment by cyanide. 60c.

7169—CYANIDATION—Operating Costs, Homestake Slime Plant. C. W. Merrill. (Eng. and Min. Journ., Aug. 22, 1908; ½ p.) Contains a tabulated and analyzed statement of the operating costs at the Homestake plant during March, 1908. 20c.

7170—CYANIDATION—The Adair-Usher Process. Alfred Adair. (Journ. Chem. Met. and Min. Soc. of South Africa, May, 1908; 9½ pp.) Describes the use of umber in the treatment of slime. Contains details of the experiments and a description of the Usher washing apparatus used in connection with this treatment. 60c.

7171—DREDGE WORKING in Severe Cold. E. N. Barbot de Marny. (Min. Journ., Aug. 1, 1908; ¾ p.) Describes the operation of a gold dredge in Russia when the work was carried on in severe weather. 40c.

7172—DREDGING—Recent Developments in Gold Dredging. F. W. Griffin. (Min. and Sci. Press, Aug. 15, 1908; 4½ p.) Recent improvements in gold-dredging machinery are discussed; the method of dredging used at Folsom, Cal., is described, and the construction of No. 6 dredge of Folsom Development Company is described in detail. 20c.

7173—DEPOSITION OF GOLD—New Theory of Bed-rock Concentration of Gold. (Min. and Sci. Press, Aug. 15, 1908; ½ p.) In this editorial the explanation of the settling of gold particles in moving gravel is extended so as to include concentration of gold during the downward movement of surface soil in valleys, etc. 20c.

7174—DEPOSITION OF GOLD—Some Principles of Concentration in River-Bed Gravels. James Park. (Min. Journ., Aug. 1, 1908; ¾ p.) Discusses the principles by which gold is deposited on the beds and along the banks of rivers. Illustrated. 40c.

7175—ELECTRO-CYANIDE PROCESSES. (Aust. Min. Stand., July 8, 1908; 1⅓ pp.) Describes the method of precipitating precious metals by electrolysis and gives the conditions governing precipitation. 40c.

7176—FILTER PRESSING—The Use of Filter Presses for Clarifying Decanted Slime Solution. W. R. Dowling. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1908; ¾ p.) Describes the installation of a filter press to clarify the solutions at the Knights Deep mine on the Rand. 60c.

7177—HYDRAULIC MINING—The Blowing-Down System of Sluicing. J. Park. (Min. and Sci. Press, Aug. 15, 1908; 1 p.) This abstract from "Geology of Cromwell Subdivision," Bull. 5. New Zealand Geol. Surv., describes this system of sluicing as used in that district. 20c.

7178—IDAHO—Atlanta Gold District, Idaho. Robert N, Bell. (Eng. and Min. Journ., July 25, 1908; 1⅓ pp.) Describes the mines of the district, and also the new mill of the Bagdad-Chase Gold Mining Company, of Rochester, N. Y., which operates the Pettit mine in the Atlanta district. Illustrated. 20c.

7179—MADAGASCAR—The Gold Fields of North Madagascar. (So. African Min. Journ., July 18, 1908; 1 p.) Describes the methods of working, the tribute system, geology and mineralogy and output to date of this gold field. To be continued. 20c.

7180—METALLURGICAL PROGRESS—Gold: Its History and Economic Development II. Evans W. Buskett. (Min. Wld., Aug. 8, 1908; 2½ pp.) Operation of the amalgamation, chlorination of cyanidation processes as well as a brief review showing the progress in the metallurgy of gold. 20c.

7181—MEXICO—Mines of Peñoles Company, Mapimi, Mexico.—I. Claude T. Rice. (Eng. and Min. Journ., Aug. 15, 1908; 5½ pp.) The ore occurs in chimneys and pipes in limestone; some modern mining methods, including use of diamond drills, are employed. Illustrated. 20c.

7182—MEXICO—Smelter of Peñoles Company, Mapimi, Mexico.—II. Claude T. Rice. (Eng. and Min. Journ., Aug. 22, 1908; 2 pp.) Several innovations have been introduced; when work of centralization is completed the plant will be one of the most modern in Mexico. Illustrated. 20c.

7183—MEXICO—The Silicious Silver Mines of Parral, Mexico. Claude T. Rice. (Eng. and Min. Journ., Aug. 8, 1908; 5 pp.) The mines of the district, the geology and cyanide treatment of low-grade ores are described. Illustrated. 20c.

7184—MEXICO—The Silver-Lead Mines of Santa Barbara, Mexico. Claude T. Rice. (Eng. and Min. Journ., Aug. 1, 1908; 5 pp.) Milling in this district has been highly developed, owing to the early recognition of the importance of the mixed sulphide ores. Illustrated. 20c.

7185—MEXICO—The Tabatacochi Mining District. (Min. and Met. Journ., July 17, 1908; 2 pp.) A description of the mining properties situated in this mining district of Sonora, Mexico.

7186—MILL—Inexpensive Home-Made 20-ton Mill. T. Kohncke. (Min. and Sci. Press, Aug. 8, 1908; 1¼ pp.) Describes a crude mill built in Central America to treat ore overlooked by former operators. Illustrated. 20c.

7187—MILL—Yellow Jacket Mill, Comstock Lode. W. Symmes. (Min. and Sci. Press, Aug. 1, 1908; 1½ pp.) The general conditions at the Comstock lode are discussed and the mill described. 20c.

7188 MILLING AND CYANIDE PRACTICE. San Prospero Mill, Guanajuato. J. S. Butler. (Min. and Sci. Press, July 25, 1908; 2½ pp.) Describes the handling of sand and the extraction of gold from the slimes at this Mexican mill. Contains data on the extraction by cyanide. 20c.

7189 NEW MEXICO—The Cochiti Mining District, New Mexico. Percy E. Barbour. (Eng. and Min. Journ., July 25, 1908; 2¼ pp.) A low grade gold-silver camp which has a reputation for failure but which possesses many promising though unexplored veins. Illustrated. 20c.

7190 ONTARIO—Property and Prospects of La Rose Mines, Cobalt. Alex. Gray. (Min. Wld., Aug. 15, 1908; 1 pp.) Describes the geology and development of this property, the ore shipments during the last four years and analysis of the engineers' reports, the ore reserves and prospective profits. Illustrated. 20c.

7191 PLACER DISCOVERY—What Constitutes a Placer Discovery. (Min. and Sci. Press, Aug. 15, 1908; ½ p.) The decision in the "Jimtilla" case regarding what constitutes a placer discovery in Alaska is discussed in this editorial. 20c.

7192 PLACER MINING—Application of Water Power in Placer Work. Philip S. Smith. (Min. Sci., July 16, 1908; 2 pp.) A novel use of a simple water wheel in the operation of scrapers for removing gravel and tailings. Illustrated. 20c.

7193 PORTO RICO—Gold Mining in Porto Rico. W. B. McKinlay. (Min. and Sci. Press, July 18 and 25, 1908; 3½ pp.) Deals with the history of gold mining including the old Spanish gold weights, and gives the production of gold in the first half of the 16th century. 40c.

7194 QUEENSLAND—The Mt. Morgan Mine. O. M. Colvocoresses. (Mines and Minerals, August, 1908; 2 pp.) Describes this famous gold mine in Queensland which has produced about $75,000,000 in gold and which has paid in dividends about $40,000,000 since its discovery. 20c.

7195—RAND MINING COSTS and Profits Reviewed. (So. African Min. Journ., June 27, 1908; ¾ p.) The costs and profits during the months of January and May are compared. Of the 63 companies which have declared their working profits, 39 show increases per ton milled, 22 show decreases and 1 is exactly the same. 20c.

7196 RAND PRACTICE—New Mining and Milling Practice on the Rand. Eustace M. Weston. (Eng. and Min. Journ., Aug. 15, 1908; 1¼ pp.) Recent improvements in efficiency and reduced cost have put criticism, based upon conditions of two years ago, entirely out of date. 20c.

7197 SILVER-ORE TREATMENT—Some Features of Silver-Ore Treatment in Mexico. W. A. Caldecott. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1908; 1½ pp.) This is a discussion of the paper by W. A. Caldecott, and treats of the theoretical consideration of the cyanidation of silver ores in Mexico. 60c.

7198 SLIME FILTER—Continuous Slime Filter. Robert Schorr. (Min. and Sci. Press, Aug. 8, 1908; 2 pp.) Describes the Schorr continuous slime filter and outlines the steps in the process. Illustrated. 20c.

7199 STAMP MILL—The San Rafael Mill at Pachuca. Mark R. Lamb. (Eng. and Min. Journ., Aug. 15, 1908; 1 p.) Briefly describes the installation of the 60-stamp mill at this company's property in Mexico. Illustrated. 20c.

7200 STAMP MILLING—Notes on the Stamp Mill Water Feed and Backed Up Dies Introducing the Shallow Front Mortar Box. Harry T. Pitt. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1908; 3¼ pp.) Discusses various methods of water feed and a number of trials stamping varying amounts of coarse and screened rock. Illustrated. 60c.

7201 TUBE MILL—The Hardinge Conical Pebble Mill. H. W. Hardinge. (Paper to be read before the A. I. M. E., Oct., 1908; 5 pp.) This tube mill consists of two cones placed base to base and this construction effects a sizing of the crushed material. Illustrated.

7202 TUBE MILL CRUSHING. E. B. Wilson. (Mines and Minerals, August, 1908; 3 pp.) Use of tube mills for crushing in connection with the cyaniding of slime. Different styles of mills. Illustrated. 20c.

7203 TUBE MILL PEBBLES—A Laboratory Comparison of Tube Mill Pebbles. G. H. Stanley. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1908; 2¼ pp.) Describes a microscopic examination of Rand and imported pebbles and a study of the physical and chemical differences. Illustrated. 60c.

7204 WASHINGTON—Northport and Its Mines. (Northwest Min. News, July, 1908; 3 pp.) Describes the operation of the Northport smelter and the principal mines and prospects of this district of Washington. Illustrated. 20c.

7205—WEST AUSTRALIA—Tellurides of Kalgoorlie. Donald Clark. (Aust. Min. Stand., June 17, 1908; 1 p.) Describes a test for the qualitative determination of tellurides at Kalgoorlie, Western Australia, together with [illegible]. 40c.

7206 WEST AUSTRALIA—The Kimberley Goldfields. [illegible] (Aust. Min. Stand., August, 1908; 1 p.) Briefly [illegible] the geology of this West Australian District. 20c.

IRON AND STEEL

7207 ALABAMA—Gray Hematite [illegible] (Iron Tr. Rev., Aug. 6, 1908; 3½ pp.) Discusses the location, history and development, geology of the district, form and origin of the ore deposits, character and grades of the ores, probable tonnage and furnace utilization of these iron ores. 20c.

7208 ANALYSIS—The Determination of Vanadium, Molybdenum, Chromium and Nickel in Steel. Andrew A. Blair. (Journ. Am. Chem. Soc., August, 1908; 3 pp.) [illegible] to separate the rare metals in steel, the author discovered that molybdenum was separated with the iron in the ethereal solution of ferric chloride, and that this gives a perfect separation of molybdenum from vanadium, chromium, copper, manganese, nickel and aluminum in steel or iron. 80c.

7209—BLAST FURNACE—The New Vanderbilt Furnace of the Birmingham Coal and Iron Company. (Iron Tr. Rev., Aug. 6, 1908; 5 pp.) This is a southern furnace fitted with a revolving distributor, auxiliary dust catchers and many devices looking to economical operation. Illustrated. 20c.

7210 BLAST FURNACE PRACTICE—Recent Progress and Present Problems in the Blast-Furnace Industry. John J. Porter. (Mech. Engr., July 17, 1908; 3¼ pp.) Discusses dry-air blast, the distribution of costs at the Northern and Southern furnaces, heat required per pound of coke, blast problems, efficiency of hot-blast stoves, use of gas engines and various other subjects connected with the operation of a modern blast furnace. Conclusion. 20c.

7211—CARBON-IRON DIAGRAM. Henry M. Howe. (Paper read before the A. I. M. E., February, 1908; 67 pp.) Discusses the carbon-iron diagram which has become famous among steel and iron metallurgists. The paper gives the reasons which led to Roozeboom's form of the diagram of the freezing-point curves and general equilibrium of the iron-carbon compounds, steel and cast iron; and then those which led them to replacing it with the present single or double diagram.

7212 CASTINGS—Hard Spots in Steel Castings, with an Account of Certain Diffusion Phenomena. Arthur P. Scott. (Electrochem. and Met. Ind., August, 1908; 2½ pp.) Conclusion of a previous article on this subject and discusses the practical and theoretical considerations relative to the formation of hard spots in steel castings. 40c.

7213 COLORADO FUEL AND IRON COMPANY'S PLANT at Minnequa, Colorado. George J. Bancroft. (Min. Sci., July 16, 1908; 5 pp.) Describes the blast furnaces, steel works, rolling mills, sheet and tin-plate mills, wire plants, cast-iron pipe foundry and general equipment of the Minnequa works of the Colorado Fuel and Iron Company. Illustrated. Continuation of article previously indexed. 20c.

7214 CORROSION—Report of Committee Upon the Corrosion of Iron and Steel, American Society for Testing Materials. (Chem. Engr., July, 1908; 6 pp.) Outlines a series of tests to be made to determine if it is possible to manufacture steel or iron which shall be highly resistant to corrosion; study of the methods of coating with other metals, such as zinc, copper, lead, nickel, etc.; study of effects of physical conditions of surface on resistance to corrosion, study of excluding coatings, such as pigments, [illegible]. 40c.

7215 DULUTH STEEL PLANT—[illegible] (Eng. and Min. Journ., Aug. 15, 1908; [illegible]) [illegible] at Duluth.

7216 ELECTRIC SMELTING—[illegible] (Journ. of Electricity, Power and Gas, July 18, 1908; 3 pp.) Discusses the history of iron smelting in the electric furnace, and then describes the furnace itself [illegible]. Illustrated. 20c.

7217 ELECTRIC SMELTING—Treatment of Iron and Steel in the Electric Furnace. Ernesto Stassano. (Electrochem. and Met. Ind., August, 1908; 6 pp.) Describes the operation of and results obtained from the [illegible]

[illegible] Illustrated. [illegible]

7218 [illegible] METALLURGY [illegible]

7219 ENGLAND [illegible] mining the large orebodies [illegible] is employed with varying [illegible]

7220 HARDENING HIGH-SPEED STEEL [illegible] replace the lead bath. The surfaces and cutting edges of tools are not impaired and the accuracy of size is not [illegible]

7221 HEAT TREATMENT [illegible]

7222 STEEL RAILS [illegible] of the author leads to the conclusion that [illegible]

7223 STRUCTURAL STEEL [illegible] Boilers and Machinery Under Board of Trade Survey. (Iron and Coal Tr. Rev., July 17, 1908; 1½ pp.) [illegible]

7224 SWEDEN [illegible]

7225 TOOL STEEL MAKING [illegible] Quarterly, July, 1908; 12½ pp.) Some notes on the history of steel making [illegible]

7226 UTAH—The Iron Ores of the Iron Springs District, Southern Utah. [illegible] and E. C. Harder. (U. S. Geol. Surv. Bull. 338, 1908; 102 pp.) Describes the geography, topography, general geology, sedimentary formations, igneous rocks, description of the iron ores and [illegible]

7227 VANADIUM DETERMINATION [illegible] Edward DeMille Campbell and Edwin Le Grand Woodhams. (Journ. Am. Chem. Soc., August, 1908; [illegible])

LEAD

7228 ANALYTICAL METHOD—Determination of Lead in [illegible]

7229 RUSSIA [illegible] A. Meyer. (Eng. and Min. Journ., July 25, 1908; 3¼ pp.) Galena [illegible]

7230 SMELTING [illegible] furnace and shows the steps in the reduction [illegible]

7231 SMELTING [illegible]

7232 SPAIN [illegible]

MANGANESE

7233—PRODUCTION of Manganese Ores in 1907. E. C. Harder. (U. S. Geol. Surv., 1908; 28 pp.) Describes the uses, prices, production, occurrence and statistics of manganese ores, manganiferous ores, ferro-manganese and speigeleisen in the United States.

MINERAL PAINTS

7234—PRODUCTION of Mineral Paints in 1907. E. F. Burchard. (U. S. Geol. Surv., 1908; 15 pp.) Gives statistics of ocher, umber and sienna; metallic paint; pigments made directly from ores; chemical pigments in colors and paint test.

MOLYBDENUM

7235—OCCURRENCE AND USES of Molybdenum Ores. (Bull. Imp. Inst., Vol. VI, No. 2; 10 pp.) Describes the composition, the occurrence in Europe, South Africa, Australia, North, South and Central America and Asia of deposits of molybdenum, discusses the commercial value, the technology and uses of molybdenum and its salts. 40c.

NICKEL

7236—CANADA—Nickel Deposits of Sudbury in Canada. (Bull. Imp. Inst., Vol. VI, No. 2, 1908; 4 pp.) Describes the geology, mode of occurrence of the deposits, methods of mining and other details of this important nickel field of Canada. 40c.

7237—ELECTRODEPOSITION of Nickel. E. F. Kern and F. G. Fabian. (Sch. Mines Quart., July, 1908; 29 pp.) Describes a series of elaborate experiments upon the deposition of nickel by electrolysis. Contains much data relative to the experiments. 60c.

PETROLEUM

7238—BARBADOS—The Petroleum and Manjak Industry of Barbados. Edmund O. Hovey. (Min. Wld., Aug. 15, 1908; 1¾ pp.) There is an intimate relation between petroleum and the manjak of Barbados, the latter being derived directly from the former. 20c.

7239—FIRE—The Great Oil Fire in Mexico. (Petrol. Rev., Aug. 15, 1908; ½ p.) The method to be used in attempting to put out the fire at this immense "gusher" is outlined.

7240—NEW ZEALAND—The Quest for Oil in the Poverty Bay District. William E. Akroyd. (New Zealand Mines Rec., May 16, 1908; 3¾ pp.) Discusses the three principal oil districts of New Zealand and forecasts the future of this industry in New Zealand. 40c.

7241—OHIO—Structure of the Berea Oil Sand in the Flushing Quadrangle, Harrison, Belmont Counties, Ohio. W. T. Griswold. (U. S. Geol. Surv., Bull. 346, 1908; 30 pp.) Report of the work undertaken to determine accurately the geologic structure of the Berea oil sand, and from this structure to determine, if possible, where the conditions are favorable for the accumulation of oil and gas.

7242—PETROLEUM INDUSTRY. (Chem. Tr. Journ., July 25, 1908; 4 pp.) Describes the past, present and future conditions of the petroleum industry in an address by the president of the Society of Chemical Industry.

7243—ROUMANIA—The Petroleum Industry of Roumania. V. Toroceanu. (Petrol. Rev., Aug. 15, 1908; 3 pp.) Translation of article in the *Moniteur du Petrole Roumain*, giving information regarding the various fields, including statistics of production for several years. 40c.

7244—TRINIDAD—Oilfields of Trinidad. (Bull. Imp. Inst., Vol. VI, No. 2, 1908; 4½ pp.) Describes the geology and occurrence of oil in Trinidad, based upon reports of the government geologist. 40c.

PLATINUM

7245—PLATINUM SITUATION. (Min. Journ., July 25, 1908; ¾ p.) Describes the situation in the platinum industry in Russia and in Colombia. Translated from *Torgovo Promysshlennaya Gazeta*. 40c.

POTASSIUM SALTS

7246—POTASSIUM CHLORIDE of the Upeo Plateau, Chile. Julio Schneider. (Min. Journ., July 11, 1908; ½ p.) Discusses the occurrence of potassium chloride and the theory as to how this salt was deposited. 40c.

PRECIOUS STONES

7247—ALLUVIAL DIAMOND MINING. P. B. Holte. (Mines and Minerals, August, 1908; 1 p.) Describes the nature of the ground, the methods and apparatus for washing, and gives a list of the literature on the subject of diamond mining. 20c.

SALT

7248—SALTON SEA—Evaporation from the Salton Sea. C. E. Grunsky. (Eng. News, Aug. 13, 1908; 3¼ pp.) Describes the recovery of salt from the Salton Sea in California, the surface of which is 200 ft. below sea level. Contains data on the evaporation, temperature, rainfall, etc. Illustrated. 20c.

TIN

7249—BOLIVIA—The Tin Deposits of Bolivia. Eduardo A. L. DeRomana. (Min. Journ., July 11, 1908; ½ p.) The history, geography and geology of the Bolivian tin deposits is discussed, together with the characteristics of the principal deposits. 40c.

7250—CONCENTRATION—New Methods of Concentrating Alluvial Tin. H. D. Griffiths. (Min. Journ., July 11, 1908; ½ p.) Describes new methods introduced at the Kuils River tin mines, Cape Colony, which consist in effecting a coarse concentration by means of a rotary pan, similar to that used in diamond washing, and then cleaning the rough concentration in a hydraulic separator to the grade required. 40c.

7251—CORNISH TIN MINING. (Eng. and Min. Journ., July 25, 1908; ½ p.) The production of tin from the various mines in Cornwall is given, as well as the average price received for the output of these mines during the last eight years. 20c.

7252—MALAYA—Mining Lode Tin in Malaya. (Eng. and Min. Journ., Aug. 22, 1908; 1⅓ pp.) Describes the mining districts and the ore occurrence in Malaya and gives an outline of the operations of several companies in the district. 20c.

7253—QUEENSLAND—Stanhills Tinfields. B. Dunstan. (Queens. Gov. Min. Journ., June 15, 1908; 4 pp.) Discusses the geology, the mines, the alluvial deposits and prospects of this tinfield in Queensland. Illustrated. 60c.

7254—SOUTH AFRICA—The Groenfontein Tin Plant. (So. African Min. Journ., July 4, 1908; ¾ p:) Describes methods for the recovery of tin in the Potgietersrust field, and also a new plant which is to be built. 20c.

7255—SOUTH AFRICAN TIN DEPOSITS. W. R. Rumbold. (Paper read before the A. I. M. E., April, 1907; 7 pp.) From an economic point of view the South African tin fields are, so far, distinctly disappointing. The Cape Town field offers the most encouraging prospect for future development. Illustrated.

TUNGSTEN

7256—CALIFORNIA—Tungsten at Victorville. Gordon Surr. (Am. Min. Rev., July 11, 1908; 1 p.) A description of a newly discovered deposit of tungsten ore in San Bernardino county, Cal. 20c.

ZINC

7257—GREAT BRITAIN—Zinc Mining in Great Britain. (Engineering, July 24, 1908; 1 p.) Discusses the occurrence of zinc ore throughout Great Britain, and briefly describes the state of the industry. 40c.

7258—SAMPLING AND BUYING ORES in the Joplin District. Evans W. Buskett. (Eng. and Min. Journ., July 25, 1908; 1 p.) Describes the basis upon which zinc ore is bought, and mentions the premiums and deductions for zinc and iron. Describes the instrument used for sampling and the method of taking the sample. 20c.

7259—SMELTING—Zinc and Lead Smelting in Silesia. J. S. G. Primrose. (Eng. and Min. Journ., Aug. 8, 1908; 4 pp.) See under "Lead."

ECONOMIC GEOLOGY—GENERAL

7260—ASIA—A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet. S. G. Burrard and H. H. Hayden. (Geol. Surv. of India, Parts I, II and III, 1907; 230 pp.) Part I, The High Peaks of Asia; Part II, The Principal Mountain Ranges of Asia; Part III, The Rivers of the Himalaya and Tibet. Illustrated.

7261—BRITISH COLUMBIA—The Correlation of International Strata.—III. H. F. Evans. (Min. Wld., Aug. 15, 1908; ¾ p.) Describes the relation existing between the Pre-Cambrian, Archaen, Devonian, and Silurian rocks in the Dominion of Canada. 20c.

7262—CHINA—Mineral Resources of China. J. A. Church. (Econ. Geol., July-Aug., 1908; 2½ pp.) Discussion of paper by B. Willis. Additional information is given regarding this subject. 60c.

7263—CORNWALL—Geological Aspect of the Lodes of Cornwall. D. A. MacAlister. (Econ. Geol., July-Aug., 1908; 17 pp.) The history of mining in Cornwall is first outlined; then the general geology of the region, the structure of the lodes, the relation of the tin and copper ores to the granite, the amount of oxidation of the ores and the genesis of the minerals are discussed. 60c.

7264—GENESIS OF ORE—A Graphic Comparison of the Alteration of Rocks by Weathering with Their Alteration by Hot Solutions. E. Steidtmann. (Econ. Geol., July-Aug., 1908; 28 pp.) Discusses the alteration of rocks by hot solutions in the Clifton-Morenci district, both in respect to the chemical and the mineralogical changes involved; then treats of alteration of rocks by weathering in respect to the chemical and mineralogical changes involved; finally, compares the effects of these two modes of alteration. 60c.

7265—LOCALIZATION OF VALUES IN ORE BODIES and the Occurrence of Shoots in Metalliferous Deposits. H. V. Winchell. (Econ. Geol., July-Aug., 1908; 3 pp.) Discusses separately the causes of localization that existed prior to, and that arose subsequent to the formation of the ore deposit. 60c.

7266—MEXICO—Geology of the Mining Districts of Chihuahua, Mexico. R. M. Bagg, Jr. (Min. and Sci. Press, Aug. 1 and 8, 1908; 4 pp.) Describes the ore deposits in solution-chambers in sedimentary rocks; in true fissures; in fault-zones and in zones of shearing. Illustrated. 40c.

7267—NEW MEXICO—Geotectonics of the Estancia Plains. C. R. Keyes. (Journ. of Geol., July-Aug., 1908; 17 pp.) The dynamic geology of this portion of central New Mexico is discussed. 50c.

7268—NEW MEXICO—The Ore Deposits of Magdalena, New Mexico. Philip Argall. (Eng. and Min. Journ., Aug. 22, 1908; 5 pp.) Hematite and zinc blende are found associated at the ground-water level, creating a zone of impoverishment instead of one of enrichment. Illustrated. 20c.

7269—NEW YORK—Highly Folded Between Non-Folded Strata at Trenton Falls, N. Y. W. J. Miller. (Journ. of Geol., July-Aug., 1908; 5 pp.) Describes a case of such a peculiar occurrence in the Trenton limestone, and gives different theories regarding the cause. 60c.

7270—ORE DEPOSITION—A Theory of Ore Deposition. F. L. Ransom. (Econ. Geol., July-Aug., 1908; 5 pp.) Discusses the hypothesis regarding ore deposition suggested by Mr. Spurr, especially in regard to the originality of the hypothesis. 60c.

7271—ORE DEPOSITION—Diffusion as a Factor in Ore Deposition. H. H. Knox. (Min. and Sci. Press, Aug. 1, 1908; ½ p.) The original paper by Lewis T. Wright is discussed, and the Soret principle of segregation is defended. 20c.

7272—ORIGIN OF AUGITE ANDESITE and of Related Eltra-Basic Rocks. R. A. Daly. (Journ. of Geol., July-Aug., 1908; 20 pp.) The scattered facts gathered from experimental and field study of this subject are correlated and the conclusion reached that fractional crystallization is very potent in the formation of igneous rocks. 60c.

7273—PEGMATITE—Origin of Pegmatite. John B. Hastings. (Paper read before the A. I. M. E., Feb. 1908; 24½ pp.) Contains the definition of pegmatite by various authorities and discusses its occurrence in various parts of the world.

7274—SOUTH AMERICA—Natural Soda and Other Deposits of the Atacama Desert, Argentine-Chilian Andes. Fritz Reichert. (Min. Journ., July 11, 1908; ¾ p.) Contains a description of the deposits of soda, sulphur, gold, alum and pyrites in the mountains between Argentine Republic and Chile. 40c.

7275—VOLCANIC WATERS. John B. Hastings. (Read before the A. I. M. E., Feb., 1908; 10 pp.) A discussion of sediments, the depth of volcanism and the relation of waters of the volcanism to those included in the sediments.

7276—WESTERN AUSTRALIA. (Geol. Surv. of West. Australia, 1908; 16 pp.) Contains a concise account of the operations of the Geological Survey of Western Australia for the calendar year 1907.

MINING—GENERAL

7277—ACCOUNTING—Standardization of Mine Accounts. H. G. Nichols. (Min. and Sci. Press, Aug. 15, 1908; 2½ pp.) This is a plea for the standardization of mine accounts. It outlines a system in which the different terms are grouped under a few important beads. The principal motive for incurring the expense is the fact that determines the classification. 20c.

7278—AIR COMPRESSION—Efficiency of Hydraulic Air Compression. (Eng. and Min. Journ., Aug. 1, 1908; ¾ p.) Discusses the hydraulic air compressor recently installed in one of the mines at Clausthal, Germany, and discusses the operating expense of a water-driven plant and an electric-driven plant. Illustrated. 20c.

7279—AUSTRALIA—Mining Prospects in Commonwealth of Australia. John Plummer. (Min. World, July 18, 1908; 2 pp.) The import duties of machinery, etc., increase the cost of mining and ore treatment. The consolidation of Broken Hill mines, which in 24 years produced 2,250,000 tous of lead, large quantities of gold and silver, etc., is mentioned. 20c.

7280—DAMS—A Formula for Calculating Flashboards for Dams. R. Muller. (Eng. Rec., Aug. 22, 1908; ½ p.) A formula for the strength of flashboards to be used to increase the height of fall at a dam in periods of low water is derived. 20c.

7281 DRILLING—Prospect Drilling in the Joplin District. Otto Ruhl. (Mines and Minerals, August, 1908; 1¾ pp.) Describes the difficulties encountered in drilling and the method of locating the orebody by drill holes. Includes also the cost of drilling. Illustrated. 20c.

7282 DRILLING—Steam Churn Drill in Hot and Cold Climates. John Power Hutchins. (Eng. and Min. Journ., Aug. 1, 1908; 3 pp.) Transportation difficulties and high costs of fuel, labor and supplies render operations expensive at best. It is expensive to transport a drill and conduct operations in either a very hot or very cold climate. Illustrated. 20c.

7283 EXCAVATION—A New Method of Wet Excavation. C. M. Ripley. (Can. Engr., Aug. 14, 1908; 3 pp.) Describes the method of excavating for the new $350,000 sewer at Gary, Ind., and the manner in which quicksand troubles were overcome. Contains much data of costs. Illustrated. 20c.

7284 EXCAVATION—Cost of Excavating Earth with an Electrically Equipped Shovel. (Eng. Con., July 22, 1908; 1 p.) Gives the cost of operation and wages paid in connection with the work of excavation by means of an electrically equipped shovel. Illustrated. 20c.

7285 EXCAVATION—Examples of High and Low Cost of Wheel Scraper Work, with Comments on the Efficiency of Work Done. (Eng. Con., July 22, 1908; 1 p.) In carrying on earth excavations the cost varies according to local conditions or management, or both. Examples of excavation by wheel scrapers are given. 20c.

7286—EXCAVATION—The Cost of Excavating Earth and Hard Pan for a Creek Change. (Eng.-Con., Aug. 19, 1908; 1 p.) The method used is described and discussed; the manner of staking out the work is stated; costs are given. 20c.

7287 EXPLOSIVES. E. A. Mann. (Monthly Journ. Chamber of Mines of W. A., June 30, 1908; 6 pp.) Describes some of the characteristics of explosives and the method of testing, storing, etc.

7288 EXPLOSIVES—High Explosives. John I. Preissner. (Northwest Min. News, July, 1908; 1¾ pp.) Describes the manufacture of gun-cotton, nitro-glycerine and other high explosives. Formulas are given as well as the method of manufacture. 20c.

7289 GREAT BRITAIN—Twenty-Five Years of Mining. Edward Ashmead. (Min. Journ., Aug. 1, 1908; 2¾ pp.) A continuation of a former article. Discusses mining conditions in Europe and Asia from 1880 to 1904. 40c.

7290—HAULAGE—Electric Haulage in Mines. W. C. Mountain. (Electrician, July 10, 1908; 7 pp.) Gives the advantages and disadvantages of main-rope haulage, main and tail haulage, endless rope haulage, and by electric locomotives. Illustrated. 40c.

7291 HOISTING—Electric Winding. I. Campbell Futers. (Electrician, July 10, 1908; 5 pp.) Discusses the subject of electric winding plants from the theoretical and economical standpoint, and also describes several installations of electric hoisting engines. Illustrated. 40c.

7292—HOISTING—Electrical Winding. Granville Poole. (Journ. Brit. Fed. Soc. Min. Students, June, 1908; 14 pp.) Describes the practice of electrical winding according to several systems. Illustrated.

7293—KOREA—The Mineral Resources of Korea. H. R. Robbins. (Paper to be read before the A. I. M. E., Oct., 1908; 13½ pp.) Discusses the mines, labor, transportation, methods of mining, and the general conditions in the country. Illustrated.

7294 MEXICO—On Horseback in Western Chihuahua. Mark R. Lamb. (Eng. and Min. Journ., July 25, 1908; 3½ pp.) Describes the author's trip to Western Chihuahua where transportation is difficult and where nearly all machinery is sectionalized before transporting. Illustrated. 20c.

7295 MINE METHODS and Timbering. W. H. Storms. (Am. Min. Rev., July 11, 1908; ¾ p.) A continuation of the article on mine and methods of timbering. This instalment deals with extension tracks for sinking, inverted rails compared with heavy wooden skids, sinking ladders and inclines in hard rock. 20c.

7296 MINE VALUATION—Calculating the Value of a Mine. J. B. Wilson. (Aust. Min. Stand., July 8, 1908; 1½ pp.) Discusses the work in general which a mining engineer has to perform in calculating the tonnage and value of ore with special reference to sampling. To be continued. 40c.

7297 MINE VALUATION—Valuation of Mining Properties. George H. Gillespie. (Can. Min. Journ., July 15, 1908; 2 pp.) Discusses the duties of the engineer who is called upon to place a valuation upon mining property. Several supposed cases are discussed. To be continued. 20c.

7298 MINING LAW—Short Talks on Mining Law—V. A. H. Ricketts. (Eng. and Min. Journ., Aug. [illegible], 1908; [illegible] p.) [illegible] with the source of mining law. Miners' rules, regulations and customs were introduced into the United States by the early miners of California, who obtained them in their principal features from various foreign sources. 20c.

7299 MINING LAW—Short Talks on Mining Law—VI and VII. A. H. Ricketts. (Eng. and Min. Journ., Aug. [illegible], 1908; [illegible]) Discusses placer claims, mill and tunnel sites, [illegible] 20c.

7300 MINING LAW—Short Talks on Mining Law—VIII. A. H. Ricketts. (Eng. and Min. Journ., Aug. 22, 1908; 2 pp.) Discusses the entry as mineral ground of ground claimed otherwise; coal and oil lands; hydraulic and dredge mining; laws applying to mineral lands in the Philippines. 20c.

7301 MINING LAW—The St. Louis-Montana Companies' Apex Litigation. Matt W. Alderson. (Min. Wld., Aug. 8, 1908; 1½ pp.) A peculiar case in which a 30 ft. strip has been granted the usual apex right and a vertical right also. Illustrated. 20c.

7302 MINING STOCKS as Bank-Collateral. J. R. Finlay. (Min. and Sci. Press, Aug. 1, 1908; 1½ pp.) The discussion of this subject is continued, and the attention is drawn to the fact that such standard stocks as Standard Oil, U. S. Steel and Colorado Fuel & Iron are shares in mining companies. 20c.

7303 PERU—The Physical Features and Mining Industry of Peru. G. I. Adams. (Paper read before the A. I. M. E., Feb., 1908; 10 pp.) Describes the physical and climatic conditions, the commercial features, mineral production and labor conditions pertaining to the mining industry of Peru.

7304 PUMPING PROBLEMS of the Joplin District. Doss Brittain. (Eng. and Min. Journ., Aug. 1, 1908; 3½ pp.) Abundant rainfall, broken ground, numerous streams subject to flood increase the difficulties of keeping the workings free from water. Illustrated. 20c.

7305 QUEENSLAND Railways to Mineral Districts—II. (Queens. Gov. Min. Journ., June 15, 1908; 2¾ pp.) Describes three railroad systems which have been authorized by the Queensland government, and which will open up copper and silver-lead districts as well as grazing land in Queensland. Illustrated. 60c.

7306 ROCK DRILL TESTS—Report of a Committee on Rock Drill Tests Conducted at the Meyer & Charlton G. M. Co., Ltd., and a Discussion of Some Special Observations. E. J. Laschinger. (Journ. So. African Assn. Eng., June, 1908; 30 pp.) The results of the investigation by this committee furnish interesting data on the subject of drilling underground in South Africa. 80c.

7307 SHAFT SINKING by Cementation. L. Morin. (Eng. and Min. Journ., Aug. 1, 1908; 2 pp.) While sinking the third of a series of ventilating shafts at the Lievin collieries, a stratum of water-bearing white chalk was met with at a depth of 17.9 m., the flow from which, 240 cu. m. per hour, put a stop to sinking operations and necessitated the employment of the process described in the paper. Illustrated. 20c.

7308 SHAFT SINKING—Some Observations on Sinking to a Great Depth with a Bucket. F. W. Girdler-Brown. (Journ. So. African Assn. of Eng., June, 1908; 3 pp.) Observations concerning three accidents of a similar nature which happened to buckets on the up-trip while sinking deep shafts in South Africa. 80c.

7309—STOPING—Back Stoping vs. Underhand Stoping in Large Bodies of Iron Pyrites. J. J. Rutledge. (Eng. and Min. Journ., Aug. 22, 1908; ¾ p.) Discusses the advantages and disadvantages of these methods and the reasons given for adopting underhand stoping methods in several large iron-pyrites mines. 20c.

7310 TONNAGE COMPUTATION—Relation of Density to the Specific Volume of Ore. Walter J. Mead. (Min. Sci., July 30, 1908; 2¾ pp.) A graphic method for the determination of the specific volume of ore from its porosity and included moisture. Illustrated. 20c.

7311 TUNNEL—The Newhouse Tunnel. E. C. DeWolf. (Min. and Met. Journ., July 10, 1908; 1¾ pp.) A description of the operations and the haulage system of the Newhouse tunnel in Colorado. Illustrated. 20c.

7312 TUNNELING—Western Practice in Tunnel-Driving. W. [illegible] (Eng. and Min. Journ., Aug. 1, 1908; [illegible]) [illegible], handling waste rock, maintenance of ventilation and other important points in the driving of the tunnel in the Cripple Creek [illegible]. Illustrated. [illegible]

7313 VENTILATION of Mines by Electric Fans. J. W. Gibson. (Electrician, July 10, 1908; [illegible]) [illegible] in England and treats more especially of the modern installation operated by electric motors. Illustrated. 40c.

7314—WAGES—The Payment of Wages. [illegible] 20, 1908; 2¾ pp.) Describes the effect of various [illegible]

7315—WAGES—The Various Plans for Payment of Wages. [illegible] purpose of increasing the efficiency of employees. [illegible]

[illegible] ventilation and sanitation.

ORE DRESSING—GENERAL

7317—CONCENTRATOR—Simplex Concentrator. [illegible] has been installed at Kuil's River Tin Mines, Ltd., near Capetown, South Africa. Illustrated. [illegible]

[illegible] ORE SAMPLING by Machines. L. P. Mathewson. (Eng. and Min. Journ., Aug. 15, 1908; [illegible]) [illegible] Church in the JOURNAL of July 18, and gives a table showing the variations in sampling and assaying.

7319 ORE SAMPLING—Machine Sampling. L. S. Austin. (Eng. and Min. Journ., Aug. 1, 1908; [illegible]) [illegible] on "Conditions Necessary to Accurate Sampling by Machines," dealing with conditions influencing incorrect sampling. 20c.

7320—ORE SAMPLING—Machine Sampling. Philip Argall. (Eng. and Min. Journ., Aug. 8, 1908; ¾ p.) Discussion of the article by John A. [illegible] essentials of sampling. [illegible]

METALLURGY—GENERAL

7321 BROKEN HILL—Metallurgy at Broken Hill. G. W. Williams. (Aust. Min. Stand., May 27, 1908; 1 p.) The first of a series of articles, dealing with the metallurgical methods of Broken Hill, N. S. W. Describes the general treatment method and gives details of the plant of the Broken Hill South mine. To be continued. [illegible]

[illegible] BROKEN HILL—Metallurgy of Broken Hill. Gerard W. Williams. (Aust. Min. Stand., June 17, 1908; 2½ pp.) Describes the concentrating plant of the Sulphide Corporation, [illegible] sheet. 40c.

7323 BROKEN HILL—The Metallurgy of Broken Hill. G. W. Williams. (Aust. Min. [illegible] ore treatment at the Broken Hill Proprietary [illegible]

7324—ELECTRIC SMELTING—Experimental Electric Smelting. Louis D. Farnsworth. [illegible] pp.) Describes the experiments carried out in order to learn some of the fundamental principles of electric smelting and to obtain data of their working. The experiments are more mechanical than metallurgical. Illustrated. 40c.

7325—EVAPORATING by Means of Steam. Oscar Nagel. (Electrochem. and Met. Ind., August, 1908; [illegible]) [illegible] of apparatus for evaporating by means of steam. [illegible]

[illegible] ROASTING—[illegible] J. E. Edwards. (Mex. Min. Journ., August, 1908; [illegible]) [illegible] ents of various classes of furnaces. 20c.

[illegible] ACID. (Electrochem. amd Met. Ind., August, 1908; 1 p.) Describes the manufacture and [illegible]

[illegible] SMELTER—[illegible] Lake Min. Rev., July 15, 1908; 3 pp.) A description of the new smelter in the Tintic district, [illegible] 32,000,000 lb. lead and 10,000,000 lb. of copper [illegible]

[illegible] SMELTER FUMES—[illegible] for Condensing Smelter Fumes. (Eng. and Min. [illegible]

[illegible] SMELTING [illegible]

MINING AND METALLURGICAL MACHINERY

7331—AIR COMPRESSORS—Steam Consumption of Air Compressors. W. A. Macleod and J. P. Wood. (Aust. Min. Stand., July 8, 1908; 2 pp.) Describes in detail tests showing the steam consumption of air compressors under varying conditions. To be continued. 40c.

7332—BOILER ROOM ECONOMY—Fuel and Boiler Room Economics. C. H. Benjamin. (Eng. Rec., Aug. 15, 1908; 1 p.) Paper read before Internat. Assn. for Prevention of Smoke. Deals with installation of plant and the purchase and burning of fuel. 20c.

7333—CHIMNEYS—First Cost of Mechanical vs. Chimney Draft. J. T. Kinealy. (Black Diamond, Aug. 22, 1908; ½ p.) Discusses hight of chimney necessary for a good draft, and then the relative advantages of the two systems, both when the hight of chimney required is moderate and when the chimney must be 100 ft. to 150 ft. high. 20c.

7334—ELECTRIC POWER—Employing Electric Power in Joplin District—I. Doss Brittain. (Min. World, July 18, 1908; 2 pp.) Describes the construction and equipment of buildings of the Spring River Power Company. Electric power is used for lighting, pumping and hoisting. Comparative costs of electric and steam power. Illustrated. 20c.

7335—ELECTRIC POWER—General Survey of Electric Power Applied to Mining. W. S. Toplis. (Electrician, July 10, 1908; 4 pp.) Considers the subject of gas engines, power-house auxiliaries, transmission and distribution of electrical power, application of motors, winding, fan-motors, pumping and other questions relating to the use of power in mining. 40c.

7336—GAS POWER—Suction Gas Plants and Their Application to Mining. George D. Stephen. (Journ. Brit. Fed. Soc. Min. Students, June, 1908; 22 pp.) Describes the various steps in the production of gas for power purposes including the chemistry of the process; describes a number of existing gas plants in England. Illustrated.

7337—GAS PRODUCER—Three Typical Gas Producer "Troubles" and Their Causes. F. C. Tryon. (Power, July 21, 1908; 1 p.) Describes some of the difficulties experienced in the operation of a producer-gas plant, and how these difficulties were overcome. 20c.

7338—LUBRICATION as a Factor of Engine Economy. W. E. Snow. (Power, July 21, 1908; 1½ pp.) A discussion as to the economy when cylinder oil is and is not used for lubrication. Illustrated. 20c.

7339—ORE-HANDLING MACHINERY—Modern Ore-Handling Machinery.—II. Walter G. Stephan. (Iron Tr. Rev., Aug. 20, 1908; 3½ pp.) Describes the Brown ore-handling bridge and the fast plant made by the Brown Hoisting Machinery Company. Illustrated. 20c.

7340—POWER PLANT—Steam-Electric Plant in a Western Mining Camp. A. J. Anderson. (Power, July 21, 1908; 1 p.) Brief illustrated description of the plant of the Carney Coal Co., situated in the northern part of Wyoming. 20c.

7341—POWER SYSTEMS of the Mines of the Joplin District. D. T. Boardman. (Eng. and Min. Journ., Aug. 15, 1908; 2½ pp.) Of the three types in use the gas-engine plant shows the greatest economy, the first cost being slightly less than for steam. 20c.

7342—POWER TRANSMISSION—Electric versus Compressed Air Transmission. A. B. Foote. (Min. and Sci. Press, Aug. 15, 1908; ½ p.) Several statements in an article, "Underground Air Compressors," published in the *Mining and Scientific Press*, Aug. 1, are discussed. 20c.

7343—CORNISH PUMPS. S. E. Brown. (Min. and Sci. Press, Aug. 1, 1908; 1 p.) The discussion of this subject is continued. Different forms of pumps are discussed. 20c.

7344—PUMPS—The Science and Art of Electricity. George Farmer. (Sci. and Art of Min., July 11, 1908; 1¼ pp.) The use of electric pumps is discussed, including gearing, the stroke, and the type of motor and the position of the plant. 20c.

7345—REPAIR SHOPS—Equipment of Calumet & Arizona Company's Shops. H. W. Chittenden. (Min. Wld., Aug. 8, 1908; 1¼ pp.) Describes the installation of machinery and the arrangement between this company and the Superior & Pittsburg company with regard to repair and construction work. Illustrated. 20c.

7346—RESCUE APPARATUS—Demonstration of Rescue Apparatus, Felling, August 31, 1907. Compiled by L. Austin. (Trans. North of Eng. Inst. Min. and Mechan. Eng., Vol. LVIII, Part 4, May, 1908; 20 pp.) Describes a series of experiments with five types of rescue apparatus for mines, and gives tabulated results.

7347—RESCUE APPARATUS—Requirements of a Breathing Apparatus for Use in Mines. W. E. Mingramm. (Paper to be read before A. I. M. E., Oct., 1908; 9½ pp.) Discusses the requirements of rescue apparatus in general, and more particularly the Draeger apparatus showing its construction and operation. Illustrated.

7348—TUNNELING—A History of the Tunnel-Boring Machine. George J. Bancroft. (Min. Sci., July 30, 1908; 3 pp.) Describes the various forms of tunnel-boring machines which have appeared since 1856. This is the second article of a series. Illustrated. To be continued. 20c.

7349—TUNNELING—A History of the Tunnel-Boring Machine. George J. Bancroft. (Min. Sci., Aug. 6 and 13, 1908; 4 pp.) The third and fourth articles of the series describe the Unanue, Sigafoos and Bennett machines. To be continued, illustrated. 40c.

7350—TUNNELING—A History of the Tunnel-Boring Machine. George J. Bancroft. (Min. Sci., Aug. 20, 1908; 2 pp.) Fifth article of the series, describing the tunneling machine invented by W. A. Lathrop in 1906. 20c.

7351—TURBINES—Exhaust and Mixed Pressure Turbines for Mining Work. (Electrician, July 10, 1908; 1 p.) It is pointed out that the exhaust turbine is capable of working up to its full output with low-pressure steam and can also use high-pressure steam when required, by means of reducing valves. 40c.

7352—TURBINE—The Westinghouse Double Flow Turbine. (Power and Engr., June 16, 1908; 7 pp.) A self-balancing unit especially adapted for large capacities; material simplification and reduction of weight and floor space. Illustrated. 20c.

7353—WELDING—Electric Welding and Some of Its Products. (Iron Age, June 4, 1908; 2¼ pp.) The paper describes many articles which may be constructed by electric welding. Illustrated. 20c.

ANALYTICAL CHEMISTRY

7354—ARSENIC AND ANTIMONY—The Iodemetric Determination of Arsenic and Antimony Associated with Copper. F. H. Heath. (Amer. Journ. of Sci., June, 1908; 6½ pp.) Describes an attempt to determine arsenic and antimony in the filtrate from cuprous iodide after titration of the free iodine by means of sodium thiosulphate and filtration. 60c.

7355—ASSAY FURNACES—Two Portable Assay Furnaces. Evans W. Buskett. (Eng. and Min. Journ., June 6, 1908; ⅔ p.) Details of a portable coal furnace constructed of brick and sheet iron, also describes a new portable gasolene furnace. Illustrated. 20c.

7356—BALANCES. A. Austin and S. Hunter. (Min. and Sci. Press, Aug. 15, 1908; 2 pp.) The requirements of different types of balances, and the installation, care and operation of them are discussed. 20c.

7357—DETERMINATION OF LIME in Limestone, Etc. Richard K. Meade. (Min. Wld., June 13, 1908; 1¾ pp.) The precipitation of lime in cement, blast-furnace slag, etc., is made in a solution of oxalic acid. The article contains comparisons of various methods for determining lime. 20c.

7358—IRON, URANIUM AND VANADIUM—Some Facts in the Separation of. J. B. Lowell. (West. Chem. and Met., May, 1908; 4 pp.) Describes a method which has been worked out to overcome the weak points in the old scheme, the new method being based on a series of 200 experiments. 60c.

7359—LABORATORY—Die metallurgischen und chemischen Einrichtungen des National-Physikallschen Laboratoriums in London. W. Rosenhain. (Metallurgie, June 8, 1908; 4½ pp.) Describes the equipment of this laboratory, and gives a number of its methods for analyzing irons and steels. 40c.

7360—METAL ANALYSIS—Fortschritte auf dem Gebiete der Metallanalyse. O. Brunck. (Chem. Zeit., June 6 and 10, 1908; 3 pp.) A review of recent literature on the analysis of copper, silver, zinc, cadmium, mercury, tin, arsenic antimony, bismuth iron, nickel and cobalt. 40c.

7361—MINERAL ANALYSIS—The Influence of Fine Grinding on the Water and Ferrous-Iron Content of Minerals and Rocks. W. F. Hillebrand. (Jour. Am. Chem. Soc., July, 1908; 12 pp.) It is claimed by the author that extremely fine grinding of rocks or minerals affects the determination of ferrous-iron and combined water. 80c.

7362—NICKEL—Ueber die Elektrolytische Bestimmung des Nickels in Nitratiösung und Seiene Trennung vom Kupfer. A. Thiel. (Zeit. f. Electrochem., April 17, 1908; 7½ pp.) Gives results of a series of experiments on methods for the electrolytic precipitation of nickel, and the separation of nickel from copper. 40c.

7363—IRON AND CHROMIUM—The Volumetric Estimation of Iron and Chromium by Means of Titanous Chloride. S. B. Jatar. (Journ. Soc. Chem. Ind., July 15, 1908; 1½ pp.) Describes the method of titrating chromium with titanous chloride, using an indicator consisting of a dilute solution of pure ferrous sulphate, to which are added a few drops of potassium of thiocyanate. 80c.

INDUSTRIAL CHEMISTRY

7364—ATMOSPHERIC NITROGEN—The Fixation of Atmospheric Nitrogen—Cyanamide. (Engineering, June 12, 1908; 1 p.) Discusses the application of artificial nitrate and discusses the paper by Dr. Albert Frank of Berlin on the utilization of the atmospheric nitrogen in the production of calcium cyanamide, and its uses in agriculture and chemistry. 40c.

7365—COAL TAR INDUSTRY—The Services Rendered by the Chemist in the Development of the Coal Tar Industry. H. A. Metz. (Journ. Soc. of Chem. Ind., Mar. 31, 1908; 1 p.) Gives a history of the industries originating in the utilization of the various products contained in the substance known as coal tar. 80c.

7366—ELECTROCHEMISTRY as Applied to Industrial Chemistry. Samuel A. Tucker. (Journ. Soc. of Chem. Ind., Mar. 31, 1908; 4 pp.) Discusses this subject under two heads, the application as electric energy to motive power and illumination, and its utilization to bring about chemical changes in order to form new and useful materials. 80c.

7367—NITRATE OF SODA. (Am. Fertilizer, June, 1908; 2 pp.) Gives figures of production for the fiscal year ending March 31, 1908, exports and consumption for this period, and a review of the present and future of the sodium nitrate industry in Chile. 20c.

7368—SODIUM NITRITE—The Manufacture of Sodium Nitrite. Gilbert T. Morgan. (Journ. Soc. Chem. Ind., May 30, 1908; 2 pp.) Goes into the production of this salt from sodium nitrate, describing each step in the process and the accompanying reactions. 80c.

7369—SULPHURIC ACID—Some Modern Chemical Plants. Oscar Guttmann. (Journ. Soc. Chem. Ind., July 15, 1908; 2½ pp.) Describes the modern construction of sulphuric acid plants. Illustrated. 80c.

7370—SULPHURIC ACID—The Contact Process To-day. (Chem. Eng., April, 1908; 9 pp.) After some preliminary historical notes on this subject, the process of the Verein Chemischer Fabriken, or Mannheim system, as it is commonly called, is described. 40c.

MATERIALS OF CONSTRUCTION

7371—CEMENT: Its Use and Abuse. R. W. Lesley. (Journ. Frank. Inst., August, 1908; 16 pp.) Describes the growing use of cement and concrete for building and points out some of the bad construction that has been made. Numerous examples of good concrete buildings are given. Illustrated. 60c.

7372—CEMENT MORTAR AND CONCRETE—Sands: Their Relation to Mortar and Concrete. H. S. Spackman and R. W. Lesley. (Cement Age, July, 1908; 7½ pp.) It is pointed out that the strength of cement mortar and concrete is dependent as much on sand as on cement, and that a careful and systematic inspection and testing of the sand, as well as the cement, on all important construction, is necessary. To be continued. 20c.

7373—CONCRETE—Tests to Determine the Effect of Addition of Hydrated Lime on the Water-tightness of Concrete. (Eng. Con., July 15, 1908; 1½ pp.) These permeability tests were made to determine effect of adding various percentages of hydrated lime to concrete of different proportions. Abstract of a paper before the Am. Soc. for Testing Materials. 20c.

7374—PORTLAND CEMENT—Standards for Portland Cement, Especially for the Tensile Strength. W. W. Maclay. (Cement Age, July, 1908; 3 pp.) The author points out that many of the tests for the tensile strength of cement are unnecessary, and that it would be advisable to adopt a single test which would be representative. Paper read before the Am. Soc. for Testing Materials. 20c.

7375—PORTLAND CEMENT—The Influence of Fine Grinding on the Physical Properties of Portland Cement. R. K. Meade. (Cement Age, July, 1908; 5½ pp.) Results of experiments to determine the actual commercial value of fine grinding. Paper read before the Am. Soc. for Testing Materials. 20c.

7376—PORTLAND CEMENT—The Life of Portland Cement. G. G. and A. J. Wheat. (Clay Rec., May, 15, 1908; 6¾ pp.) Discusses cements generally, with special reference to the action and life of portland cement under varying conditions; fully illustrated. 20c.

7377—REFRACTORY MATERIALS. Thos. Holgate. (Engineering, Feb. 21, 1908; 1 p.) Points out the importance of the complex question of the nature of materials in their refractoriness to heat, and gives methods for determining the same. 40c.

7378—TESTING MACHINES—Nouveaux Mecanismes et Nouvelles Méthodes pour l'Essai des Métaux. P. Breuil. (Revue de Mécanique, Apr. 30, 1908; 27 pp.) Describes and illustrates several new machines for testing the strength of metals, and also a variety of mechanisms by which a graphical record is obtained. Gives results of a number of tests.

7379—TESTING MATERIALS—Nouveaux Mécanismes et Nouvelles Méthodes pour l'Essai de Métaux. P. Breuil. (Revue de Mécanique, Feb. 29, 1908; 35 pp.) Describes a number of new machines, and the methods of operating them, for the testing of metals by tension, compression, torsion, repeated shocks, etc.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, SEPTEMBER 12, 1908. NO. 11.

The Shape of the Iron Blast Furnace

Factors Which Have Determined the Dimensions of the Stack in the Past and Are Likely to Govern Changes in the Future

BY HENRY M. HOWE

For most of the ideas here presented I am indebted to the patient consideration of Frank Firmstone, F. L. Grammer, and J. E. Johnson, Jr., and to many interesting talks with Sir Lowthian Bell and James Gayley and E. S. Cooke. I doubt if any one of them agrees with all I say, and some of them certainly do not.

Though it is no doubt true that the present size and shape of the iron blast furnace have been reached in part empirically, and in another considerable part by reasoning which is none too convincing, it is nevertheless interesting, and it may be profitable, to seek the causes which through both empirical and reasoned trials, have guided the evolution of this wonderful engine to its present size, and to its shape, Fig. 1, a pair of truncated cones set end to end, the upper one upright and very acute, the lower one inverted and relatively obtuse.

Such a search as this for causes can hardly be expected to lead to very definite and positive conclusions. Nearly all that can be expected of it is that the hypotheses which it frames shall be sharp and clear cut, and therein fitted for consideration, and for improvement or rejection.

There are those who would refer the shape of the blast furnace chiefly to variations in the mechanical condition of the charge; others who would refer it in very large part to the need of having the rising gases pass evenly through the different parts of each horizontal section, neglecting neither the axial parts, nor the circumferential, nor the intermediate ones; and still others who would refer that shape to the variations in the volume of the gases in different parts of the furnace. To the bystander it certainly seems as if each of these elements was important, and as if the blast furnace, like the human body, had to comply with a great many different conditions, some not readily grasped, some limiting it in one way, some in another, and some having to be met by such compromise as can be devised.

The advantage which the large unit offers in most industrial operations, of economizing installation, labor, and administration, is reinforced in case of the iron blast furnace, as indeed in case of most metallurgical furnaces, by the farther great advantage of lessening the proportion which the outer heat-radiating and hence heat-wasting surface bears to the whole mass, and hence to the unit of product; in short, of saving heat. Let us consider in what way the furnace builder's natural desire to make his furnace and his output as large as possible is limited by the conditions of the case.

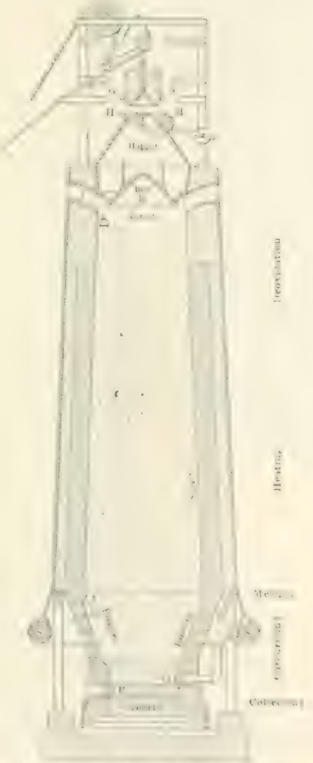


FIG. 1. SECTION OF ONE OF THE [illegible] BLAST FURNACES

G G, flanges on the ore bucket; *H H*, fixed flanges on top of furnace; *J*, counterweighted [illegible]; *K*, [illegible]; *O*, tuyeres; *P*, [illegible]; *R R*, water-cooled boxes; *S*, blast pipe.

The width at the tuyeres has in general been limited to about 12½ ft. by the fear that, if the hearth were materially wider, the blast would penetrate relatively feebly to its center, that hence too great a difference in conditions between center and circumference would arise, and that from this difference serious unevenness of working would result. It is true that the width of the hearth has at the Lackawanna furnaces been increased to 17 ft., and as a result of these important experiments it may well prove that a hearth-width of much more than 12½ ft. can be used with advantage. In this event it may also follow that the furnace may be widened all the way from top to bottom, and the volume and rate of production be increased in a very important degree. Indeed, the reasoning which we shall follow tends to show that, if there is to be any important increase of size, it is more likely to be an increase in diameter than in hight.

[illegible]

With the hearth diameter thus provisionally fixed at 12½ ft., the furnace designer naturally tries to gain volume as rapidly as possible by widening his furnace abruptly, and in this way comes the outward flaring bosh, which begins shortly above the tuyeres. In order that the increase of volume may be as great as the attendant conditions permit, the boshes are made as flat as practicable, i.e., the inverted cone of which the lower part of the furnace consists is made as obtuse as practicable. In practice it is found that the angle which the boshes make with the horizontal must not be [illegible] usual angle.

If, now, we are asked what it is that prevents us from making the boshes still flatter, a very natural reason which suggests itself is that if they were flatter, the descending column of solid materials would not slide freely over them as its lower end is gradually eaten away by the burning of the coke and the melting of the ore and flux, or rather of the reduced iron, the gangue, the ash, and the flux, of which the last three in melting unite to form the slag.

In order to grasp the conditions here we should bear in mind that in the lower part of the furnace, as sketched in Fig. 2, the descending column of solids consists of coke only, because from the tuyeres to [illegible] perature is so high that everything but the coke melts, while past it the molten iron and molten slag trickle down.

---

*Professor of metallurgy, School of Mines, of Columbia University.

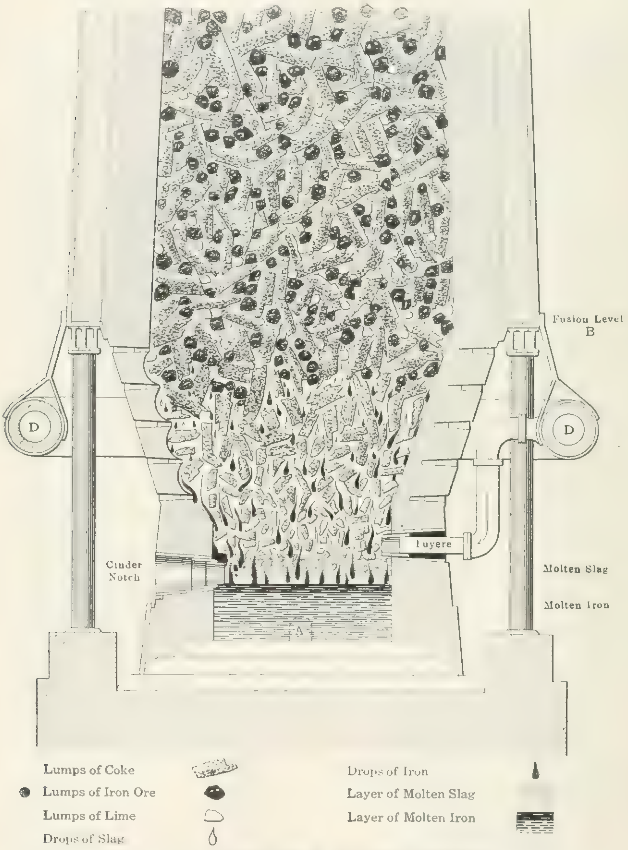


FIG. 2. LOWER PART OF THE BLAST FURNACE

NOTE—The ore and lime actually exist here, not in lump form, but in powder. They are shown in lump form simply because of the difficulty of presenting to the eye the powdered state.

To make the boshes needlessly steep, on the other hand, as in furnace No. 10, not only sacrifices room, but in fact also leads to irregular working. While we may not dogmatize as to the reasons for this, two independent ones suggest themselves. The first is that too steep a bosh tends to lead the rising gases to travel in undue proportion along the smooth walls and too little through the descending column of solids, with the consequence that the axial ore may reach the lower part of the furnace insufficiently reduced. In short, this uneven distribution of the rising gases would make the reduction of the axial ore lag behind that of the circumferential ore, and thus set up unevenness of working.

The second is that, whereas with a flattish 76-deg. bosh the charge descends only as the lower end of the column is eaten away, because the constriction which the flatness of the bosh represents causes a degree of incipient jamming which lets the coke descend only as its lower end is quite free; yet if the bosh is steeper, and if the coke, therefore, descends more easily, it slides down so freely that it presses down into the molten layers of slag and iron collected at the bottom of the furnace, and there acts most energetically on them. Further, slight variations in the conditions vary the depth of this immersion of the coke in the ore and slag, and hence vary the degree to which this intense action of the coke on the slag and iron takes place. With a flattish bosh the coke is held up enough so that it never dips materially into either slag or metal; with a steeper bosh the coke slides so freely that it does so dip, and dips to a depth which varies materially. It is this variation that causes serious variations in the degree to which the energetic action of coke on molten slag and iron takes place.

Be it understood that these statements are made tentatively, not as depicting the actual condition of things, but as indicating a possible contributory explanation of the observed fact that with too steep boshes the furnace works irregularly.

HOW FAR UP MAY THIS OUTWARD FLARE BE CARRIED?

In the very swift-running furnaces of the Pittsburg district, Fig. 1, this outward slope of the boshes stops short at about 12 ft. above the tuyeres, and is there replaced by a slight batter in the opposite direction, *C D* in Fig. 1. In other words, at this level the furnaces change from a relatively obtuse inverted cone to a very acute upright one. A reason assigned for this is that, at this level, the descending charge reaches a temperature so high that the gangue and the flux soften and become pasty. Below this level the column of solids descends even through the narrowing region of the boshes, and descends freely enough, because the only solid is the coke, itself perfectly dry and without suggestion of pastiness. But at this upper level, where the gangue and flux become pasty, they tend to cement the whole together, coke and all, into something like what a freshly-mixed concrete would be if it had but a small proportion of grout, and if that grout were very sticky, like tar. In order that this rather pasty mass shall descend with the necessary freedom as the coke below works down, it is said to be necessary that the furnace shall in this region of pastiness, grow wider downward, instead of growing wider upward, as it does at the boshes.

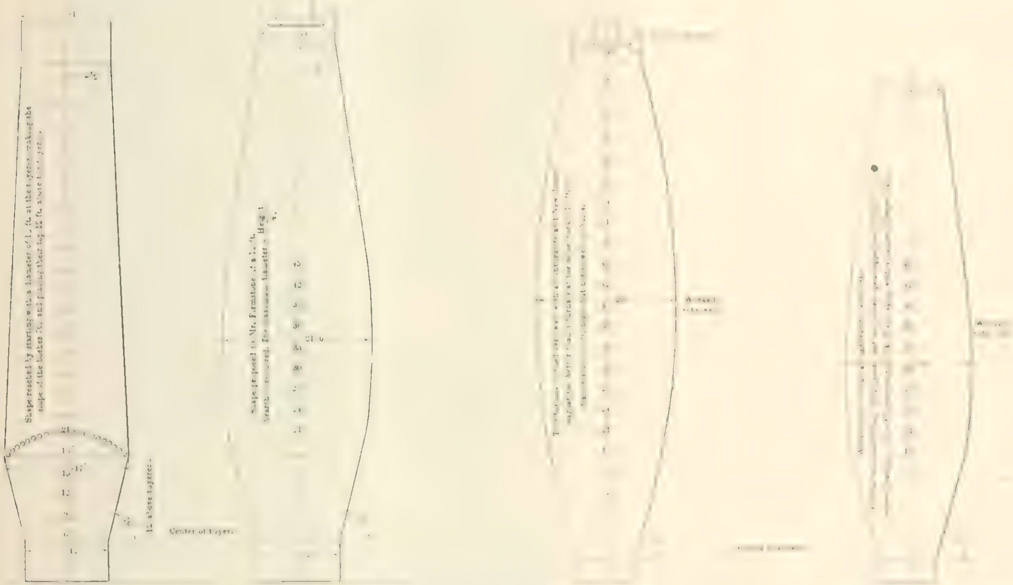
To this two objections are made: First, that such jamming does not occur; second, that it cannot occur. Let us examine these separately.

First, as to the alleged absence of jamming. In many of the older furnaces the outward batter of the boshes was prolonged far above this level, though somewhat steepened; and indeed, it was carried nearly midway toward the top of the furnace, as shown in furnaces Nos. 3, 5 and 7, which worked very well. This indeed shows that at least under those special conditions, it is wholly practicable for the charge to descend, even while in its pasty stage, through a region which grows narrower downward.

To this, in turn, it may be said that, though this may be practicable in case of relatively slow-running furnaces, and in case the slag is relatively fluid, or rather in case the slag passes rather quickly from the solid to a relatively fluid state, yet it is not practicable in case of a sticky, very calcareous slag, and of extremely rapid working, and the freedom of descent which that rapid working requires.

Second, as to the alleged impossibility of such jamming. It is held to be impossible that so wide a column, composed of such relatively small lumps, can possibly thus become so blocked, jammed, or engorged, even with the aid of the pastiness of the barely melting slag, that it would not descend freely between and past converging walls. Imagine, they say, that the materials before the tuyeres and hence to the top of the boshes, in No. 1, have been melted or burnt away, so that this space is empty. How is it possible that a truly supporting arch, or rather dome, of such fine lumps should stretch across a span as wide as 17 ft., and thus hold up the weight of the column above, without the aid of the lifting frictional action of the blast?

The answer is fivefold: First, if we may judge from description of what happens in many scaffoldings after the blast has been taken off, such arching does actually occur. A very trustworthy friend assures me that he has actually seen the coke arched across at or near the top of the boshes after the greater part of the space below had been emptied. The blast, of course, was off at the time.



No. 1 No. 2 No 3 1871 No 4 Glendon No. 5, 1869.

FIG. 3. INSIDE DIMENSIONS OF BLAST FURNACES, SHOWING VARYING FORM

Second, in actual running, the lifting action of the blast is actually at work.

Third, the assumed jamming need not be of the arch type; it may be of the dome type. The dome of the Pantheon has a wide opening in its center, as indeed have most domes; yet they do not fall. Indeed, each horizontal course of stones in such a dome may be stable and sustained by itself and the courses outside it, without the aid of the courses inside it. Such a domed jamming, even if confined to a relatively narrow ring next the walls, might cause grave irregularity.

Fourth, "wheat will often arch completely across the ordinary elevator bins." If this is possible with so smooth a substance as wheat[1], with its grains all of about the same size, and without any viscid material to act as a bond, it should be far easier at the top of the boshes, (1) because of the coarseness of the coke, (2) because of its roughness, (3) because of the great variations in the size of the lumps, which leads to "chinking in," and (4) because of the assumed presence of slag in its formative sticky state.

Fifth, if the outward flare of the boshes were extended up past the fusion zone, the charge in its pasty slag-forming stage might well have enough freedom of descent to prevent its actually arching across, or even forming the beginning of domes, and yet not have the much greater freedom of descent needed for the smooth and regular working of a swift-running furnace. Such an extension of the boshes might not create complete or even incipient arches, but yet might impede harmfully a very rapid descent of a very pasty charge.

This is a question to be decided by evidence. The point which this evidence should cover is this: Has it been found practicable to make any furnace of very great output, and running on a very calcareous slag, work regularly and evenly in case the outward flare of the boshes was continued upward past the region of pastiness and incipient fusion?

[illegible]

It is of fundamental importance that the charge shall be distributed properly over the top of the furnace. There are serious difficulties in the way of making this distribution proper in case the fur[illegible]

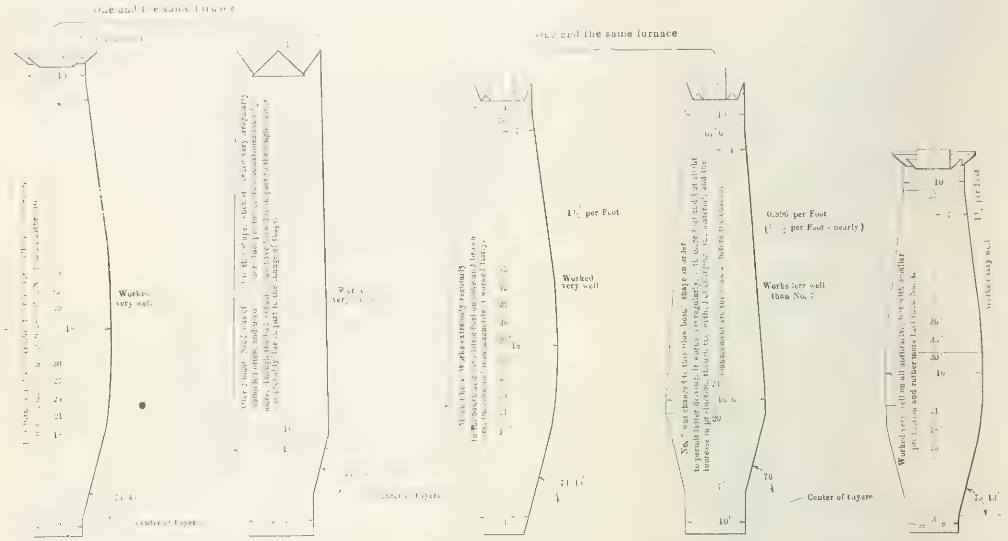
In practice the diameter is rarely greater than 16 ft. at this level. On the other hand, a narrow top has the disadvantages of restricting the room available for the charge in the upper part of the furnace; of throttling back the rising gases and so increasing the power needed for driving them through the furnace; and of giving them so great a velocity that they entrain much of the fine ore and carry it out of the furnace.

THE BA[illegible]

Passing downward from the top, the [illegible] also to ease the descent of the charge, which here is obstructed by the rapid de[illegible] reaction, $2\,CO = C + CO_2$, or rather by the swelling of the individual pieces of ore [illegible] rise. Witness the harm done by steepening the upper part of the shaft to 3 deg. in No. 12. To widen the furnace still more rapidly would, of course, still further ease [illegible] would still farther increase the room [illegible] regularities in the distribution of the rising gases, and through this in the reduction of the ore, with the consequence that some of the ore might reach the bottom of the furnace insufficiently deoxidized. However true this may be, it is hard to believe that the particular angle of batter which is appropriate to the very top of the furnace, is also that most appropriate to each and every level thence downward to the top of the boshes. We naturally expect that this present shape, reached as an early approximation to the best, will later on be improved in the way of making the batter in the several different levels conform to the conditions which exist in each.

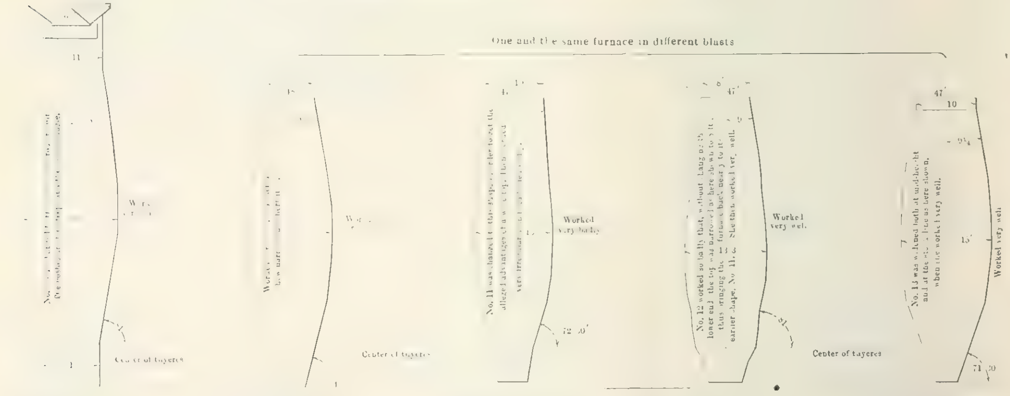
---

[1] [illegible] Soc. Civil Engineers, 60, 1908, p. 61.



No. 5. Glendon No. 2, 1882. No. 6. Glendon No. 2, 1890. No. 7. 1902-1905. No. 8, 1905. No. 9. Glendon No. 1, 1877-1886.

FIG. 4. DIFFERENT FURNACE LINES EMPLOYED IN PRACTICE



No. 10. Glendon No. 1, 1889. No. 11. Glendon No. 4, 1856. No. 12. Glendon No. 4, 1860. No. 13. Glendon No. 4, 1860. No. 14. Glendon No. 4, 1862.

FIG. 5. LINES OF TWO OLD FURNACES AND THE RESULTS IN OPERATION

THE HIGHT OF THE FURNACE

This is limited usually to 100 ft. and probably better to 80 ft. under most conditions, Mr. F. L. Grammer argued against extreme hight in his article in *The Iron Trade Review* in February, 1902. The reason for this limit probably lies not so much in any crushing and jamming effect of an excessively high column of solid materials on the coke in the lower and narrowing end of the furnace, as in the frictional resistance, which even for constant velocity, increases very rapidly with the hight of the furnace. But, in order to get the benefit of added hight the velocity of the rising gases, instead of being constant, must be increased about proportionally to the hight, as the least reflection shows. The chief purpose in lengthening the furnace is to increase the rate of production. But the chemical needs of the process demand that, for every ton of iron made, a certain quantity of blast shall be blown through the furnace. Hence, if by hightening the furnace we hope to increase its production by, for instance, 25 per cent., we must expect to blow 25 per cent. more blast through it, and thus to increase the velocity of the rising column of gases by 25 per cent. In short, lengthening the furnace implies increasing the friction in two ways which act cumulatively, (1) lengthening the path through which the rising gases must be forced; and, (2) increasing the already very great speed at which they must be forced through their most tortuous and narrow passages. The average velocity of the gases rising through a 100-ft. furnace of, say, 32,000 cu.ft. capacity, with 64,000 cu.ft. of air blown through per minute, is probably much greater than 2000 ft. per minute, or that of a "high wind." In places it may rise to 4000 ft. per minute. Conceive, now, these gases moving at this velocity, which is impressive enough when met in the open, through the narrow interstices between adjoining lumps of coke and ore; conceive further that, where these lumps come nearest to each other, at their corners where the salient points on their rough edges actually touch, there is still farther narrowing of these minute spaces through which this inverted gaseous Niagara must tear, and you may get some idea of the energy needed for overcoming the frictional resistance, and indeed of the terrific dynamic conditions inside the peaceful-looking blast furnace.

With this picture in mind, not only the great entrainment of fine ore from rapidly driven high furnaces, but the hangings and slips, readily explain themselves. The frictional lifting effect of the rising gases may at times readily become so great as to interrupt the regular descent of certain parts of the column, for instance those in which the frictional resistance of the solid column to the upward passage of the blast is increased by the swelling of the ore caused by the deposition of carbon within it, and by the denseness, not to say impenetrability, of the column where thus swollen and compacted. Part of this enormous column may thus be suspended like a ball in the rising jet of a fountain, and may later fall with great violence and even with destructive effect when, by some change in the conditions, the friction is lessened. When such a suspended mass once starts downward, its fall becomes ever freer and freer, less and less impeded by the rising gases, because as it descends, between it and the furnace walls an ever widening space for the free upward rush of those gases is given by the outward batter of these walls.

The considerations which have now been presented give the profile of the furnace closely enough for the purpose of this elementary article, by fixing the hight, the diameter at top and bottom, and the batter of the boshes and of the upper part of the shaft.

The results already reached with hearths wider than 12½ ft. lead us to hope, as already indicated, that widths much greater than this may be found practicable. The proper distribution of the charge at the top of the furnace is not intrinsically so difficult a thing that it may be expected to baffle indefinitely the attempts to bring about proper distribution over much wider tops than are now used. If we could widen the furnace at top and bottom, then for all we now see we ought to be able to widen it proportionally throughout, and thus to increase its volume and production very greatly. But the difficulties in the way of increasing the hight seem of a different and more insuperable kind. Therefore, we may expect that future increase of production will come rather through increase in width than through lengthening the furnace.

Mr. Firmstone gives us sketches of furnaces 1 to 14, inclusive, which are very valuable additions to our records.

Four points here deserve special notice.

(1) The good working of Nos. 3, 4, 5, 7 [illegible] though somewhat steepened, very far above the region of pastiness.

(2) The great harm, as regards regularity, scaffolding and fuel consumption, done by changing from the high bosh of No. 5 to the low bosh of No. 6, and the corresponding, but much less harm done [illegible]

(3) The great harm done by the extreme steepening of the boshes, to 81 deg., and substituting a single for a double bell in changing from No. 9 to No. 10.

(4) The great harm done by lessening the batter of the upper part of the shaft to 3 deg. in changing from No. 11 to No. 12, its removal on changing back in No. 13 to a batter of 9 deg.; and nearly to the shape of No. 11, and the absence of harm on widening top and mid-diameter without changing the batter of the upper part of the shaft in changing [illegible]

Camp Bird, Ltd.

This English company [illegible] operates a mine at Ouray, Colo. The report for the year ended April 30, 1908, shows the capital stock authorized, £1,100,000; issued, £820,000, in shares of £1 each. In addition to the mines which it operates the company owns 574,830 shares of $1 each, in the Imogene Basin Gold Mines Company.

The statement of earnings and expenses, as made in sterling from the London office, is as follows, the averages being based on 80,087 tons dry ore treated in mills. The averages are given in dollars:

	Total.	Per Ton.
Bullion	[illegible]	[illegible]
Concentrates	[illegible]	[illegible]
Cyanide slag and matte	[illegible]	[illegible]
Miscellaneous and interest	[illegible]	[illegible]
Total receipts	[illegible]	[illegible]
Mining and [illegible]	[illegible]	$4.232
Stamp-mill expenses	19,454	1.166
Cyanide-mill expenses	10,051	0.602
[illegible]	[illegible]	1.398
General expenses	24,630	1.476
Depreciation, etc	10,333	[illegible]
Total expenses	[illegible]	[illegible]
Net earnings	£267,700	$16.011

The expenses are given in much detail. The report is accompanied by a plan and section of the mine.

The income account [illegible] condensed, is as follows:

Net earnings, as above	[illegible]
Interest, exchange, etc.	[illegible]
Total	[illegible]

T. F. Wa [illegible]

[illegible] year, made a total surplus of £131,453 at [illegible]

[illegible] there were 48,711 tons of ore broken down [illegible] livered to the mills, and 26,588 tons were [illegible] also broken during the course of development work. From the reserves in stopes, 54,425 tons were withdrawn (10,304 tons in excess of the original estimates), making a total delivery to the mills (based on measurements) of 79,512 tons ore (based on mill weights), 79,043 tons dry; 77 tons dry were added to the mill reserve storage bins, making a total of 78,966 tons of dry ore from mine treated in the mills. In addition, there were treated 1121 tons (dry weight) of mixed ore, concentrates, etc., gathered from the wreck of the stamp mill burned in 1906; making the total treated in the mill 80,087 dry tons.

The mill report shows that only nine days were lost during the year by holidays, repairs, etc. Of the gold values in crude ore there was a saving of 93.84 per cent., being 0.09 per cent. greater than for the previous fiscal year, and is a new record in the history of the mill. Of the total value extracted, there was obtained through amalgamation 74.76 per cent., through concentration 16.02 per cent., and through cyanidation 9.22 per cent., of which gold constitutes 94.82 per cent., silver, 3.31 per cent., lead, 1.85 per cent., and copper, 0.02 per cent. The value of metallic contents is as follows: Gold, $1,963,839; silver, 68,540; lead, $38,376; copper, $307; total, $2,071,068. In the stamp mill there were treated by amalgamation and [illegible] the cyanide mill—82,574 tons, wet, or 80,087 tons dry ore. There were passed to the cyanide mill 74,072 tons of tailings, from which were separated and treated 40,805 tons, dry weight. The gross receipts [illegible] expenses, $94,935; net, $1,785,278. In the cyanide mill gross value saved was $190,854; expenses, $49,049; leaving $141,805 net recovery.

[illegible] cause of an increase in mining expenses. [illegible] city to handle 1000 gal. per minute.

[illegible] above the mill to prevent any recurrence of the damage from snowslides which has occurred in previous years. A geo- [illegible] work will depend.

Costs of Mining Quartz Pyrite Gold Deposits

A Study of the Costs of Mining and Milling as Shown in the Reports of Several Profitable Operations in Different Parts of the World

BY JAMES RALPH FINLAY*

Included in the class of quartz pyrite mines are all of the properties of the Witwatersand in the Transvaal, in fact all the gold mines of South Africa, nearly all the mines in eastern Australia, those of the Kolar district in India, of El Oro in Mexico, of California, Nevada and Douglas island, Alaska. In general, these ores are a light-colored or whitish quartz containing from 0.25 to 10 per cent. of iron pyrite and other sulphides in varying but usually subsidiary amounts. The quartz and pyrite may fill open fissures, or they must be replacements of country rock, or the cementing material of beds of conglomerate. Deposits of this kind have proved to be extensive, often persistent to great depths, and are worked on a grand scale.

Treadwell Group

The group of mines on Douglas island, Alaska, known as the Treadwell, Mexican and Ready Bullion, furnish ore for 780 stamps at the rate of 1,200,000 tons a year. This work with good reason stands at the head of the list of quartz-pyrite operations, furnishing an example of the simplest metallurgical problem, the lowest costs, and, I believe, the best management to be found in this class of mining. The external and internal factors which effect the results obtained are of great interest to the student of mine economics.

Robert Kinzie, now superintendent of all the mines, published in *Trans.*, A. I. M. E., Vol. XXXIV, a detailed account of these properties up to 1902; in addition to this we have the full and excellent reports issued by the companies. On the whole the information available is definite and satisfactory

Along a great porphyry dike which cuts the black slate of Douglas island, there are three or four large lenses or oreshoots where the dike has been profoundly altered and silicified by the action of magmatic waters. The largest and most northerly of these is the Treadwell orebody, which was 400 ft. wide and 1000 ft long at the surface. The Mexican and Ready Bullion orebodies are approximately 20 ft. thick and from 500 to 1000 ft. long in horizontal section. These orebodies are situated within a stone's throw of a splendid harbor on a sheltered waterway, which extends for 1000 miles from Puget sound to Skagway. The most convenient and cheapest transportation facilities are thus provided for coal, timber and other supplies. Concentrates, in the shape of auriferous iron pyrite, are shipped 800 miles to the Tacoma smelter at a cost of $1.72 per ton. The climate, though rainy, is mild and pleasant, corresponding to that of Scotland or southern Norway. While wages are not low, according to some standards (averaging about 32c. per hour in actual cost), I believe that labor, owing to its efficiency, is really cheap. In addition to these advantages an abundance of water power is available. Little pumping is necessary in the mines. These external factors are so favorable as to be quite exceptional; perhaps unrivaled.

Internal Factors

The internal factors are also exceptional. The orebodies are large and firm; standing nearly vertical between pretty solid walls, they come up under the glacial drift in large masses that could be attacked in open pits. The metallurgical problem is the simplest.

Mining these orebodies, therefore, presented to the management the following factors: Several million tons of ore favorably situated for cheap handling, but containing less than $3 per ton. To make the maximum profit, or to make profits at all, required cheap methods both of mining and milling.

These conditions as to mining were met at the beginning by the "milling" method in an open pit; and as to treatment by the adoption of a large, simple, water-actuated stamp mill in which ore could be amalgamated and concentrated in wholesale quantities and at minimum cost. The simple metallurgical treatment proved amply effective, for the ore is thus treated at a cost of 17 to 27c. a ton with an apparent extraction of 90 per cent.

As the mining proceeded it became increasingly difficult and finally impossible to maintain the required output from open pits and it became again imperative to devise a method of mining, this time underground, that would be cheap enough. It was a broader problem than the first because it involved the question of how much ore could be sacrificed on the one hand and how cheap the mining could be done on the other. It was discovered that about 75 per cent. of the ore could be mined without timbers from large chambers kept full of broken ore, only enough being drawn off at the bottom to afford room for the miners at the top. In the widest deposit this process costs $1 per ton and in the narrower bodies $1.20 per ton.

No change being required in milling methods on account of increasing depth the inauguration of the method of mining described seems to have solved the problem of making these orebodies pay to an indefinite depth as long as they maintain anything like their present size and value.

The milling of the Treadwell ores, its results, the collection and shipment of concentrates are all shown up to 1902 in the accompanying tables given by Mr. Kinzie. It is well to note that in each of the mines the value recovered is about equally divided between free gold saved by amalgamation and auriferous pyrite which constitutes 2 per cent. or less of the original ore. The shipment and treatment of these concentrates costs about $6.75 a ton and when spread over the original ore milled costs from 10 to 14c. a ton.

The actual results and average costs up to the end of the reports for 1907 for the various mines are as follows:

	Treadwell.	Mexican.	Ready Bullion
Tons milled...	8,485,085	2,447,063	1,841,079
Tons in sight..	4,982,883	794,924	1,378,651
Feet development work, 14 years	74,717	59,960	27,362
Tons developed per foot approximate..	120	54	100
Total value recovered per ton	$2.44	$2.55	$1.89
Profits, operating, per ton.	1.16	0.77	0.25
Total operating cost per ton.	1.28	1.78	1.64
Last depreciation figures per ton.....	0.21	0.23	0.35
Total estimated cost....	1.49	2.01	1.99

From the above it appears that the Treadwell and Mexican mines have been very profitable, but that the Ready Bullion has not as yet earned enough to justify the investment but the improvement in grade at the bottom is such as to be very promising for the future. It further appears that the combined mines have treated 12,773,227 tons of quartz worth $30,446,947 or $2.38 per ton for a total operating cost of $1.43 per ton, to which is to be added 24c. a ton as a fair estimate (it seems very liberal) of the value of the plants employed; the total to be estimated for cost being $1.67 per ton and the profit 71c. or 30 per cent. of the gross value recovered.

Below are given, more in detail, the costs of these remarkable mines, for the Treadwell in the year ending May 31, 1907, and for the Mexican and Ready Bullion for the calendar year 1907, the ore

*Consulting mining engineer, 2 Rector street, New York.

ALASKA TREADWELL GOLD MINING COMPANY

[illegible]

[illegible]	Total Gross Bullion and [illegible]	Supplies.	[illegible]	[illegible]	Total	[illegible]	[illegible]	Total	[illegible]	Underground.	[illegible]	[illegible]	Pounds Powder Used Per Ton Ore.	Water Power.	Steam Power.	[illegible] Labor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	$3.49	[illegible]	[illegible]	[illegible]	$1.71	[illegible]	[illegible]	$1.89	[illegible]				[illegible].01	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2.95	[illegible]	[illegible]	[illegible]	1.50	[illegible]	0.08	1.51	[illegible]				[illegible].93	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible] 16	[illegible]	
[illegible]	2.94	[illegible]	[illegible]	[illegible]	1.35	[illegible]	[illegible]	1.63	[illegible]				[illegible].76	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	3.21	[illegible]	[illegible]	[illegible]	1.35	[illegible]	0.10	1.96	[illegible]			[illegible]	[illegible].73	[illegible]	[illegible]	21.34	$[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2.60	[illegible]	[illegible]	[illegible]	1.37	[illegible]	[illegible]	1.29	[illegible]		[illegible]	[illegible]	[illegible].60	[illegible]	[illegible]	13.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.88	[illegible]	1.0		[illegible]	[illegible].76	[illegible]	[illegible]	13.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.11	[illegible]	[illegible]	[illegible]		[illegible]	[illegible].97	[illegible]	[illegible]	14.47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2.32	[illegible]	[illegible]	[illegible]	1.48	[illegible]	0.12	[illegible]	[illegible]	10.5	[illegible]	[illegible]	[illegible].84	[illegible]	[illegible]	8.36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2.71	[illegible]	[illegible]	[illegible]	1.28	[illegible]	0.12	1.55	[illegible]	11.9	[illegible]	[illegible]	1.08	[illegible]	[illegible]	12.13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2.07	[illegible]	[illegible]	[illegible]	0.92	[illegible]	0.06	1.21	[illegible]	33.0		[illegible]	[illegible].80	[illegible]	[illegible]	5.71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.19	[illegible]	0.08	0.77	[illegible]	52.3		[illegible]	[illegible].14	[illegible]	[illegible]	5.33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.29	[illegible]	0.05	0.68	[illegible]	44.0	[illegible]	[illegible]	[illegible].65	[illegible]	[illegible]	5.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	0.05	0.87	[illegible]	41.7	[illegible]	[illegible]	[illegible].34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ALASKA UNITED GOLD MINING COMPANY—READY BULLION MINE

[illegible]

Year.	Total Gross Bullion and Concentrate Yield Per Ton.	Supplies.	Labor.	San Francisco, London, Paris and Consulting Expenses.	Total.	Operation.	Other.	Total.	Surface Pits.	Underground.	Shaft Sunk.	Other Development Work.	Pounds Powder Used Per Ton Ore.	Water Power.	Steam Power.	Per Cent. Indian Labor.	Average Daily Pay All Island Employees.	Per Cent.	Value Per Ton.	Tons Ore Milled.	Profit.	Year Ending [illegible]
1898	2.42	$0.71	$0.5[illegible]	$0.03	$1.29	$1.13	$0.07	$1.19	100.0		60[illegible]	2112	2.69		100		$3.[illegible]	2.03	$72.00	19,612	[illegible]	1898
1899	2.72	0.90	1.04	0.03	1.97	0.7[illegible]		0.7[illegible]	37.98	62.02	47	4272	1.52		100	4.23	3.08	1.9[illegible]	38.10	162,10[illegible]	[illegible]	1899
1900	2.15	0.78	0.83	0.03	1.67	0.48		0.48	8.42	91.58	2[illegible]	35[illegible]2	1.19		100	8.50	[illegible]	2.[illegible]	31.[illegible]	179,41[illegible]	[illegible]	1900
1901	1.94	0.88	0.90	0.03	1.86	0.08		0.08	4.17	95.83	165	2370	1.28		100	2.[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible],64[illegible]	[illegible] 61	1901
1902	1.48	0.70	0.78	0.02	1.56	0.02		0.02	1.43	98.57	[illegible]8	2787	1.19		100	1.00	3.16	[illegible]	[illegible]	226,522	[illegible]	1902

700-FOOT CLAIM.

Year.	Total Gross Bullion and Concentrate Yield Per Ton.	Supplies.	Labor.	San Francisco, London, Paris and Consulting Expenses.	Total.	Operation.	Other.	Total.	Surface Pits.	Underground.	Shaft Sunk.	Other Development Work.	Pounds Powder Used Per Ton Ore.	Water Power.	Steam Power.	Per Cent. Indian Labor.	Average Daily Pay All Island Employees.	Per Cent.	Value Per Ton.	Tons Ore Milled.	Profit.	Year Ending [illegible]
1899	1.72	$0.54	$1.10	$0.03	$1.68	$0.04		$0.04	73.02	26.98		1624	1.11	100.0		1.87	$[illegible].01	1.94	$[illegible]7.87	[illegible]	$[illegible]	1899
1900	1.81	0.69	0.84	0.03	1.56	0.25		0.2[illegible]	[illegible]	50.11	72	486	1.24	58.42	41.58	[illegible]	[illegible].01	1.73	[illegible]	12[illegible],612	[illegible]1,71[illegible]	1900
1901	1.50	0.90	1.05	0.03	1.97	0.48		Loss 0.4[illegible]	23.14	76.86	312	1596	1.05	53.16	46.84	1.52	[illegible].11	1.71	[illegible]	[illegible]	Loss [illegible]	1901
1902	1.3[illegible]	0.[illegible]	0.63	0.02	1.17	0.16		0.16		100.0		[illegible]82	0.78	81.82	18.18		3.[illegible]	1.81	[illegible]	11[illegible],311	19,[illegible]	1902

ALASKA MEXICAN GOLD-MINING COMPANY.

Receipts and Expenditures in Dollars Per Ton. Also Conditions Affecting Operating Costs.

Year	Total Gross Bullion and Concentrate Yield Per Ton.	All Expenses Per Ton.				Profits Per Ton			Per Cent Ore From		No Feet		Pounds Powder Used Per Ton Ore.	Per Cent. Ore Milled By		Per Cent Indian Labor.	Average Daily Pay All D. Island Employees.	Concentrates.		Grand Total.		Year Ending Dec. 15.
		Douglas Island																				
		Supplies.	Labor.	San Francisco, London, Paris and Consulting Engineer.	Total.	Operating.	Other.	Total	Surface Pits.	Underground.	Shaft Sunk.	Other Development Work.		Water Power.	Steam Power.			Per Cent.	Value Per Ton.	Tons Ore Milled.	Profit.	
1894...	$2 79	$0.84	$1 00	$0 13	$1.97	$0 82		$0 82	41 37	58 63	110	795	1 07	53 33	46 67	18 75	3 70	2 02	$35 45	73,141	$59,639 65	1894
1895...	2 85	0.85	1 03	0.07	1.95	0 90		0 90	48 37	51 63	236	2946	1 08	57 42	42 58	19 48	3 47	2 01	44 84	79,439	71,391 78	1895
1896...	2 42	0.77	0 98	0.06	1 81	0 61		0 61	46 37	53 63	62	2333	1 21	43 39	56 61	26 08	3 49	2 18	42 49	101,702	61,650 43	1896
1897...	2 12	0.69	0 84	0.05	1 57	0 55		0 55	37 76	62 24		2130	1 18	62 68	37 32	23 91	3 28	1 81	37 77	158,005	87,101 46	1897
1898...	2 31	0.75	0 90	0 05	1.70	0 62		0 62	34 55	65 45		2081	1 25	55 50	44 50	16 16	2 95	2 07	34 80	162,457	100,663 07	1898
1899...	2 09	0.72	0 97	0 03	1.73	0 36	$0 01	0 37	28 84	71 16	302	1910	1 36	48 47	51 53	15 59	2 93	1 98	37 85	166,054	62,333 42	1899
1900...	1 89	0.68	0 97	0.04	1 69	0.20		0 20	16 30	83 70	107	2987	1 24	42 10	57 90	11 49	3 05	1 64	26 07	166,449	33,821 02	1900
1901...	1.90	0.75	0 98	0.03	1.76	0.14		0 14	0 53	99 47	112	5329	1 00	43 97	56 02	0 76	3 07	1 78	39 30	178,960	24,709 63	1901
1902...	2 06	0.62	0 99	0.03	1 64	0.41		0 41		100 00	218	4988	1 32	50 60	49 40	. .	3 12	1 83	39 51	207,455	86,025 51	1902

all coming from underground stopes except 12 per cent. of the Treadwell ore which came from an open pit. In each case the costs, while not the lowest on record, are quite near the average. I believe in the case of the Treadwell that the costs are overstated, certain sums being credited to the receipts which might logically be deducted from the costs, but I have made no attempt to change the figures given.

	Treadwell.	Mexican.	Ready Bullion.
Tons milled	702,953	214,263	213,370
Cost mining and development	$1 00	$1 19	$1.00
Milling	0 17	0 27	0 36
Shipping and smelting concentrates	0 12	0 12	0 11
General expense	0 04	0 09	0.07
Construction	0 04	0 01	0.01
Total operating	$1.37	$1.68	$1 55
Depreciation	0.21	0 23	0 35
Grand total	$1.58	$1.91	$1.90

Homestake

From the Treadwell group one naturally turns to the Homestake mine in the Black Hills, South Dakota, to make comparisons. This is the greatest gold mine in the world in point both of tonnage and of gross value produced. In eight years out of the last nine the output has been as follows:

		Per ton.
Tons milled	9,383,114	
Gold recovered	$34,638,518	$3.69
Cost	28,587,300	3.04
Profit	6,051,218	0.65

It is to be observed that the costs are more than twice as high as at the Treadwell group. Why the difference should be so great does not appear. One is tempted to suspect that the management may have had something to do with it, although nothing is more dangerous than to jump at such a conclusion.

The external conditions are not so favorable as at Douglas island. The wages are about the same, but there is not such a good supply of water and timber and transportation are more costly. The cost of water alone is approximately 10c. a ton at the Homestake.

The internal factors would appear to be about the same. A vast body of silicified slate has been followed from the surface to a depth of nearly 1600 ft. The thickness is several hundred feet. The metallurgical problem seems to be simple; 4.7 tons are crushed per stamp per day. Amalgamation is followed by cyaniding the tailings at the very moderate cost of 18c. per ton stamped. The finer slimes receive a farther treatment not described in the reports.

There are 1000 stamps employed on Homestake ore in six different mills. The whole process in 1907 cost as follows per ton:

Milling and amalgamating	44c.
Cyaniding	18c.
Slime treatment and construction	24c.
Total	86c.

The recent cost for mining and development is $2 a ton. For mining at the rate of 4000 tons a day from a single orebody this seems high. Possibly the methods are too good; a more wasteful one might be more profitable. Assuming that with the methods that have been used the profit averages 75c. a ton, it is demonstrable that the adoption of a method that would reduce the mining cost from $2 to $1.25 per ton at a sacrifice of 25 per cent. of the ore now saved would increase the value of the mine 60 per cent. If on the present basis 20,000,000 tons would be mined in 15 years at a profit of $15,000,000, the present value, figuring interest on deferred payments at 4 per cent., would be $11,111,000. On the other basis, 15,000,000 tons mined in 11 years at a profit of $22,500,000 would give a present value of $17,700,000.

Mines of the San Juan Region, Colorado

The external conditions at the Camp Bird property are unfavorable. The altitude of the mine is 11,200 ft. in steep and snowy mountains. Two years ago a snow slide destroyed the mill and delayed operations six months. Wages are about average for the Rocky mountain region, but it is not to be supposed that men are capable of sustaining their best exertions at such an altitude. Supplies have to be hauled several miles from the railroad station, Ouray, over a steep mountain road often blocked with snow.

The internal factors are as follows: The ore occurs in extensive shoots in a nearly vertical quartz vein 3 to 10 ft. thick, in a horizontal formation of bedded porphyries. In a total length of 4500 ft. explored there are four ore shoots aggregating 1700 ft. long. This has involved an expense for development of 76c. a ton.

Stoping is done as at the Treadwell by breaking the whole vein upward from the levels and drawing out only enough to make room for the miners. Up to April, 1907, about 489,000 tons had been taken out and milled; 112,000 tons remained broken in the stopes.

The costs for 1906-7, stated to be very near the average, are as shown in the accompanying table, only the underground costs being given in detail.

COSTS AT CAMP BIRD MINE, 1906-07.

Blocking-out ore	$0.76
Ore breaking	0.56
Timbering	0.73
Loading and tramming	0.76
Electric lighting	0.01
Engineering and surveying	0.05
Mine sampling and assaying	0.06
Foremen, bosses, etc	0.22
Power	0.39
Maintenance	0.43
Other expense—diamond drilling, hoisting, etc	0.39
Total mining	$4.16
Tramway expense, mine to mill	0.20
Stamp mill expense	1.25
Cyanide expense	0.61
Freight, smelting and selling concentrates	1 75
General expense, consulting engineer, taxes, etc	3.06
Depreciation of plant	0.85
Survey and labor on unpatented claims	0.16
	$12.04

Total cost of operating this mine from the beginning:

Current operating expenses	$11.05
Construction	2.15
Total	$13 20

These costs are much higher than those of the Liberty Bell mine a few miles away. The reason undoubtedly is the higher grade of the Camp Bird ores; this accounts for higher costs in taxes, freight and treatment, etc., and furnishes the excuse for pretty liberal fees and management.

RESULTS OF OPERATIONS AT THE LIBERTY BELL MINE.

Tons mined and milled		[illegible]
Net receipts per ton		$7.20
Costs:		
General expense	$1.05	
Mining and development	2.61	
Tramming to mill	0.42	
Milling	1.70	
Shipping concentrates	0.36	
Total operating		$6.14
Depreciation		0.50
Total		$6.64
Profit per ton		0.56

At this mine 26,446 ft. of opening work has been done in nine years, resulting in mining and developing about 900,000 tons of ore, or 34 tons to 1 ft. The cost per foot of development seems to be about $10, and per ton developed, $0.30. The stoping width is about 5 feet.

Analyzing roughly the difference between the costs of the Camp Bird and the Liberty Bell it appears that the former is more expensive, as follows:

Underground cost	$1.16 a ton
Milling	0.15
Treatment charges	1.75
General expense	2.00
Depreciation of plant	0.55
Total	$5.61

It may be fairly said that the higher cost at the Camp Bird for milling and treatment charges are entirely justified by the higher grade of the ore. As to other expenses one may doubt their necessity.

Other mines in the San Juan region whose reports are available are the Tomboy and the Smuggler Union. I have not investigated these reports, but in a general way the costs at these mines are not greatly different from those of the Liberty Bell. These mines have each reported costs lower than those given, for a single year, but it is doubtful if they would be lower if figured upon a long term of years.

In general mining in the San Juan region costs about $7 a ton. The external factors of a rough surface, a severe climate, costly transportation and a debilitating altitude are all unfavorable. The internal factors are such that only a small tonnage can be maintained. Metallurgically the ores are only fair, and while not markedly difficult, do not seem to permit of full treatment at a cost of less than $2 a ton. The explanation, therefore, of the big jump in costs from $1.50 at the Treadwell and $3 at the Homestake to $7 in the San Juan is the cumulative effect of a variety of both external and internal factors.

El Oro, Mexico

The mines at El Oro, Mexico, are well managed; they pay good dividends and [illegible] The [illegible] mines are the Esperanza and El Oro on the San Rafael vein and the Dos Estrellas on a parallel vein to the westward. The Mexico mine just north of the Esperanza on the San Rafael lode is promising. The veins are large mineralized shear zones in slate or shale. There are numerous cross faults. The veins are for the most part obscured by a later flow of andesitic lava which covers the important orebodies to a depth of several hundred feet. The ore is quartz with pyrite sprinkled through it. The gold is very finely divided, and will yield by amalgamation only about 15 per cent.

[illegible] about average for gold mining. The wages for natives are low and their labor inefficient. Water-generated electric power is furnished to the mine. The El Oro company owns a railroad, timber lands and a sawmill, and presumably supplies the other mines as well as its own, with timber and transportation.

The walls are heavy, and where broken by cross-faults become very soft. Ordinarily the square-set rooms can be kept open to a hight of 40 to 50 ft.; then they must be filled. The mines are pretty hot. The ore while forming in good-sized bodies is separated into streaks in different parts of the shear zone. The development of these requires considerable crosscutting and drifting along the intersected streaks. Work is also done on entirely distinct veins separated by some hundreds of feet of waste. The experience to date has shown the requirements in the way of development to be as follows:

	Feet	Tons Mined	Tons Developed
El Oro	88,800	820,000	605,000
Esperanza	60,640	875,000	142,000
Total	149,440	1,695,000	747,000

About one foot of opening work to 16 tons discovered.

COSTS

	El Oro.	Esperanza
Tons mined	1,080,788	350,000
Tons milled	1,027,282	333,330
Mining	$1.99	$2.80
Development	0.71	0.80
Milling	0.77	2.63
Cyaniding	1.11	
Water	0.02	
Other	0.13	
General	0.90	1.08
Construction	0.38	0.19
Total	$6.02	$7.50

The Esperanza produces other higher-grade ores that are not cyanided. These ores are either concentrated and the concentrates smelted, or shipped directly to the smelters. Ores shipped direct have paid for freight, treatment and shipping expense about $18.75 per ton.

The recovery of metals at the two mines is reported for 1906-7 as follows:

	Gold, Per Cent.	Silver, Per Cent.	Total Value, Per Cent.
Esperanza	90.64	57.33	86.20
El Oro	90.28	68.5[illegible]	86.63

[illegible] been higher than at the El Oro both for mining and milling. There is nothing in the reports to explain why this should be so.

[illegible]

In Vol. XXXIII, Part 1, of the "Memoirs of the Geological Survey of India," F. H. Hatch gives an excellent practical description of the Kolar mines as they were in 1900. Since that time certain changes have been introduced, notably water-generated electric power; the scale of operating has increased and the costs diminished, but no specific description of these changes has come to my attention. The reports of the various companies give abundant information about output, costs, mine developments, etc. It is possible that something might be changed by Mr. Hatch if the descriptions were to be brought down to the present day, but on the whole the sources of information are satisfactory. One feels particularly like complimenting Messrs. John Taylor & [illegible] their complete and detailed annual reports to their stockholders.

The principal mines are the Mysore, Champion Reef, Ooregum and Nundydroog: other mines are not very profitable. The district has been opened since 1882. The output has been steadily increasing, but the maximum seems to have been reached. The climate is tropical; the rainfall averages 30.13 in. per year, but is variable.

This Indian gold-field is one of the most instructive examples to be found anywhere in studying the basic principles of mine economics. The center of the field is 183 miles from the important seaports of Madras: the freight rate for various articles being as followes (presumably per long ton):

Coal in carloads	$ [illegible]
Timber less than 17 ft. long	1.90
Timber more than 17 ft. long	[illegible]
Steel, cast iron, pipe, [illegible] soda	[illegible]
Wire ropes and [illegible]	[illegible]
Machinery [illegible]	[illegible]
Explosives	16.8[illegible]

Indian coal is delivered at the mines for $6.50 per ton; English coal for $9.75 and fire wood for $2.50. Ordinary mining timber costs from $30 to $45 per M., a large proportion being of the more expensive kinds. Dynamite costs about 27c. per lb. and blasting gelatin (93 per cent. nitro glycerin) 35c. These supplies, it will be observed, are all more expensive than in the United States in the proportion of perhaps two to one.

[illegible]

When we come to labor the situation is interesting. Men are employed in the following pr[illegible]:

[illegible]	[illegible]
[illegible]	[illegible]
Natives	[illegible]

I have no means of computing the average wages earned by three classes. Europeans are paid by the month, on contract usually for three years. Transportation is provided by the companies to and from Europe, and quarters, furniture, fuel, lights and servants also. Men laid up by sickness draw full pay. The salaries vary from $30 a month for some of the miners to $100 for smiths and machinists and $250 to the highest paid chemists and foremen. Considering the debilitating effect of the climate and the loss of time during illness, voyages and holidays, it does not seem improbable that the work done by these men costs at least twice as much as work done in the United States would cost if done by men paid the same wages. Indeed I believe this estimate is too low.

Wages of natives are as follows:

Carpenters	12 to 50c.
Smiths	8 to 48c.
Timbermen	16 to 43c.
Engine drivers	20 to 33c.
Trackmen	20 to 41c.
Gang bosses	24 to 33c.
Machine men	20 to 33c.
Hand miners	16 to 24c.
Blasters	16 to 24c.
Landers	16 to 20c.
Trammers	16 to 18c.
Muckers	14 to 16c.
Firemen	12 to 16c.
Surface coolies	8 to 12c.

It is, of course, impossible to obtain from these details an exact estimate of the wages paid, but on the assumption that the wages of miners are somewhere near the average for natives and that Europeans average $5 a day including expenses and Eurasians $2 we have:

2.2 Europeans at $5 equals	$11.00
1 6 Eurasians at $2 equals	3.20
96.2 Natives at $0.23 equals	22.12
100.0	$36.32

This means an average wage of 36c., or thereabouts for all employees.

Factors in Mining

The internal factors are a single marvelously persistent quartz vein, with a few branches, developed for a length of 17,500 ft. The vein occurs in a belt of schists which I suppose, from the presence of beds of quartzite, are undoubtedly in part metamorphosed sediments. The belt seems to be a syncline, but it is invaded on both sides by intrusive granites. The bulk of the schist consists of altered traps or lavas. There are some later dikes of a basic character. The vein corresponds both in strike and dip, which is about 50 to 55 deg. west, with the foliation of the schists. The ore is a clean quartz containing 0.25 per cent. of pyrite. The quartz occurs in a number of shoots along the vein. Some of the shoots occur in sharp anticlinal folds where something like the saddle reefs of Bendigo, Australia, has been developed in the vein. The direction of other ore shoots along the plane of the vein seems to be about parallel to the axes of these folds. The extent of the shoots is variable; some of the largest are known to be more than 4000 ft. deep along the slope, and as much as 800 ft. wide, measured at right angles to the long axis. It is difficult to ascertain the thickness of the vein stoped; the average is probably between 3 and 4 ft. Taking the vein at large, the poor with the good, the average thickness of mill ore developed on the Mysore property in 1907 was 1.8 feet.

Although these mines, particularly the Mysore, are looking exceedingly well in the bottom, the thickness and grade of the ore show some diminution. The greatest vertical depth reached is about 2400 ft. in the Edgar shaft of the Mysore. In earlier years, when the mines were less than 1000 ft. deep, vertically, the ore shoots on the Mysore and Champion Reef mines seem to have averaged nearly 5 ft. in thickness.

OPERATIONS OF THE PRINCIPAL MINES IN THE MYSORE DISTRICT, END OF 1906.

Mine.	Tons Milled.	Value.	Dividends, Cash.	Profit, Per Cent.	Cost, Per Cent.
Nundydroog	699,730	£2,732,000	£1,317,000	48.2	51.8
Ooregum	1,236,812	4,258,000	1,514,000	35.5	64.5
Mysore	1,817,451	9,117,000	5,156,000	56.4	43.6
Champion Reef	1,730,677	7,796,000	3,647,000	47.0	53.0
Total	5,484,670	£23,903,000	£11,634,000	48.7	51.3

Method of Treatment

The milling practice is simple. The ore, when properly sorted, yields a clean quartz with very little clayey matter in it. The process consists of amalgamation in a stamp battery followed by cyaniding the tailings. A special cyanide process is used for the comparatively small proportion of slimes. The only distinctive fact is that the crushing duty per stamp is low, being only 2.25 tons per day per 1050-lb. stamp. The pulp is put through screens averaging about 1600 apertures per sq.in. The low stamp duty is made necessary by the high grade of the ore. In the Transvaal and at the Treadwell, the duty per day is about five tons per stamp.

A few years ago a striking and uneconomical feature of the metallurgical practice was that the work was done in a number of small mills instead of in a central large one on each property. This bad feature has been, I believe, largely corrected.

VALUE AND COSTS PER TON.

	Value.	Profit.	Cost.
Nundydroog	$19.03	$ 9.21	$9.82
Ooregum	16.79	5.96	10.83
Mysore	24.48	13.81	10.63
Champion Reef	21.98	10.33	11.65
Average	21.28	10.36	10.92

These figures are not far from the real performance of the mines for the period, although they are in error in two respects on different sides of the account. On the one hand the costs include the royalty paid to the Mysore government. This royalty is, of course, an operating profit, although it takes the place of taxes which invariably constitute an important cost item. On the other hand the profits include the proceeds of a considerable amount of shares issued for improvements and sold at high premiums.

A Question of Bookkeeping

To charge improvements to capital account, even if they are absolutely new, is a bookkeeping error into which nearly all mining companies fall. This error is, of course, in most cases theoretically rectified by writing off a certain amount for depreciation. While in the case of these Kolar mines it appears that the depreciation has kept pace with the increase of capital (for 11 years the Mysore company received from stockholders about £60,000 a year), this does not alter the fact that the money thus written off did not come out of the mine. To some extent, of course, the money thus provided was used to make a real increase in the company's resources, and to this extent it will be paid back in the shape of increased profits, or lower costs, in later years. But it should never be forgotten for a moment that there is always some work going on about a mine in the shape of permanent improvements and that for a period of years the average amount thus expended should not be written off the balance sheet; it should be charged to operating. To pay operating expenses out of new capital is either a fraud or a bookkeeping sophistry. It is always a mistake more or less complete. It may be partly justified but never wholly.

The accompanying table prepared by Mr. Hatch shows the distribution of costs for the year 1899. These costs are a little higher than the average, but not so much as to give a seriously false impression.

Within the past year or two considerable economy has been effected by the introduction of water-generated electric power from the Cavvery falls. In 1899 steam power cost $150 per horsepower year and the cost per ton for the power used was more than $3. Electric power is now furnished for $90 a year, reducing the power cost more than $1 per ton.

I will not go into details regarding all the mines, but will give some facts regarding the Mysore, the largest and best mine in the district. This property in the years 1902-1907, inclusive, did 163,691 ft. of development work, mined and milled 1,080,464 tons of ore, and increased its reserves from 340,000 tons to 904,139 tons. The actual ore developed during the period was 1,644,603 tons, being a trifle more than 10 tons per foot of development work. This development with approximate costs was made up as follows:

Drifts and crosscuts, 117,912 ft. at $10 equals	$1 179,120
Raises, 24,041 ft. at $40 equals	960,000
Winzes, 12,291 ft. at $40 equals	490,000
Shafts, 9,447 ft. at $100 equals......	944,700
Total..........................	$3,574,000

The costs are approximations from Hatch's report.

COSTS AT THE MINES OF MYSORE IN 1899 ACCORDING TO HATCH

	Mysore	Champion Reef	Ooregum	Nundy-droog	Balaghat	[illegible]
Mine costs	$5.79	$7.15		$7 02	[illegible]	[illegible]
Mill...	1 28	1 68		1 41	1 41	[illegible]
Wheeler pans		[illegible]	$9 46	[illegible]		
Cyanide	0 69	0 89		0.75	[illegible]	[illegible]
Administration	0 28	0.27	0 44	0 51	[illegible]	0 76
General charges	0.75	0 61	0 49	0 48	0 31	[illegible]
Total..	$8 79	$11 29	[illegible]	$10 38	$15 13	$8 19
Royalty on gold ore	1 58	1 51	0 86	1 12	0 63	0 21
Depreciation	0 41	0 26	0 11	0 40	2 20	.....
London office.	0 39	[illegible]	0 33	[illegible]	0 88	0 71
Grand total	$11 17	$13 36	[illegible]	[illegible]	[illegible]	[illegible]

COST OF RAISING (10x6 FT.) 15.6 FT. PER MONTH

Labor, white	$8 25
Labor, native	4.50
Explosives	6 25
Supplies.......	4.90
Compressed air	21 00
	$44 90

COST OF DRIVING

Hand	$9 per ft., rate 15 ft. per month.
Machine ..	.$11 per ft., rate 30 to 35 ft. per month

Stoping in 4½ ft. vein without timbering cost about $1 25 per ton

Equivalent work in the United States may be estimated as follows:

Sinking large working shafts (Lake Superior, Butte, Coeur d'Alene, or Cripple Creek), average rate per month 50 ft., cost per ft	$100
Raising with complete timbering, 10x6 ft.	25
Drifting in average ground, 5x8 ft. .	9

High Development Cost

If these costs are anywhere near the actual, and I believe that they are, we have an average cost per ton developed of about $2.10, and per ton milled of $3.30.

In the abstract of Hatch's figures for various kinds of work is to be observed that the development accounts for about half the cost of mining. In this connection, however, it is well to point out that a considerable portion of the development work does not appear in the working costs, but is charged to capital account. The only place where this expenditure appears is in the balance sheet where certain sums are "written off" for depreciation, etc. These sums amount in six years to $2,122,000 on machinery, plant, etc. Of this a good deal must represent the cost and equipment of Edgar's and other shafts.

To show how this bookkeeping works, let us take the revenue account for the year 1907. Here we find that administration and working costs including directors' fees, insurance and all general expenses amount to $8.96 per ton. To this we must add from the balance sheet in order to get the managment's real estimate of the costs, the sum of $1.97 per ton for depreciation, this being the average for the last six years. With this addition the total cost is $10.93. This, it will be observed, is very close, both to Mr. Hatch's figures in 1899, and to my own estimate based on the output and dividends.

Mr. Hatch comments as follows:

"The working costs are high, but there is not much difficulty in accounting for this. First, the nature of the ore-deposit dictates a high cost of working, as, for instance, the occurrence of the pay-ore in shoots, which, though of high grade, are of comparatively limited extent. This leads to a heavy expenditure in development, as much sinking, driving and crosscutting must be done in waste rock in order to open up pay or shoot ore. The cost of this development work is included in the figures given for working costs. Then again the heaviness or instability of the ground in parts of the mines necessitates a big expenditure on timber to secure the stopes, shafts, and levels.

[illegible]

"Further it must not be forgotten that the cost of working a high-grade ore is of necessity greater than that of a low-grade ore, and the reason for this is plain. In mining low-grade stuff, the main object is to obtain a large tonnage at a low cost; consequently the stopes are carried as wide as possible and the whole mass of the orebody is, as a rule, exploited, the exploratory or dead work being at a minimum. With high-grade stuff, on the other hand, the stopes are kept as narrow as possible, and great care is exercised only to extract the payable portions of the orebody. Much exploratory work on waste rock is, therefore, necessary in order to locate the pay ore. Similar factors influence the metallurgical treatment. With low-grade stuff the ore is passed quickly through the mill, a high stamp duty being maintained by the use of coarse screening and a low discharge, and the cyanide process is relied upon to catch the gold that escapes amalgamation. Whereas with high-grade ore the usual practice is to crush fine, and to catch as [illegible] by amalgamation.

"For these reasons it is impossible to compare the working costs of high-grade mines, such as those at Kolar, with the low-grade mines of other countries, as for instance, those of the Witwatersrand in the Transvaal. At the same time, it must be admitted that a reduction in working expenses at Kolar could no doubt be effected by improvements in milling plant, and by the substitution of automatic mechanical means for native labor in the handling of the ore delivered at the shaft top, and of the tailings leaving the mill. The subsituation of a large centrally placed mill with heavy stamps for several small and scattered mills with light stamps, which at the present moment is being carried out on the Champion Reef, and is in anticipation at Ooregum, will decrease the cost of milling at these mines. The introduction of mechanical haulage, automatic sorting tables, tailings, wheels for elevating the tailings, and pointed boxes for classifying and filling directly into the cyanide vats, all these improvements would no doubt have a similar effect. So also will the introduction of water power transmitted by electric current, as it is proposed to do by the Cauvery power scheme."

COST PER FOOT OF SHAFT SINKING IN [illegible]

	Nundy-droog 12 x 6 ft.	[illegible] 16 x 8 ft.	[illegible]	[illegible]
Labor	$31 27	$32 68		
Timber	7 88	25 22		
[illegible]	13 40	24 20		
Compressed air .	32 84	33 88		
[illegible]	10 93	4 84		
Drill sharpening	[illegible]			
	[illegible]	$120 82	[illegible]	$120
Speed per month	15 ft.	25 ft	28 ft	[illegible]

[illegible]

I have given many details about the Kolar mines because I wish to illustrate the extraordinary lack of correspondence between the wages paid and the costs. There does not seem to be any detail in which work at these mines is done cheaper than in the United States. In Cripple Creek, or Butte or the Cœur d'Alene where wages average ten times as high as at Kolar work can be done just as cheaply. This is true of drifting, of crosscutting, of raising, of shaft sinking, of stoping, of everything on which I can find data for comparison.

It is true that supplies cost more than in the United States; nevertheless out of working costs of $8.96 per ton I find that labor must account for about $5.50 or 60 per cent. This is the usual proportion in the United States. We find that the number of men employed to mine and mill 104,830 tons of rock in 1907 at the Mysore mine was 8334 or 23 tons per man per year. At the Camp Bird mine in Colorado, where external conditions are unfavorable, the ore being of the same grade and the costs nearly the same, the wages are ten times as high and the output per man ten times as great.

It is inconceivable to me that the energy expended by a miner in Colorado is ten times as great as that expended by the Indian miner. The true explanation of the wonderful difference in performance lies in the industrial efficiency of the community by which the men are surrounded. This is a broad subject, and I do not intend to go into it here further than to point out these mines as an excellent illustration of an economic fact, i.e., that wages have very little to do with costs; that you get what you pay for throughout the world. As Lord Brassey put it, "It costs as much to move a yard of earth in one place as in another."

The Cobalt Silver District, Ontario, Canada

By William B. Phillips

The local correspondent of the *Toronto World* gives in the issue of that paper of June 28 a list of the mines of the Cobalt district and shipments from January 1 to June 1, 1908, as follows: La Rose, 1515 tons; O'Brien, 1230; Nipissing, 851; McKinley Darragh, 689; Tretheway, 497; Silver Queen, 322; Buffalo (high grade and concentrates), 304; Coniagas (high grade and concentrates), 255; Temiskaming & Hudson Bay, 223; Kerr Lake (high grade), 195; Watts (King Edward group), 184; City of Cobalt, 166; Temiskaming, 132; Cobalt Lake, 123; Right of Way, 119; Nova Scotia, 113; Silver Leaf, 98; Cobalt Central (concentrates 3500 oz.), 98; Foster, 89; Provincial, 75; Drummond, 74; Nancy Helen, 69; Town Site, 68; Silver Cliff, 26; Crown Reserve (very rich ore), 20; Miscellaneous car to smelters, 20 tons or a total of 7516 tons.

This is practically a gain of 3000 tons as compared with shipments during the corresponding period of 1907. The total shipments from the district since 1904 appear to be as follows:

	Tons.	Value
1904	158	$136,218
1905	2,144	1,468,524
1906	5,335	3,764,113
1907	14,040	6,020,649
1908 first five months	7,516	4,509,600
Total	29,193	$15,899,204

The value of the ore shipped during the first five months of 1908 is in the absence of official statements taken at $600 a ton. In 1904 the average value per ton was $862; in 1905, $685; in 1906, $705; in 1907, $428. The average value per ton for the four years ending with 1907 is $670. Practically all the value of the ore is in the native silver, for while cobalt, arsenic and nickel may be and generally are present the value of these, as compared with that of the silver, is not very great.

It is doubtful if the value of any 29,000 tons of silver ore from any district in the world is anything like as great as that of the ore shipped from the Cobalt district during the last 4½ years. Several carloads of more than $100,000 a car have been shipped and in one case the total value was not far from $150,000. These figures show that silver ores of very unusual character are found in this relatively small camp, which has produced during the 4½ years of its existence at a rate of $9863 a day.

The Future of Cobalt

What is to be the future of the district? Allowing that the present production is at the rate of $10,000,000 a year, may it reasonably be expected that the mines now in operation and others that may be added to the list will continue to turn out the metal at this rate? Intimately connected with this question are considerations affecting the security of investments already made and to be made. I do not speak of profits based on stock movements, but of legitimate mining enterprises, designed with care and carried out upon sound business principles. There are such enterprises here as elsewhere.

It seems to me that continued success in the production of silver depends not so much upon the discovery and exploitation of the very rich deposits as upon the possibility of extracting from the ores all of their value. Disregarding the arsenic, cobalt, nickel, etc., there has been a great waste in silver. Even now the smelters do not care to take ore containing less than 100 oz. silver per ton, and it is more than likely that the tonnage of material mined with less than this amount is far in excess of that of the richer ore. With the exception of two or three plants no attempt is made to concentrate the ore other than by hand picking. There are two, perhaps three, modern concentrating plants attached to the regular mining companies, and I understand that they are doing satisfactory work, the Coniagas mill in particular.

With these few exceptions the companies are confining their attention to such ore as can be shipped direct, and to such as can be cobbed up to a high grade. The veins are thin but some of them are extremely rich, and mining in the district has been almost entirely confined to the search for and the development of these thin veins of high value. The operations around Cobalt lake, Cross lake, Peterson lake and Kerr lake have been devoted almost exclusively to high-grade material without regard to milling and concentrating.

Some of the companies, however, are beginning to realize that the high-grade ore, i. e., such as can be shipped direct or brought up by hand-cobbing, is not the only source of profit. In many of the mines the wall rock is shot through with particles of silver for a distance of 2 to 5 ft. from the main calcite veins and the assays run to $20 a ton and upwards. In the wall rock the silver appears for the most part to be closely associated with small calcite stringers, but there are some cases in which the calcite is absent and there is no apparent connection between the main silver-bearing veins and the impregnation of the wall rock. All of this material should be milled and concentrated.

If silver can be produced here at a cost of 15 to 20c. an ounce, it is because of the exceptionally favorable character of the ore. Anything that detracts from these extremely rare conditions increases by so much the cost of extraction. In respect to silver the Cobalt district occupies about the same position as the Birmingham district, Alabama, does in respect to iron. There is no district in the world where silver is produced as cheaply as in Ontario, nor any in which iron is produced as cheaply as in Alabama, with the possible exception of the Luxembourg district, Germany.

Extension of the Area

The extension of the workable area east from Cobalt and between Cross lake and Temiskaming lake is now in progress. The Trinity company is installing machinery on its claim directly on the east side of Cross lake, southeast of the King Edward, Silver Cliff and other mines on the west side of Cross lake. Still further east two miles from Cross lake and about half way from this lake to Lake Temiskaming, the Big Fissure company has sunk its main shaft 105 ft. and is preparing to drift along the vein 200 ft. to a connection with another well-defined vein. This company has also unwatered an old shaft that was sunk 40 ft. on a separate vein and will carry this down 110 ft. deeper. The property of the Wabi company is between the Big Fissure and Lake Temiskaming and it is reported that operations are to be resumed there.

These operations between Cross lake and Temiskaming lake will furnish new data in respect to a region not yet explored. The finding of sheet silver between a thin calcite vein showing cobalt and the wall rock of gabbro on the Big Fissure property has encouraged the owners to add new equipment, to deepen one of the shafts to the 150-ft. level and to drift along two well marked veins. This work is now in progress and should be completed within four months.

There is a confidence in Cobalt properties which persists whatever may be the fluctuations of the stock market. Silver will be produced more cheaply in Cobalt than in any other district in the world for many years to come.

---

*Mining engineer and metallurgist, Birmingham, Ala.

Pachuca and Real del Monte Silver District

The Silver Ore Contains Little Gold; Mining and Milling Methods Are Being Rapidly Modernized; Much Construction Is Under Way

BY CLAUDE T. RICE

The silver producing area in Hidalgo, **of which** Pachuca and Real del Monte **are the** most important camps, is possibly **the oldest** silver-mining area in Mexico, **for the** Aztecs worked these silver de**posits long** before the coming of the **Spaniards.** It was not long after the **Conquest** (some say only two years) be**fore the** Spaniards themselves began to **work the** Pachuca veins. While Pachuca **is much older** than Guanajuato, it has not **the same** romance attached to it, for at **Pachuca** the bonanzas have been smaller **than those** in the Veta Madre and the ore **has generally** required milling on the spot. **Consequently,** Pachuca **can** only name **one man,** Pedro Terreros, later the Conde **de Regla,** whom the richness of its mines **has ennobled.** Instead of noblemen it **proudly** boasts of that greatest of Mexi**can** scientists, Bartolemé de Medina; the **visitor still** sees the now idle *hacienda*, the **Purisima** Grande, where 350 years ago **Medina** discovered and developed the **patio** process.

Frequently this silver producing area is **referred** to as the Pachuca district, but **more often** Pachuca and Real del Monte **are** considered as two separate districts; [illegible] on this area published by the Instituto Geologico Mexicano (to which I am greaty indebted for much of the geological information concerning the district) each of these camps is treated separately. But in this article, Pachuca and Real del Monte, only a few miles apart, with one master vein, the Vizcaina, connecting the two, having a similar country rock of porphyritic andesite, and the same ore minerals in a similar [illegible], will be considered as forming the Pachuca and Real del Monte district.

[illegible]

Pachuca, the capital of the State of Hidalgo and also the main city, is situated at an altitude of about 8000 ft., in a narrow valley near the base of the western slope of the ridge that bounds the Mexican plateau on the east. The town, although said to have a population of 35,000, has few pretty buildings, handsome statues or magnificent churches.

The hillsides on the Pachuca slope of the range are covered with a sparse vegetation, but on the eastern or Real del Monte side, owing to the abundant precipitation, a luxuriant vegetation covers [illegible] with a beautiful grove of oaks, whose un-Mexican character, together with the [illegible] the white-fenced graveyard with shading firs almost force one to imagine himself in some other land. Indeed, Pachuca is often called the "Cousin Jack" camp of Mexico, and appropriately so, for the gable-roofed houses throughout the district, the predominance of headframes at mines abandoned years ago, the numerous Cornish pumps, the Spanish-speaking, English-featured Mexicans, or the "yorks" that occasionally some Mexican shiftboss sports as proudly as any Northumberlandman newly arrived in some mining camp far from his home—all these constantly remind one that Englishmen worked these mines almost a century ago.

The early history of Pachuca mining is interesting for romance, hinted scandal, and rapine are mixed with it sufficient[illegible] of more importance than the past. Still, in passing I must mention the great fight that the early Mexican miners made [illegible] del Monte mines alone there were 28 *malacates* running that required 400 men and 1200 horses at an annual cost of $250,000 to operate them.

About 2½ years ago 98 per cent. of the stock of La Compañia Minera de Real del Monte y Pachuca was purchased by the United States Smelting, Refining and Mining Company; since then it has been building or remodeling cyanide mills, installing electric pumps in the mines and erecting an aërial tramway. The Loreto and Guerrero mills are being used to determine the best system for treating the ore; when this is determined, the company will enlarge the present mills and erect others so as to treat the large tonnage necessary to decrease the proportionate cost of pumping, which is high at present.

SANTA GERTRUDIS MINE, PACHUCA

BARRON MINE, BLANCA IN DISTANCE, PACHUCA

DINAMITA AND SANTA ANNA, PACHUCA

SAN RAFAEL MINE, PACHUCA

One of the most important things for the district has been the bringing in of electric power. The first plant, the one using the water power at the Hacienda de Regla, was built in 1896, but its capacity has since been increased so that it can now furnish 3000 h.p. The other plant, at Irigadora, built in 1898, now has a capacity of 6000 h.p. This power, which is transmitted at 40,000 volts, is generated by the fall obtained from the sewage of Mexico City.

GEOLOGY

The Pachuca and Real del Monte district consists of a mass of Tertiary eruptives overlying the Upper Cretaceous sediments which outcrop near Regla to the east of the mines. Immediately overlying the sediments is a small flow of basalt, but the main rock of this eruptive series is the porphyritic andesite in which all the veins occur. This andesite is more than 2000 ft. thick. Farther to the east around Real del Monte the summits of the higher hills are capped by rhyolite, and still farther to the east by basaltic flows. This mass has been eroded into deep gulches and rolling-topped ridges so that the andesitic base of the mass forms most of the hills. A few rhyolite dikes occur in the district, more in the eastern than the western part.

The region has been fractured along an east-west and also along a north-south system of fissures, the main system being the former. The Vizcaina vein seems to be the master vein of the district, and from it extend many important branch veins, such as the Maravillas, the Analcos and others. Near Pachuca there is little indication of the north-south fracturing, but near Real del Monte the north-south veins appear to be the more important. Only these are being worked at present. The east-west system is characterized by compound fracturing, for in the San Rafael, the Vizcaina vein has six different workable branches; the Maravillas vein, in the mine of that name, three; and the Analcos vein, in the Xacal mine, two branches. The north-south system is characterized by simple fracturing with only occasional branches.

All in the district do not agree as to the relative age of these two systems of fracturings, but, since several of the north-south veins are displaced by the east-west veins, and because of the different character of the fracturing in the two systems, it seems that the fracturing must be of different ages and that the north-south fracturing must be the older. Still some think that all the fracturing occurred practically at the same time and, as indicating this, they point to the fact that the Santa Inez vein ends in stringers near the Vizcaina instead of continuing a strong vein to the Vizcaina.

Whether or not the fracturing occurred at approximately the same time, the mineralization in the two systems occurred at the same time, for the ore follows for some distance, sometimes in both directions, along many of the east-west fractures where they displace the north-south veins. Besides, the similar mineralogical character of the filling in both systems and the constancy of the silver and gold ratio (five grams gold per kg. of silver per metric ton) throughout the district seems to prove that the veins were filled by the same character of solutions and therefore probably at approximately the same time.

The dip of the east-west system varies in the different veins from almost vertical to 60 deg. toward the south. The veins of the north-south system dip to the east at a high angle, averaging about 80 deg. and varying between 85 and 65 deg., rarely being as flat as the latter figure.

The veins in the district are not characterized by definite walls, but generally one wall is fairly well defined. Frequently tongues of porphyry project into the ore, but rarely do large "horses" occur in the Real del Monte veins, although, of course, "horses" are characteristic of the compound, branching fracturing of the Pachuca area. In places on both systems there has been a movement in the vein subsequent to its filling, and near the plane of movement much of the silver has been leached out by the water following down along the fracture. Frequently along the footwall a thin clay gouge is observed.

The gangue in both systems is highly silicious, and in many of the veins much amethystine quartz is found. In the oxidized portion of the vein the silver occurs native, and as chloride, iodide and bromide; in the sulphide zone argentite is the main silver mineral, although some stephanite and polybasite are found and occasionally at the Barron mine in the deepest level a little ruby silver is to be found. In many mines in both camps much rhodonite is found; generally where there is much rhodonite the ore is rich in silver. This rhodonite is more characteristic of the Real del Monte than of the Pachuca veins, but some of the latter, for instance the Maravillas and the Santa Gertrudis, contain much manganese. Other vein minerals are pyrite, galena, and occasionally chalcopyrite, blende and calcite. Both the pyrite and galena are argentiferous, but the pyrite carries only a little [illegible]

In many of the veins the ore found at a depth less than 300 ft. is low grade. Local tradition has helped to establish an impression that this is true throughout the district, but the bonanza orebodies found at surface at the Xacal, the Cristóbal, and the [illegible] to this rule. The large orebodies generally are found at or near the juncture of a branch with the main vein or where a cross-fracture has cut the vein; it is peculiar that throughout the district the wider the orebody, the richer is the ore.

The Real del Monte Veins

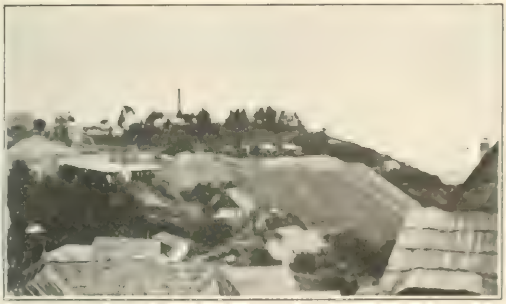
The main veins in the Real del Monte area belong to the north-south vein system, but connecting this area of mineralization with the one about Pachuca is the Vizcaina, which has an east-west strike. The other east-west veins in the eastern part of the ore zone are small, and show that the buckling that produced this series was not nearly so strong as farther west. [illegible] and several, such as the San Jose y San Pablo, the San Felipe, and the Moran vein, have been mined in the past; in fact, the Moran vein has produced along a length of 800 meters.

From the upper part of the Vizcaina vein a large amount of silver has been obtained. The east end of this vein has been [illegible] at present no work, except sampling, is being done on that end of the Vizcaina. Near Pachuca, however, the San Rafael and Camelia are producing considerable ore from this vein. The Vizcaina vein does not end at Real del Monte, but extends farther east and passes under the basaltic capping in that part of the country.

DOLORES MINE, REAL DEL MONTE

SORTING ORE, [illegible] MINE, REAL DEL MONTE

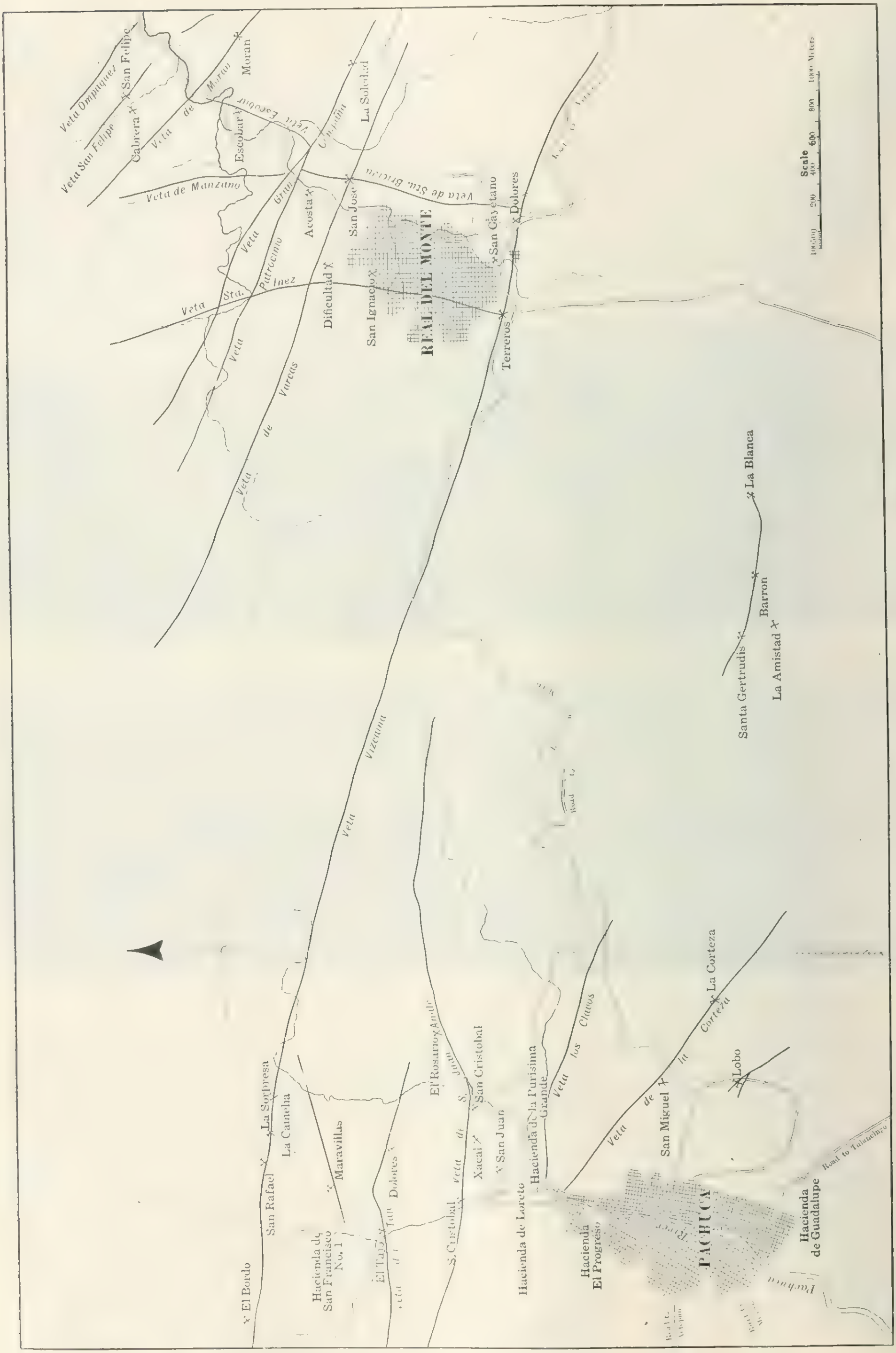
DIFICULTAD MINE, REAL DEL MONTE



SAN [illegible] SHAFT, REAL DEL MONTE

It is notable that no trace of the north-south fissuring has been found to the south of the Vizcaina vein. This fact, were it not that the Santa Inez vein seems to "peter out" as it approaches the Vizcaina, would unquestionably indicate a great displacement of the southern area to the east; but until more is known about the Santa Brigida vein in the vicinity of the Vizcaina vein, this question of displacement must remain undecided. The Vizcaina vein is approximately vertical with a tendency to dip at a high angle to the south.

The Santa Inez vein, although one of the last to be found in the Real del Monte district, is at present the most im-



MAP OF PACHUCA AND REAL DEL MONTE MINING DISTRICT portant, for from it comes most of the ore being mined for the Guerrero mill. The vein [illegible] in width from 20 [illegible] and the ore, as is characteristic of the veins at Real del Monte, carries much rhodochrosite and amethystine quartz. The proved workable area is about a kilometer long, the largest production coming from the part between the Dificultad shaft and the Terreros shaft, which is sunk near where the Santa Inez joins the Vizcaina vein. The vein dips about 85 deg. to the east as does its approximately parallel sister vein, the Santa Brigida, which is farther to the east.

At the north end, which is worked through the Dolores shaft, the Santa Brigida vein is displaced by several small east-west faults that generally throw the north end to the west. The ore often makes out along these cross-fractures, but it is peculiar that none of these small faults affect the Santa Inez vein. Another difference is that the Santa Brigida vein splits in several places, while the Santa Inez does not show any such tendency. Near the Dolores shaft the Santa Brigida vein is from 10 to 15 ft. wide, but to the northward the vein widens, and at the Acosta shaft it has its greatest width, 30 ft., in some of the upper bonanzas of that mine. Characteristically the Santa Brigida vein is quite variable; it suddenly contracts and widens, and sometimes it splits, sending off spurs into the country.

North of the Acosta shaft the Santa Brigida vein is cut by the Gran Compaña vein; soon afterward the Santa Brigida splits into two branches, the eastern one of which is called the Escobar vein. North of the Escobar shaft the vein is faulted. Many think that the Cabrera vein is the extension of this vein. If that is true, then also along this fault the north block had been thrown considerably to the west. The San Juan and the San Louis veins also belong to the north-south series of veins, but are smaller and less important.

THE PACHUCA VEINS

In the Pachuca area there are three main vein systems, the Vizcaina, the Analcos, and the Santa Gertrudis. The Vizcaina vein continues westward from Real del Monte, but only occasional outcrops are seen. It extends beyond Pachuca, and it is said that the Vizcaina fracture can be traced several kilometers farther west. Although the main vein of the east-west series and the master vein of the camp, the Vizcaina vein was not worked for many years after the Analcos because along the western portion rich ore does not outcrop. But at present most of the ore mined in the district comes from it.

The Vizcaina vein is a compound break composed generally of three parallel ore-bearing fissures, each from 1 to 5 or 6 m. wide. Along most of its length there are only three main branches, but in the central part of the San Rafael mine there are six workable branches to the Vizcaina vein; these again reunite into the usual three branches farther west. The Camelia, the San Rafael the largest single mine in the district, the Bordo, the Santa Ana and the Dinamita mines are the only ones at present working along the Vizcaina lode; only the first two of these are mining a large tonnage. The Camelia mine is 385 m. deep, and the San Rafael 500 m. deep (475 m. below the mine *patio*).

The drainage of the Vizcaina vein is greatly aided by the Girault adit, driven jointly by the San Rafael and the Real del Monte y Pachuca companies; this cuts the Vizcaina vein in the San Rafael mine on the 225-m. level, and in the Camelia on the 170-m. level.

Many important branch veins extend from the Vizcaina; indeed some think that future development will show that all the veins in the western part of the district are branches of the Vizcaina. The Maravillas vein, whose point of departure from the Vizcaina is debated in the district, and the Analcos system of veins, which branches from the Vizcaina near the Reunion claim, have already been shown to be branches from the Vizcaina.

The Analcos vein was the one first worked in the western area, for along it are the Xacal, the San Cristóbal, the Rosario and the San Juan mines. In most of these the rich ore outcropped at surface. At present these mines, which belong to the Real del Monte y Pachuca company, are not worked.

The other important vein system is the Santa Gertrudis, to the east of Pachuca. On this vein the Santa Gertrudis, the Amistad, the Barron (one of the best mines belonging to the Real del Monte y Pachuca company), and the Blanca mines are working. Mining on this vein, like a great deal of the mining on the west end of the Vizcaina, is quite recent, for it began only a few years prior to the organization of the Santa Gertrudis y Anexas company in 1875. Although it is said that a line of outcrops can be traced from the Guadalupe and Fresnillo veins to the Santa Gertrudis, no mining is being done on these intervening outcrops, and the Santa Gertrudis, which is about 475 m. deep, is not only the deepest mine on this vein, but also the one farthest west. The Barron, the next deepest, is 450 m. deep, but the main shaft is being sunk another 50 m. so as to open up [illegible].[1]

At present in the Barron mine, the vein above the 425-m. level has been worked fairly thoroughly so that most of the ore comes from the stopes between the 425-m. and 450-m. levels. The Santa Gertrudis vein is widest on the west. In the Santa Gertrudis company's ground, near the west end line of the Barron mine, it is fully 35 ft. wide; but farther east the vein seems to decrease in width, narrowing to about 15 ft. on the east end of the Barron mine. The vein [illegible] some of the ore shipped from the Bar- [illegible] Gertrudis vein has a tendency to send off branch veins, for in the Barron a branch puts off to the north and also one to the south. The vein dips about 60 deg. to the south.

There are several other important veins near Pachuca, such as the Maravillas, from which about 100 tons of ore per day are being mined, and the Corteza, which was worked considerably in the past and from which the Real del Monte y Pachuca company is shipping some sorted dump ore. To the north of Pachuca a few miles is the Chico district, in which there is an east-west system of veins quite similar to the Pachuca veins, but at present, far less developed.

[illegible]

Several methods of mining are used in the Pachuca and Real del Monte district. At Real del Monte, where the veins are nearly vertical and the wall rock strong, underhand stoping is used, and the ore blasted into mill-holes. These are sunk from the level above, for in this, as in most camps of Mexico, driving a raise costs more than sinking a winze. Underhand stoping is well adapted to Mexican labor, but a possible disadvantage is that only the ore in the mill-holes and bins at surface is held in reserve. This is also true of the method of mining generally used on the Pachuca side where overhand stoping with waste filling is used; in this method as used at Pachuca, horizontal cuts 2½ m. high are taken along the vein, and the ore is broken onto floors to keep it from mixing with the waste. The waste filling is carried along close behind the drillers for, owing to the flatness of the vein, in some places, the ground is quite heavy; cribbed chutes are carried up through the waste filling as stoping progresses. In some of the heavy stopes, notably in some parts of the San Rafael and the Santa Gertrudis mines, square sets are used, the sets being subsequently filled.

At the Camelia mine overhand stoping with ore-filled stopes will be used, the excess ore being drawn through "Chinamen¹," until the stope progresses enough to allow the ore to be drawn through the cribbed chutes that are carried up in the ore filling. When the ore in the stopes has been broken from level to level, the ore will be drawn and waste filling will follow it down.

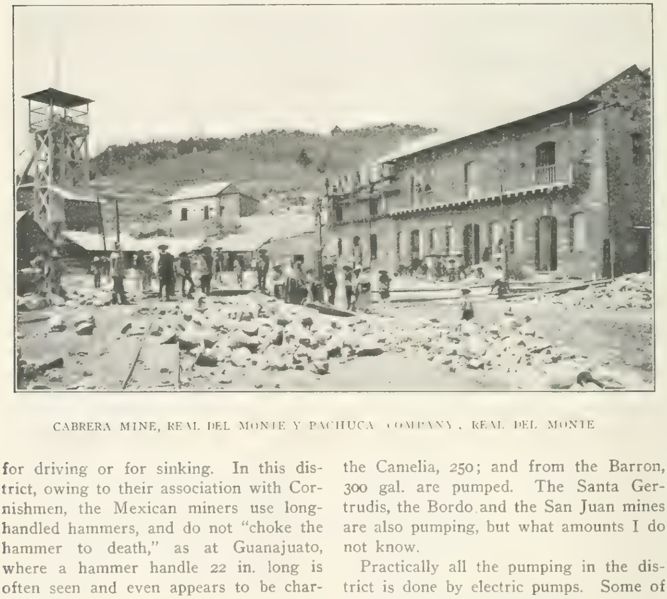
Much dry walling is used in lining the drifts along the vein, the arch being made of cut stone, but this cracks badly under pressure. At the Barron mine rock-lined drifts that apparently would have lasted forever, have become so badly cracked in a year's time that timbers will soon be needed to hold open the drift. This stone lining, including the cost of the cut rock forming the arch, costs in place 50 pesos per meter. Timbering a drift including cost of timbers and framing, costs only 16 pesos per meter, and lasts from nine months to a year. In the future, at the Real del Monte y Pachuca properties, as the timbers are cheaper and can be "eased" or replaced readily when necessary, the main levels, instead of being lined with masonry, will be timbered.

---

[1] [illegible]

Owing to the great weight in some parts of the Barron mine a lateral drift is driven in the foot-wall in order to work those portions of the mine, but this, I think, is the only mine in the district where a lateral drift is used.

Most of the drilling in the camp is done double-hand, but a few air drills are used in some of the mines, mainly for driving or for sinking. In this district, owing to their association with Cornishmen, the Mexican miners use long-handled hammers, and do not "choke the hammer to death," as at Guanajuato, where a hammer handle 22 in. long is often seen and even appears to be characteristic.



CABRERA MINE, REAL DEL MONTE Y PACHUCA COMPANY, REAL DEL MONTE

Driving a 2x2-m. drift costs from 30 to 40 pesos per meter, while a crosscut of the same size costs from 40 to 50 pesos. Mining, inclusive of development, costs from 6 to 10 pesos per metric ton, for in many of the stopes 60-per cent. dynamite must be used, and owing to the hardness of the rock a pair of miners can only drill 9 to 12 ft. per shift.

Practically all the mining in the district is done on contract. At some mines the stopers are paid by the cubic meter; in others by the running meter, the miner breaking the vein from wall to wall, no matter how much it varies in width. As the ore is softer in the wider portions and the cost of explosives is relatively high and that of labor small, the easier drilling and breaking of the softer ore about balances the increased cost of shoveling.

Pumping

At Pachuca pumping on the Vizcaina vein and to a less extent on the Analcos vein system is aided by the Girault adit. At Real del Monte, all the mines are connected with the Aviadero adit which cuts the Santa Inez vein at a depth of 300 m. At most of the other mines, for instance, the Barron, short adits have been driven to drain the upper workings. Consequently, at no mine does the water have to be pumped to the collar of the shaft. At present the water pumped from the Real del Monte mines amounts to 4500 gal. per min., 1100 gal. of which comes from the Dificultad shaft. But in Pachuca the amount of water is considerably less; from the San Rafael mine, 400 gal.; from the Camelia, 250; and from the Barron, 300 gal. are pumped. The Santa Gertrudis, the Bordo and the San Juan mines are also pumping, but what amounts I do not know.

Practically all the pumping in the district is done by electric pumps. Some of these are plunger pumps, but more are centrifugal pumps. A few electric sinkers are used, but these have not proved very satisfactory. While in the past many Cornish pumps were used, now, owing to the high cost of power, nearly all of these have been shut down. Many of them have been dismantled, but at some of the shafts, for example, the Dificultad, the Dolores and the San Juan, the Cornish pumps and the boilers are held in readiness for use in case of breakdown to the electric-power system. The Cornish pump at the Dificultad shaft, which is of the Rittenger type, is a monster, having a capacity of 2000 gal. per min. and an 8-ft. stroke.

Owing to its low cost, electrical power is employed with one or two exceptions, to run all machinery at the mines. The Compañia de Potencia Electrica de Estado Hidalgo (the Landero company) can furnish 3000 electrical horsepower, generated at Regla, 20 miles from Pachuca, while it has in reserve in case of accident a 1500-h.p. steam-turbine generator-set in Pachuca. The Compañia Irigadora é Electrica has a capacity of 6000 h.p. distributed between its three plants. At all the plants impulse wheels, directly connected to the alternators, are used. According to the amount of power covered by the contract, the cost varies from 96 to 150 pesos per horsepower per year. The electric current is carried underground at 1040 volts and is transformed to 440 volts for the motors other than those operating the pumps.

Mines in Operation

In Real del Monte the Santa Inez vein is worked the most extensively. The Dificultad shaft is used for sinking, pumping and lowering timbers, while the ore is hoisted through the San Ignacio shaft. The Santa Inez vein is worked to a depth of 440 m. The Santa Brigida, San Juan and San Louis veins, all having a north-south strike, are worked through the Dolores shaft. This at present is 500 m. deep, but is being deepened; the lowest level is the 475-m. level. The Dolores shaft has a steel headframe 60 ft. high, and at the San Ignacio shaft a similar one will soon be erected. The Cabrera and the Escobar veins are also being worked. The Cabrera shaft is 255 m. deep. The ore coming from this mine is oxidized, and, therefore, heavily stained with manganese oxide. The vein is about 4 m. wide in the widest stopes, but the ore is the richest mined in Real del Monte.

The ore from the Escobar, Cabrera, and Santa Inez mines goes to the Guererro mill. At the Dolores shaft only the richer ore is hoisted at present for only the shipping ore can be sent away. The milling ore that is sorted out is held at the mine. The ore from the Escobar and the Cabrera mines is hauled by mules to the Guerrero mill. The ore from the Santa Inez vein is conveyed from the San Ignacio shaft to the Guerrero mill by a Pohlig aërial tramway, which is equipped with a bucket counter and weigher, and also an automatic governor. It is probable that this tramway will be extended so as to handle the ore from the Dolores shaft. At present about 300 tons of ore from the Real del Monte mines is being milled, but considerably more ore is broken, and is accumulating in the stopes and at surface.

At Pachuca, the San Rafael, the Maravillas, the Camelia and the Barron, belonging to the Real del Monte y Pachuca company, the Santa Gertrudis, the Blanca and the Amistad mines, are hoisting much ore, while the Santa Ana, the Bordo and the Dinamita mines are working on a small scale. The San Rafael mine, which is a little over 500 m. deep, is mining about

500 tons of ore per day, but about [illegible] per cent. is sorted out either as waste, or as ore good enough to mill when the company's own mill is running. This sorted milling ore is too low-grade to pay to send to custom mills, which purchase the ore, charging about 20 pesos per ton for treatment, inclusive of the cost of quicksilver and other chemicals lost, and paying nothing for the gold in the ore. The Real del Monte y Pachuca company is mining about 600 tons of ore per day, about 60 tons of which is shipped.

At Pachuca the ore is not so easily handled as at Real del Monte for at present it has to be hauled in mule cars to the different mills. In time this will be remedied by building cyanide plants near the larger mines. Then only the ore from the smaller mines will be hauled to [illegible] mills.

SORTING THE ORE

At present, owing to the tonnage milled locally (extremely small compared with the possibilities of the camp), the special rates that the smelters offer for silicious ores, and the comparatively high treatment charges at the local mills, not only concentrates but also all ore assaying 2 kg. silver or better per ton are shipped to the smelters. This rich ore is obtained by sorting the ore that does not pass a 1-in. grizzly. At some mines the large pieces from the oversize of the 2-in. grizzly are crushed in a Blake breaker, but at others the sorters break the larger pieces with hammers. The cost of sorting ore by contract is at the Dolores shaft 2.25 pesos per ton of ore shipped; at the San Rafael, 1.40 pesos, and at the Cabrera, 1.40 pesos, the difference being due to certain circumstances, such as the manner of breaking the coarse ore and the amount of shipping ore in the run-of-mine ore. The work of the sorters is kept efficient by sampling the milling ore and the waste as well as the shipping ore.

At the San Ignacio shaft the ore is sorted on a Robins belt conveyer. The ore below 1-in. size goes to the mill direct, but the oversize from the 2-in. grizzly is crushed in jaw breakers before joining the oversize from the 1-in. grizzly which feeds direct to the inclined Robins belt. The ore is washed with water as it is elevated up the incline; women, paid 50 centavos per day, sort out both the shipping ore and the waste. Ore assaying over 200 grams silver per ton is sent to the mill but that which assays over 2 kg. is shipped. There are 15 of these women, one expert women picker, paid 1 peso, who picks over the ore and waste sorted out by the others, and one boss, a man, who is paid 1.50 pesos. The cost when 150 tons per day are sorted is 10 centavos per metric ton. Throughout the district men do the sorting when the ore is broken by hand, but the Pachuca y Real del Monte company has found that when a picking belt is used women do the better work. This is also the experience at Guanajuato.

The wages paid in the district are as follows: *Peones* on surface, 75 centavos; *peones* underground, 1 peso per 10-hr. shift; miners on day's pay, 1.25 pesos; timbermen, 1.25 to 2.50 pesos; carmen, 1 peso; cagers, 1.40 pesos; hoisting engineers, working 8-hr. shifts, 14 to 18 [illegible] boss, 3 pesos; blacksmiths, per 10-hr. shift, 2.50 pesos; blacksmith helpers, 1.25 [illegible]

At the Real del Monte mines, 1000 men are on the pay roll; at the San Rafael, 2000 (but considerable construction is going on and about 175 men are working in the *patio* sorting the ore), at the Barron, 350 men; at the Camelia, 350 men. The Santa Gertrudis and the Blanca are the only other mines that are employing many men; probably they employ 550 men between them. The small mines employ about 100 men more, making the total number employed underground in the district about 4000 men. Probably never more than two-thirds of this number are working at one time.

THE ESCOBAR MINE, REAL DEL MONTE Y PACHUCA COMPANY, REAL DEL MONTE

Throughout the district there are several good-sized dumps that will average 400 to 500 grams silver and 2.5 grams gold per ton, but these, with the exception of the dump at the Corteza mine which is being sorted for shipment, are not being worked because the mines furnish a tonnage of heads, assaying from 700 to 1000 grams silver, far in excess of the milling capacity of the district. At present the ore milled assays on an average about 1 kg. silver per ton, but ore considerably lower in grade can be treated as is shown by the fact that at the San Ignacio shaft the content at which the ore already mined and at surface will no longer pay for treatment is 200 grams silver per ton. Consequently as [illegible] process and steam power did not mine ore assaying less than 500 to 600 grams silver, there is much ore in the old workings which now will pay to mine.

[illegible]

The future of Pachuca looks very encouraging [illegible] electric power, a fairly efficient labor, and many good mines it only awaits the erection of more cyanide plants to take the place among silver-producing districts which it occupied years ago. As it is, the rapid modernizing of the district, which has been so conspicuous during the last 18 months, has been due to the example set by the Real del Monte y Pachuca company, which during this time has been gradually modernizing the methods of mining, milling and even bookkeeping. Being a conservative company, [illegible] period of experimenting is passing, and soon the metallurgy of the ores will be proved by the mills just completed, and those now being built. In closing, I must draw attention to the fact that it was here that A. Grothe first introduced the Brown tank outside of Australia. To him great credit is due for this boldness.

I wish to thank all the men in charge of mines and mills at Pachuca, all of whom were very kind to me; especially V. B. Sherrod, consulting metallurgist to the Real del Monte y Pachuca company, R. H. Lyman, assistant to the manager, [illegible] Rafael y Anexas company.

In conclusion I wish to state that, provided silver will return to 60c. per oz., I [illegible] producer in Mexico within the next seven years.

American Smelting and Refining Company

The brief annual report issued by this company for the year ended April 30, 1908, is devoted to the financial affairs of the company; it contains no statements of the production of metals by the various plants of the company. The balance sheet, compared with that of 1907, is as follows:

ASSETS	1907.	1908.
Property	$ 86,845,671	$ 86,845 672
Investments	3,810,595	3,950 088
Metals on hand	18,251,587	17,519,664
Materials on hand	1,317,544	1,380,742
Net current assets	... ...	500,526
Cash and demand loans	6,706,984	5,629,034
Total assets	$116,932,381	$115,825,725
LIABILITIES		
Capital stock	$100,000,000	$100,000,000
Bonds	457,000	349,000
Net current liabilities	439,051	....
Unearned treatm't charges	2,639,301	2,068,506
Surplus	13,397,028	13,408,219
Total liabilities	$116,932,381	$115,825,725

Under the requirements of the mortgage, the outstanding bonds issued by the Omaha & Grant Smelting Company, and maturing in 1911, have been reduced by the sum of $108,000, leaving now outstanding $349,000.

The income account for the two years may be compared as follows, the earnings given being the net earnings over operating expenses:

	1907.	1908.	Changes.
Earnings	$13,250,058	$ 9,403,282	D. $3,846,776
General expenses	$ 763,854	$ 836,866	I. $ 73,012
Ordinary repairs	976,535	933,130	D. 43,405
Employees profit sharing fund	540,420	....	D. 540,420
New construction	$1,054,996	622,096	D. 432,900
Total	$ 3,335,805	$ 2,392,092	D. $ 943,713
Net income	$ 9,914,253	$ 7,011,190	D. $2.903,063
Dividends	7,000,000	7,000,000	....
Surplus for yr.	$2,914,253	$ 11,190	D. $2.903,063
Surplus for prev. year	10,482,775	13,397,028	I. 2.914,253
Total surplus	$13,397,028	$13,408,218	I. $ 17.190

Taxes are included under general expenses. The president's report says: "There were deducted from the net earnings of the preceding year $540,420 on account of employees' profit-sharing fund, and $1,054,996 on acount of new construction and improvements, or a total of $1,595,416; whereas during the past year there has been no payment made to the employees' profit-sharing fund, and the amount deducted for improvements and new construction has amounted to $622,096. The net amount applicable to the payment of dividends shows a reduction, as compared with the preceding year, of $2,903,063.

"Together with most commercial enterprises in this country your company has suffered as to earnings. The simultaneous and sudden decline in the value of lead, silver and copper, together with no proportionate decline in the expenses of operating mines, notably freights, supplies and labor, made it unprofitable for many of the various mines under contract to your company to continue their usual output of ore. This had the necessary and inevitable result of bringing about the reduction shown above. The large surplus, however, already accumulated was not impaired, and now amounts to a total of $13,408,218.

"Preferred stock dividends Nos. 32 to 35, inclusive, and common-stock dividends Nos. 15 to 18, inclusive, amounting to $7,000,000, have been paid regularly each quarter. The directors thought it best to reduce the dividend on the common stock for the last quarter of the fiscal year to 1 per cent., thus bringing the dividend payments within the net profits of the year, even after charging off against profit and loss the entire amount expended during the year for improvements and new construction.

"There has been completed and added to the property of the company during the past year a lead- and copper-smelting plant at Chihuahua, Mexico, which commenced operations in July, 1908. The entire cost of the construction of this plant has been charged to profit and loss, as has been the universal custom of the company in connection with new construction for the past five years.

"The slight increase in investment account is due to a reorganization of the United States Zinc Company. The earnings of the American Smelters' Securities Company were affected by the same causes as those which reduced the earnings of your company. We are pleased to state, however, that after the payment of dividends on preferred stock for the year ending May 31, 1908, there was a surplus to the credit of profit and loss account of that company of $33,709. The various smelting plants under construction since the organization of the Securities company are now in partial operation and are fast reaching completion.

"There is a marked improvement at the present writing in the market value of copper and lead. The directors feel warranted, therefore, in expecting that the net earnings of the Securities company for the coming year will not make necessary any further encroachments upon the surplus, and it is not expected, therefore, that your company will be called upon to make any payments under its guarantee of dividends on Securities B preferred stock."

Magnalium, an Alloy of Aluminum and Magnesium

Magnalium is an alloy of aluminum and magnesium manfactured by a syndicate in Germany. It contains from 90 to 98 per cent. aluminum, and possesses properties which render it suitable for many industrial purposes. It is imported in the form of pigs or ingots for castings or forgings and its manipulation is said to require no training other than that possessed by the ordinary foundryman or blacksmith.

The chief advantages claimed for magnalium are that it can be forged, soldered, by men without special training, it can be rolled and annealed and that in all forms its strength is greater than that of pure aluminum although its weight is slightly less. The specific gravity is about 2.5, varying slightly with the composition, while that of pure aluminum is 2.64. The tensile strength of magnalium has been found by test to be as follows in pounds per square inch: Castings, 19,000 to 42,000; forgings, 30,000; annealed and hard rolled plates, 42,000 and 52,000 respectively; drawn rods, 60,000; wire, 41,000 to 53,000; and tubing 74,000. The melting point varies from 1185 to 1250 deg. F., and the specific heat is 0.2185.

The properties of the alloy vary somewhat with the composition. A small proportion of magnesium makes a good alloy for casting, but for forging, rolling or wire-drawing a larger admixture of magnesium is required. Tubing is made of material containing about 90 per cent. aluminum while rolled plates contain about 94 per cent.

The electric and thermal conductivity of the alloy is 56 per cent. of that of pure copper. The material takes a high polish and resists oxidation better than aluminum. It is unaffected by dry or damp air, water, gaseous ammonia, carbonic acid, hydrogen sulphide and most organic acids. It is very slightly affected by nitric and sulphuric acid and more rapidly by alkalies or strongly alkaline solutions. It is slightly attacked by salt water and surfaces exposed to sea water should be protected by a coat of lacquer. A multitude of articles made of magnalium are found in the European markets, varying from parts of delicate balances and optical instruments to agricultural implements, horseshoes and engine castings.

The new alloy is sold at prices only slightly higher than that of aluminum, considering its greater tensile strength and the smaller quantity required for a given purpose. Quoted prices for magnalium f.o.b. New York are as follows: Crude metal, $47 to $61 per 100 lb. according to quantity; wire, $85 to $90 per 100 lb. with extra charges for very small diameters; plates, $80 to $85 per 100 lb. with extra charge for plates less than one millimeter thick; rods, $80.70 to $85.70 per 100 lb.; tubes, $160 to $180 according to size; and solder $1 per lb. A material reduction in price is made when the alloy is ordered in large quantities.

Tom Johnson (*Journ.* Chem., Met. and Min. Soc. of South Africa) states that he prefers grooved steel to octagonal steel for chisel bits since the strength is under the corners. He used 1¾-in. steel for a 2-in. bit, and 1½-in. steel for a 1¾-in. bit. No trouble was experienced on account of "fitchering" as the whole width of the bit was carried for an inch back from the edge of the bit.

Short Talks on Mining Law—X

By A. H. Ricketts*

The instability of the possessory title to a mining claim before the legal title has passed from the government has been already shown. And even in the case of a patented claim, because of the complications that may arise under the "apex rule," the patent for a lode claim may only secure title to the surface ground described therein. The patent gives no greater mining rights than those acquired by location; each confers the right to veins or lodes that may apex within the ground covered by the patent, together with the attendant right to follow the vein on its downward course (its dip) within the vertical extension of the parallel endlines of the claim and beyond the sidelines into other territory to any depth or distance. This right to follow the vein on its dip is not affected by the fact whether or not either or both claims are held by patent, or location, nor whether the vein or lode extends from one endline to another, or from one sideline to another, or from one line of any kind to another, but it is applied throughout their entire depth to all veins or lodes whose apexes lie within the surface lines of the claim. This right is subject to the same right in others similarly situated, i. e., the locator or patentee may invade other claims or have any part of his own claim invaded which lies within the extended endlines of other claims if conditions warrant. As a rule, priority does not matter.

A patent regular in form is evidence of a perfected right, and that a vein or lode lies within the area described therein, yet the fact may be that the vein or lode embraced in such ground does not apex within the limits of the patented area; then the patented portion of the vein would belong to another who possesses the apex of the vein. It is not the custom of the land department to inquire into this question as a precedent to patent, but it has been held that the charge that a vein or lode sought to be patented is located upon its dip "imposes on the land department the duty to determine the question before the issuance of the patent."

Endlines

It does not follow that the endlines shown in the location notice or the patent are the only endlines of the claim. Additional endlines within such lines, but not outside thereof, may be fixed by judicial decree, but a court cannot change the location by making a new endline or lines. It is said that as there may be different veins with different extra-lateral rights within the same location, "the planes which bound such rights of different veins may be as different as the extent of their respective apexes, though all such planes must be drawn vertically downward, parallel with the endlines of the claim. The endlines of a location, or the endline planes of all veins or lodes, having their apexes therein, do not shift as endlines to accommodate the sinuosities of the vein or lode; in other words, the endlines cannot be drawn at right angles to the strike of all the veins or lodes if they do not have the same strike.

It has been held that when the apex of the vein or lode passes through one of the parallel endlines and a sideline, the extra-lateral rights are bounded by the vertical plane of such endline and a parallel plane passing through the point at which the apex crosses the sideline. In the case of a lode located under the law of 1866 (which did not require parallel endlines, although specifically giving extra-lateral rights) and patented under the law of 1872, it has been held that, where the endlines of such lode diverge from each other, extra-lateral rights on the dip are to be measured upon the dip between vertical planes drawn perpendicular to the strike of the lode through the extreme points of its length.

If the claim is laid across, instead of along, the vein or lode, the courts have held that what the locator intends shall be the endlines of this claim are really his sidelines, but that in all such cases where the apex crosses the original sidelines, the sidelines must be parallel in order to insure the extra-lateral right. If the apex of a vein or lode "bellies" beyond a sideline—i. e., passed beyond such line and recrosses the same into the claim —its owner is entitled to the vein within the walls thereof.

In this connection it may be said that it has been held that there is no limit in the Mining Act as to the portion of a vein that may be located on its width, nor for its lateral division, and that there is no provision as to how the vein over 600 ft. wide shall be located. By the terms of the law the lode claimant is entitled to locate 300 ft. on each side of the *middle* of the vein at the surface without any provision regarding the width of the vein. Consequently the law makes no provision as to how to determine the width of a location where only one wall of the vein or lode is discovered.

The width of the outcroppings is not necessarily the width of the vein, or lode, and the outcropping is not always determinative of the location of the vein or lode, for it may be detached therefrom. It has been held that, when the outcroppings are within the surface boundaries of two claims, the one first located necessarily carries the right to the vein or lode; but this assumes that an outcrop is necessarily its apex, which is not true. It has been held that extra-lateral rights [illegible] depth and limit the extra-lateral right to what the "pocket" thus formed may contain.

[illegible]

The surface lines may be corrected or changed at any time before patent, provided that it can be done without prejudice to the rights of others. The Mining Act does not provide for an amended location, but in most States, this omission is usually supplied by local law or local rule. Indeed it has been held that, when the lines of the location are not parallel, the locator "has the right and perhaps it is his duty, to make such change as is necessary to parallel his endlines within any reasonable time if such change interferes with the substantial property rights of no other person; that any different rule would be a disgrace to justice and an impeachment of the common sense of lawmakers." In the case in which that language was used, the claimant drew in his west sideline about 250 ft. in order to parallel his east sideline. This was done by the deputy mineral surveyor while surveying the claim in patent proceedings, and the extra-lateral right was thus obtained.

The courts are not in accord as to whether the requirements of the law as to the parallelism of the endlines are applicable universally. The mineral claimant possesses only intra-liminal rights unless the lines are paralleled in some of the ways above shown. The court cannot make a new location for the claimant or enlarge his rights; it can give him only such rights as his original location warrants.

Burden of Proof

To establish the extra-lateral right, the existence of the apex must be shown; it must also be proved that the vein or lode is in place and continuous in the sense that it can be traced from the apex into the workings or property. The burden of proof [illegible] the party [illegible] to have the apex of a vein worked by another. In aid of this he may obtain from the court an order allowing him or his agents to inspect and survey the workings of his opponent. This matter is usually regulated by local law, but, in the absence of such legislation, it is said to [illegible] sible for the parties to determine their respective rights to the dip without litigation, by agreement or deed. Surface conflicts may be settled in the same way, even in patent proceedings.

[illegible]

When the question of priority arises as [illegible] seniority of title governs. The question is concluded by the patent. In other cases the date of the patent is not conclusive of the time when the right was initiated, but if the contest is between a patentee and one holding under a location made subsequent to the date of the patent, the patent prevails. If a contest arises between the holders of different patents, the date of the location may be shown by a certified copy of the patent proceedings obtained from the general land office at Washington. If both claims are unpatented, the date of location must be proved as in other cases.

---

*Member of the San Francisco Bar, San Francisco, Cal.

The Mining Act provides that priority of title governs where two or more veins intersect or cross each other or unite. The courts are not in accord as to whether or not these provisions are in conflict with or supplemental to other parts of the statute conferring rights upon a locator, i. e., whether such provisions do or do not limit the exclusive rights given the senior location

A Selective Electric Fuse Spitting Device

By Robert N. Bell*

Spitting holes in shafts, especially in wet ground, is hazardous work, and the danger has been greatly increased by the introduction of electric hoisting. With electric-power systems the loss of power is sudden and without warning, while in the case of air or steam there is a gradual dying away of the power. Hence, there is danger of the failure of the electric power between the blasting signal warning the engineer to be ready to hoist, and the final signal for hoisting the miners away from the blast.

Since even the best of electric-power systems are liable to fail, especially when the transmission line is long, the solving of the problem of blasting without the attendant danger of being caught when the holes are fired, has been given much study. Of course, simultaneous blasting by electric current is possible, but that is not desirable in shaft work where timbers generally have to be kept close to the bottom and where the cut holes must be fired first to get the best results.

The device described in the following paragraphs was perfected at the Hecla mine in the Cœur d' Alene district, Idaho, for selective firing of holes from a distance by means of electric current. In sinking a big three-compartment shaft at that mine, the air plant being taxed to its full capacity, the hoisting had to be done from the main plant, which was operated by electric power generated at Spokane Falls, Washington, over 100 miles distant. The frequent temporary interruptions in the transmission of the power got on the nerves of the shaftmen, for they feared that the power might fail when they were spitting heavy blasts in the shaft. The result was that the company electrician devised a plan of spitting the fuse at a safe distance so as to eliminate this danger.

One Miss in a Thousand Shots

The first device used was not satisfactory, but by rebuilding it and using a higher voltage, P. C. Schools, electrician at the mine, has succeeded in bringing the machine to such a state of perfection that the misses amount to only 1 in 1000

The perfected system consists of a firing board, where the operator tests his circuits and "spits" his holes in the order desired; a reel, on which is wound the cable carrying the wire used in spitting; and firing blocks attached to the end of the cable. The holes are charged and primed in the usual way, and the spitting wire shown in the accompanying illustration is inserted in a slit cut in the fuse near its end. The fuse is wrapped tightly with electrician's tape, and thoroughly coated with axle grease, so that the juncture is practically water-proof and the spitting can be done successfully under water.

The spitting ends are all prepared before going into the shaft and the fuses are all cut the same length, as the operator gives the time interval between holes when he inserts the plug at the firing board. Each fuse has two leads of a spitting wire projecting from its end. The cable containing the wires with the attached firing blocks, which is kept on a reel in the station on the next level above the shaft bottom, is now lowered to the bottom, and the two No. 16 annunciator wires projecting from the fuse of the first hole to be fired are securely wrapped around the two heavy copper leads of block No. 1. This gives hole No. 1 direct connection with the firing board on the level above. Holes Nos. 2, 3, 4, etc., are then attached to the numbered blocks in the order in which they are desired to explode.

The system shown in the accompanying illustration is designed for a 24-hole round, which, of course, can be used for fewer holes, if desired; the number of holes can easily be increased, but that rarely would be necessary.

Tests Insure Ignition of the Fuse

When all the holes are ready to be fired, the men are hoisted to the firing station, and the circuits are tested out. To test the circuits, the main-line switch is closed and care taken that the single-pole firing switch is open, for it is impossible to spit a fuse unless the firing switch is closed. This firing switch is kept in a box under lock and key, and only one man on each shift has a key to open it. The flexible cable and plug is then inserted into each of the holes in the firing board numbered to correspond to the holes below to be fired. If the circuits are closed, and ready to be fired, the lamps at the top of the board will light. If the lamps should not light, then there is something the matter with the circuit that must be remedied. If all the circuits test closed, then the shots are ready to be fired.

To fire the shots, the main line switch is closed, the firing-switch box is unlocked, and plug inserted into No. 1, the lamp lights, the firing switch is closed. This short circuits the lighted lamps causing them to go out, and at the same time applies 440 volts directly across the No. 26 tinned iron wire in the fuse at the bottom of the shaft. This wire melts with a blinding flash, spits the fuse, and burns itself free. The firing switch is then opened immediately so that if an arc is maintained at the fuse it will be smothered by the cutting in of the lamp resistance. With the plug still in No. 1, and the firing switch open, failure of the lamps to light indicates that the spitting wire at the bottom did its work and the fuse is now burned, but if the lamps again light up brightly, it indicates that the fuse did not spit and that the firing switch must again be closed. It is seldom, if ever, that the firing switch has to be reclosed.

Little Additional Time Required

The operator then allows his time interval—a few seconds between holes—which in most cases is simply time enough to change his plug to the next hole. He then proceeds with the second hole as above described, re-testing the circuit-firing resistance to see if the operation was successful and continuing until all the holes are spit. The melting of the fuse wire leading to each hole disconnects the firing blocks so that the lower end of the cable is free, the upper end is then detached from the firing board, the cable wound onto the reel, and set aside until the next round. The fuses are all ignited and the shots go in the order desired without any attendant danger.

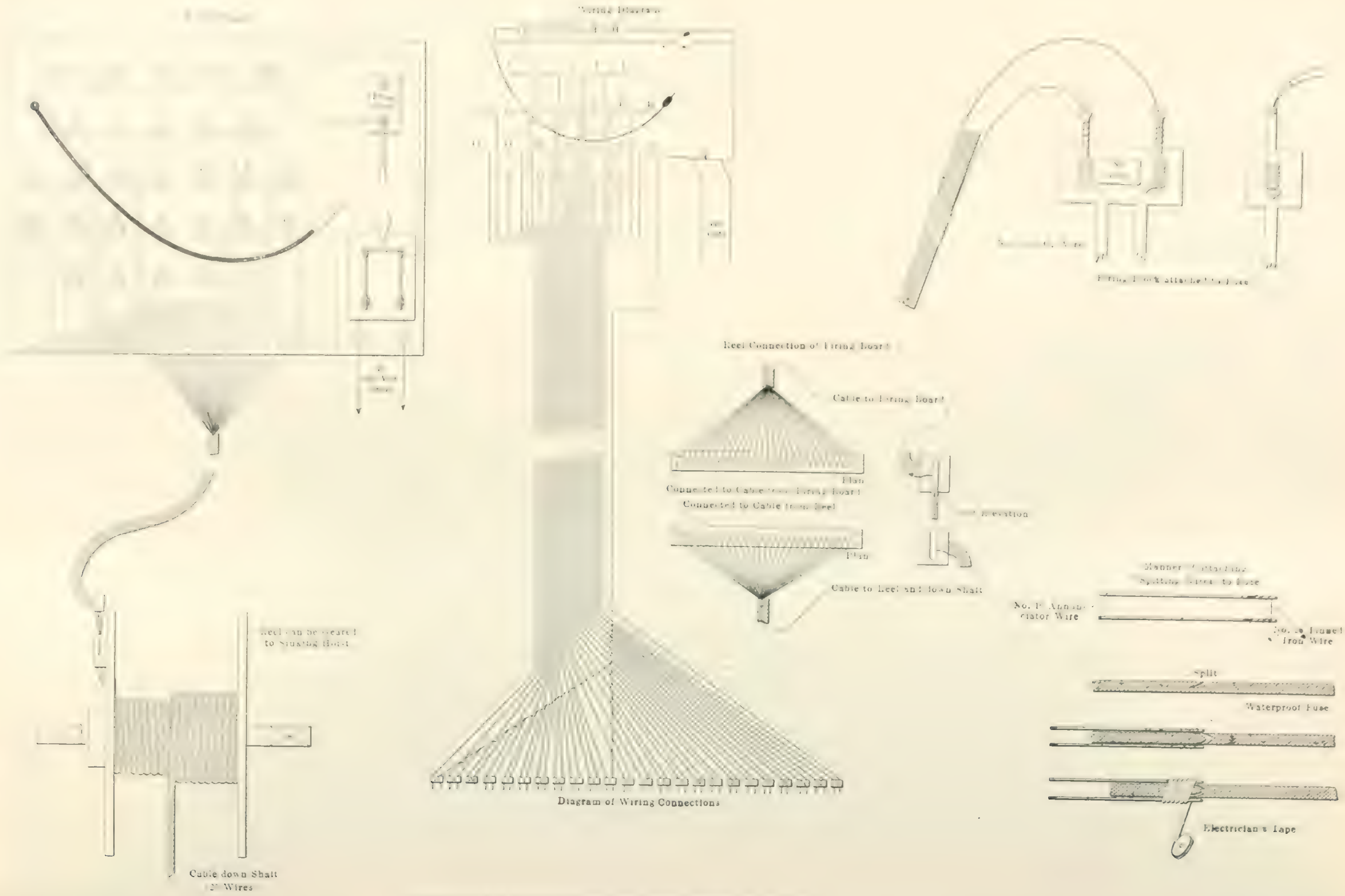
While seemingly complicated in description, this device can be cheaply installed where the current is available. In making this device nothing is required besides the ordinary material and apparatus kept at a mine where electric current is used for power. The original device was patented by one of the miners who was working in the shaft when it was used, but as neither of the inventors have taken out a patent, the perfected form is not covered by the stolen patent.

This device is as simple to operate as a telephone switch board, while the attaching of the firing blocks to the fuse takes little more time than would be required in spitting a fuse with a torch, and is quicker than spitting with a hot iron, but of course it is not speed that is important, but safety.

For lubricating engine bearings a free-running oil is said to be best.

---

*State inspector of mines, Boisé, Idaho


Wiring Diagram
Reel can be geared to Sinking Hoist
Cable down Shaft 12 Wires
Diagram of Wiring Connections
Reel Connection of Firing Board
Cable to Firing Board
Plan
Connected to Cable from Firing Board
Connected to Cable from Reel
Plan
Elevation
Cable to Reel and down Shaft
Firing Block attached to Fuse
Manner of attaching Splitting Wires to Fuse
No. 16 Annunciator Wire
No. 20 Iron Wire
Split
Waterproof Fuse
Electrician's Tape

DETAILS OF ELECTRIC DEVICE FOR FIRING HOLES IN SHAFTS

The Operation of Coal Cutting Machinery

A Technical Discussion of the Use and Economy of the Various Coal Cutters Showing the Advantages and Disadvantages of Each Type

BY GEORGE E. LYNCH*

The production of bituminous coal offers a field for the employment of machinery more favorable than that presented by any other class of mining. This has led to the development of highly specialized machines suitable for this work alone, and almost unknown to those whose operations are confined to the harder minerals.

While the difficulties and dangers encountered in producing coal are not, except when complicated by the presence of gas, any greater than those overcome by ore miners, the friable nature of the coal itself offers a better opportunity for machine mining and engineers have not been slow in taking advantage of this.

.In most modern times, the coal is undercut and drilled for shooting down by electric or compressed-air machines, and hauled to the shaft bottom or tipple by electric or compressed air locomotives. In cases it is even loaded into cars underground by the same power.

The commercial machines of the present time may be divided roughly into two classes; the percussion or puncher type which imitates the action of a hand miner's pick, and the chain and cutter-bar machines which use the continuous cutting effect of a series of tools or picks working in a manner similar to a milling cutter in metal or a circular saw in wood.

The Percussion Type of Machine

The puncher has proved a satisfactory machine in practice and is adapted for use in many places when the second type is nearly, if not quite, useless. Its mechanism is not unlike that of a small steam pump with the water cylinder omitted. The piston and rod are made heavy and are guided by an extension of the front cylinder head; the outer end of the rod is fitted with a taper socket or chuck adapted to hold a single, double-pointed pick. The machine is mounted on low wheels and furnished with a pair of handles at the rear end of the cylinder. The motive power is always compressed air, for there is, as yet, no practical electrically driven puncher on the market.

In use the puncher is placed on a sloping platform called the "board," the front end of which rests against the coal face, the rear end being elevated on a low trestle or "horse." The object of the slope is, of course, to overcome and neutralize the effect of the recoil at each stroke. The runner sits on the board back of his machine and blocks one wheel with a wooden clog strapped to his foot, guiding the direction of each blow of the pick by the handles, already mentioned. A second man, called the "scraper," kneels on the floor by the board and keeps the cut clear with a long-handled shovel.

The completed undercut is about 6 ft. wide and 4 to 6 ft. deep, and is wedge-shaped in section, the hight decreasing from about 18 or 20 in. at the face to 2 or 3 in. at the extreme depth. This wedge form of the undercut is very effective in causing the coal to roll over and break up when shot, rendering it easier to load.

The puncher with its board is shifted along the face about 6 ft. as each cut is finished until the whole place is undercut. In room and pillar work the miner usually starts at the corner of the room so that when the work is completed it is unnecessary to drag the machine and board over the accumulated slack and cuttings in shifting to the next place. Each puncher is supplied with a special low truck of a gage to fit the mine tracks upon which it is loaded with its board, coil of hose, box of picks, etc., when moving about the mine.

The Different Makes of Puncher Machines

There are several makes of punchers on the market, all similar in outward appearance and efficiency and differing principally in the valve gear. All receive air through a large main valve which is in turn governed by a smaller auxiliary valve. In the Sullivan puncher, this auxiliary valve is driven directly from the main piston by means of a rifle bar with a pinion engaging a rack. A movable false seat under the auxiliary valve may be adjusted by the operator while the machine is running, thus advancing or retarding its stroke and consequently governing the movement of the main piston. In the Ingersoll-Rand, the Harrison, and other standard punchers, the auxiliary valve is moved by a small engine independent of the main piston, its action being under the control of the operator as in the previous case.

Each puncher, in the hands of an efficient runner, will average 60 to 70 ft. of face undercut per 10-hour shift. The power consumption is from 100 to 150 cu. ft. of free air compressed to 80-lb. gage per minute, thus giving a speed of about two strokes per second, which is regarded as the most economical rate of running. Any higher speed tends to disconnect the runner so that he is unable to place each stroke to the best advantage. The working efficiency of a pick-machine plant is very low. After deducting losses due to the compressor, friction, pipe line, leakage, etc., the resulting power applied to the coal is rarely more than 12 per cent. of the horse-power supplied at the steam cylinder of the compressor.

A New Type of Cutter

A new type of percussion coal cutter has been introduced in the last few years which consists essentially of a rock drill mounted on a mining column and arranged to be swung in an arc across the face by means of a worm and sector. A series of steels of varying length, each carrying a bit of proper gage, are used just as in ordinary rock-drill work, except that instead of pounding away at one spot, this drill swings radially and cuts a groove 10 to 15 ft. long, advancing ⅝ to ¾ in. each swing. Machines of this type have been successfully used abroad. These European machines, however, are provided with universal adjustment so that the drill may swing at any desired angle regardless of the setting of the column; this is a patented feature not used on those made in this country, since the latter are capable of a horizontal and a vertical swing only.

Coal cutters of this type may be used for shearing, when the coal will not stand undercutting, by setting the worm sector to swing in a vertical plane without any other change. When a room is cut, the machine may be clamped in place and the holes drilled for shooting with the same steels working as a rock drill.

The danger of a long cut closing and stopping the swing of the steel is a serious disadvantage with this machine. There is also considerable difficulty in holding a column up against a greasy surface of slate or roof coal, a trouble experienced even with the small power rotary drills and naturally much augmented by the repeated shocks of a percussion machine.

The Stanley header was designed to drive a complete gangway or tunnel at one cut. It consisted of a disk of large diameter rotated on a horizontal axis by a duplex air engine or an electric motor; the front face of the disk was provided with a number of cutting tools. The whole machine was mounted on a heavy truck and forced against the coal face. A conveyer was arranged to take the slack and cuttings to the rear where they were loaded into cars. This machine proved unsuitable for American conditions and is now practically obsolete.

---

*Mechanical engineer, Boston, Mass.

Some attempts are being made at the present time to perfect a machine which will do the cutting and the loading at the same operation. These machines are, however, more or less experimental and it is as yet impossible to form any definite opinion of their capabilities.

One of the earliest continuous-cutting machines to obtain success was the old cutter-bar type now almost obsolete in this country, although still used to some extent in England. This machine employed a tapering bar of steel, of a length sufficient to give the proper depth of undercut, in which a number of picks or tools were set. The bar was rotated by a compressed air engine or an electric motor and cut the coal in a manner similar to a surface mill in working metal. The picks were arranged in a line along the bar with the object of clearing away the cuttings and preventing sticking by a sort of screw conveyer action.

While this machine was strong and simple in construction, it was found nearly impossible to maintain a level cut in irregular coal, as the bar was easily forced upward or downward by hard spots of sulphur or by "horse-backs" in the bottom and was with difficulty returned to the proper level. This led either to a set of broken picks when they encountered a limestone floor, or a job of taking up bottom where the bar had worked upward.

The disk longwall machine was also popular for a time and is still used to some extent. This machine imitated the action of a circular saw, the cutting tools being mounted on the periphery of a large steel disk, set horizontally and driven by bevel gearing from an air engine or electric motor. The central bearing was made short and supported by steel plates above and below the disk so that almost the entire diameter was available for extending under the coal.

Since in longwall working some pressure and consequent settling of the coal is essential to easy shooting down, it is obvious that there was a continual pressure on the rearmost edge of the disk and that practically the whole active edge was required to work continuously after the cut had progressed a few yards. This caused a large consumption of power and a consequent low efficiency of the machine.

The Chain Coal-cutter

The chain coal-cutter has been standard for a number of years and is used in practically every field in the country. There are two types adapted for room-and-pillar work, the chain-breast and the so-called continuous-cutting machine, which is a modified longwall type.

The chain-breast machine is made up of two essential parts; a stationary base or frame which rests on the floor, and is clamped down while the machine is running by jacks set obliquely at either end [illegible] roof respectively; and a movable triangular cutting frame carrying a chain, provided with picks or cutters, on sheave wheels at its angles. The motor or engine is fastened rigidly to the triangle at its apex, the base being presented to the coal. The frame with its motor travels in and out in guides on the stationary base or carriage, the feed being accomplished by a rack and pinion. A cut 30 to 40 in. wide and 5 to 7 ft. deep is made at each setting, the hight of cut varying from 4 to 5½ in. according to the setting of the picks. The cutter frame is then withdrawn and the whole machine moved over by hand a distance equal to the width of the cut where the same procedure as before is followed, the operation being repeated until the entire face is undercut. Th machine is then drawn away from the face and loaded on a special truck built for the purpose, ready to be moved to the next place.

Each chain-breast machine requires the services of two men, a machine runner and a helper, the latter keeping the cut clear of slack and assisting in moving and loading the machine. A skilful operator will undercut from 150 to 180 ft. of face per shift. The electric machines require about 12 kw., equal to 48 amp., at 250 volts, or 105 amp. at 115 volts, and the compressed-air machines about 400 cu. ft. of free air compressed to 80-lb. gage per minute when running at full power.

Advantages and Disadvantages

The advantages of this machine lie in the smaller number of men required to produce a given tonnage as compared with pick machines or hand labor, its greater mechanical efficiency, and the higher percentage of lump coal due to the low kerf or undercut which it makes.

Its disadvantages may be stated as the difficulty of obtaining a level floor, the necessity of placing all props 10 ft. to 14 ft. back from the face to allow of its working, the liability of pinching the wide cutter frame in any settling of the coal, and the labor involved in moving the machines by hand along the face after every cut.

To overcome these disadvantages the continuous-cutting machine was developed. There is at present but one of this type on the market, but it is probable that most other manufacturers will have machines running on this principle in the near future.

The continuous-cutter is essentially a longwall machine modified to adapt itself to room-and-pillar work. The cutter [illegible] sheave at either end, the construction [illegible] described. In the starting or "tight" cut, the cutter frame is fed in as before, the [illegible] stead of a rack and pinion in the machine under discussion. The rear portion of the underframe is then detached, and the feed chain is extended the length of the face, and fastened securely at either end to a steel prop or jack provided for the purpose; the whole machine is drawn along the face, making a continuous undercut from end to end. At the further end of the room, the cutter frame is withdrawn, the detached portion of the underframe being replaced for the purpose, and the machine is then loaded on a truck as before described.

The fact that this coal-cutter traverses the width of the room with the cutter frame under the coal, allows the setting of props close to the face, since the space necessary for working is only that taken up by the motor and feed mechanism and this does not exceed 3 ft. in most cases.

Both this machine and the chain-breast type are usually provided with a sprocket wheel and chain or other mechanical connection with the axle of the truck so that they may be moved about the mine by their own power, the cutter chain drive being, of course, thrown out of action by some form of clutch.

Points to Consider

While the chain coal-cutter represents the highest development of the mining machine at the present time, it is by no means conceded that it is, necessarily, the form best suited to the work. The internal friction due to the large number of chain joints, and the sliding contact on the guides, all of which may be regarded as constantly under the coal, and consequently difficult to lubricate, causes a serious loss of mechanical efficiency. Indeed, those machines which employ a high speed chain waste more than 50 per cent. of the power supplied at the terminals of the motor or the throttle valve of the air engine in overcoming this internal friction.

Another serious difficulty is encountered when cutting in high seams, from the fact that the coal tends simply to settle down the hight of the undercut, when shot, and does not roll over and break up as it does when cut with the puncher. This necessitates a second shot to break up the mass, and makes it almost as difficult as shooting off the solid in the first place.

[illegible] compelled to return to some modified form of the old cutter-bar machine to avoid these troubles. The bar itself could be built up of cast-steel skeleton sections to form a screw conveyer of a pro- [illegible] bled on a stout steel shaft. A steel frame attached to the body of the machine and traveling behind the bar in the undercut, its form being similar to a longitudinal section of the bar itself, would assist in preserving the level of the cut. This frame could be inserted after the work had progressed a few yards, or could be attached rigidly to the machine, the latter construction necessitating a radial swing of the bar under the coal in starting and there leaving a corner uncut.

A coal-cutter of this type could be made very strong and simple in construction and the small number of bearings and rigidity of the mechanism should aid greatly in reducing the internal friction. The construction of such a machine would naturally introduce a number of problems which could be solved only by actual experience in cutting coal.

Door Opener

Glückauf, May 9, 1908, illustrates a simple contrivance by which to facilitate the opening of a door against a heavy air pressure. As is well known, the tug always comes while opening a door the first few inches, after which, the air pressure having had a chance to become equalized, the door opens easily. A bent lever, formed as shown in the illustration, is pivoted to the edge of the door, its shorter arm pressing against the doorpost. This arm, although the shorter, is made sufficiently heavier than the other to insure its falling into position when released.

ARRANGEMENT OF LEVER ON DOOR

The Use of Compressed Air for Hoisting

Compressed-air hoisting engines should be fitted with extra large exhaust ports and pipes but should have small clearances, although the former may be dispensed with if the air to be used is reheated near the engine. A small amount of coke is all that is necessary for reheating, which prevents all danger of freezing besides effecting a decided saving. To obtain the best results, reheat the air near the place where it is to be used. The pipe for conveying the reheated air from the heater to the cylinder should be covered as the loss of heat takes place rapidly. Live steam is a good reheater if available. Feed-water heaters give good results if the heating surface is ample and the air passage free. It has been estimated that ⅛ lb. of coke per horse-power per hour will effect a raise in temperature of 366 deg. and cause a saving of from 25 to 35 per cent.

The greatest efficiency in a compressed-air hoisting plant is obtained where a central compressing plant can be used to drive a number of different sized hoists located far apart, and necessitating a separate supply of water and fuel for each hoist, if there is no central heating plant. Such boilers scattered about a mine are wasteful of fuel and usually do not give an efficiency of more than 3 or 4 lb. of water for each pound of coal burned, while a central boiler plant will average an efficiency of 8 or 10 lb. per pound of coal. A compressed-air engine at the central plant is ready for instant, continuous service at full speed. No time need be lost in working out water or quickening fires and there is no loss of steam when the hoist is stopped while the boiler fire is hot.

Foundations for Hoisting Engines

Hoisting-engine foundations may be built of either brick, rubble, cut-stone masonry or concrete. The foundation excavation should be carried down below the frost line, to rock or firm gravel if possible. Never rest a part of the foundation on rock and the remainder on compressible soil, as such a foundation is certain to crack. If no good foundation soil or rock can be reached, use piling capped with concrete. When rock is not reached a sub-base of a minimum thickness of 8 in., made of one part cement, four parts sand, and eight parts broken stone, should be placed under the foundation proper to level the bottom and equalize the load. If stone is to be used for the foundation, the stones chosen should be as large as possible, and plenty of cement should be used. The anchor bolts should be long and well secured. It is also well to form an eye in the lower end of the bolt and insert an inverted T-rail; this will afford a firm fastening. Pass the rail through as many bolts as possible instead of using a washer and nut for each bolt. When the foundation has reached a suitable hight, level it carefully so that the engine-bed plate will have a bearing at all points. Fill all openings between the bed plate and the foundation with cement.

When undercutting soft coal, all sprags used at the coal faces should be set with a tapered wedge of wood against the coal at the end of the sprag nearest the coal face.

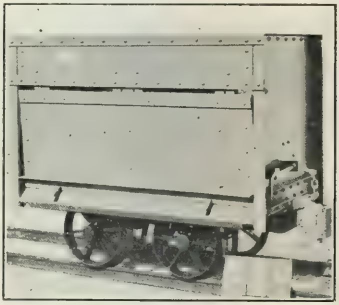
An Improved Mine Car

An order has been completed by the Arthur Koppel Company, of Koppel, Penn., for 200 mine cars for the Copper Queen Consolidated Company, Bisbee, Arizona. The cars were especially designed for this company, and have a capacity of 21 cu.ft. and a gage of 20¼ in. The side door and end plates are built of 3/16-in. steel, and the floor sheets of ¼-in. steel. These plates are put together in such a way that all possibility of a strain on one point is eliminated.

The weight of the car complete is 1368 lb.; the over-all length of the car is 6 ft. 1 in.; over-all width, 2 ft. 8 in.; over-all hight, 3 ft. 10 in. The general dimensions give a uniform and proportionate construction suitable for this kind of work.

The wheel base is 21 in., which allows the car to easily take curves having a 15-ft. radius. The wheels are spoke wheels of cast steel and are equipped with Siamese roller bearings, which reduce the traction power and lubricating expenses.

An important feature of the car is the arrangement of the door-operating mechanism. This is operated by a trip located between the rails at any point on the line where it is desired to discharge the car. The mechanism is secured to the underframe, and is in no way connected to the floor of the car, which latter arrangement is the general practice on cars of this type.



THE 21-IN. WHEEL BASE ALLOWS THE CAR TO TAKE CURVES HAVING A 15-FT. RADIUS

The principal advantage of this arrangement is that there are no rivet heads or bolt heads on the inside face of the floor sheets to interfere with the discharge of the load. This was a requirement made by the Copper Queen Company, which has had considerable trouble with an obstructed floor sheet on other cars. The doors are automatically relocked when they fall into position after the load has been discharged. The whole design is simple and was put together with a view to durability and economy. All parts are riveted together, which lessens the chance of the cars becoming out of order through the slipping of nuts or screws.

The Variable Color of Coke Ashes

By W. P. Young*

It is a matter of general knowledge, that the coke from any given region, having a somewhat similar analysis, gives normally an ash that is characteristic of that particular field, and even plant. It is not so well known that the color of coke ashes depends less on the chemical composition of the coal from which it is made, than upon the change in the chemical condition brought about by treatment of the coke as made and drawn, and to a certain extent, on conditions during the time of its later combustion.

I once had occasion, in conjunction with J. C. Brydon and L. C. McDowell, of West Virginia, to make numerous experiments in the line of the determination of the color of coke ash and its relative bearing on industrial problems, a resumé of which may be of interest.

Attention was first directed to this question by occasional complaints from consumers, especially from those using coke in open furnaces, that the coke had red ashes, and was high in sulphur, thereby injuring their product, as lead, for instance. As the normal color of the ash from coke made in the region in question is a light yellowish brown and very characteristic, it was at first thought the complaints were more or less justifiable; that the coke did really vary in its sulphur contents, and that the red-ash coke was higher in iron, and, consequently, in sulphur, inasmuch as nearly all the sulphur in the coke in question comes from its iron compound. Experiments carried on for quite a time, with cokes of varying sulphur contents, convinced us, however, that the varying color of the ashes was due to totally different causes, and that sulphur had nothing to do with the matter.

Regulating the Sulphur Content

The first point we determined was that the coke from any one oven (ordinary bee-hive oven) was practically uniform in its sulphur and iron contents, although we did find that the coke next the door was usually a little lower, say, two-hundredths of 1 per cent. than that from the rear of the oven, while coke from the center of the oven to the door was the lowest in sulphur. Usually, however, the difference did not exceed two- or three-hundredths.

We found that the sulphur contents did not vary between the bottom and top of the stands of coke more than a hundredth or two, in the event that the oven had been well burned, and had been good and hot on the preceding charge, as the amount of the sulphur left in the coke is determined largely by the treatment of the coal in the oven. If the oven is drawn after the preceding charge in a good, hot condition and not drowned with water, the conditions for the making of a low sulphur coke are good.

The oven should be allowed to stand about one-half hour before recharging, in order that the heat from the interior of the brick is allowed to come through into the oven so as to cause the fresh coal to be fired quickly after charging. It was also found advisable to have the charge of slack coal in a moist condition as the steam given off in the hot oven assisted materially in carrying off the sulphur compounds. By carefully carrying out the above conditions we found we could burn off more of the total sulphur of the coal, thus leaving the lower sulphur coke.

An Interesting Experiment

As it was believed that the color of the ash depended largely on the state of oxidation of the iron, both when the coke was made and when it was consumed afterward, a number of tests were made by treating the coke in various ways, with water and steam. A stand of coke from an oven just drawn very hot, which had been watered slowly, so as to allow for the greater part of the cooling to be made by the agency of steam instead of the water, was taken in a bright-red condition and one-half of it was immediately buried in dry sand, the other half being plunged into water.

After the lapse of some time, both samples were taken, dried and ground. They were then redried at 105 to 110 deg. C. for one hour, and were then burned in open crucibles. The ash from the sample cooled in the sand was somewhat lighter in color than the "normal" for the plant, being almost a yellow, tinged with light brown. The ash from the part of the sample plunged in the water was a dark red.

This showed that the total sulphur and iron contents had little to do with the color compared with the change in oxidation due to the treatment with water on the coke at red heat. Analysis showed the sulphur contents to be the same, or within the limits of experimental error, in the different samples. These results were repeatedly obtained by the same treatment, although I have noticed, at times, a lowering of the sulphur in the water-treated sample, the one having the red ash. This, however, may have been merely accidental, as it was only one-hundredth of one per cent.

[illegible] ing as stated, were wet with water, immediately placed in crucibles over a powerful blast lamp and burned as rapidly as possible. The ash in both samples was materially darkened, that from the sand-cooled sample being nearly, though not quite, as dark as the "normal" color for the region, while that from the quenched sample was a deep vermilion. This showed the same chemical change, though not to nearly the extent produced when the water was allowed to act on the red-hot coke.

Various Methods of Watering the Coke

Experiments were made by watering the coke in the ovens, with excess of water. This produced an ash much darker than the "normal," but not so deep a red as when the coke was plunged into water and thus immediately quenched. An experiment by using the hose on coke, drawn very hot from ovens, was also productive of dark ash.

After repeated experiments we found we could produce coke having an ash of almost any shade between the yellowish brown below the light brown "normal" and the vermilion mentioned above. It was altogether a matter of treatment with varying quantities of water at varying temperatures. The matter may be summarized as follows:

CONDITION AS DRAWN	CONDITION AS BURNED.	COLOR OF ASH
Carefully watered in oven	Dried at 110 deg. C.	Light brown (normal)
As above, watered in oven	Wet state	Darker brown
Carefully watered in oven and exposed to heavy rain on yard	Dried	[illegible]
As above	Wet state	[illegible]
Overwatered in oven	Dried	[illegible]
As above	Wet	[illegible]
Drawn hot, buried under water	Dried	Dark red
As above	Wet	Vermilion
Drawn hot, buried in dry sand until cool	Dried	Yellowish
As above	Wet	Slightly darker than normal

The "normal" color would appear to be the result of the usual amount of water used in the ovens. It is usually quite uniform for a given plant, provided there is no great variation in the coal charged, or in the atmospheric conditions. The occurrence of heavy rains on the coke yard, while coke is hot from the ovens, will materially affect the color of the ash, as will also, in lesser degree, rain on the coke while it is in stock, either on the yards or stock piles at the consumer's plant. The fact of there being more or less moisture in the coke as burned, will to a certain extent, govern the color of the resultant ash.

With the exception of the coke that is buried in dry sand, the surface of which acquires a dingy appearance, the other cokes were similar in appearance, although a practiced eye could detect those having had the excess of water. However, an observer could not, from the appearance of the coke on the yard, determine with any degree of accuracy, what would be the color of the resultant ash.

---

*Superintendent of Inspections, Somerset Coal Company, Meyersdale, Penn.

Colliery Notes

Samples of coal when kept in carefully sealed vessels are subject to deterioration.

Using rails and water lines as the return for an electric current is a dangerous practice and should be avoided.

When using rescue apparatus supplying nearly pure oxygen, remember that oxygen acts as a poison at high pressure.

The roof, sides and foundations of underground rooms where electric machinery is installed should be constructed of fireproof material.

Recent tests showed that the addition of pitch made it possible to coke some coals that, when tested, gave inferior coke, or no coke at all.

Coal loaded in box cars shrinks less than that loaded in open cars, as the latter presents a larger exposed surface to the drying action of the atmosphere.

In Continental mines when dangerous quantities of gas are present, gasolene locomotives, exhausting into water tanks are used successfully for haulage purposes.

Nearly two hundred different materials have been used for boiler cleaning purposes, but only four are effective: They are soda ash, caustic soda, tannin and kerosene.

In 1906, one of the larger anthracite companies pumped 24,437,000,000 gal. of water to the surface or more than 120,000,000 tons. A single pumping station sent up 3,000,000,000 gal. or 15,000,000 tons.

A blueprint of the mine, showing plainly the method of ventilation, the gangways and manways, roads, doors, etc., if hung up in some place near the colliery where the miners could familiarize themselves with it, might be the means of saving many lives in case of accident.

The part played by insects in the destruction of mine timbers is not often realized. A regular and thorough inspection against insect-infected timber should be a part of the routine work of all mines. Peeling timber soon after it is cut is an effective method of preservation against insect attacks.

In robbing pillars on the retreat from the boundary of a property, it is always best to keep the workings carefully in line, so that a larger proportion of lump coal will be won; undue weight on any one pillar is thus prevented, and the crushing of the coal as well as dangerous falls of rock are avoided.

The adoption by some of the Welsh collieries of an all-round eight-hour shift for fire bosses has had beneficial results so far as the safety of the miners is concerned and has materially reduced the number of accidents taking place. In one mine, only one fatal accident has occurred since this system was inaugurated.

The average consumption of coal by an ordinary reciprocating engine, is 5 lb. per horsepower produced; with the most improved types it is 2½ lb. per horsepower; internal-combustion engines are capable of operating on as little as 1¼ lb., while the most improved types consume a little less than one pound of coal per one horsepower.

In many European collieries, the whole length of hoisting rope is passed through a radial cleaning device once a month. Wire scratch brushes, arranged radially and pressed against the rope by springs are seated in a circular frame, which is free to rotate as the rope passes through it. This removes the grease and reveals any broken strands.

In Austrian mines, old winding and haulage ropes are used in tension to reinforce the roof timbers. The rope is cut in various lengths, is laid quite straight, and may be shaped to the timber if thought best, although this is not necessary. The roof pressure holds the ends fast when the weight comes on. Ropes used in this way prolong the life of the timber fourfold.

After an explosion has occurred and before beginning rescue work, ascertain the condition and direction of the air current. If the connections are broken, repair them temporarily and at once. Examine the current in the intake with an anemometer. If the fan is damaged beyond the possibility of a hasty working repair, turn live steam or exhaust steam into the outlet as far down as possible until ventilation is restored.

Ventilation is an important point in the life of mine timber. Poorly ventilated gangways and air passages with a fairly high temperature are favorable to decay, which is produced by bacteria, whose growth is caused by alternating wet and dry conditions or continued dampness. Decaying mine timber is also a fruitful source of danger to sound timber as the germs which produce the decay are easily contracted by the sound timbering.

Austrian mines are provided with underground rescue chambers. They are made to hold 50 men, being used as retreats in cases of danger. Each chamber is provided with all kinds of food, also water, first-aid supplies and individual rescue apparatus of the most modern type. Pure oxygen is laid down in pipes from the surface to the chambers. Storage-battery lamps are kept in these chambers and at intervals of 500 yd. along main roads.

Worm gearing used to reduce the speed from a motor to an endless rope drum gives good results, has few moving parts and is practically noiseless. Only machine-cut teeth should be used; these latter tend to increase the expense, but are positively necessary. The frictional loss of such gearing depends upon local circumstances; it may be as low as 15 per cent., or as high as 70 per cent.; 50 per cent. is considered a good average. This frictional loss may be reduced by running the worm in an oil bath.

The Whitewood collieries, at Normantown, England, have a system of vacuum cleaning for removing coal dust, which they have found cheaper, and more effective than watering. The effect of wetting coal dust is only temporary, the dust soon dries and is finer and more dangerous than before, but the vacuum cleaner removes the fine coal bodily from the mine. Vacuum cleaning is also more thorough than any system of watering as it is capable of removing the large quantities of dust that accumulate above and on timbers and the dust which collects in cracks.

Concrete made of portland cement may be safely used in freezing weather, if 1 lb. of salt rock is mixed with every 18 gal. of mixing water, when the temperature is at 30 deg. F.; one additional ounce of salt is added for each degree of temperature below the above limit. This method of mixing has been found effective not only in preventing the freezing of concrete mixtures, but in addition affords a substantial aid to a more uniform setting of the whole mass. The heating of the water and pans used in mixing concrete also gives added protection against freezing.

Creosote in which timber is immersed for preservative treatment should be raised to a temperature of about 220 deg. F. Zinc-chloride solution should be raised to about 212 deg. F. In no case should the temperature be allowed to go above 240 deg. F. lest the fiber of the wood be injured or the strength of the timber decreased. After the bath is over, allow the timber to stand in the solution until it has cooled to 170 deg. or 140 deg. F. The length of time necessary for heating and cooling depends much upon the kind of timber used and the amount of seasoning; cooling also depends largely upon atmospheric conditions.

In the Compagnie de Bethune mining district of France the coal measures are covered by more recent rocks containing large quantities of water; these rocks consist of chalk supported by shales and clay. The amount of water contained in the numerous fissures makes the usual method of shaft sinking difficult and expensive, so the following method has been adopted with fair success: Previous to the actual excavation, four bore holes are put down at the corners of a square coinciding with the outside circle of the shaft. Into these bore holes is injected cement milk, which runs into the fissures. When the head of water is not sufficient, a force pump is employed to drive as much cement as possible into the ground. As high as 43 tons of cement are sometimes required to fill a single hole. Practically all the large fissures are sealed.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

John A. Hill, Pres. and Treas. Robert McKean, Sec.

505 Pearl Street, New York

London Office: 6 Bouverie Street, London, E. C. Eng.

Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of The Engineering and Mining Journal.

Our circulation for August, 1908, was 50,000 copies.

September 5............ 12,000

September 12 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
American Smelting and Refining Company 535
Smelters' Troubles in California 536
An Important Coal Decision.......... 536
Forest Fires.......................... 536
*The Shape of the Iron Blast Furnace *Henry M. Howe* 507
Camp Bird, Ltd...................... 511
Costs of Mining Quartz, Pyrite Gold Deposits..........*James Ralph Finlay* 512
The Cobalt Silver District, Ontario, Canada . . . . *William B. Phillips* 518
*Pachuca and Real del Monte Silver District...............*Claude T. Rice* 519
American Smelting and Refining Company 526
Magnalium, an Alloy of Aluminum and Magnesium 526
Short Talks on Mining Law—X. *A. H. Ricketts* 527
*A Selective Electric Fuse Spitting Device . . . . . *Robert N. Bell* 528
The Operation of Coal-cutting Machinery . . . *George F. Lynch* 530
*Door Opener. 532
The Use of Compressed Air for Hoisting 532
*An Improved Mine Car.................. 532
The Variable Color of Coke Ashes. *W. P. Young* 533
Colliery Notes 534
Correspondence
How to Sell a Mine *Allen H. Rogers* 537
Cadmium as a By-product *Paul Speier* 538
Multiple Arrangement of Drills on the Rand *J. H. Weston* 538
*Tailings Elevators on the Rand *Eustace Moriarty Weston* 539
*Transvaal Mining Notes *Special Correspondence* 540
Personals, Obituaries, Societies and Technical Schools 541
Special Correspondence 542
Mining News . 544
Markets, etc. 550
*Illustrated

The American Smelting and Refining Company

[illegible] pecially unsatisfactory because it does not [illegible] they were affected by the commercial de[illegible] stand the effect of adverse market conditions. The management of the company could at some time throw full light upon this subject, but in the report to the stockholders it does not do so.

According to the report, the company earned the dividends paid on the common stock, but there was a surplus of only $11,000 against upward of $2,900,000 at the end of the previous fiscal year. The reduction of surplus corresponds substantially with the falling off in net income. However, the falling off in what the company called "net earnings" and also in gross earnings was nearly $3,000,000. The comparatively better showing in the matter of net income is due to the failure of the company to pay anything on account of employees' profit-sharing fund, and also to a smaller appropriation than ordinarily for new construction and improvements. The latter account is of the nature of an allowance for amortization of plants, and it being doubtful whether the company on the average [illegible] aside sufficient for this purpose, the smallness of the appropriation for the last fiscal year must be considered as postponing this charge against future profits.

The most surprising thing in the report is the insignificance in the falling off in metal account, which was $[illegible] on April 30, 1907 and $[illegible] on April 30, 1908. The [illegible] depends upon the method of making the inventory. There are several ways of [illegible] possible to defer a settlement, which may [illegible] on the metals are sold at a price higher or lower than the inventory value. We are [illegible] of the American Smelting and Refining Company in this respect. In its liabilities it includes unearned treatment [illegible] against $2,639,302 at the end of the previous fiscal year. This indicates a smaller amount of ore in stock. On the other hand, there was undoubtedly an increase in the stock of refined lead. However, in spite of that, it is difficult to understand why in view of the great decrease in prices for silver, copper and lead in 1907-1908 the metals account of the American Smelting and Refining Company fell off only $731,023, unless it be that its metals have been uniformly inventoried at low prices. It has been gossiped that the policy of the company is conservative in this respect.

The president of the company is silent about this. He remarked that "the simultaneous and sudden decline in the value of lead, silver and copper, together with no proportionate decline in the expenses of [illegible] unprofitable for many of the various mines under contract to your company to continue their usual output of ore," and thus diminish the amount to be smelted, and consequently the treatment charges and gross earnings, but nothing is said here about losses on metals. Further on, in speaking of the American Smelters' Securities Company it is remarked that "there is a marked improvement at the present writing in the market value of copper and lead," recognizing that the prices for the metals have an effect on the smelting business, which, of course, is the case.

We are inclined to believe that the last report of the American Smelting and Refining Company is not so good as it looks at first sight, and that some of the adverse results may have been carried forward into the current year, with the hope that a rise in the prices for the metals will offset them. The fact that the credit to the profit and loss account of the American Smelters' Securities Company on May [illegible] well. It brings the Smelting company upon the verge of having to pay the guaranteed dividends on the "B" preferred [illegible] be necessary. But even so, the last fiscal [illegible] ing capacity of the Smelting company under unfavorable conditions.

There has been more or less comment [illegible]

American Smelting and Refining Company as disclosed by the books at the time of the last annual meeting. The fact that the Guggenheims were nominally but small stockholders does not, of course, disclose how they really stand. We understand that the proxies in the hands of another important interest made a strong showing, but not enough to effect any change in the management, even if such were desired.

Smelters' Troubles in California

The opposition to the construction of any smelting plant on the shores of the bay of San Francisco seems to be gaining ground, and it is doubtful whether such plants can be completed and operated in the face of it. A large plant was planned at Point San Bruno, where ores, coke and other materials could be delivered by water, and a large sum of money was expended in the purchase of land, grading and building foundations, when work was stopped on account of opposition by the residents of Burlingame and other places near the smelter in San Mateo county. An organization was subsequently formed in Alameda county, on the opposite shore of the bay from the smelter site. Now, in order to secure coöperation, the Bay Counties Anti-Smelter Association has perfected a permanent organization in San Francisco, the expressed object being to prevent the building of a smelter on the bay shore south of San Francisco.

At the meeting where this association was formed, representatives were present from a number of cities and towns in the counties bordering on the bay, and it was decided to take aggressive action to prevent the completion of a smelting plant. Of course, the motive is the fear of injury to agriculture and of annoyance and damage to the towns by the fumes from the smelter. It is impossible to convince people that the smelting business can be so conducted as to prevent the spread of injurious fumes, and they are taking action to prevent its establishment at all; just as the people in the neighborhood of Benicia stopped work at the Selby plant by legal action.

The smelting companies evidently have a hard fight ahead of them in convincing these opponents that the smelting business may be carried on without injury to other interests. Like the Anti-Débris Association, which really killed the hydraulic-mining industry in the drainage basins of the Sacramento and San Joaquin rivers, the anti-smelting party will be hard to convince contrary to first impressions. These persons are not in the slightest degree interested in the mining industry of the State and care little or nothing for its advancement or whether the closing of smelters will injure it; and they are indifferent to any industrial advantages which the operation of a large plant may bring locally.

An Important Coal Decision

An important legal case in connection with coal mining was decided by Judge Herndon of the Eighth West Virginia Judicial Circuit on Aug. 6, 1908. James G. Boyd, district mine inspector for the eleventh mining district of West Virginia, on May 26, 1908, reported to James W. Paul, chief mine inspector, that explosive gas was being generated in dangerous quantities in the mine of the Jed Coal and Coke Company, thereby rendering the mine unsafe and violating Section 14 of the mining law of West Virginia.

In accordance with said law, Mr. Paul immediately examined the mine and, finding that the mine generated dangerous quantities of explosive gas, ordered the mine officials to provide safety lamps for use in the workings, and abolish all naked lights underground. The mine officials refused to comply with this order, and Inspector Paul, in accordance with his powers as bestowed by the State Legislature, ordered that the mine be closed until safety lamps should be provided and used.

The Jed company immediately brought the case to a test and presented more than a dozen expert mine superintendents and engineers who testified that the mine was not sufficiently dangerous to necessitate the use of locked safety lamps. Chief Inspector Paul with two of his district inspectors appeared for the State, averring that careful investigations showed the mine to be exceedingly dangerous. Having heard the evidence, Judge Herndon directed that the mine be opened until he could give the testimony proper consideration. Seven weeks later he rendered a decision in favor of the Jed company, stating that the mine is in a sufficiently safe condition to permit, without unnecessary danger, the use of naked lights as heretofore.

There was, of course, no question of law involved in this case, but merely a determination of fact, or rather the consensus of expert opinion. It is detrimental to the prestige of the mine inspectors to be reversed in this way, but at all events they will still feel that they have conscientiously done their duty.

Forest Fires

Two important mining districts have suffered severely this season from extensive forest fires. A few weeks ago we recorded the destruction of two important coal-mining towns in the Crow's Nest Pass district of British Columbia, accompanied by costly damage to mining plants. In the present week the western part of the Mesabi iron range in Minnesota is suffering from the same cause. Several smaller towns have been destroyed already, and the town of Hibbing, the largest and most important on the range, is fighting desperately to save itself from the fires which have almost surrounded it. In the Minnesota case no reports have yet been received of the damage done to mining plants, but it must have been considerable, as the fires have swept over a district where there are a number of such plants. Around Hibbing are several of the larger open-pit mines on the Mesabi, and fire there would probably do great damage.

The present season has been dry over a large part of the Northwest, and conditions have been favorable to the spread of forest fires. We do not hear, however, that any special measures have been taken to prevent them. It would seem to be prudent for mine-owners in districts like the Mesabi to take some precautions to prevent the start of fires, and to keep them from spreading. It would be much easier and less costly to do so, than to wait until the fires gain headway, and then try to fight them.

THE NEWS OF THE resumption of operations at the Great Falls smelter of the Boston & Montana company, and at the company's Mountain View and Pennsylvania mines at Butte, these mines furnishing employment for an additional 1000 miners, is gratifying. It will be remembered that on April 15 the flood from the Hauser lake dam washed out about 22 miles of track on the line of the Great Northern railway between Butte and Great Falls; pending the rebuilding of the track the Great Falls smelter was practically closed down.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

How to Sell a Mine

The editorial on, "How to Sell a Mine," in the JOURNAL of Aug. 29, fails to treat of the subject in its entirety. As far as it goes, it covers the ground as to markets for mining property, but it seems to me that you have failed to note the most important requisite for successfully negotiating the sale of a mine. I speak from many years' experience both in New York and the City of Mexico, as engineer of one of the large exploration companies mentioned, as well as of concerns of smaller capital, and from the standpoint of the would-be investor. The man with a mine for sale fails to excite interest in his proposition by the general character or inconsistency of his statements, through ignorance, or by setting a prohibitive price on the property.

As you say, many of the large companies employ agents or scouts to look for mining property but it is not altogether because an insufficient number are brought to them. The principal reason is that hardly one in a hundred of the many proposals brought in gives information on points most important to the company's engineer. It would be amusing, if it were not generally so exasperating, to read the common type of report in these cases. Frequently long descriptions of scenery, climate and other general conditions constitute the major portion of the report. The acreage owned is always accentuated. The description of the mine and its workings occupies a subordinate position, while maps, if any are presented at all, generally show only the claims. An assay map, the most important feature of the report, is as rare as hen's teeth. Statements of width of ore, assays, tons developed, etc., are given in round numbers, usually not the result of measurement and calculation; and, where it is possible to check them up, they show wide discrepancies. Costs are generally utterly neglected and the value of "ore in sight" given is the gross value. In general it may be said that the economic, the business feature of the enterprise is entirely neglected; and since the investor's engineer can form no idea of this most important feature, he cannot advise his clients to spend several thousand dollars in the examination of the mine.

THE SORT OF INFORMATION NEEDED

Of course, in the case of a prospect all such data cannot be given but even then some data of economic value can be given. Most prospectors lose sight of the fact that, in many cases, much information as to the distribution of the value may be obtained by exposing the vein by crosscut trenches at frequent intervals and taking samples and measuring widths. A man who can stake a claim should certainly be able to make a rough sketch-map showing the vein and the points where sampled, with assays and widths marked down.

But it is not to prospects, which are rarely brought in or considered by the development companies, that I refer particularly. Most propositions brought in for sale, in whole or in part, have had more or less development work performed on them, and in most cases some showing underground has been made. What the engineer to whom the data are referred wants to know is whether there is a reasonable chance of making a mine, the operation of which will return the money invested and leave a profit. While two men may differ as to what constitutes a reasonable chance, the data they require will always be the same and will consist of such information as the extent of the vein, its width or the width of the ore, the value it carries and the distribution; all of which may be embodied in an assay map. He further would want to get an idea of the composition of the ore, the cost of producing it, if ore has been produced, the cost of drifting and sinking, wages paid, etc., while data as to climate, topography, means of access, etc., are of interest only as they affect the cost of operation.

All this and other data are, of course, what go to make up a properly constituted engineer's report. If the investor's engineer, after consideration of the data presented, examines the mine, they are what he will gather himself to verify the vendor's statements. But if all these points are presented by the man seeking to interest capital and in such a way that the calculations going to make up the totals may be checked, he will find that his proposition gets much more attention than if he presents a rambling description containing hardly a figure. The vendor may have to employ an engineer to get up such a report and assay map but it will well repay him. There is no doubt in the world that a great many meritorious propositions fail to attract attention because of the indefinite and unbusiness-like way in which the facts regarding the property are presented.

WHAT IS A FAIR PRICE

A word as to prices. It would, of course, be impossible to frame any general rule for the valuation of mining prop- [illegible] our most successful mining investors quoted as saying that he would pay any time twice the net value in sight if the bottom of the mine looked good. But this is too general, and could be applied in only a limited number of cases. The price a man is willing to pay for a mining property is dependent on the risk of loss of his investment and on the profits he estimates can be made over and above the total cost of developing and equipping it to put it on a profit-paying basis. As one extreme, there is the promising prospect, i.e., a claim on which little work has been done. Here the risk is large, perhaps eight or ten to one, even when selecting prospects with discrimination. The value, therefore, is low. At the other extreme is the systematically developed mine with large tonnages blocked out, which needs only equipment to make it a dividend payer. Assuming that accurate estimates of the cost of equipping the property and of mining the ore are made, no risk attaches to the operation so far as the ore blocked out goes. But a developed mine usually sells for more than the net value of the ore blocked out on the assumption that more ore will be found in the extension of the deposit. The degree to which this is warranted must be determined by the purchaser, and this is the risk necessary to assume in a mine at this stage.

Between these two extremes lie mines in all stages of development. As the development increases the ore blocked out, so the risk decreases and the price increases. From these facts, it is natural, as generally occurs, that the great profit is not to the original locator nor to the purchaser of the developed mine but to the developer, the man who takes the prospect and makes a mine of it, whether he operates or sells the mine after development. As illustrating this point, the accompanying table may be taken as summarizing the history of a mine from the time of its location to its productive stage:

VALUE OF A MINE AT DIFFERENT STAGES OF DEVELOPMENT

Development	[illegible]	Ore Developed	Probable Ore.	Value
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1 year	[illegible]	[illegible]	[illegible]	[illegible]
2 year.	[illegible]	[illegible]	[illegible]	[illegible]
3 year.	3000	[illegible]	[illegible]	[illegible]

[illegible]

New York, Sept 1, 1908

Cadmium as a By-product

The editorial in the JOURNAL of June 11, p. 92, describes the situation in the cadmium industry perfectly. The production is, however, larger than stated in that article. In the year 1907 the output in Upper Silesia reached 32,949 kg. as compared with 9840 kg. in 1897. Lately considerable cadmium has been produced, not as a product in the preparation of crude zinc, but as a by-product in purifying zinc solutions in the manufacture of lithophone. In the preparation of lithophone the impure zinc solutions are purified by boiling with zinc dust which precipitates foreign metals, chiefly cadmium, after iron and manganese have been removed. In a new process at Marienhütte the crude solutions are subjected to electrolysis in lead-lined tanks. For anodes plates or bars of metallic zinc suspended in the middle of the tank are used. The zinc dissolves in the neutral liquor while the foreign metals are deposited as a slime on the lead lining which serves as cathode. The electrolysis is complete as soon as a sample shows the absence of cadmium. This complete removal of cadmium also serves to prevent the development of a yellow tint in the finished lithophone.

At present residues containing cadmium are utilized in Germany as well as in Great Britain for the preparation of metal containing about 99.5 per cent. cadmium. Cadmium yellow is, however, also produced directly from the residues, which naturally also affects the consumption of the metal.

The price of American cadmium given in the JOURNAL, $1.25 per lb., is rather high, for it is here offered at 6.75 marks per kg. Hamburg (about 70c. per lb.). Metal from the Silesian furnaces is held at about the same price. The price naturally varies with fluctuations in production and consumption. The market price of the metal is subject to marked fluctuations. In 1874 cadmium brought 15 to 16 marks per kg., while in 1884 the price had fallen to 8.50 and 9 marks. Between 1888 to 1893, quotations fell to 4 and 5 marks per kg. In April, 1896, the Government Feuerwerks-Laboratorien and the Konigl. Sachs Artillerie-Direction took considerable quantities out of the market for special purposes, so that at the end of December, 1897, the price had risen to 21 marks per kg. When the special demand ceased, a rapid decline occurred. The price varied between 5.50 marks and 6.50 marks per kg. until the close of 1905. In the beginning of 1905 active inquiry advanced quotations to 15 marks per kg., the high point of that year. The high price stimulated the manufacturers to increased production, which the consumption could not absorb. As stated above, quotations fell to 6.75 marks per kilogram.

PAUL SPEIER.

Breslau, Germany, July 22, 1908.

[The price that we give for cadmium in the United States is the quotation of the sole producer in this country.—EDITOR.]

Multiple Arrangement of Drills on the Rand

About a year ago, the JOURNAL published an article by E. M. Weston, of South Africa, entitled "Multiple Arrangement of Drills on the Rand." A letter from W. P. J. Dinsmoor, of Denver, comparing the work described in Mr. Weston's article with work in the Cripple Creek district (described in the May, 1907, issue of *Mine and Quarry*, under the title of "Western Practice in Tunnel Driving") was published in the JOURNAL of October 26, 1907. A copy of the letter, and of the May, 1907, issue of *Mine and Quarry*, were sent to Mr. Weston, requesting that he make such comment on them as seemed to him proper. I inclose herewith a copy of his reply.

This letter was submitted to Mr. Dinsmoor with the request that he make any further comment which might occur to him, in order to close the correspondence. In reply, he said: "I have read Mr. Weston's article with a great deal of interest, and appreciate the fact that conditions were different and until they were brought more closely together, no accurate comparison could be made, my comparison having been made on Mr. Weston's first letter, which did not give the complete details mentioned in his second letter."

S. BOWLES KING,
Editor *Mine and Quarry*.

Chicago, Ill., July 28, 1908.

E. M. WESTON'S LETTER TO MR. KING

The article on Western practice in tunnel driving in *Mine and Quarry*, May, 1907, explains several matters not clear to me in connection with Mr. Dinsmoor's letter.

Mr. Dinsmoor has endeavored to compare two entirely different things, and has naturally arrived at wrong conclusions. He compares a 9x9-ft. straight tunnel driven into the mountain side, provided with double tracks and mechanical haulage to within, say, 150 ft. of the face, the tunnel being also provided with a 15-in. blower pipe, with a drift along a lode which turns and twists every few yards. This drift was taken 5x6x7 ft. only, and was provided with a single track. (It was, I believe, the intention at the time to widen this drift later on to take a double track, as some extra haulage was expected along this drift connecting two deep shafts; but on nearly all the mines on the Rand, single tracks with sidings every 500 ft. are almost always put in for main drifts.) This drift was about 500 to 800 ft. in from the bottom of a shaft 4030 ft. deep and the trucks had to be run out all this distance by natives, and emptied, not into a bin but into a three-ton skip. Owing to the curvature of the drift it was practically impossible to carry in any blower pipe and the compressed air from the receiver was the only means of blowing out smoke. This smoke if blown away from the face when the drift becomes any considerable length, tends, owing to the bends in the drive, to hang about in it and often affects the trammers. The number of men per shift depends on the South African custom of having two natives per machine and one white man to supervise three or more machines. Owing to curves in the track, two natives are used to run out trucks while four natives shovel.

Now to turn to the question of rock hardness. Mr. Dinsmoor is of opinion that this cannot be much harder here than in the tunnel he mentions. I would remark that the Sullivan drill, which for some reason unknown to me, is not introduced in the Witwatersrand mines, may be a more efficient machine than others of the same class by different makers, but it can scarcely be so very much better as to make the difference between five holes and ten holes per shift. As a matter of fact the 15 holes in the face on the Rand were drilled in eight hours only, when the machines had been set up previously and then not always in that time. I am also told by miners from Cripple Creek that they could run their steel on ⅛ in. difference of gage, whereas here ¼ in. in 18 in. is nearer the average. One 5 to 6 ft. dry-roof hole alone will take the best part of two hours to bore, and that with air pressure approaching 80 lb. at the face.

Sharp steel was always available in plenty so that I am afraid no other machine would have done much better. A certain amount of delay is caused by waiting for smoke to clear, and it is the usual custom to fire the cut first, for in tight ground it cannot always be depended on to come on the first firing. In the tunnel mentioned, the width of face allowed of a different and easier arrangement of holes that could all be blasted together. I might remark that had the tunnel been driven a full round of 5½ to 7-ft. holes every eight hours, allowing the holes to have broken 5 ft., it could have been driven 465 ft. in a month instead of 375 ft. So we must conclude that even in this tunnel there were misfires and partially broken out holes, and that hitches and delays occurred in the work. I still wish to know what is the greatest footage driven in the deep levels of the mines of say Butte, Lake Superior and California of a true drive, along a lode that has twists and turns in it in really hard ground.

E. M. WESTON.

Brakpan, Transvaal, June 5, 1908.

Tailings Elevators on the Rand

By Eustace Moriarty Weston*

For many years, despite its high capital cost, the tailings wheel has reigned almost supreme on the Rand for raising water, sands and slimes from the foot of battery plates to the collecting vats of the cyanide plant and spitzluten. There were one or two Cornish lift sand pumps at work on the older mines or used as "stand-bys," but the tailings wheel was the standard type of elevator. Its supremacy has now been challenged on the score of high capital cost. A 30- or 40-ft. diameter wheel costs about $8000 to install. Several alternative schemes have been tried of late years. In the plant erected on the Meyer & Charlton under the supervision of G. A. Denny, a vertical belt elevator was installed to lift tailings 70 ft. with a plunger sands pump as a stand-by. The sands pump has, however, proved most suitable for constant work.

In the new plants on the Angle & Cason mines on the east Rand, M. Wilson, the consulting mechanical engineer, has installed a modified form of the Pohle air lift for lifting the pulp from the battery. It consists of a plain pipe given the necessary submergence in water; at the bottom is fixed a bell mouth and compressed air inlets. The air mixes in the pipe with water, sand and slime, and reduces the specific gravity of the whole so that an upward current is generated. The parts must be properly proportioned to give the maximum efficiency. The design of air inlet adopted for a 14- or 16-in. rising main is a ring of 12 one-inch holes placed 39 in. above the bottom of the foot-piece. Just above this is a small funnel-shaped enlargement of the pipe to give room for air expansion. The foot piece is a large bell mouth open at the bottom having about twice the diameter of the pipe. The ratio of submergence to lift is 1.8 to 1; air is used at 34½ lb. per sq.in., and 2.4 cu.ft. of free air per cu.ft. of pulp is used. The efficiency estimated on the indicated horsepower of the air-compressor's steam cylinders is nearly 40 per cent., which compares favorably with that of a tailings wheel or pump.

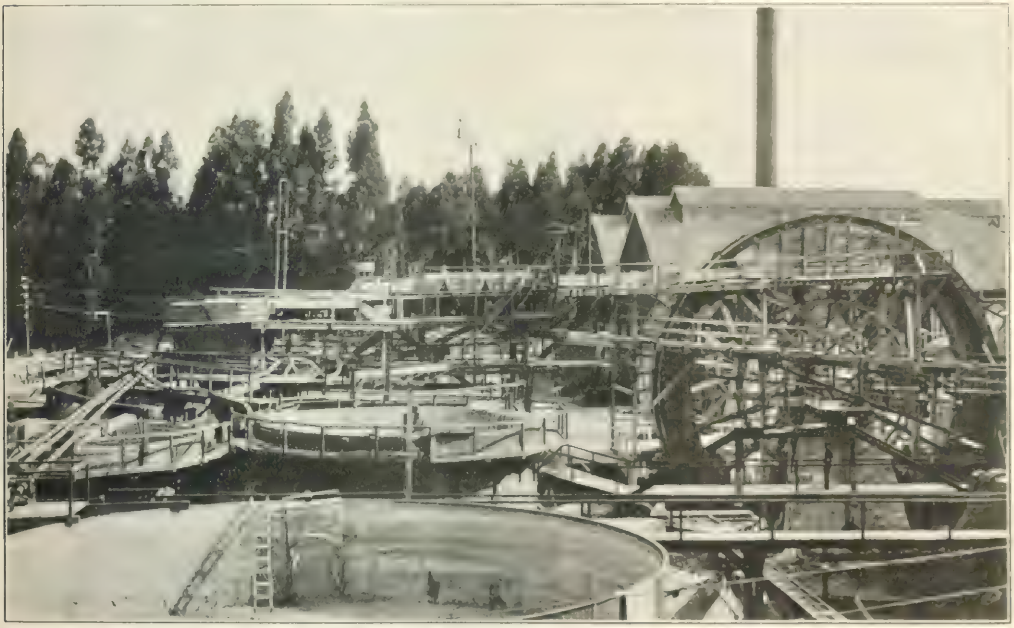
The Use of Pumps

The mechanical engineer of H. Eckstein & Co., A. M. Robeson, has adopted an improved form of centrifugal pump to do this work, and it is now at work on the Rose Deep, Crown Deep, New Heriot and other mines

About a year ago one of the ordinary types had to be put in at the Rose Deep owing to a breakdown. The [illegible] steel liners wore out very quickly, and the pump capacity was insufficient. The design of the pump has been modified, and locally-made cast-iron liners have been put in rendering it more efficient and more easily and cheaply repaired. A great saving in capital cost is made compared with [illegible] a stand-by, can be put in for $1800 to do the work of an $8000 tailings wheel. The life of a tailings wheel is 12 years here. What the life of a pump with renewable liners will be under the same conditions is unknown. The efficiency reached is 40 to 45 per cent. Personally I should be inclined to try what the efficiency of a properly designed jet elevator, as known to the hydraulic miner, would turn out to be. With an economical pump to produce the necessary pressure, it might be well worth trying, for nothing is simpler.

As indicative of returning confidence in the Rand, the *South African Mining Journal* (May 23, 1908) states that since the first of the year 40 new stamps and [illegible] come into operation, and that there is now in course of erection, or under order, 700 new stamps and 45 tube mills, equivalent to an increased capacity of 1620 stamps The following seven new producers are included among those ordering equipment: Simmer Deep, Jupiter, Knight Central, Main Reef West, Cinderella Deep, West [illegible]

An authority on the subject states that [illegible] unsuitable alloy containing a large proportion of zinc; the only cure for this is [illegible]



TAILINGS WHEEL AT THE ROBINSON MINE, AT [illegible]

---

*Mining engineer, Brakpan, Transvaal

Transvaal Mining Notes

SPECIAL CORRESPONDENCE

The latest encouraging news is the finding of the Main Reef on the East Rand, in the Brakpan shaft.[1] The high assays and the width of the reef make this a most important find for the eastern portion of the Witwatersrand.

OPERATIONS IN THE SOUTH RAND

The Nigel company, which has been paying dividends since 1889, and which, with the Nigel Deep, is the only gold-producer upon the Main Reef outside the Witwatersrand boundaries, has decided to extend its operations by the acquisition of a neighboring property—the Rand Nigel. This holding has been idle for 13 years. Active operations have, indeed, been so long confined to the richer shoots associated with the anticlinal fold upon which the Nigel and Nigel Deep are situated, that such expansion is particularly gratifying. Working costs on this southern lip of the Rand basin are comparatively high, owing to the small width of the flatly inclined reef; but working on a basis of 10,000 to 11,000 tons milled per month, for a $93,000 yield, the Nigel has reduced expenses to $5.30—a figure putting a new complexion on the prospects of the district.

COMPANY AMALGAMATIONS

Amalgamations continue to be the order of the day, and no sooner is one batch of properties united than a new consolidation is placed under discussion. The most recently effected was that of the East Rand Proprietary subsidiaries—including the Angelo, Driefontein, New Comet and Cason, which, with 820 stamps employed, turned out in June nearly $1,000,000. Awaiting shareholders' approval, is the amalgamation of the Turf Mines and Village Deep. A further centralization is talked of in connection with the Consolidated Main Reef and its subsidiaries, the Main Reef West, Main Reef Deep, and Main Reef East. Of greater interest will be the destined amalgamation of Eckstein properties, individually famous in the mining world, in the West Central Rand. This will involve, according to report, the Crown Reef, the Crown Deep, the Robinson Central Deep and the new South Rand. The Crown Deep and Robinson Central Deep work with a joint mill of 300 stamps and the Bonawya's old 55-stamp mill. The Crown Reef, now in its declining years, has a 120-stamp mill within 1500 ft. of the South Rand headgear. Another feature linking the properties, apart from the primary one of similar financial controls, is the ready ability of the Crown Deep company to begin development on the South Rand claims on the dip before the new vertical shaft—to be commenced shortly upon completion of the permanent steel headgear—has been carried to the reef over 2000 ft. down.

The new South Rand shaft has seven compartments, and is being sunk on the dip of the Crown Deep. The steel headgear, shown in the accompanying photograph, is of the latest type in use on the Witwatersrand.

DISCUSSING MINING METHODS

Not for many months has the Rand technical world been treated to a discussion upon mining methods and conditions of such warmth and stimulating influence as that now proceeding under the auspices of the Chemical, Metallurgical and Mining Society. A few months ago complaints were heard that the controversial spirit, once so cogent a factor and so essentially serviceable upon a field where lack of secrecy enables officials to discuss the practical details of their work unreservedly, ceased to be in evidence; that the proceedings were becoming too tame to arouse the working members and draw them into an active debate. It merely required, however, some enterprising and imaginative member to present a few revolutionary ideas and to advance a few sharp criticisms of mining practice, to awaken the fighting spirit so normally characteristic of technical life at this altitude of 6000 ft. In the present instance, the starting point was a paper by Tom Johnson on Rand mining, raising a multitude of questions which have exercised the minds of managers from the earliest days. The main points upon which Mr. Johnson has evoked discussion have been his advocacy of circular shafts —tried long ago upon the Rand and found uneconomical; of endless rope haulage in moderate inclines underground; of a greater number of machines in each stope; of cheap hand-drilling steel; of boilers to be used underground; of stope-filling with sand residues; and of a greater number of white men in the mines. His criticisms also touched on the common disposition of shafts and the alleged extravagant dimensions of new shafts for the duty they are designed to maintain.

STEEL HEAD GEAR, SOUTH RAND MINES

After coming in for much healthy criticism at the hands of T. Lane Carter, E. M. Weston, C. B. Sauer and J. M. Phillips, Mr. Johnson found his ideas again pulled to pieces at a later meeting by practical men. Certainly he can find no support for his proposition to crowd a large number of machines (like hammer-boys) into a stope, it being a generally accepted axiom in Rand mining that the contractor must be allowed a long stoping face, for the two or three machines under his supervision, to enable him to work successive benches to best advantage. There is the supplementary difficulty—practically insuperable in the majority of cases, where all the broken rock has to be "lashed" from the faces to the boxes at the level—that the stope would speedily become choked with dirt and work impeded. In other words, the machines would beat the lashing boys, whose working space and capabilities are restricted by various factors. Mr. Johnson, in condemning the great seven-compartment shafts of today and citing hauling speeds which should enable 5000 tons per day to be raised through two compartments (excluding pump-way), called upon himself a storm of contradiction, to which he will have difficulty in replying. His allowances for the lowering and raising of the army of men and the tons of steel, explosives, etc., required for the breaking of the 5000 tons, and for the fact that hoisting must proceed in a Rand mine from several different levels, have been so hopelessly inadequate as to completely destroy the force of an argument which, stated in general terms, would have been sound in its application to certain mines.

The question of filling the mines with residues is one which is raised periodically, and disposed of finally with corresponding regularity. The practice of Kalgoorlie is sometimes quoted in this respect, no attention being paid to the primary circumstances governing the West Australian system, namely, that methods of working the great vertical orebodies necessitate the provision of some stope-filling as a support to the machine-men, and that the residues used have been, in the ordinary course of slime - treatment, thoroughly water-washed before dumping as waste.

The best all-round drill steel (W. E. Kimber, *Journ.* Transvaal Inst. Mech. Eng., May, 1908) contains, according to the manufacturer's rating, 0.50 to 0.60 per cent. carbon, for this combines maximum toughness with a hard cutting edge. Milder and cheaper steel should be used for the shanks since it is cheaper, welds up to the cruciform easier, and is less liable to crystallize and break.

---

[1] See ENGINEERING AND MINING JOURNAL, Aug. 8, pp. 290 and 294

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

E. J. Yetter, of Denver, Colo., has been in the Kougarok country in Alaska.

C. M. Clark, of Los Angeles, Cal., has been examining mines in the Tonopah district.

Dr. Milton L. Hersey, of Montreal, has given $10,000 to the Kingston, Ont., School of Mining.

A. W. Amphlett, of Tonopah, Nev., has gone to Nicaragua, to take charge of La Luz mill in that country.

Thomas Crago, of Laurium, Mich., has been examining mines in Gilpin county, Colo., during the past month.

Etienne A. Ritter, of Colorado Springs, Colo., has been making an examination of mines in Gilpin county, Colorado.

J. V. N. Dorr has returned to Denver, Colo., after spending several weeks in British Columbia on professional business.

F. A. Gardner has resigned his position as chief engineer of the Union Iron Works, San Francisco, to engage in business on his own account.

Leopold Zimmerman, of New York, and M. M. Johnson, of Salt Lake City, Utah, have been examining the United Rico mines, at Rico, Colorado.

Frank B. Aller, a graduate of the Colorado School of Mines, who has been for some years at Antofogasta, Chile, recently made a visit to Colorado.

H. S. Lefevre is now in Reno, Nev., having returned from a professional trip to Mexico and Central America. He expects to spend some time in Nevada.

Robert A. Wood, of London, England, has been in Goldfield, Nev., on his way to the Ubehebe district in Inyo county, Cal., to examine mines for English parties.

H. B. Morrow, electrical engineer for the Galena Iron Works, Galena, Ill., has accepted the position as instructor at the Wisconsin School of Mining at Platteville.

Robert McElvenney, superintendent of the lead works of the Tacoma Smelting Company at Tacoma, Wash., has been looking at various smelters in Colorado during the past month.

Alexander McKay, government geologist of New Zealand, has retired from service on account of his advanced age. He has been engaged in mining and geological work in New Zealand for 50 years.

A. A. Hassan, of New York, has gone to Cobalt, Ont., to examine several mines in the Cobalt and Larder Lake districts. After completing this work, he expects to spend several months exploring in Ontario and Quebec.

Charles A. Short has resigned the management of the Jennie Gold Mining Company, at Gold Springs, Utah, and has been succeeded by W. F. Odin, formerly with the Ophir Hill Mining Company, at Ophir, Utah.

[illegible] known mining engineer has been in Gilpin and Routt counties, Colo., with a party of English capitalists and engineers, looking at mining properties, with a view [illegible]

J. H. Plummer, president of the Dominion Iron and Steel Company, is taking up his residence in Toronto, having purchased a house in the suburb of Rosedale. It is thought that this foreshadows his retirement from the presidency of the company.

Eugene A. Delaney, recently mining engineer for the Berwind-White Coal Mining Company, at Windber, Penn., has received an appointment in the technologic branch of the United States Geographical Survey. He is now on duty at the fuel-testing plant at Pittsburg.

Obituary

F. J. Falkenback, chemist for the Goshen Iron Company, Goshen, Va., was drowned Aug. 26 while boating.

Eagleton Hanson, secretary of the Trenton Iron Company, Trenton, N. J., died at his home in that city Aug. 27, after five months' illness of heart disease. He was born in England in 1842 and had been with the Trenton Iron Company over 40 years.

George G. Blackwell died at Straidland, England, Aug. [illegible], aged [illegible] years. He was well known as a metallurgist, who had for many years devoted his attention to the rarer metals and their uses. He was the founder and head of the firm of George G. Blackwell, Sons & Co., of Liverpool, extensive dealers in minerals, ores and alloys.

Societies and Technical Schools

[illegible] ment Manufacturers—The quarterly meeting of this association will be held at Detroit, Mich., Sept. 14, 15 and 16. Headquarters will be at the Hotel Pontchartrain. The executive committee will meet Sept. 14, and on Sept. 15 the business meeting will be held. On Sept. 15 there will be meetings for the reading and discussion of papers and the meeting will close with a dinner in the evening.

[illegible]—The results of this year's examinations for coal-mine managers, underground managers, overmen and enginemen in connection with the coal-mining schools, reorganized last year under control of the new Department of Technical Education of Nova Scotia, have been satisfactory. There were [illegible] managers, [illegible] underground managers and 17 overmen passed this year, [illegible] The teachers are all practical men who have worked at coal mining. The regular coal-mining instructors all hold managers' certificates.

Iron and Steel Institute—The autumn meeting will be held at Middlesbrough, England, Sept. 29-Oct. 2. The local arrangements include visits to a number of furnaces, mills and other points of interest in the district.

The following papers have been offered for reading:

1. On the Scientific Control of Fuel Supply. By Prof. H. E. Armstrong, London.

2. On Metallurgy at the Franco-British Exhibition. By H. Bauerman.

3. On Gas Producer Practice. By Prof. W. A. Bone, Leeds, and R. V. Wheeler, Normanton.

4. On the Constitution of Carbon Steels. By Prof. E. D. Campbell, Ann Arbor, Mich.

5. On the Freezing Point of Iron. By Prof. H. C. H. Carpenter, Manchester.

6. On the Production of Finished Iron Sheets and Tubes in One Operation. By S. O. Cowper-Coles, London.

7. On the Chemical Control of the Basic Open-Hearth Process. By Alfred Harrison, Warrington, and R. V. Wheeler, Normanton.

8. On the Mechanical Cleaning of Iron Ores. By T. C. Hutchinson, Middlesbrough.

Canadian Mining Institute—The members and visitors of the Canadian Mining Institute visited the plant of the Nova Scotia Steel and Coal Company, at Sydney Mines, N. S., on Aug. 28, and were shown through the works by President R. E. Harris, General Manager Thomas Cantley, and Superintendent John Johnston. The plant was in full operation and the visitors had an opportunity of observing the processes in use. They were the guests of the company at luncheon at the Eastern Club, North Sydney, among those present being Lieutenant-Governor Fraser, of Nova Scotia; James Ross, president of the Dominion Coal Company, and H. E. Burchell, manager of the Sydney Cement Company. Professor F. H. Sexton, on behalf of the Nova Scotia Mining Society, expressed thanks for the entertainment afforded them. They returned to Sydney in the yacht of President James Ross and attended a [illegible] party given at the residence of J. K. L. Ross. Subsequently the excursionists visited the Acadia Coal Company's colliery at Stellarton, N. S.; the asbestos mines near Thetford, Quebec, and the Canadian Chrome Company's plant at Black Lake. They were entertained at Montreal on Sept. 2 by the local com- [illegible] Falls, the party leaving the same evening for Cobalt and Sudbury.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 4—The miners of California are fervently wishing for early fall rains which may replenish the streams and furnish a water supply for their operations. The summer has been an exceptionally hot one and the streams and springs in the mountains have run low earlier than usual. There has been an unusual evaporation in the reservoirs, ditches, flumes, etc., with the result that by the middle of August the scarcity of water began to make itself unpleasantly manifest. There has been no rain since last April, and the snow supply in the higher mountains, the melting of which is expected to keep the upper rivers and smaller streams flowing during the long dry California summer is lighter than usual. The result of all this has been that the water supply for mining purposes has almost given out and the mines cannot reasonably expect any heavy rainfall before November. The complaint about light water supply is confined to no particular locality, but is general. The gravel miners throughout the State suffered from a short water season, and many were unable to run their properties for more than a few weeks, instead of for several months as expected. The quartz mines have only now commenced to feel the effects of the water situation. Numerous active producers in the leading mining counties have been recently forced to curtail or entirely suspend operations. Even in the Grass Valley district, where the water lasts longer than at most mining centers by reason of the extensive ditch and reservoir systems the water has now run low. This scarcity of water has, of course, also interfered with the generation of electric power for mining and other purposes. One effect of this has been to bring to the front the idea of using gasolene engines for power at mills, to tide over the situation until the rains come. At the more prominent mines, they have auxiliary steam-power plants for this purpose. At smaller ones, gasolene engines are now being put in at a number of mines in the mountain and foothill regions.

Salt Lake City

Sept. 4—The Utah-United Copper Company was formed here last week to take over the properties of the Skylark Copper Mining and Milling and the Wasatch Mining and Milling companies, in the Beaver Lake mining district, Beaver county. A strong syndicate of Salt Lake mining and business men has taken hold of the enterprise and proposes to open the properties on an elaborate scale.

The output of copper from Utah mines and smelters in August aggregated about 8,000,000 lb.: the Garfield plant of the American Smelters Securities Company, nearly 6,800,000 lb.; Yampa, 750,000 lb., and the Independent smelter at Ogden, 15,000 lb., the latter being in the form of matte. The Boston Consolidated Mining Company has been operating four units of its new Garfield mill, but the concentrate produced is held for later shipment to the smelter, owing to the difficulty experienced at Garfield in treating the concentrate derived from the Bingham porphyry ores. Since the installation of new equipment, costing $200,000, and which includes a converter plant, the Yampa Smelting company is producing 30,000 lb. of blister copper daily. The product is of a good grade, containing $175 worth of gold and silver to the ton and grading at about 98.5 per cent. copper.

The North Utah Mining Company has been organized in London to take over the properties of the Utah Development, Butler-Liberal and other Bingham companies. It has been announced that a fund of $250,000 has been provided to be used in the purchase of equipment and for exploitation purposes.

Copper ore, worth $300,000, in the form of concentrate, is piled up at the Garfield mill of the Boston Consolidated Mining Company, awaiting shipment to the smelter. For the reason that there is a lack of furnace capacity at the Garfield smelter of the American Smelters Securities Company, with which the mining company has a contract, the product is being withheld. In the meantime, however, the Boston company is operating its plant; the smelting company making advances on the ore in storage. The Boston mill has been treating daily during August between 800 and 900 tons of the porphyry ores from its Bingham mine, with four units of the plant in commission. Four more are ready and will be in service by the middle of September, or October 1 The ore shipped to the mill in August has averaged 1.7 per cent. copper, making a concentrate assaying from 20 to 22 per cent. copper. An extraction of about 71 per cent. has been maintained, while the milling costs have been reduced to about 50c. per ton. With additional units in service, the management expects to bring the costs down to 35c. per ton.

A special meeting of shareholders of the South Columbus Mining Company has been called for September 15, when the matter of increasing the capital stock from 300,000 to 500,000 shares will receive consideration. It is proposed to purchase the Wedge, a valuable property adjoining, all located in the camp of Alta.

Butte

Sept. 3—The Boston & Montana smelter at Great Falls partially resumed operations the first part of the week, and it is expected that in another week the plant will be working at its full capacity of about 3500 tons daily. The ore from the Boston & Montana mines, which for the past three months has been sent to the Washoe smelter at Anaconda, will now go to Great Falls. After an idleness of three months the company's Mountain View mine has resumed operations, and the Pennsylvania, shut down while the shaft was being retimbered, will resume the first of next week. With all the mines of the Boston & Montana company working at their full capacity, there will be employment for an additional 1000 men in Butte.

The North Butte Extension Copper Mining Company has been made defendant in two attachment suits within the past week. The National Mining and Investment Company, a brokerage concern of Butte, has brought suit for $3,446.60 for money alleged to have been paid out for the benefit of the mining company. Goeffrey A. Lauzier is suing the company to recover $5400 alleged to be due him for services as general manager of the company from March, 1907, to August, 1908.

The first meeting of creditors of the Butte Central and Boston Copper Company, bankrupt, was held Monday. The claim presented at that time amounted to $158,000. Inasmuch as a number of the claims are to be contested by the various creditors, the meeting was continued until Sept. 12, at which time it is expected that a trustee will be decided upon.

A new building has been erected at the Montana State School of Mines, Butte, for ore-reduction purposes. The machinery and apparatus, consisting of Wilfley tables, calcining and reverberatory furnaces, a cyanide plant, and a stamp mill, are now being installed. When completed it will constitute the best equipped smelting department of any mining school in the West. Horace J. Stevens, of Houghton, Michigan, editor of the

"Copper Handbook," spent several days in Butte last week. He examined a number of the more important mines in the camp, particularly that of the North Butte company. He also visited the Washoe smelter at Anaconda.

Denver

Sept. 5—In the Cripple Creek district the Portland mine is credited with having paid the largest amount in dividends of any mine in the State, the total sum being in round numbers $8,000,000. This mine was located in 1892 by Burns, Harman & Doyle, and was only a small claim. The early proceeds of the mine, however, paid for the 200 acres which were subsequently acquired, and on which the company was organized with a capital of $3,000,000. The mine also paid for the whole of the plant, which includes a big mill.

The Camp Bird gold mine in the San Juan region of Colorado is said to have paid nearly $4,500,000 in dividends. This mine was discovered by W. Weston and George Barber in 1877, and was then known as the Gertrude and Una, two claims on the same vein. The latter was deeded by them to H. W. Reed in consideration of his driving a crosscut tunnel to intersect the vein at a depth of 150 ft. below the surface. The Gertrude was sold to the Allied Mines Company, of Quincy, Ill., with five other claims, for $40,000 in 1881. This company was wrecked by its president, and later its claims, which included the Gertrude, were picked up by Thomas F. Walsh, chiefly, it is said, on tax titles, and rechristened the "Camp Bird," the Una and other adjoining claims being acquired by purchase, and included under that name. A small streak of rich telluride ore which had been overlooked by the Allied Mines Company led to the subsequent discovery of the bonanza ore.

The most important development work in Colorado today is the Roosevelt tunnel, projected for the deep drainage of the Cripple Creek mining district. The tunnel has now reached a total distance from the portal of 3173 ft., and this is being increased at the rate of about 300 ft. per month; but inasmuch as the shaft has now reached the tunnel horizon, two faces will be started immediately from this intermediate shaft, when a total monthly average of about 1000 ft. is expected to be made. If this rapid advance is achieved, the deep drainage tunnel will be completed at the estimated time, and the district drained nearly 1000 ft. below the present water level, and while the veins may not continue to carry their surface richness to such a depth, the elimination of pumping, together with lower rates of freight and treatment, will enable ore of a much lower grade to be mined and a substantial profit realized, so that one is safe in predicting that the Roosevelt drainage tunnel will add at least a quarter of a century to the life of the Cripple Creek district. Meanwhile the output for August is reported at 66,886 tons of gold ore, of $1,329,444 gross value.

The Elkton mine, which fell from its high estate in the effort to pump out the Cripple Creek basin, has for some years been worked in a quiet way, and paid regular dividends. Lately, however, the resumption of pumping in the Portland and Strong mines has lowered the water so that the bottom level of the Elkton is now dry, and the company is doing no pumping whatever. Some parallel lodes have also been discovered, and the property is looking better than it has for several years past, and is making a larger output. Production was suspended for the greater part of August, on account of the necessity of retimbering the first 100 ft. of the shaft. This work is now completed, and the mine operations are in full swing.

Considerable friendly rivalry is being indulged in between Denver and Salt Lake City in the endeavor to secure the building for the Mining Temple, which will form the permanent home of the American Mining Congress. The Salt Lake people are showing much energy and liberality to obtain the building for their city, knowing that it will attract mining men from all over the United States to the various congresses, which would naturally result in great benefit to them, and attract universal attention to the ore deposits of Utah. The Denver citizens, however, are showing their usual apathy in this important matter, and unless they promptly wake up to the full realization of the situation that confronts them, the Mormon Temple will have a rival in the Mining Temple to be built later in the city of Salt Lake.

The Portland Gold Mining Company, of the Cripple Creek district, is building an experimental mill at the mine. It will be the Clancy process, a modification of the cyanide process. Tests will be made on the low-grade ores of the mine and also on the dump ore; that is, on those ores which have proved too low-grade to be treated in the company's chlorination mill in the valley. In this connection, it must be remembered that the Portland company has one of the largest chlorination mills in this State, its capacity being about 10,000 tons per month, and it has been and is now, kept busy on the ores from that great mine.

On the Half Moon mine, of Gold Hill, Cripple Creek, by the caving-in of an old stope [illegible] and thousands of tons of milling ore were exposed.

Up to date the Red Mountain district, between Ouray and Silverton, has been comparatively quiet, awaiting the resumption of operations on the properties of the Red Mountain Railway and Mining Company, which has been closed since the financial squeeze of October last. It is now stated that the [illegible] has returned from the East, paid up all obligations and [illegible] driving two long transportation and mining tunnels which are already in several thousand feet, and also to sink the shaft at the [illegible]

Toronto, Ont.

Sept. 7—The Bonanza Creek Mining Company, of the Yukon Territory, has brought suit against the Canadian government for $17,600,000 damages for the cancellation of a concession which the company secured. The company claims that not only was it given a title to the ground but was granted water rights of a valuable character which were afterwards wrongfully annulled.

A number of prospectors are going into the region around Sturgeon lake and numerous good finds are reported. It is anticipated that with the completion of the Grand Trunk Pacific Railway which will facilitate communication active development will be begun. Spencer Bannerman brought in to Port Arthur a few days ago a 5-lb. sample of ore from the district, showing chalcopyrite, bornite and gold. The find was made on the Northeast bay of Surgeon lake.

The long standing litigation over the claims of E. C. Hargreaves, of Bay City, Mich., and the White Silver Mining Company to three locations in Coleman township, that comprise about 145 acres, has been settled. The suit was brought by the attorney-general of Ontario, to set aside the leases granted to the defendants, at the instance of James McKay and James G. McMillan, who asserted that there had been no valuable discoveries made before location. The hearing of the case occupied ten days, and on June 25, 1906, judgment was given to the effect that the Government might cancel the leases upon indemnifying the holders for their expenditures in developing the property. An appeal was taken and has since been pending. By the settlement just arrived at the property is to be held by E. R. C. Clarkson, as trustee for E. C. Hargreaves, William F. White, James McKay and James G. McMillan, and the Government is to receive a royalty of 25 per cent. on the gross output of the mine. Mr. Hargreaves had expended $40,000 in development work before the litigation compelled him to suspend operations.

A board of conciliation as provided for by the Lemieux Act has been appointed to act in settling the dispute between the Standard Mining Company of Cobalt and its men as regards hours and wages. The board consists of John A. Ewan, chairman, C. B. Duke, representing the miners, and C. E. Fraleck for the company.

F. H. Sherman, president of the local of the United Mine Workers at Fernie, B. C., has forwarded an appeal to the Trades and Labor Congress of Canada asking for assistance for 524 miners, 284 women and 814 left homeless by the recent fire.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

California

Amador County

Bright—Work has commenced in unwatering this mine at Jackson so it may be inspected by Nevada men who have it under bond. Andrew Noce is superintendent. The mine is also known as the Bellwether.

Valparaiso—This pocket mine continues to yield high-grade ore in small quantities, some of it going as high as $3 per pound.

Butte County

Francisco—At this mine, near Enterprise, a 20-stamp mill is to be built to work the ore from the orebody recently discovered.

Calaveras County

Brunner—This mine at Angels has been bonded by M. L. Eppinger, of Blair, Nevada.

Boston Consolidated—Work has been commenced on this mine at Mokelumne Hill under superintendence of A. G. Keeler. The 30-stamp mill is being repaired.

Black Metal—This mine on the Gobbi ranch is being examined for John Heisner, of San Francisco, with a view to purchase.

Calaveras Consolidated—This Oakland company has been organized to work the General Grant group of claims at Mountain ranch.

Peek Ranch and Deep Gulch—These properties near San Andreas, consisting of 240 acres of patented land, have been bonded to George Calahan, of Santa Rosa, who is organizing a company to work them.

El Dorado County

Spanish Dry Diggings—At this place, near Greenwood, the Nevada, Washoe, Choctaw, Chickasaw and Concordia claims are being prospected by means of an extensive tunnel. The work is being done by members of the Monitor Mining Company.

Sale—The Joe Delwisch and Jimmy Breedlove claims of T. H. Fowlar have been sold to Los Angeles men, and W. H. Hartwig has been placed in charge of development work.

Inyo County

Casa Diablo Mining Company—This company is about to add to its equipment an air compressor, with machine drills, cyanide tanks and slime [illegible]. A winze has been started on the Dawn of Hope mine.

Mariposa County

North Fork—In this district, Samuel Harris is developing the Moonlight or Derrick mine in this district, with George De Sallier as manager. A number of other mines are under bond to Mr. Harris and a mill is to be erected.

Virginia—This old mine near Coulterville, John McLean manager, is sending fair grade ore to the 10-stamp mill, which is run night and day by electric power.

Nevada County

Birchville Mining Company—This company, operating near Graniteville, has made a strike of considerable importance in the old Birchville mine, which was a large producer years ago.

Brunswick—In this mine, C. H. Mallen superintendent, considerable good ore is exposed in the lower workings and recent developments have opened several promising pay shoots. The sinking of a new working shaft is contemplated.

Kenosha—At this mine, G. W. Root, manager, the rich ore shoot opened on the 200- and 300-ft. levels has again been cut, and a great deal of high-grade ore is being taken out.

Norambagua—This mine, near Grass Valley, has been placed under bond to a capitalist, represented by Samuel Colt, who will at once develop it extensively. The mine was formerly a large producer.

Placer County

Big Jim—Alfred Dixon has applied to the California Débris Commission for a permit to mine this property near Michigan Bluff by hydraulic process.

Plumas County

Arcadia—This mine, owned by D. McIntyre, has been bonded to W. G. Devereux and W. H. Mader, of Colorado, who will at once begin the work of exploration and development.

Castle Rock—Many nuggets are being taken from the lower tunnel of this mine at Nelson Point, owned by E. G. Lindsay and others.

San Bernardino County

Ibis Mountains—In this region, west of Needles, a large amount of mineral land has been taken up as the result of copper and gold strikes made this spring. As soon as cool weather comes, considerable development work will be undertaken.

San Diego County

Cleveland Pacific Mining Company—The five-stamp mill of this company at Escondido has been started up on ore from the Grace shaft. The ore product of the Leonard & Stammer lease will soon be milled.

Shasta County

Greenhorn—This copper mine, French gulch district, has again been bonded by the Bully Hill Mining and Smelting Company, which did some work on the property three years ago.

Sierra County

Ladies' Cañon—F. Leveroni has applied to the California Débris Commission for a permit to mine this property by hydraulic process.

Red Star—In this mine at Alleghany, L. P. Woodbury, manager, a rich "blind" ledge has been encountered at a point 2300 ft. from the mouth of the tunnel which is being run to intersect the northern extension of the ledge of the Tightner mine.

Sixteen-to-One—This mine in Alleghany district has been bonded to Searls & McFall, of Nevada City. There is a 400-ft. tunnel on the property.

Siskiyou County

Bread & Butter—At this mine near Fort Jones, Daniel McCarthy is taking out many large nuggets. The latest pocket found yielded $8000 in all.

Cinnabar—A. M. Cowgill has located on the west fork of Beaver creek, near the Garretson Cinnabar springs, three claims of cinnabar ore.

U. S. & B. C. Mining Company—This company has finally accepted the bond on the Big Cliff group, owned by Wintering & Osgood, and will proceed at once to prepare for working the mine this winter.

Trinity County

Nevley Thomas—In this mine on Packer's gulch, near the head of Copper creek, ore of exceptional richness has been discovered.

Tuolumne County

Excelsior—This mine, near Sugar Pine, worked profitably in early days, has been bonded to James E. Conde, of Arastraville, who will reopen it. The mine is on the East Belt.

Hazel Dell—The shaft at this mine is being unwatered and retimbered, so the property may be examined by intending purchasers.

Kern County Gold Mines Company, Ltd.—This company, F. W. Gwynne, superintendent, has taken the Jumper mine, at Stent, under a working bond for a year, and men have been set at work.

Nonpareil—This company is being reorganized and meantime the mine is being worked by leasers.

Rhode Island—Work has been resumed at this mine, which has been closed down several years.

Wild Cat—A shoot of rich ore in a 12-in. vein has been found while sinking the shaft in this mine. R. L. Hendricks is superintendent.

Colorado

Boulder County

Montgomery-Goldfinch—Denver, Boulder and Eastern men are interested in this property at Jamestown, and they intend to erect a 50-ton cyanide plant for treatment of their own and custom ores, as well as to install a power plant on Jim creek, to supply power for mines and mill. L. W. Aldrich, Boulder, Colo., is in charge of operations.

Gilpin-Boulder Consolidated Mines Company—Denver and Boulder parties have purchased the Ragged Top group at Sugar Loaf and are installing a plant of machinery. E. H. Crabtree, of Boulder, is in charge.

Gold Run—Colorado Springs and Boulder owners of the Tambourine mine are building a 50-ton cyanide plant at Wall Street, to handle the low-grade ore. F. C. Tiffany, Colorado Springs, is manager of the property.

Union Mining and Development Company—Chicago men have purchased for $20,000 the Hugo ranch near Nederland, and extensive operations are planned by E. J. Short and associates.

Gilpin County

Calumet & Colorado Mining Company—Michigan copper capitalists have become interested in the Success-Meeker property in Lake district and will install a plant of machinery and carry on active developments.

War Dance—The litigation in regard to this claim, where high-grade telluride ores were found last spring, has been settled, and the lessees will still carry on operations. C. O. Richards, Central City, is in charge.

Buckley—It is reported that this property has been sold to W. F. Morphy, of Denver, and Eastern associates, for the sum of $50,000. A Leyner air-compressor plant has been ordered and the operators intend liberal developments. J. Loughran, Central City, is superintendent.

Gold Spring Group—Interests in this property in Pine creek district have been sold to Leander A. White, of Tolland, Colo., and operations are to be carried on through the Gold Spring tunnel.

Sampson—This group in Leslie gulch has been sold to the Copper Six Mining Company. It is the intention to install machinery and sink the main shaft. John Petersen, Tolland, Colo., is superintendent.

Union City Mining and Milling Company—Indiana men are interested, having purchased the Weidmann group of claims in Pine creek district, have installed a plant of machinery and will erect new buildings. O. G. Gist, Tolland, Colo., is superintendent.

A. K. R. Gold Mining and Milling Company—Articles of incorporation have been filed, showing capital stock of $300,000, with G. M. Ashmore, of Rollinsville, Colo.; G. W. Kraft and F. H. Rehling, of Decatur, Ill., as incorporators. The company owns and operates the Smuggler mine and mill in Moon gulch, near Rollinsville. G. M. Ashmore, Rollinsville, is manager, and there is some talk of increasing the milling capacity.

Illinois Gold Mining and Milling Company—Denver men are interested in the Twelve Mile district, where they have opened up a good body of concentrating ores and are thinking of erecting their own mill. George L. Holland, Apex, Colo., is superintendent.

Lake County—Leadville

Big Evans Gulch—The mines in this section of the district are already beginning to feel the benefits of the driving of the Yak tunnel. A number of idle shafts that were filled with water are now nearly dry. This is accounted for by the fact that the tunnel has crossed the Ball mountain fault, thereby taking the bulk of the water from the different properties. This being the case, it is very probable that several shafts will resume work in the near future.

Yak Tunnel—The owners of the A. Y. & Minnie have leased the property for a number of years to the Yak company. Laterals will be run from the tunnel level to the A. Y. & Minnie ground, opening the orebody at greater depth than that now attained. When the ground is thoroughly opened a large force of men will be put to work breaking ore.

Valley Shaft—The Rio Grande railroad recently completed the switch to this property, South Evans, and now the mine is enabled to ship 40 tons daily of a good grade of ore.

Fryer Hill—The Forepaugh is being worked through the Sliver shaft and a regular tonnage of good iron is being sent to the smelter. The old dump of the Dunkin is being sorted and the lessees are shipping a fair tonnage of excellent ore daily. From the Robert E. Lee the lessees are shipping steadily to the Salida smel- [illegible] being run from the bottom of the shaft to catch the rich ore that made the mine famous in the early days of the camp; the drift is now in 150 ft. and has another 50 ft. to go to the objective point. Some good silicious ore is being shipped from Matchless No. 5 shaft. A new engine and hoist are being installed at No. 7 shaft, and underground work will be started this week.

Star of the West—The lead ore that was opened in this property, south side of Iron hill, a few weeks ago, has been developed and proves to be a fine oreshoot and not a pocket. Thirty tons daily of high-grade lead ore is being sent to the Arkansas Valley smelter.

Crescentia—In August this property, [illegible] of lead ore from the old workings. At present development work is being confined to driving into new territory to catch the ore-shoots that trend from southern Iron hill.

Little Jonny—During the latter part of the month all of the repairs at No. 4 shaft, Breece hill, were completed, and a number of lessees are again at work in this part of the property. In addition to the shaft being repaired, a new foundation was set under the engine.

San Juan County

[illegible]—Work is [illegible] the new tramway and the mine buildings, to replace those destroyed by fire. The mine is ready to resume work as soon as the tramway is finished.

Red Mountain District—This district is active. Regular shipments are being made from the Genesee. Work has begun on the Gold Lion and the National Belle. Good progress is being made in unwatering the old Yankee Girl mine.

Idaho

Shoshone County

[illegible]—The [illegible] the Federal Mining and Smelting Company is about to abandon this property has come as a sort of thunderbolt to the miners of the Burke section. Work has already been started in the Standard mine at Mace, cutting a station for the great pumps of the Tiger, and these will be moved to the new property as soon as a place has been made for them. In the meantime all the men at work on the Tiger are engaged in cleaning up and as soon as this has been done and the machinery removed, the big mine will pass into history. The closing down of this mine on account of the giving out of the orebody is significant, and is the first mine in all the Cœur d'Alene district in which an action of this sort has been taken.

Blue Bell—Another strike of galena is reported from this property, located on Big creek. Sometime ago after driving a 300-ft. adit the vein was intersected and good ore carrying lead and silver was encountered.

Pilot Mine—Another rich pocket of ore is reported to have been found. An attempt is now being made to strike the shoot at depth, and the indications in the lower tunnel are said to be good.

Clearwater Gold Mining Company—This company is expending about $7000 in the installation of hydraulic power. The claims of the company are located in St. Joe county, and for some time past the gravel being worked has panned from a minimum of 25c. a yard upward. The company owns about two miles of the creek bed.

Iron Mask—Six feet of good milling ore has been opened up in this property, located in the Carter mining district. This strike is of importance to a large number of prospects working in the district. The ore is lead-silver and was encountered at a distance of about 900 ft. from the portal of the tunnel and at a depth of about 500 ft.

Surprise—The mine and mill on Pine creek has resumed with a full force of men and shipments have been made. Last year a mill of 125 tons daily capacity was erected and after running a short time was closed down on account of the depreciation of the metal market.

Mineral Point—A strike of about 3 ft. of gray copper ore has been made in the upper workings.

Liston Mining Company—About $12,000 is to be expended in new equipment. Ten men are engaged drifting on the vein, which has been proved in length to the extent of 4800 ft., and in width to 60 ft.

Indiana

BLACKFORD COUNTY

There has been a marked falling off in the product of oil wells in the Montpelier district, due to the decreased demand. Recent development, however, brought in 12 wells with good average production.

GREENE COUNTY

Vandalia Coal Company—This company has adopted a plan to relieve suffering miners and lessen the injuries resulting from mine accidents. A series of lectures are being given to mine bosses on "First Aid to the Injured." They are told what to do before and after removing an injured man from the mines. At each of the Vandalia mines, hereafter, will be found a room which contains medicine and bandages, and the mine boss is being taught to care for the men until physicians arrive.

VIGO COUNTY

Du Pont Powder Company—Three more suits have been filed for damages against the company growing out of the Fontanet explosion last October. There are now about 100 suits pending, mostly for damages to miners or members of miners' families.

Michigan

COPPER

Forest Fires—Serious forest fires broke out on Sept. 8 near the Ahmeek mine, which, at the time of the latest press despatches, threatened not only the town of Ahmeek, but also Calumet and the entire copper district. Firemen from Calumet, Tamarack, Mohawk, North and South Kearsarge and Wolverine, assisted by 1000 miners, were on the ground fighting the flames. A number of villages on the Mesabi range, Minnesota, including Hibbing, were also threatened with destruction by fire which was sweeping the country.

King Phillips—This company has added several additional drilling machines to its underground installation, and consequently a larger tonnage is to be taken out. A most encouraging showing is being made at the various levels. The shaft is put down in the footwall and crosscuts driven through the lode.

Keweenaw—All operations at the Medora shaft are being concentrated in opening up stoping ground and otherwise making ready to maintain regular shipment to the mill direct from underground as soon as the snow comes and interferes with the shipment of rock from the stock pile. At present about one-half the rock is coming from the stock pile. At the Phœnix mill the old jigs have been replaced by the Woodbury type.

Superior—The spur connecting the Superior shaft with the Atlantic railroad has been completed. The two heads of the Atlantic mill which are to treat this rock have been overhauled and put in working order. Shipments will be made from the stock pile, which has accumulated during the past four years of development work, but as soon as the shaft house is erected rock will go direct from the underground openings. The crosscut from the 10th level has reached the lode.

Isle Royal—The structural steel for the new shaft house on the site of No. 6 shaft has been raised and the building is now ready to receive the sheathing. The underground conditions at Nos. 4, 5 and 6 shafts, the newest of the company's openings, are most encouraging, and the copper content of the rock is showing better than at the northern portions of the tract.

Victoria—Explorations are being carried on in three different manners, crosscutting, tunneling and diamond drilling, all in view of opening a better grade and a more consistent copper-bearing formation. A crosscut is being extended from the 19th level of the shaft toward the south, and from the river bank a tunnel is being driven toward the shaft; in this manner the southern portion of the tract will be exposed while to the north a diamond drill is in operation.

Winona—The electrically-operated hoisting plant is ready and will be tried out preparatory to going into regular service.

Calumet & Hecla—This company has completed the erection of a high-tension pole line connecting its substation at Calumet with Lake Superior water works, and at that point a 3,000,000-gal. centrifugal pump is being installed. At No. 15 shaft on the Osceola amygdaloid lode preparations are about completed to begin hoisting from the second compartment. An engine for each compartment is to be used temporarily.

North Lake—Preparations are about completed to begin diamond drilling on the lands of the newly organized North Lake property. Two drills will be put into service and two parallel cross-sections of the tract made; in this manner the various formations will be exposed, also their trend and continuity.

Tamarack—No. 2 shaft house is being remodeled to accommodate the use of Kimberly skips in place of the cage and cars now in use.

Montana

BUTTE DISTRICT

Tuolumne—Grading is being done for the new boiler and air-compressor plant. The management states that a 1000 h.p. boiler plant has been ordered and also a 20-drill cross-compound two-stage air compressor. At the 800-ft. level a station 18x45 ft. has been completed, and a crosscut is being driven to the lead. Ore is being extracted from the 1000-ft. level. Storage ore-bins with a capacity of 258 tons have recently been erected.

Davis-Daly—Sinking on the Colorado shaft continues. The shaft is now down past the 1200-ft. mark.

Copper Eagle Mining Company—Sinking on the shaft is in progress. A short distance below the 250-ft. mark in the shaft an ore-shoot was encountered. The shoot pitches to the west in the vein and runs high in silver.

Pittsburg & Montana—The Pittsmont mine is producing on an average of 200 tons daily. The management states that the new 300-ton concentrator will be entirely completed in two weeks. The water pumped from the mine will be used in the concentrator.

North Butte—The ore pockets and stations at the 2000- and 2200-ft. levels have been completed, and from both stations crosscuts are being run to the veins. When ore is ready to be hoisted from these levels more power will be required for the hoisting engine. With this end in view two new boilers, giving an additional 500 h.p., are being installed. The mine is producing between 1300 and 1500 tons daily.

Red Metal—At the tramway shaft sinking is in progress below the 1500-ft. mark. From the 1500 station a crosscut is being driven north to develop the adjoining Minnie Healy ground. Crosscuts are also being run north from the 1300 and 1400 stations for the same purposes. Owing to the smouldering fires in the old stopes on the upper levels of the Minnie Healy, the mine has not been worked through its own shaft for over a year. At the Rarus mine preparations are being made for sinking the shaft below the 2000-ft. level, and it is expected that the work will soon begin. The Red Metal mines now produce on an average of 1000 tons daily, and this will be gradually increased as the orebodies of the Minnie Healy are opened up.

BEAVERHEAD COUNTY

Benton Mining and Milling Company—The properties are located in what is known as the Quartz Hill mining district, and carry principally silver, with some gold and copper. The claims have been idle for the last 15 years until the organization of this company last spring. The shaft on the Argyle claim is down 150 ft. Butte men are in control of the company.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Production—The output for the week past amounted to 2388 tons, valued at $178,520. The Combination mill treated 560 tons of Consolidated ores. The Western Ore Purchasing Company handled from: Mohawk Jumbo, 610 tons; Van Riper lease, 31; Engineers lease, 43; Mushett, 54; Consolidated Red Top, 58 tons. The Nevada Goldfield Reduction Works treated from: Engineers lease, 208 tons; Little Florence, 29; Combination Fraction, 34; Francis Mohawk, 175; Curtis Mohawk, 100; Florence Annex, 36; Higginson, 40; Black Butte, 77; Begole, 265; Sandstorm, 18; Mushett, 50 tons.

Zinn Florence—Work is progressing rapidly on the 185-ft. level. In drifting along the hanging wall of the Jumbo dike toward the Baby Florence, scattered bunches of ore assaying from $5 to $80 have been found, indicating that the drift is approaching the orebody. The sublease on the 76-ft. level is looking good although the ore is bunchy and irregular.

Portland—This mine is not working at present. One watchman in an eight-hour shift is able to hoist all the water which accumulates. This amounts to about 5000 gal. The shaft is 459 ft. deep. It is reported that the recent diamond-drilling failed to find any orebodies.

Florence Jumbo—The Von Polenz lease, otherwise known as the Florence Jumbo, is sinking its shaft with three shifts of miners. The shaft is now 310 ft. deep. Ore-bins are being erected. Stoping will begin when the 350-ft. level is reached.

Kansas City Goldfield Mining Company—The Velvet lease of this company is making an excellent showing. A raise has been started from the 100-ft. level to connect with the winze from the 50-ft. level, in which ore assaying $50 to $60 per ton has been found. Work is being pushed on the 300- and also on the 500-ft. levels.

[illegible] *Company*—This company has just started work at its lease on the Golconda. The shaft is 150 ft. deep. No drifting will be done until the 300-ft. level is reached.

Mohawk Ledge—The 300- and 400-ft. levels have been cleaned out, and the work of sinking another 125 ft. in the shaft has been started. The shaft will then be more than 600 ft. deep. It is expected to cut the rich Kalfus ore-shoot on its dip before that depth is reached.

Combination No. 3—The Mitchell-Fairfield lease is sinking at the rate of 5 ft. per day. The bottom of the shaft is now down 485 ft. A station will be cut for the 500-ft. level.

Begole Syndicate—This syndicate has just sold the Nevada Goldfield Reduction Works all its dump on Consolidated ground. This dump contains approximately 4000 tons of ore.

Red Hills Mining and Leasing Company—At the company's lease on the September claim, good assays are being obtained from streaks of ore cut in development work. The shaft, now 410 ft. deep, will be sunk to a depth of 500 feet.

Empire—The Goodfriend lease on the Empire has a small vein, between one and two feet wide of ore assaying $40 per ton. This is in the vicinity of the Commonwealth claim from which leasers are shipping.

ESMERALDA COUNTY—RAWHIDE

Royal Tiger—At the Stinson lease on the Royal claim of the Royal Tiger the incline shaft down to the 220-ft. level is all in ore. The company intends to sink a vertical shaft to tap this orebody. On the 30-ft. level for a distance of 30 ft. the ore has been stoped to surface, and shipments show an average value of $250 per ton. The company is mining 3 tons a day of this grade of ore.

Veteran Miller Lease—The first ores treated in the Watt mill, that has just been completed, came from this lease. From the 40-ton initial shipment an 84-oz. bar of bullion was obtained, worth $16 per ounce.

Codd Mill—This 10-stamp mill, being erected at Rawhide Junction, the western terminus of the Rawhide Western railroad, is expected to be running by the end of October. It will treat ores from the Rawhide Mining Company's mines and from the St. Ives lease on the Rawhide Queen property.

[illegible] It has been announced that a mill by this name will be built on Reduction Flat, south of the townsite. The [illegible]

[illegible] has been installed in the Hathaway mill of this company. The tunnel is supplying almost enough water for the plant, the balance will be obtained from wells.

[illegible]

Production—Tonopah is producing at the rate of $9,278,100 per annum. This week's production amounted to 6675 tons of ore worth $178,425. The Tonopah Mining produced 3700 tons; Belmont, 1000; Montana Tonopah, 1050; Midway, 100 tons; MacNamara, 350; West End, 105; Jim Butler, 200; North Star, 40; Tonopah Extenson, 130 tons.

Belmont—In the face of the east drift on the A vein, 50 ft. north of the Mizpah fault, the vein is 2½ ft. wide, all good ore. This vein, when first cut by the main east crosscut was but 10 in. wide. The face of the west drift along the hanging wall of the Mizpah fault shows that the vein is increasing in width, it being over a foot wider than last week. The whole winze being sunk on the orebody, exposed by the east drift from No. 24 south crosscut is in ore. The dip of the winze is gradually being changed so that the winze will be nearer the hanging wall. At the bottom of the winze, this vein is known to be over 20 ft. wide, and the hanging wall has not yet been reached. The ore is becoming richer as the hanging wall is approached.

[illegible] completed his examination of the mine.

Tonopah Mining Company—Most of the ore at present comes from the Mizpah vein on the 500- and 600-ft. levels and from the Valley View vein on the four levels between the 240- and 540-ft. levels. The Mizpah vein averages 10 ft. in width and the Valley View 5 feet.

MacNamara—The pipe line from the power house of the Tonopah Extension has been completed and four additional drills have been started in the MacNamara mine, making eight air drills now in operation. Half of these are drilling in ore and the other half are on development work. On the 300-ft. level the vein contains 4 ft. of high-grade milling ore in the easterly stope and 3 ft. of good milling ore in the westerly stope. The new orebody on the 250-ft. level 50 ft. south of No. 1 stope continues to have a width [illegible]

[illegible] the south vein on the first or 300-ft. level was advanced 20 ft. during the week. This vein contains 2 ft. of good milling ore. On the second or 465-ft. level in the Macdonald stopes, 800 ft. west of the shaft, the vein contains 3 ft. of good ore. These stopes are 150 ft. long with ore the entire distance. In the new stopes started above the drift the orebody has widened to 12 ft. and is of milling grade.

Jim Butler—Extensive development is going on in this property. With the exception of the south crosscuts on the 200- and 400-ft. levels from the Stone Cabin shaft all breasts are in ore. On the 100-ft. level the west orebody has widened considerably. The shaft now 615 ft. deep will be sunk to a depth of 800 ft. Crosscuts will then be run.

NYE COUNTY—CACTUS RANGE

Cactus Range Gold Mining Company—This company has been developing its property for about two years. During the financial trouble and owing to a heavy flow of water the property was idle, but now a compressor and a pump having been installed, the work of sinking the shaft has been resumed.

NYE COUNTY—ROUND MOUNTAIN

Solid Gold Mine—Only two wagonloads of material are required to complete the mill. The company has purchased machine drills, which will be started at once; these are the first machine drills in the camp. The company has obtained preliminary bids on a cyanide plant.

Splinx Mill—The management is considering increasing the capacity of the mill. At present the mill is treating 25 tons per day and is cleaning up $11,000 per month, but the mine can produce more ore.

Round Mountain Reduction Company—The mill is making a test run of ore from the Nazro lease; this ore is expected to average more than $30 per ton. A test run will also be made on ore from the Gallagher-Gordon lease on the Daisy.

NYE COUNTY—MANHATTAN

Manhattan Milling Company—This company, which now has the Lemon mill, has completed improvements, and has started up the mill. The initial run is being made on $150 ore from the Shea lease on the Union No. 9 claim. The company guarantees to save 90 per cent. of the assay value.

WHITE PINE COUNTY—ELY

Nevada Consolidated Copper Company—Contracts are to be let immediately for the fourth unit of the concentrator. The work of excavating for the foundations begins this week. There are 1050 men on the pay-roll at present, but this new work will largely increase the force. The first section of the second unit is completed, and the other section will be finished in another week. The third unit will be completed in four to six weeks. The smelter is producing about 30,000 lb. of blister copper per day, or at a rate of 10,800,000 lb. per year. The reverberatory capacity is large enough to treat the concentrates when the mill is handling 7000 tons of ore per day.

New York

ESSEX COUNTY

It is reported that the iron mines at Sanford lake are to be reopened. These mines were operated for about 30 years, supplying local forges and furnaces, but work was suspended over 50 years ago on account of the cost of transportation. It is now proposed to connect the mines with Lake Champlain by a railroad about 55 miles long, to be operated electrically. The ore deposit is large, and much of it carries 50 per cent. iron.

North Carolina

ASHE COUNTY

Copper Knob—This old mine that gained notoriety on the New York mining boards in 1880 to 1882, is again in operation. The vein carries bornite and other copper ores with gold and silver.

ORANGE COUNTY

North State Mining Company—This company, composed of Pennsylvania capitalists, is opening up a mine near Teer P. O. The vein is quartz and carries gold. The company is erecting a 10-stamp mill and will have it in operation within 60 days. H. L. Whiteman, is superintendent.

Pennsylvania

BITUMINOUS COAL

Haws Coal Company—This company in Somerset county, has completed the sinking of its shaft to the *B* seam and is now making rapid progress in the development of the inside workings. The construction of the headframe and tipple was completed about a month ago. A pair of Lepley self-dumping cages were installed, together with a Touhill first-motion engine. The fan was put in operation about a month ago and the company expects to be in shape to produce 800 tons per day for the winter trade. W. D. McCausland, is general superintendent and C. P. Collins, chief engineer.

Jenner-Quemahoning Coal Company—This company, in Somerset county, which began sinking No. 2 shaft on the *E* seam to the *C*, on June 17, a distance of 95 ft., completed the sinking on Aug. 17. The company expects to instal a rope haulage for the working of the dip headings and in six months the output for this shaft will be in the neighborhood of 2000 tons per day. At this rate the output for the two shafts will be about 4000 tons. John Gibson, Jr., is superintendent and C. P. Collins, resident engineer.

Quemahoning Coal Company—This company, at Ralphton, has completed the construction of one mile of railroad to No. 4 mine. The tipple was completed about a month ago and the mine, which was opened last October, has been driven a distance of 1200 ft. The company is at present installing a motor haulage which will be completed within 10 days; this will increase the output to 600 tons per day. In six months it is expected to ship 1500 tons per day from this mine. Mr. Summerville is general superintendent and C. P. Collins, chief engineer.

South Dakota

LAWRENCE COUNTY

Alder Creek—Plans for the consolidation of the Alder creek, Wasp and other properties are about completed. It is expected to erect a 500-ton treatment plant to handle the large orebodies.

Homestake—Two additional filter presses are being put in and four more will be added shortly, in order to handle the increased amount of slimes caused by the operation of the regrinding plant. This should increase the capacity of the slime plant to 1800 tons daily.

Imperial—A vertical lode 3 ft. wide has been struck on the Dakota claim in the quartzite formation at a depth of 575 ft. The vertical was found in the east drift 80 ft. from the shaft and is believed to be the main orebody.

Tinton—A carload of tin concentrates has been sent to London for the benefit of an English company interested in an option. The mill is handling 800 lb. of tin concentrates per day.

CUSTER COUNTY

Extreme—This claim was sold at receiver's sale to R. T. Walker, of Keystone, who will organize a company to operate the 10-stamp mill and the ground.

Westinghouse—The company is shipping to Pittsburg 150,000 lb. of mica weekly from its Custer properties and is working 112 employees. The vein, 40 ft. wide on the 200-ft. level, is supplying the plants with mica.

Utah

JUAB COUNTY

Tintic Shipments—In August, the mines of the Tintic district produced about 23,000 tons of ore, the mines contributing and the number of carloads dispatched being: Beck Tunnel, 14; Black Jack, 1; Bullion Beck, 9; Bullock, 1; Carisa, 11; Centennial Eureka, 167; Colorado, 101; Eureka Hill, 18; Eagle & Blue Bell, 5; Dragon Iron, 23; Grand Central, 34; Gemini, 3; Iron Blossom, 11; Lower Mammoth, 13; Homestake, 3; May Day, 20; Swansea, 9; Swansea (lease), 4; Sunbeam, 1; Uncle Sam, 20; Victoria, 2; Yankee Consolidated, 7 cars.

Lower Mammoth—In a raise from the 1600 level, a body of rich gold ore was encountered last week. It is regarded as being one of the most important finds ever made in this property.

PIUTE COUNTY

Gold Development—This company, which has been developing a gold property near Marysvale, has announced through its president, H. J. Maynard, of Philadelphia, that preparations have been made to broaden the campaign of development and that facilities will be provided to treat the large bodies of low-grade ores. Power equipment is also to be installed.

Wisconsin

Zinc-lead District

Benton—This camp is at present the biggest shipping point in the district; the Frontier, Etna, Vandeventer, Pittsburg-Benton, Corr and Fox are the heaviest producers. Two new roasting plants will be built by the Fox and the Benton Mining and Development companies, the latter representing a consolidation of a number of local companies. The Calvert is preparing to erect a 100-ton mill.

Cuba City—Northern Michigan men are endeavoring to effect a consolidation of the Baxter, Big Four and Roosevelt properties. Another consolidation mentioned includes the Dall, Gritty Six, Meekers Grove and Anthony. The Dall and Baxter, which have been holding their zinc ore for better prices, are shipping again. The Board of Trade and Pittsburg mills are completed.

Platteville—The Empire, Acme, Homestead and St. Rose are shipping again from this point. The Enterprise, Empire and Acme roasters are running full blast. The electrostatic separator closed down Aug. 29 to make necessary repairs; this plant is now equipped to handle 75 tons of concentrates every 24 hours. The Cruson has foundations laid for a 50-ton mill. The Lyght is drilling to locate its ore range south of the shaft, where an incline shaft will be sunk and a concentrator erected.

Canada

Nova Scotia

Dominion Coal Company—The output for August was estimated at 310,000 tons. For the eight months ended Aug. 31 the total output was 2,602,619 tons, as compared with 2,291,022 for the corresponding period of 1907. The branch line to No. 12 mine has been completed and accumulations of coal are now being shipped. Work on No. 14, situated a mile farther west, has been started. Vice-president Wanklyn reports a steady market and anticipates that the year's output will reach about 4,000,000 tons.

Boston Richardson—This mine at Goldboro, has gone into liquidation, the Supreme Court having appointed the Eastern Trust Company receiver. The company has $59,000 first-mortgage bonds, $350,000 consolidated bonds and about $52,000 floating debt. The present company—of which Franklin Playter, of Boston, is president—took the old Richardson mine in 1903, and has spent a large sum in improvements, new machinery, etc. The mine is a large low-grade deposit, and it is said that the working costs have been less than $2 per ton; but for some months the expenses have exceeded the receipts.

[illegible]

Canadian Oil Fields, Ltd.—An order has been obtained at Toronto winding up this company, John D. Noble being appointed interim liquidator. The company was organized in England to buy up Canadian oil properties, nearly all its property being mortgaged to secure indebtedness. George A. Sedgwick, the applicant, holds mortgages for $10,000 advanced.

[illegible]

Ore Shipments—Shipments of ore from Cobalt, for the week ended Aug. 29 were as follows: Buffalo, 91,000 lb.; Kerr Lake, 61,000; La Rose, 414,000; McKinley-Darragh, 61,000; Nova Scotia, 40,000; O'Brien, 191,000; Townsite, 40,000; Hudson Bay, 120,000; total, 1,018,000 pounds.

Princess—A new vein has been discovered in driving on the main vein at 70 ft., which carries about 4000 oz. silver to the ton.

[illegible] shaft away from the orebodies, to be used as the main shaft, a rich blind vein has been struck at 75 ft. of calcite, niccolite, and native silver. It is reported to be of unusual width.

Trethewey—A financial statement, as of Sept. 1, issued by the company, shows cash in bank, $123,543.96, due from smelters, $41,795; value of ore sacked and in transit, $23,113; a total of $188,451.69. The dividend amounts to $47,273, leaving a balance of $141,179 on hand.

[illegible]

Detola Gold Mine—This mine has been equipped with a new compressor plant and boiler, supplied by the Canadian Rand Company. Active mining operations have been resumed.

Mexico

Jalisco

Amparo—During the month of July the extraction secured at the reduction plant in the Etzatlan district was 93.5 per cent. During the month of June the extraction was 82.96. In July the ore crushed amounted to 3,180 tons, and in June to 3,205 tons. William Howard, formerly at the Esperanza mine in the El Oro district, is now in charge of the Amparo reduction plants. The ore hoisted from the Amparo mines in July amounted to 3,605 tons. For every ton of ore hoisted another ton was broken and left in the stopes as a reserve supply. In addition, at the upper terminal of the aërial tramway connecting the mines and the 40-stamp mill, there is an ore reserve of 6,000 tons.

[illegible] over the mines to the Balaños Mining Company of St. Louis, the result of legal technicalities, the supreme court of Mexico has issued a peremptory order for the immediate transfer of the mines to the American company. The order is directed to Judge Vicencio of the federal district court of Jalisco.

[illegible]

[illegible] transfer of the La Caridad property has been reported at a price approximating $40,000. This property lies about three miles to the east of the Pilares mines of the Moctezuma Copper Company, and has about 6000 tons of ore developed averaging from 4 to 6 per cent. copper. The vendors are represented by Frank M. Watts, of Nacozari and the purchasers by the firm of Whelan & Werner, of Los Angeles. The property will be added to the other holdings of the company.

Moctezuma Copper Company—The second unit of the new 2000-ton concentrator now being erected at Nacozari is nearing completion, and the full plant will be in operation about Sept. 15. H. K. Burch, who has been acting as superintendent temporarily will, on the completion of the plant, leave for Globe, Ariz., to take charge of the erection of the new plant projected for the Miami Copper Company, of that place.

Silver Seal Exploration Company—This company, incorporated under the laws of Arizona for 150,000 shares of the par value of $10 per share by John A. Judah and associates, of Los Angeles, has commenced work on the "Capillo" mine a few miles south of the Pilares. The company was incorporated in July of this year, and in addition to the above property, owns the "La Juela" claim, near the Sonora river, west of Cumpas.

Carterra Mining Company—This company has given an option on the majority of the stock to J. T. Boothroyd and associates, of Douglas, Ariz., and it is expected that development work will be commenced in the near future.

[illegible] of the company lying west of Cumpas are [illegible] the controlling interests and future operations will depend upon his report.

El Tigre—Conflicting rumors are afloat regarding the proposed, or supposed, sale of the "El Tigre" mine west of Yzabel It is generally accredited to people in close touch with the Phelps-Dodge interests, but the sale is said to be to the Standard Oil Company and associates, of New York City. No examination has been made as yet. The price reported is $100 per share on the capitalization of 65,000 shares. The stock sold at $6 per share during the lawsuit of a year ago, on a [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 9—The coal trade in the West is again reported as showing a slight improvement. The gain is gradual, but can still be noted as a gain. The demand for steam coal is the chief point, and that is said to show now a total equal to about 60 per cent. of the high level of the early part of last year. Of course, there are local variations, but the figure given represents the general average.

The Lake trade is less held up by congestion at the docks at the upper ports. There is still a good deal of coal to go forward on contracts, but it can probably be sent without any great rush at the end of the season.

The Alabama strikers are ready to go to work again. The operators, while their position has been sustained, say that they will not refuse work to the men as individuals, but will employ all the labor that they need, without recognizing the union.

In the East the bituminous trade shows little change. The anthracite trade is also quiet, notwithstanding the season. The Coastwise trade shows a slight improvement.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Aug. 29, in short tons:

	1907.	1908.	Changes.
Anthracite......	3,758,153	3,353,696	D. 404,457
Bituminous.....	25,599,696	21,431,663	D. 4,168,033
Coke.............	9,326,687	4,471,614	D. 4,855,073
Total..........	38,684,536	29,256,973	D. 9,427,563

Total decrease this year to date was 24.4 per cent.

Anthracite coal shipments in August were 4,599,094 long tons, being 57,588 tons more than in July, but 997,923 tons less than in August, 1907. For eight months ended Aug. 31 the shipments were, in long tons:

	1907.	1908.	Changes.
Reading..........	9,106,769	7,787,233	D. 1,319,536
Lehigh Valley....	7,612,807	7,143,440	D. 469,367
N. J. Central......	5,785,407	5,475,650	D. 309,757
Lackawanna.. ...	6,904,349	6,601,398	D. 302,951
Del. & Hudson....	4,344,552	4,188,863	D. 155,689
Pennsylvania .. .	3,851,991	3,833,603	D. 18,388
Erie................	4,782,998	4,887,882	I. 104,884
N. Y., Ont. & West	1,814,409	1,890,973	I. 76,564
Total............	44,203,282	41,809,042	D. 2,394,240

Only two companies—the Erie and the New York, Ontario & Western—show gains this year. The total decrease was 5.4 per cent.

New York

ANTHRACITE

Sept. 9—Anthracite trade continues dull for the prepared sizes. Apparently no one thinks of putting in stocks yet. In steam sizes there is some demand for pea and buckwheat, which are in rather short supply.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Steam-size prices are unchanged: Pea, $3.25@3.50; buckwheat, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

There is no change in the Seaboard bituminous trade, activity showing here and there, and then ceasing for a time. Little business is coming from the Far East, though the time is rapidly approaching when winter stocks must be put in at the ice-making ports. Inquiries are coming from the Sound ports to some extent.

New York harbor trade is moderate. Ordinary grades of soft coal are selling at $2.40@2.45; better grades at $2.55@2.60. All-rail trade is quiet. Cars are in good supply, but transportation has been a little slow, owing to the rush of passenger traffic around Labor Day.

Coastwise trade is about the same, and rates are hardening, though there has been no actual change. Rates for large vessels from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Newburyport, Gardner and Bangor, 70@75c.; Portsmouth, 55@60c.; Bath, 65@75c.; Providence, New Bedford and the Sound, 50c. From New York harbor ports 50c. is asked to Boston and Portland.

Birmingham

Sept. 7—Alabama will by the end of this week be producing its normal amount of coal and a little more, it is expected. The general resumption of operations at the mines is now on. The strike was declared off by the national officers of the United Mine Workers of America and this was indorsed by the district organization officers. The operators have announced that there will be no feeling shown in the re-employment of the old men and that as many as are needed will be given work in the mines. It is estimated that out of 18,000 strikers something like 15,000 men will get work again. The United Mine Workers, it is understood, will care for the other men either in Alabama or in other States. The statement is also made that at each mine a check-weighman is to be placed, the miners employed to select such an official.

Several batteries of coke ovens will be started up by the end of the week.

Chicago

Sept. 8—The coming of September has made a slight improvement in the steam coal market, but trade is still far below the hopes of dealers. In the domestic market bituminous coals are slowly increasing in sale; anthracite, with the arrival of the end of the discounts, is dull and is expected to remain dull until the coming of cold weather. Eastern coals are bettering their sales more rapidly than Western.

Lump from Illinois and Indiana mines shows improvement in country districts and fine coals are less in demand relatively. Lump brings $1.75@2.45, run-of-mine $1.55@1.75 and screenings are almost dull at $1.35@1.55, for car lots.

Eastern coals hold well to circular prices which in some cases have been advanced slightly as a result of the increased demand, the increases resulting in practically no change in the volume of sales. Smokeless is in increasing demand from country as well as city trade, and Hocking sales are good. Gas coals move steadily on contracts at standard prices, with a small outside market.

Indianapolis

Sept. 7—President Lewis, of the United Mine Workers and President Van Horn, of District No. 11, are engaging in a bitter contest over their respective authority. President Lewis has ordered the Rood miners to work at once, but Van Horn insists that no man return to work until a discharged driver is reinstated. Lewis says he will throw the district organization out of the National Association, and the situation is interesting.

Pittsburg

Sept. 8—Mine operations in the district increased this week, and 80 per cent. of the railroad mines are running. The congestion at the Lake docks has been removed, and coal is being rushed for the Northwestern markets. The river mines are practically suspended, as all the empty coal boats and barges are loaded. Large operators are holding prices on the basis of $1.15 a ton for mine-run coal at mine. Sales by smaller producers are reported as low as $1. Slack continues to be a drug on the market, and sales are recorded at around 30c. a ton.

Connellsville Coke—Improvement in the coke trade is noted, and prices are firmer. Furnace coke on contract is quoted at $1.65@1.85, and foundry at $2.10@2.25. Several important contracts were closed during the week. The *Courier* in its weekly summary gives the production in both fields at 200,283 tons. Shipments were 7777 cars as follows: To Pittsburg, 3169; points west of Pittsburg, 4173; to points east of Connellsville, 435 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, seven months ended July 31, long tons:

	1907.	1908.	Changes.
Anthracite....	1,489,511	1,587,299	I. 97,788
Bituminous	5,644,219	4,897,677	D. 746,542
Total coal........	7,133,730	6,484,976	D. 648,754
Coke..	512,036	368,392	D. 143,644

These figures do not include coal furnished to steamships in foreign trade. Canada took this year 4,947,748 tons of coal, or 76.3 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, seven months ended July 31, long tons:

	1907.	1908.	Changes.
Anthracite.	12	15,023	I. 15,011
Bituminous	1,128,456	912,820	D. 215,636
Total coal	1,128,468	927,843	D. 200,625
Coke	79,935	73,307	D. 6,628

Canada furnished this year 615,267 tons of coal and nearly all the coke; Australia, 260,588 tons coal. Imports are chiefly on the Pacific Coast.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Aug. 29: Best Welsh steam, $3.96; seconds, $3.78; thirds, $3.48; dry coals, $3.72; best Monmouthshire, $3.54; seconds, $3.30; best small steam, $2.28; seconds, $1.98. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 9—There has been little of special note in the iron and steel markets during the week. The advance promised in September has not yet made its appearance, and may be postponed for a time.

Pig iron has been fairly active, especially in the foundry grades. Buyers, however, are cautious, and will not listen to any advance in prices. Makers are, therefore, not realizing any better prices; but they are not as ready to make concessions as they were. There is some improvement in basic pig, but prices are making difficulty.

In finished material there is a fair demand for bars, and sheets are a little more active. Structural material shows little improvement, and large contracts are still being held back. Inquiries on small orders are more frequent, however. The railroads are still holding back.

Little is heard about export business, and the published figures show a considerable decrease in values from last year.

Birmingham

Sept. 7—With the coal-miners' strike a thing of the past and the general conditions throughout the country picking up, the Alabama pig-iron manufacturers are looking happier. No. 2 foundry is quoted at $13 per ton. Business is coming in from all directions. The make in htis section is holding up well. The settlement of the troubles in the coal mines was of great moment to the iron trade; both coal and coke were being brought from other States in order that there should be no hesitation in the iron production in the State. There is very little iron in the yards, and home consumption shows no falling off.

The steel plant at Ensley in month of August produced 32,424 tons of steel rail, the best month's production in the history of the plant. There is to be no cessation of operations at the steel plant, and in consequence it will be necessary to increase the output of the basic iron.

Baltimore

Sept. 8—Exports for the week included 1,130,608 lb. tin scrap to Rotterdam; 263,723 lb. wire and 1100 tons steel billets to Liverpool; [illegible] tons of steel rails to Guaymas, Mexico.

Chicago

Sept. 8—The iron market is stronger as regards sales of finished materials, notably railroad supplies; pig iron, though not booming, shows no notable falling off. In fact it is probably somewhat stronger than a week ago, the tendency being to increase purchases for the last quarter. Reluctance still exists on the part of sellers to contract freely for 1909 delivery at prices which melters will pay. For general business 500 tons is a good lot; occasionally a lot runs over this and into the thousand class. Small lots still comprise the bulk of the business. The abundance of inquiries for the first half of 1909 is held to be encouraging.

Efforts to hold Southern No. 2 iron firmly at $13, Birmingham ($17.35, Chicago), have not been successful generally, and $12.50 more nearly represents the prevailing price. Sales under conditions most favorable to the consumer as regards delivery and in small lots have been made at $13. Northern iron is shaded slightly under the $17 standard quotation for No. 2—perhaps 50c. on the most favored lots, 25c. on others. Northern charcoal iron holds at $19.50 [illegible]

[illegible] best Connellsville, with sales fair.

Philadelphia

Sept. 9—A general hardening of pig-iron quotations has set in, accompanied with a withdrawal of extremely low quotations in two or three instances and an increase in inquiries. Two causes led to this change, the realization among consumers that the pig-iron accumulations were reaching the vanishing point and that no interference of Southern irons is probable. Large orders are on the point of being closed today for both forge and foundry. The interest in forge is due to the information that large orders for common iron are about being placed. Buyers of basic are about closing for round lots. Makers have made a sudden about-face. A revision of 1909 delivery quotation may be announced any time. No. 2 foundry is selling in small lots better than for months. More pipe-iron inquiries have appeared and orders will be closed. No advance in prices will be attempted, however, while there is so much idle capacity. [illegible] $15.50@16.

Steel Billets—A stronger tone is manifested [illegible] drawn.

Bars—Retail distribution throughout this territory has improved. Prices are unchanged. Large orders for car-building [illegible]

[illegible] no takers at the price.

Pittsburg

Sept. 8—Improvement in mill operations is noted here and there in the Pittsburg district. This week La Belle plant [illegible] tions for steel bars, against old contracts, are showing a further improvement. Track supplies are being bought in somewhat larger volume, but there is no large buying of rails.

A moderate amount of structural work [illegible] been the bridge over the Allegheny river at Oakmont and the First National Bank building, totaling 4000 tons between them.

Pig Iron—The market has been particularly dull in the past few days. While the settlement of the coal strike in Alabama had no direct effect on the Northern market, it has relieved the situation from [illegible] to make up for an insufficient supply from the South, and buyers are correspondingly cautious. Purchases are for small lots for early delivery. Most large consumers are fairly well covered. The Valley furnaces adhere to $14.50, furnace, on No. 2 foundry, equal to $15.40, Pittsburg, but a couple of western Pennsylvania furnaces are ready to give away enough of their freight advantage to undersell this price by 10 or 15c. a ton in Pittsburg. Bessemer is still quotable at $15@15.25, Valley; malleable and basic at $14.50@14.75, Valley, and gray forge at $13.75, Valley, the freight to Pittsburg being 90 cents.

Steel—The market for billets continues quiet, but the regular mill price of $25, Pittsburg, is still the market. Sheet-bar shipments to tin mills have fallen off materially in the past fortnight, and sales are light, the price remaining at $27, Pittsburg. Plates remain at 1.60c. Pittsburg. The regular price of 1.40c. on steel bars is strictly adhered to.

Sheets—Demand is showing a moderate improvement, both from jobbers' stocks and from mills. Prices remain at 2.50c. for black and 3.55c. for galvanized.

Ferro-Manganese—The market remains quiet, with prompt ferromanganese at $43, seaboard, or $44.95 Pittsburg, and 50c. to $1 higher quoted for future deliveries.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 9.

At all U. S. Ports in July and year.

Metal.	Exports.	Imports.	Excess.
Gold			
July 1908..	$ 4,845,272	$ 2,916,408	Exp. $ 1,928,864
" 1907..	7,478,366	3,410,782	" 4,067,584
Year 1908..	58,363,247	29,324,304	" 29,038,943
" 1907..	43,779,098	24,879,429	" 18,899,669
Silver:			
July 1908..	4,930,746	2,982,074	Exp. 1,948,672
" 1907..	5,955,042	3,387,225	" 2,567,817
Year 1908..	30,445,291	24,123,422	" 6,321,869
" 1907..	35,174,251	25,782,836	" 9,391,415

Exports of specie from New York week ended Sept. 5: Gold, $400, to Haiti; silver, $801,785, chiefly to London. Imports: Gold, $305,049; silver, $62,046, both from the West Indies, Mexico and South America.

Specie holdings of the leading banks of the world, Sept. 5, are reported, as below, in dollars:

	Gold.	Silver	Total.
Ass'd New York	....	....	$329,086,500
England........	$191,727,200	....	191,727,200
France..........	643,488,865	$177,701,425	821,190,290
Germany.......	195,230,000	80,910,000	276,140,000
Spain...........	78,510,000	172,630,000	251,140,000
Netherlands....	38,530,000	20,300,500	58,830,500
Belgium........	20,016,665	10,008,335	30,025,000
Italy...........	184,685,000	22,500,000	207,185,000
Russia.........	579,165,000	40,530,000	619,695,000
Aust.-Hungary.	237,305,000	66,755,000	304,060,000
Sweden.........	20,405,000	....	20,405,000
Norway........	8,255,000	....	8,255,000
Switzerland....	22,815,000	....	22,815,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

The Treasury Department estimates the amount and kinds of money in the United States on Sept. 1 as follows:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)............	$ 184,003,816	$ 619,990,263
Gold certificates.........	30,911,760	806,653,109
Silver dollars............	754,887	74,891,095
Silver certificates........	12,684,277	475,083,723
Subsidiary silver	23,774,263	124,005,574
Treasury notes of 1890...	9,582	4,837,418
U. S. notes...............	5,369,090	341,311,926
Nat. bank notes.........	54,692,308	630,633,800
Total....................	$312,199,983	$3,077,406,908

Estimated average circulation per capita, $35.07.

Silver Market

SILVER AND STERLING EXCHANGE.

Sept.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Sept.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
3	4.8610	51⅛	23[illegible]	7	......	....	24
4	4.8608	51¼	23 11/16	8	4.8615	51⅞	23 15/16
5	4.8605	51⅝	23⅞	9	4.8635	51½	23¾

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Purchases for the Indian bazaars carried silver up to 24d., but subsequent operations on speculative account forced the market back to 23¾d., at which figure it closes dull.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Aug. 27:

	1907.	1908.	Changes.
India... ...	£8,086,834	£6,306,713	D. £1,780,121
China.......	......	516,400	I. 516,400
Straits......	598,700	90,510	D. 508,190
Total......	£8,685,534	£6,913,623	D. £1,771,911

Receipts for the week, £5000 from the West Indies and £162,500 from New York; a total of £167,500.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

Sept.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
3	13⅝ @13⅞	13⅜ @13⅝	60[illegible]	29	4.55 @4.60	4.70 @4.72½	4.55 @4.57½
4	13[illegible] @13⅞	13⅜ @13⅝	60½	28¾	4.55 @4.60	4.70 @4.75	4.55 @4.60
5	13⅝ @13⅞	13[illegible] @13[illegible]	..	28¾	4.55 @4.60	4.70 @4.75	4.55 @4.60
7	.....	..	61[illegible]	.		......	......
8	13[illegible] @13[illegible]	13[illegible] @13	61⅜	28¾	4.55 @4.60	4.75 @4.77½	4.60 @4.62½
9	13[illegible] @13[illegible]	13⅜ @13[illegible]	60⅞	28[illegible]	4.55 @4.60	4.75 @4.77½	4.60 @4.62½

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—There has been a fair business since Sept. 2, both with foreign and domestic consumers, together with transactions by traders. Electrolytic copper has been offered by all of the producers at 13¾, delivered, 30 days, or about 13⅝c., cash, New York, but the transactions have been made at about 13½c., at which figure everyone has been willing to meet buyers. In Lake copper a curious case of disparity of price according to brand has occurred. Up to Sept. 3 a large interest was selling at the equivalent of 13¾c., but the next day raised its price to 14c., nominally, or about 13⅞, net, and considerable business was done at that figure and a shade under. At the same time other brands of Lake copper were sold in important quantities at about 13.60c. The higher prices were paid for special brands of copper, wanted by brass manufacturers, who appear to be experiencing a significant improvement in business. The demand for wirebars still lags. However, the capacity of the market to absorb the copper that is offered is undoubtedly increasing. Indeed, manufacturers the world over are doing an increasing business, on the strength of which they are justified in placing orders from day to day. This demand is readily met by all the large sellers and prices close unchanged at 13⅝@13⅞c. for Lake copper; 13⅜@13⅝c. for electrolytic in ingots, cakes and wirebars. The average of the week at which business in casting copper has been done is 13⅛@13⅜ cents.

The character of the London standard market remains the same as it has been for some weeks past. Prices moved up and down a little, but on the whole there is not much change. The close is cabled steady at £60 17s. 6d. for spot, £61 15s. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.@£64 10s.; best selected, £63 10s.@£64 10s.; strong sheets, £75 10s.@£76 10s.

Tin—The market in London has been kept steady throughout the week by operators over there, notwithstanding an absolute dearth of orders from this side. The close from there is cabled at £130 15s. for spot, £132 for three months.

The market does not seem to be able to awaken from its lethargy, and business continues to be of a retail character only. The tendency in general is bearish, as a falling off in consumption is expected during this and next month, due to the closing down of some of the tinplate mills. Spot tin can be bought at the close at around 28⅝ cents.

Lead—Business is almost at a standstill. Prices close barely steady at 4.55@4.60c. New York. Missouri lead is selling at St. Louis at 4.42½ cents.

Prices in London are still dropping, and the close is weak at £13 1s. 3d. for Spanish lead, £13 3s. 9d. for English lead.

Spelter—The improvement in the position of this metal is becoming more and more apparent. The accumulations at the smelting works are fast disappearing, owing to a consumption which is in excess of the current output. The close is firm and higher at 4.60@4.62½c. St. Louis, 4.75 @4.77½c. New York.

The London market is unchanged at £19 7s. 6d. for good ordinaries, £19 12s. 6d. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market continues dull with little business doing. Prices are rather weak at 8⅛@8¼c. for Cookson's; 7¾@8c. for Halletts; 7½@7¾c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $43 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $42.50 for domestic orders, and $41 for export. London price is £8 2s. 6d. per flask, with £8 quoted from second hands.

Platinum—Offers of the metal continue to be made at $17.50@19. Scrap is about $15.50 per ounce.

German Metal Imports and Exports

Imports and exports of metals in Germany for the six months ended June 30 are reported as follows, in metric tons; the figures including alloys and manufactures of the several metals:

	Imports.	Exports.	Excess.	
Copper	90,979	35,570	Imp.	55,409
Copper, 1907	68,171	30,128	Imp.	38,043
Tin	7,685	2,930	Imp.	4,755
Tin, 1907	6,611	3,489	Imp.	3,122
Lead	35,962	21,228	Imp.	14,734
Lead, 1907	37,304	17,336	Imp.	19,968
Zinc	14,482	42,177	Exp.	27,695
Zinc, 1907	15,320	45,354	Exp.	30,034
Nickel	1,572	979	Imp.	593
Nickel, 1907	1,193	646	Imp.	547
Aluminum	1,248	545	Imp.	703
Aluminum, '07	1,948	1,066	Imp.	882
Minor metals	512	4,738	Exp.	4,226
Minor met's '07	452	4,607	Exp.	4,155

Imports and exports of ores and minerals, other than iron ore, for the six months were, in metric tons:

	Imports.	Exports.	Excess.	
Gold ore	22	....	Imp.	22
Silver ore	920	..	Imp.	920
Copper ore	7,032	15,016	Exp.	7,984
Tin ore	4,902	25	Imp.	4,877
Lead ore	66,801	505	Imp.	66,296
Zinc ore	91,574	13,145	Imp.	78,429
Nickel ore	6,082		Imp.	6,082
Tungsten ore	1,012	62	Imp.	950
Chrome ore	9,651	23	Imp.	9,628
Pyrites	298,778	6,357	Imp.	292,421

Imports of slag and slag products were 205,400 tons; exports, 39,007 tons.

Wisconsin Ore Market

Platteville, Wis., Sept. 5—The base price paid this week for zinc ore was $36@37 per ton of 60 per cent. zinc. For 80 per cent. lead ore $60 per ton was paid. Shipments for week ended Sept. 5 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
[illegible]	42[illegible],010		
[illegible]	381,720	65,010	
Platteville	[illegible]	64,170	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
Mineral Point	[illegible]		
[illegible]	[illegible]		
[illegible]	100,2[illegible]		
[illegible]	88,000		
[illegible]	90,000		
[illegible]	[illegible]		
[illegible]			56,190
Total	[illegible]	[illegible]	[illegible]
Year to Sept. 5	[illegible]	[illegible]	[illegible]

There was shipped last week, not then reported, from Linden, 201,680 lb.; from Harker, 61,870 lb.; from Highland, 314,800 lb. zinc ore. In addition to the above there was shipped this week to the Joplin Separator Works at Galena, 195,100 lb., and to the Enterprise roaster, at Platteville, 88,000 lb. of zinc concentrates.

Missouri Ore Market

Joplin, Mo., Sept. 5—No sale higher than a $37 base price was reported in the zinc market, but there was very little ore sold under a $37 base, the few bins purchased at a lower price being small and of a grade not to attract general attention. The silicate market is the strongest, the base price this week being $20 per ton of 40 per cent. zinc, and the high price was $28 per ton on this base. It is the highest base reported for this mineral, and is conceded to be out of all proportion to the market for blende. The average price, all grades, was $34.28. With one lead smelter out of the market and another buying lightly the market was still strong with spirited competition between the two companies purchasing. The highest price was $59, and a large amount of the shipment was purchased at this figure. The average price, all grades, was $58.70 per ton.

Outputting is strong and is now approaching 6000 tons per week.

Following are the shipments of zinc and lead ore for the week ending Sept. 5:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,686,450	529,780	$88,1[illegible]
Joplin	2,221,500	242,670	46,926
Galena	640,200	105,500	14,289
Alba-Neck	[illegible]		9,218
Spurgeon	[illegible]	[illegible]	[illegible]
Granby	[illegible]	25,000	[illegible]
Duenweg	267,670	95,200	7,491
Oronogo	381,510		[illegible]
Aurora	396,910	16,550	7,033
Prosperity	[illegible]	[illegible]	[illegible]
Miami	[illegible]	[illegible]	5,718
Quapaw	361,140		[illegible]
Carthage	[illegible]		3,618
Sarcoxie	143,090		[illegible]
Carl Junction	[illegible]		1,687
Zincite	[illegible]		1,659
Ozark	[illegible]		184
Totals	10,436,740	1,265,330	$216,119
36 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week, $178,982; 36 weeks, $[illegible]
Lead value, the week, 37,137; 36 weeks, 1,4[illegible]

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]		[illegible]		[illegible]	
October	41.75		[illegible]		[illegible]	
November	38.60		[illegible]		[illegible]	
December	31.50		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible] ores sold.

Chemicals

New York, Sept. 9—There is no material change in the general market. Spot business continues quiet, but there seems to be more inquiries about contract business. There is little change in prices.

Copper Sulphate—Business is fair. Prices are unchanged and firm at $4.65 per 100 lb. for carload lots or over, and $4.90 for smaller parcels.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States Sept. 1 as follows, in long tons:

	1907.	1908.	Changes.	
Stocks, Jan. 1	[illegible]	[illegible]	I.	[illegible]
Imports, 8 months	[illegible]	179,450	D.	[illegible]
Total supplies	[illegible]	[illegible]	D.	[illegible]
Deliveries, 8 months	[illegible]	[illegible]	I.	[illegible]
Stocks, Sept. 1	4,545	9,750	I.	5,205
Afloat for U. S.	100,000	75,000	D.	[illegible]

Nitrate reported afloat includes all cargoes from the west coast of South America due to arrive at United States ports by Dec. 15 next.

Phosphates—Paul C. Trenholm reports shipments of phosphate rock from Charleston, S. C., in August at 3872 tons by rail. No [illegible] shipments.

Mining Stocks

New York, Sept. 9—The [illegible] were broken up by a double holiday this week, having adjourned from Friday over to Tuesday. After the holiday, however, there was a strong market, with advancing prices. It is said that there has been more outside buying, but the exchange still shows many evidences of professional work.

On the Curb, mining stocks—especially copper—were inclined to be strong after the holiday. Several of the more active [illegible]

Boston

[illegible] week, and price movements have been unimportant. It is literally a waiting market, with the trend of prices upward. There was a period of weakness, but prices have recovered. The declaration of dividends by the Calumet & Hecla and the Wolverine companies—of $5 each—has had no effect, as both were the same as the previous payments. Atlantic had a sharp upward movement from $14.75 to $18.25, with some reaction. This was due to the reports of the striking of rich copper ground. Amalgamated fell $3.25 to $77.37½, but recovered to above $80. Adventure fell $1.12½ to $8 on belated profit taking, but is back close to $9 again. Copper Range fell $1.50 to $78.50, and North Butte $3.50 to $84.75, but the latter went to above $87 again.

Old Dominion made a low record at $41.62½, later bringing $43. The Bigelow suit does not enter as a market factor to any extent in Old Dominion. Arizona Commercial is up over $2 for the week to $28.12½. Boston & Corbin has lost $1 to $16.75 on desultory trading. Lake Copper advanced $1.25, touching $13.37½. Several smaller companies are adopting the plan of issuing bonds convertible into stock, which seems to be a popular one of late. The Curb has shown unimportant price changes, except Superior & Boston, which sold up $2.50 to $9.37½. This company will issue 50,000 of an authorized increase of 100,000 shares at $5 in the proportion of one new share for three held. Application has been made to list Utah-Apex on the Stock Exchange. The Davis-Daly reorganization plan calling for a $2 assessment has been ratified by stockholders, 319,000 shares voting for it.

STOCK QUOTATIONS

NEW YORK Sept. 8		BOSTON Sept. 8	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	1/16	Adventure	8¼
Amalgamated	80	Allouez	‡36
Anaconda	47	Am. Zinc	‡27½
Balaklala	‡2⅛	Arcadian	4
British Col. Cop.	7	Arizona Com	27¼
Butte & London	....	Atlantic	16¾
Butte Coalition	26⅛	Bingham	‡ 50
Colonial Silver	¼	Boston Con	13
Cum. Ely Mining	8½	Calumet & Ariz*	122½
Davis Daly	2¾	Calumet & Hecla*	655
Dominion Cop.	2¼	Centennial	‡33
Douglas Copper	‡4	Con. Mercur	‡.42
El Rayo	3	Copper Range*	79
Florence	3 15/16	Daly West	9⅛
Foster Cobalt	.50	Franklin	14
Furnace Creek	.19	Greene—Can	11½
Giroux	4⅜	Isle Royal	24
Gold Hill	⅜	La Salle	14⅜
Goldfield Con	6½	Mass	6¾
Granby	‡105	Michigan	14¼
Greene Gold	‡½	Mohawk	66¾
Greene G. & S	‡ 1/16	Nevada	16½
Greenw'r & D. Val.	‡.75	North Butte	86½
Guanajuato	‡2⅛	Old Colony	‡ 65
Guggen. Exp.	170	Old Dominion	42½
Hanapah	‡.20	Osceola	110
McKinley Dar	⅞	Parrot	27
Micmac	2¼	Quincy	95
Mines Co. of Am.	1 1/16	Rhode Island	‡4¼
Mitchell Mining	‡¼	Santa Fe	2
Mont. Sho. C	‡⅞	Shannon	15⅝
Nev. Utah M. & S	3¼	Superior	24⅛
Newhouse M. & S	6⅛	Tamarack	75½
Nipissing Mines	8⅛	Trinity	20
Old Hundred	¾	United Cop., com.	‡10¼
Silver Queen	1.05	U. S. Oil	‡25½
Stewart	⅞	U. S. Smg. & Ref.	41¼
Tennessee Cop'r.	38⅛	U.S.Sm. & Re., pd.	45½
Tri-Bullion	1 1/16	Utah Con	47
Union Copper	‡ 15/16	Victoria	5½
Utah Apex	‡4⅛	Winona	‡6
Utah Copper	45¾	Wolverine	145
Yukon Gold	5⅛	Wyandotte	2¾

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	27¾
Am. Smelt. & Ref.	95½
Am. Sm. & Ref., pf.	106½
Bethlehem Steel	23
Colo. Fuel & Iron	36½
Federal M. & S., pf.	‡85
Inter. Salt	‡18½
National Lead	84¼
National Lead, pf.	101⅜
Pittsburg Coal	‡12
Republic I. & S.	24
Republic I. & S., pf.	81¾
Sloss-Sheffield	64
Standard Oil	‡635
U. S. Red. & Ref.	‡15¼
U. S. Steel	48
U. S. Steel, pf	111⅝
Va. Car. Chem	29

BOSTON CURB	
Ahmeek	100
Black Mt	‡3½
East Butte	‡8¾
Hancock Con	‡6⅜
Keweenaw	4⅞
Majestic	.66
Raven	.95
Shawmut	.30
Superior & Pitts.	14¼
Troy Man	.35

ST. LOUIS Sept. 5

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.50	1.75
Cent. C. & C.	68.00	66.00
C.C. & C. pd.	76.00	74 00
Cent. Oil	110 00	100.00
Columbia	5.00	4.00
Con. Coal	20.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.18	.16
St. Joe.	15.00	12 50

LONDON Sept. 9

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 10
Camp Bird	0 13 9
Esperanza	3 3 9
Tomboy	1 3 9
El Oro	1 7 0
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 9.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.19
Belcher	.18	St. Ives	.27
Best & Belcher	.47	Triangle	.05
Caledonia	.19	BULLFROG STOCKS	
Chollar	.18	Bullfrog Mining	.03
Comstock	‡ 26	Bullfrog Nat. B.	.04
Con. Cal. & Va.	.82	Gibraltar	.05
Crown Point	.26	Gold Bar	.04
Exchequer	.22	Homestake King	.20
Gould & Curry	.08	Montgomery Mt.	.10
Hale & Norcross	.28	Mont. Shoshone C.	.87½
Mexican	.62	Original Bullfrog	.01
Ophir	2 02½	Tramp Cons	.17
Overman	.12	MANHAT'N STOCKS	
Potosi	.20	Manhattan Cons.	.08
Savage	.26	Manhat'n Dexter	.06
Sierra Nevada	.25	Jumping Jack	.03
Union	.21	Stray Dog	.03
Utah	.05	MISCELLANEOUS	
Yellow Jacket	52	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.08
Belmont	1 00	Lee Gold Grotto	...
Extension	.72	Nevada Hills	1.37½
Golden Anchor	.02	Nevada Smelting	1.00
Jim Butler	.26	Pittsburgh S. Pk.	1 00
MacNamara	.53	Round Mt. Sphinx	15
Midway	.31		
Montana	1.30		
North Star	.08		
Tono'h Mine of N.	7 25		
West End Con	.57		
GOLDFI'D STOCKS			
Adams	04		
Atlanta	.28		
Booth	43		
Columbia Mt	28		
Comb. Frac	1 48		
Cracker Jack	.07		
Dia'dfield B. B. C.	.16		
Goldfield Belmont	.15		
Goldfield Daisy	72		
Great Bend	.31		
Jumbo Extension	.41		
Katherine	...		
Kendall	.15		
Lone Star	.10		
May Queen	.06		
Oro	.13		
Red Hill	.28		
Roanoke	...		
Sandstorm	.27		

COLO. SPRINGS Sept. 9

Name of Comp.	Clg.
Acacia	6⅛
Black Bell	....
C. C. Con	3⅝
Dante	6¾
Doctor Jack Pot	6¼
Elkton	61¼
El Paso	39½
Findlay	22
Gold Dollar	‡6½
Gold Sovereign	‡3
Isabella	29¼
Index	....
Jennie Sample	2½
Jerry Johnson	‡4
Mary McKinney	27
Pharmacist	3⅛
Portland	1.00
Un. Gold Mines	4⅛
Vindicator	84
Work	8¼

Assessments

Company.	Delinq.	Sale.	Amt.
Alta, Nev	Aug. 25	Sept. 15	$0.05
Belcher, Nev	Sept. 15	Oct. 6	0.10
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Challenge Con., Nev	Aug. 31	Sept. 22	0.05
Con. Imperial, Nev	Sept 29	Oct. 22	0.01
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Hale & Norcross, Nev	Sept. 3	Sept. 24	0.10
Julia, Nev	Aug. 21	Sept. 14	0.03
Little Chief, Utah	Aug. 11	Sept. 1	0.01
Overman, Nev	Sept. 23	Oct. 14	0.05
Potosi, Nev	Sept 4	Sept. 29	0.10
Savage, Nev	Aug. 27	Sept. 18	0.10
Scorpion, Nev.	Aug. 11	Sept. 3	0.02
Signet	Aug. 8	Oct. 6	0 01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Union Con., Nev	Sept. 15	Oct. 7	0.10
Utah, Nev	Aug 12	Sept. 2	0.03
Wheeler, Utah	July 16	Aug. 6	0.01½
Yellow Jacket, Nev	Aug 10	Sept. 15	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55 678	31.769	25.738
February	68 835	56.000	31.852	25 855
March	67 519	55 365	31 325	25 570
April	65 462	54.505	30.253	25.133
May	65.971	52.795	30 471	24.377
June	67 090	53.663	30 893	24 760
July	68.144	53.115	31 366	24.514
August	68.745	51.683	31 637	23.858
September	67 792	......	31 313	.....
October	62.435	......	28 863	.....
November	58 677	......	27.154	......
December	54.565	.....	25.362	.....
Year	65.327	......	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106.739	62.386
February	24 869	12.905	25 236	13 098	107.356	58 786
March	25 065	12 704	25.560	12 875	106.594	58.731
April	24 224	12 743	25.260	12 928	98.625	58.331
May	24 048	12 598	25 072	12.788	102.375	57 387
June	21 665	12 675	24.140	12 877	97.272	57.842
July	22 130	12.702	21 923	12.933	95.016	57.989
August	18 356	13.462	19 255	13.639	79.679	60.500
September	15 565	......	16 047	......	68.375	......
October	13 169	......	13 551	......	60 717	....
November	13.391	......	13.870	......	61 226	....
December	13 163	......	13.393	......	60 113	....
Year	20 004	......	20.661	......	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27 380	July	41.091	29.207
February	42 102	28.978	August	37.667	29.942
March	41 313	30 577	September	36 689	......
April	40 938	31.702	October	32 620	......
May	43 149	30 015	November	30 833	......
June	42.120	28 024	December	27 925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6.000	3 725	19 531	14 250
March	6.000	3 838	19 703	13 975
April	6 000	3 993	19 975	13 469
May	6.000	4.253	19 688	12.938
June	5.760	4.466	20 188	12.600
July	5.288	4.447	20 350	13.000
August	5 250	4.580	19 063	13.375
September	4.813	......	19 775	.....
October	4.750	......	18 531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	.....
Year	5.325	......	19.034	....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4 513	6.582	4.363	27 125	20.563
February	6 814	4.788	6 664	4.638	25.938	20 875
March	6 837	4.665	6.687	4.527	26 094	21.075
April	6 685	4 645	6 535	4.495	25 900	21 344
May	6.441	4.608	6.291	4.458	25 563	19.906
June	6.419	4.543	6.269	4.393	25 469	19 000
July	6 072	4.485	5.922	4.338	23 850	19.031
August	5.701	4.702	5.551	4.556	21 969	19.350
September	5.236	......	5 086	......	21.050	.....
October	5 430	......	5 280	......	21 781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20 075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, SEPTEMBER 19, 1908. NO. 12.

Official Reports of Costs of Producing Copper

A Comparison of Tabulated Statements of Costs of Mining, Smelting, Transportation and Administration from Reports of 22 Companies

BY ARTHUR R. TOWNSEND*

The accompanying tables show the costs of mining and producing copper as given in the reports of 22 copper-mining companies, which have been considered in this connection. The costs cover, in some cases, a period of four years, viz., 1904, 1905, 1906 and 1907. It sometimes happens that the fiscal years, which are covered by the reports, do not correspond with the calendar year so that the costs shown are not for the same period for all the companies named. In some cases the fiscal year ends on June 30, consisting of six months in one calendar year and six months in another; when this occurs the costs noted have been put in the year preceding that to which they are assigned by the company; arranged in this way they can be more fairly compared with the other costs. This lack of uniformity in regard to the period covered, somewhat impairs the value of the comparison, since the price of copper, the only element common to all the companies, has not been the same for all the periods of time shown; this defect is, however, unavoidable.

Five reports have not been obtainable for all four years. The report of the Dominion Copper Company prior to 1907 (which has here been called 1906, though its fiscal year ends July 31) does not contain sufficient information to deduce the cost of copper produced. The first annual report of the North Butte Mining Company was issued in 1905. In some cases companies have given certain information one year and withheld it the next, which will account for some of the incompleteness in the tables.

VALUE OF THE COMPARISON

In general, a study of the figures does not elicit as much information as it was hoped that it would. It has only been possible to tabulate the current mining, treatment and construction costs. To go further and derive from the reports the original cost of the property, the amount of money expended on it, and the production since the inception of the enterprise, requires more data than is available in most cases. The great difference in the bookkeeping methods employed to provide for the amortization of capital, sinking funds, capital redemption and so on would make a tabulated comparison of little value, since it would not be a comparison of similar things.

The desirability of a uniform system of cost keeping is obvious, but considering the causes that produce the differences in the present methods of keeping costs it seems idle to devote any thought to such a remote possibility. In the first place the difference of the operations performed by various companies renders a radically different system of cost keeping desirable for their individual requirements. Then there are the individual ideas of the various men responsible for the forms of different cost systems. To change a set of books from one system to another for such an altruistic motive as rendering the costs of one company comparable with those of another seems such a remote possibility that it is hardly worth considering. Lastly there are probably cases, though I cannot at present give one, in which a certain confusion in the annual reports is deliberately sought in order to baffle attempts at analysis on the part of would-be investigators. Even were this end secured it is doubtful if it would result in much of value. The physical differences of different mining enterprises so far overshadow any similarities of method in working, that it is seldom that a comparison of the operations of one property with those of another will yield information of much value.

These tables were compiled with as much accuracy as possible and it is believed that such inaccuracies as have not been eliminated will not affect the conclusions to be drawn. In many cases what was properly chargeable to the cost of producing copper for any one year is a matter of opinion; I do not claim that the costs as given represent anything other than my opinion, with which anyone is at liberty to differ, and doubtless many will hold different opinions. Some cases have re- [illegible] mate knowledge of the affairs of the companies might alter. In general the figures given represent the deduction that would naturally be made from the figures which the companies themselves publish as to the conduct of their business. Where the income received from the sale of silver and gold has not been given, the silver has been assumed to bring 95 per cent. of the ruling market price for any period, and the gold $20 per ounce.

ARRANGEMENT OF REPORTS

Reports of mining companies vary widely in form. Some companies give simply a lump sum as the cost of their operations, while a few go into such detail that the cost of individual operations such as hoisting, mucking and hauling may be reckoned; this latter class is in the minority.

The tables show a column devoted to mining cost, one to cost of treatment, one to cost of administration and another to cost of construction. These four, when added together, give the cost of producing copper. Where there has been some revenue from sources other than the production of copper, this revenue has been segregated in the last column of the tables; the total cost of producing copper represents the sum of the first four columns less the figure given in the last column. Thus if the company derived revenue from the sale of gold and silver, rentals, interest on money, or from stores, it has been assumed that the cost of producing this revenue is equal to its production and the difference between the additional revenue and the total cost properly represents the cost of producing the copper. The cost per ton of ore treated is derived by dividing the tonnage treated (not always given) into the sum of the first four columns. In deducing the cost per ton it has not been thought correct to subtract the income from sources other than copper production.

The cost per pound of copper, as has been noted above, is derived by dividing the total costs, less the income from other sources, by the total pounds of refined copper produced. The cost per ton of ore is the best indication that we have of the sort of work that is being performed by [illegible] it may be assumed that the work is good and *vice versa*. The technical ability displayed may be excellent, however, and yet the enterprise may fail because of insufficient copper content in the ore. The cost per pound of copper produced is the figure that most interests the investor. From his point of view it is better to invest in a company with careless methods of operation, but whose high copper value permits a large margin of profit, than in one in which the exercise of the highest technical ability and constant watchfulness barely permit a profit to be made.

---

*Mining engineer, 52 Broadway, New York.

Conditions of the Various Companies

It is only necessary to know the market prices for copper and glance at the column "Cost per Pound" to see which companies were in the best position to pay dividends during 1904, 1905, 1906 and 1907. There are two other considerations, however, which the table has not included. One is the capitalization of the company, which is a purely financial consideration, and need only be briefly touched upon in this connection.

When the cost of producing copper of some company is seen to be low per pound of copper produced, the last word has not been said respecting the margin of profit from which the investor must expect to draw his dividends. The copper may be produced at low cost per pound and yet the total quantity produced may be small in relation to the capitalization of the company, so that a relatively large margin of profit per pound of copper produced may be relatively small when spread, in the form of a dividend, over a large quantity of outstanding stock. The lower costs per pound of copper produced will be found on inspection to correspond with the higher tenor of the ores treated. Here is where the investor is at the mercy of the men who control the policy of his company. By selecting the best ore either by selective mining, or by sorting, a company can treat ore of a high grade only, show a high cost per ton probably, but a low cost per pound of copper produced, indicating to one not acquainted with the operations, a wide margin of profit; and yet it may all the while be gutting the mine of its best ore and leaving poorer ore, which would undoubtedly yield a narrower margin of profit, but with a considerable lengthening of the life of the mine. The precise point at which it is advisable to stop in treating low-grade ores, the considerations being those of increased life of mine against lower rate of interest on money invested, is a hard one to decide and must be separately worked out for each individual case.

The second consideration, which affects the value of each mining enterprise, and which my tables do not include, is that of future ore reserves. While the annual reports of the companies considered treat this matter more or less fully, there is little comfort to be derived from the statements of many; nor can I see how the lay investor can protect himself against deception, or, what is far more to be feared, self-deception on the part of those who compile the reports. The art of mining engineering (and I use the word "art" instead of "science" advisedly) reaches its culmination when an engineer correctly forecasts the quantity and value of ore to be extracted from a mine. The difficulties attending this are too numerous to mention here, and yet at the moment when investment in any mine is contemplated, it is the one feature that overshadows all others. The proper training of engineers to estimate ore reserves correctly, and the proper training of the public to exercise intelligence in accepting the reports of engineers is one of the problems for time to solve.

Classification of Costs

The classification of the costs under mining, treatment, administration and construction is misleading. It represents little more than the original intent of the investigation before it was undertaken. The only three companies, the costs of which have been correctly segregated, are the Tennessee Copper Company, Dominion Copper Company, Ltd., and Utah Consolidated Mining Company. The apparent classification of the others is not correct. In order to justify this a few words of explanation are necessary regarding the order of tabulation. The first table includes 15 Lake Superior companies, all of which use a certain form for their reports. This similarity, representing, as it does, similarity of operations, made it advisable to place them together since their costs are more justly comparable with one another. In some cases their costs are given in commendable detail which would permit a correct segregation according to the classification made; but it has been considered best to segregate their costs in the same manner, followed by the other companies with which they are compared. As noted before, this is misleading. Thus under the head "Mining," there is included a large portion of the treatment cost which the companies do not separate from their mining cost. Under the head "Administration," it was the intention to segregate office expenses, legal expenses, taxes, commissions, interest, travelling expenses, and all expenses not fairly

COMPARISON OF COSTS OF SEVERAL COPPER PRODUCING COMPANIES IN 1904, 1905, 1906 AND 1907.

Company.	Year.	Mining. Running Expense at Mine.	Treatment. Smelting, Freight, Refining, etc.	Administration Taxes, Interest, Commissions, etc.	Construction, Purchase, etc.	Total Cost.	Tons Ore Treated	Cost Per Ton.	Copper Produced, Lb.	Cost Per Lb.	Per Cent. Copper.	Revenue From Sources Other Than Copper Production.
Dominion Copper	1904											
	1905											
	1906	$325,144	$347,612	$67,242		$506,549	187,981	$3.94	2,910,695	$0.1740	0.774	$233,454
Granby Con.[5]	1904	2,036,495			$486,577	1,541,693	590,120	4.28	14,237,622	0.1083	1.206	981,380
	1905	2,927,441			1,287,213	3,009,253	832,346	5.06	19,939,004	0.1509	1.198	1,205,401
	1906	2,596,611			462,760	2,182,952	665,915	4.59	16,410,576	0.1330	1.232	876,419
Greene Con	1904					7,314,582	485,079	15.93	55,014,339	0.1330	5.671	412,819
	1905					8,290,312	734,018	11.29	77,991,946	0.1063	5.312	336,654[1]
	1906					7,298,708	936,318	7.80	55,943,738	0.1304	2.881	64,398
	1907[3]					10,784,632	1,552,884	6.95	58,180,856	0.1854	2.329	734,024[4]
North Butte	1904											
	1905					1,605,862			30,954,788	0.0519		679,255[2]
	1906					2,324,706			32,865,907	0.0707		746,975
Shannon	1904					2,576,949	188,856	13.76	11,414,271	0.2258	3.022	21,961
	1905					1,823,080	218,402	8.49	11,215,832	0.1625	2.568	30,532
	1906					2,484,634	209,654	12.28	13,609,000	0.1826	3.245	89,528
Tennessee	1904	364,574	418,667	122,478		905,719	241,855	3.79	8,188,897	0.1106	1.693	
	1905	229,218	414,208	104,438		747,864	229,116	3.26	8,260,982	0.0905	1.803	
	1906	347,580	739,149	132,427		1,219,156	362,900	3.36	11,319,591	0.1077	1.559	
	1907	446,701	948,626	117,219		1,512,546	389,603	3.88	12,599,019	0.1222	1.617	
Utah Con.	1904	396,902	839,291	59,431		681,988	223,700	5.79	13,553,483	0.0503	3.030	613,636
	1905	546,822	988,355	55,702		806,370	286,200	5.56	17,264,474	0.0467	3.016	784,509
	1906	577,558	1,289,670	71,841		779,938	296,989	6.53	18,533,974	0.0421	3.120	1,159,131
	1907											

[1] Total copper includes 15,169,653 lb. copper produced in 1904 and sold in 1905.
[2] First annual report made in 1905.
[3] For 17 months from Aug. 1, 1906, to Dec. 31, 1907, on account of change from fiscal year to calendar year.
[4] Value of gold and silver in period of 17 months.
[5] Fiscal year ends June 30.

chargeable to operation. This classification is as correct as the information (sometimes very limited) contained in the reports permitted. Where no administration costs are noted it can be assumed that the costs of administration have been allotted in their proper proportion to the operating costs.

The last cost column, "Construction," represents the loosest designation of all, the correctness of which can most readily be assailed. In a few instances it will be noticed that there are no construction costs given, though the other costs have been given in detail. In these cases, and they are the reports that permit of a correct classification, the current construction has been made part of the [illegible] departments. In my opinion this method is correct, and should be more generally employed. The term "construction" in the table includes all unusual expenditures such as purchase of new properties, new machinery and new construction as well as [illegible] construction.

Frequently construction is made to appear as an unusual expenditure in the reports, and to one considering a single report of a single company it would appear to be an unusual expenditure which would not occur again; hence, in deducing the cost of producing copper from the report he would omit it and would be misled into believing that copper could be produced at a lower figure than is the case. It is only when the reports over [illegible]

COMPARISON OF COST OF [illegible]

Company.	Year.	Mining. [illegible]	Treatment. Freight, [illegible] Expenses.	[illegible]	[illegible] Purchase, etc.	Total Cost.	[illegible]	Per Ton.	[illegible]	[illegible]	Per Cent. Copper	[illegible]
Adventure	1904	$211,[illegible]	[illegible]	[illegible]	$1,929	[illegible]	97,036	[illegible]	[illegible]	[illegible]	0.711	
	1905	295,984	[illegible]	9,550	[illegible]	341,221			1,606,208	0.21244		
	1906	281,964	[illegible]	8,213	37,079	348,839	136,094	2.563	1,552,628	0.22468	[illegible]	
	1907	259,759	19,485	7,932	19,272	279,635			[illegible]			[illegible]
Allouez	1904	86,825		[illegible]	62,341							
	1905	199,275	[illegible]		87,451	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1906	341,241	53,554		82,630	477,425	178,400	2.676	[illegible]	[illegible]	[illegible]	
	1907	401,975	48,887		172,589	623,451	214,720	[illegible]	[illegible]	[illegible]	[illegible]	
Atlantic	1904	533,273	65,765		5,229	604,267	390,526	[illegible]	[illegible]	[illegible]	[illegible]	
	1905	512,025	50,321		[illegible]	577,441	295,220	1.956	1,049,731	0.142	[illegible]	
	1906	219,811	22,389		[illegible]	308,003			1,139,082	0.21403		
	1907	114,494				122,288						
Baltic	1904	835,647	160,445	29,486	[illegible]	1,091,161	535,624	2.036	[illegible]	[illegible]	1.137	
	1905	908,776	179,066	43,856	75,552	1,207,250	604,709	[illegible]	[illegible]	[illegible]	[illegible]	
	1906	990,050	[illegible]	43,081	178,273	1,383,950	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1907	1,191,825	[illegible]	[illegible]	265,782	1,728,086	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Centennial	1904	231,334	27,735		91,846	350,915	69,453	[illegible]	[illegible]	[illegible]	[illegible]	
	1905	257,622	[illegible]		47,899	348,282	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1906	308,147	58,817		75,665	442,620	[illegible]	2.667	[illegible]	[illegible]	[illegible]	
	1907	433,727	36,255		64,193	534,176	200,040	[illegible]	[illegible]	[illegible]	[illegible]	
Champion	1904	706,118	166,132	[illegible]	209,149	1,144,475			[illegible]	[illegible]	[illegible]	
	1905	1,001,841	[illegible]	115,384	147,177	1,467,782	604,483	2.428	[illegible]	[illegible]	[illegible]	
	1906	1,110,191	[illegible]	71,978	174,380	1,566,891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1907	1,200,416	216,549	76,116	146,374	1,939,455	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Franklin	1904					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1905					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1906					738,395	372,378	[illegible]	[illegible]	[illegible]	[illegible]	
	1907	[illegible]	197,975		[illegible]	737,837	383,290	[illegible]	[illegible]	[illegible]	[illegible]	
Isle Royale	1904	235,000	53,782		36,065	324,847	154,830	[illegible]	[illegible]	[illegible]	[illegible]	
	1905	273,340	[illegible]		45,269	[illegible]	195,150	[illegible]	[illegible]	[illegible]	[illegible]	
	1906	294,556	[illegible]		72,637	431,371	192,210	[illegible]	[illegible]	[illegible]	[illegible]	
	1907	365,370	62,119		335,871	763,660	175,450	[illegible]	[illegible]	[illegible]	[illegible]	
Mass Con.	1904	188,434	41,481	28,219	26,909	283,687	105,614	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1905	207,314	44,275	27,865	115,460	393,342			2,007,950	0.19		
	1906	100,909	[illegible]	25,170	12,387	518,660			2,106,739	0.246		
	1907											
Mohawk	1904	653,282	87,874	8,467	178,400	928,023	459,162	2.021	[illegible]	[illegible]	[illegible]	
	1905	[illegible]	94,631	10,552	131,687	1,048,412	586,305	1.788	[illegible]	[illegible]	[illegible]	
	1906	884,712	100,452		93,873	1,079,037	618,543	1.744	[illegible]	[illegible]	[illegible]	
	1907	986,922	97,107		103,353	1,187,382	640,777	[illegible]	[illegible]	[illegible]	[illegible]	
Osceola	1904	1,646,374	259,642		132,983	2,038,999	1,095,520	[illegible]	[illegible]	[illegible]	[illegible]	
	1905	1,575,690	239,429		207,505	2,003,193	1,007,200	1.989	[illegible]	[illegible]	[illegible]	[illegible]
	1906	1,623,511	244,629		155,482	1,888,084	1,016,240	1.858	18,588,451	0.101	[illegible]	[illegible]
	1907	[illegible]	177,066		84,374	1,687,179	811,603	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tamarack	1904	1,576,924	203,627		161,958	1,942,509	642,320	[illegible]	[illegible]	[illegible]	[illegible]	
	1905	1,789,243	239,875		86,413	2,115,531	750,120	2.820	[illegible]	[illegible]	[illegible]	
	1906	[illegible]	157,504		90,517	1,439,823	389,680	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]777[4]
	1907	1,587,483	164,353		93,412	1,822,457	533,600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]791[4]
Trimountain	1904	[illegible]	124,872	19,822	[illegible]	1,073,965	534,640	[illegible]	10,211,230	0.10517	[illegible]	
	1905	[illegible]	139,743	52,264	44,225	1,145,190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	1906	[illegible]	122,189	[illegible]	[illegible]	1,156,206	506,942	2.281	[illegible]	[illegible]	[illegible]	[illegible]
	1907	870,491	109,513	15,094	66,084	1,026,464	444,358	2.310	[illegible]	[illegible]	[illegible]	[illegible]
Quincy	1904	1,594,711	144,575	49,535	106,002	1,867,193	1,018,873	1.832	[illegible]	[illegible]	[illegible]	[illegible]
	1905	[illegible]	139,097	51,406	138,732	2,015,469	1,135,162	1.775	18,827,557	0.107	[illegible]	[illegible]
	1906	1,662,520	[illegible]	62,833	138,559	1,951,070			[illegible]	[illegible]		27,410
	1907	2,012,085	[illegible]	55,276	210,700	2,420,829			[illegible]	[illegible]		[illegible]
Wolverine[7]	1905	496,061	109,373		5,111	604,067	321,813	1.877	[illegible]	[illegible]	[illegible]	6,478[6]
	1906	529,668	99,729		35,968	654,321	341,820	1.914	9,681,706	0.06758	1.446	11,044
	1907	569,470	[illegible]		42,137	695,974	344,062	2.023	9,372,982	0.07424	1.362	15,198

[1] About one tenth of product comes from mass copper.

[2] Value of silver deducted from total cost.

[3] A large proportion of the product is obtained from [illegible] copper; hence no figures per ton are given.

[4] Deducted from total cost, income from other sources [illegible].

[5] Interest; deducted from total cost, income from other sources than production.

[6] Interest.

[7] Fiscal years ending June 30.

together that the impropriety of this practice becomes apparent.

From a perusal of the table it becomes apparent that those companies that segregate their construction costs have a recurrence of them with such regularity that in order to arrive at the annual cost of producing copper it is necessary to include these costs with the operating costs. It will be noticed that the companies that have been operating for years are just as apt to have an annual construction cost as those that have just commenced operating. On reflection this does not seem extraordinary, for anyone who has had experience with seemingly complete mining plants, can testify that in spite of their apparent completeness they require something new every year.

In making this classification under construction the principle followed has been, that any expenditure in connection with the company's property which had to be paid for out of the earnings of a given year properly belonged in the cost of producing copper for that year. This is the view taken by the Dominion Copper Company, Ltd., Tennessee Copper Company and Utah Consolidated Mining Company; these companies report no construction costs but charge construction in any department to the operating expense in that department. From the point of view of the stockholder this is a great advantage. To be sure, the stockholder cannot be so sure of the quality of work being done unless costs are given in detail, and he is able to make a more extensive classification for himself; but few have the knowledge or the energy to do this. Good work, producing a low operating cost, may be offset by a larger quantity of construction than usual; and poor work, with high operating cost, may be made to show a low cost by failure to perform needed construction in the case of companies that make their construction part of the operating costs of the respective departments. Construction should be indicated; but in the long run the interests of the investing public will best be served by making construction costs part of the operating costs of their respective departments.

Theoretically the construction of a plant that will last several years is not justly chargeable to the operating cost of the year in which it was built, and there are excellent systems of mine bookkeeping that permit the proper allotment to each operating cost of its share in any new construction. Almost any degree of difference in the cost of producing copper can be obtained by excluding this or that item, on the ground that it is an extraordinary expendiure, that it will not occur again, etc. Anyone who spends much time in working out such costs cannot fail to be impressed with the fact that the elaborate systems of cost-keeping which provide for the correct distribution of construction costs do not, after all, accomplish much. The sums listed under construction do not vary any more or any more irregularly in relation to the amount of ore mined than do the other costs.

OPERATIONS REPRESENTED IN THE TABLES

The Lake Superior companies listed in the second table mine an ore (locally called "rock") containing metallic copper. Their operations consist of mining, crushing in what is locally termed the "rock house," stamping under steam stamps, concentrating and smelting either at their own or at the Michigan smeltery. The seven companies represented in the other table treat their ore in a variety of ways, and make various products such as matte, blister copper, bessemer copper and ingot copper. They all carry on smelting operations; in some cases they smelt all the ore directly, but the majority concentrate a part of it and smelt the concenrate. The practice of the seven companies in the second table and the conditions under which they operate are much less uniform than those listed in the first table. Mining in the Lake Superior district has been carried on for so many years under comparatively similar conditions by so many companies, that it almost constitutes a system of mining in itself.

The Lake Superior companies, with a few exceptions, produce only copper. The exceptions, the Mass-Consolidated Mining Company and the Quincy Mining Company, produce a small quantity of silver.

The seven companies represented in the first table, with only one exception, the Tennessee Copper Company, which produces copper only, treat ores carrying gold and silver, the value of which is represented by the sums listed in the last column of the table.

A study of the figures is interesting. One is at once impressed by the low cost per ton of the Lake Superior companies and by the low percentages of copper from which they extract profits. In most cases the cost per pound of copper is not low because of the low copper content, but the low per-ton costs show what economical mining the companies are doing. The Wolverine Copper Mining Company with its higher copper content is able to make a much better showing per pound of copper produced than the others, maintaining at the same time a per-ton cost as low as the average. The only company which approaches the Wolverine in cost per pound of copper produced is the Utah Consolidated Mining Company, which derives a substantial income from the gold and silver in its ore, and moreover the ore has double the copper content of that of the Wolverine. The high cost per ton of ore treated by the Greene Consolidated Copper Company and the Shannon Copper Company may well excite comment. In the case of the Greene Consolidated Copper Company its former ability to pay dividends and show a fair cost per pound of copper produced is traceable to the high copper content of the ore, the highest of any of the companies named in the tables. When the grade of the ore ran down, the cost of production increased to a high figure.

Flood-Gold

The principal characteristics of flood-gold, according to C. W. Purington (Bulletin No. 44, Ins. Min. and Met.), are its distribution at and near the surface of the gravel bars in streams rather than throughout the section, and its fine, flaky nature. Flood-plained streams, characterized by curves, in wide valleys burdened with gravel, are the usual areas in which this kind of gold occurs. The richest bars are found on the up-stream side of the convex curves of the river, and in the corresponding portions in the former channels occupied by the river. The causes responsible for the enrichment of the bars are, undoubtedly, periodical floods. Such areas of flood-gold generally occur at distances of from 30 to 70 miles from the original sources of the gold in question.

Flood-gold constitutes a phenomenon of subordinate or parallel importance in river valleys where a portion of the alluvial gold is of more ancient origin. For example, in the California dredging areas of the Feather and Yuba rivers, the drill prospecting indicates that occasionally the richer gravel lies near the center, or even in the upper portion of the vertical section of the gravel, while all the operators who have investigated the subject agree that notwithstanding the profitable recovery that is made, the finest gold is not saved either in the rocking of samples or on the dredge tables, but is carried away with the water in washing.

The distinction in physical form between flood-gold and that which is slowly transported and deposited in stream channels affords an illustration of the selective action of running water. The flood gold is invariably flaky, although the particles may present a comparatively large surface. On the other hand, gold deposited in the bed-rock pay-streaks of small streams may be extremely finely divided, but will have a form approaching the spherical.

In the examination of auriferous river gravels to determine if they may be profitably worked by dredges it may be said that, with very rare exceptions, the gold deposited and constantly shifted by annual floods must be neglected in the sampling, not only because of the irregularity of its horizontal and vertical distribution, but because of the extreme difficulty in recovering it by the appliances ordinarily used in placer mining.

---

[1] One cu. ft. of water weighs approximately 62.5 pounds.

Some Metallurgical Processes at Pachuca, Mex.

The Older Processes Are Rapidly Being Displaced by Cyanidation; Even the Old Tailings Are Treated Successfully by This Process

BY CLAUDE T. RICE

With the exception of the hyposulphite lixiviation process all the leading wet processes or modifications of them have been tried at Pachuca. Even now the patio, the pan-amalgamation, the Kröncke barrel and the cyanide processes are in operation, and only a few years ago a modification of the Francke process was also in operation.

Many metallurgists visit Pachuca, attracted by the diversity of the processes in use and the equipment of the mills. South Africa as well as Australia has had its representative at Pachuca, for the Adair-Usher process was given a short trial at the cyanide plant of the Blaisdell Coscotitlan Syndicate on the flat below town. This process briefly consists in agitating the pulp by means of cyanide solution entering near the bottom of the tanks through radial arms extending from a central vertical supply pipe. For success with this process it is essential to have a clear overflow at the periphery of the tank. At Pachuca, where the agitation of an unclassified sandy slime was attempted, a clear overflow could not be obtained when the agitation was strong enough to keep the granular slime in suspension. On this account and for other reasons the Adair-Usher process was abandoned and Blaisdell movable agitators used for agitating the slime. The cyanide plant of the Blaisdell Coscotitlan Syndicate is metallurgically one of the features of Pachuca, for there the cyanidation of old tailings from the patio, the barrel, and the pan amalgamation processes are being worked out.

PACHUCA; PROGRESO MILL IN MIDDISTANCE

The [illegible] refinery at the Loreto mill is also interesting. This refinery is not in operation at present as the Real del Monte y Pachuca company is working on plans for remodeling and modernizing it. This plant is one of the few custom refineries for treating only a mill bullion.

The Patio Process

At the Guadalupe *hacienda*, where the patio process is used, about 1000 tons of ore per week are treated; the ore comes from the Santa Gertrudis and Amistad mines. At the mine the ore is spalled or crushed, and then sorted so as to remove the waste, as well as the ore assaying 2 kg. silver per ton. At the mill the ore is passed through trommels having ½-in. openings, and the oversize is crushed in jaw breakers. This oversize rejoins the undersize from the trommels and then goes to 14 Chilean mills, 5 ft. diameter, crushing through 60-mesh screens. The pulp from the Chilean mills is elevated to 28 Johnston tables, where a good part of the gold is saved in the concentrates. The tailing from these tables goes to settling tanks from which the thickened pulp goes to the patio for treatment.

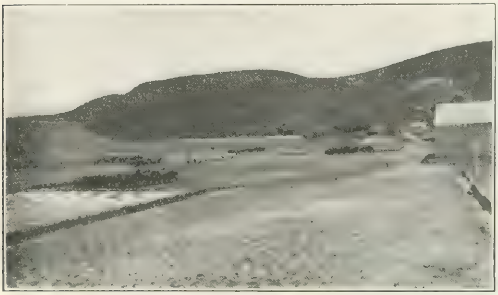
The Guadalupe *patio* is large, being capable of treating at one time 18 *tortas*, or slime beds, 25x30 m. long (including the small space between the *torta* and the inclosing wooden beams). This *torta* is 30 cm. thick and contains about 300 tons of dry slime. After draining and drying for one day, salt is dumped from boxes into regular piles on top of the charge, so as to insure an even distribution on the *torta*; then the salt is mixed into the moist slime; after that the copper sulphate is added and the *torta* is treaded with horses. In Medina's time men mixed the *torta*, and even now, after the horses have stopped work for the day, men turn over every part of it to insure thorough mixing. After the copper sulphate has been mixed, the mercury is added and the tramping begins again. About 14 tons of salt, one ton of copper sulphate, and 500 to 1000 kg. of mercury are mixed with the pulp; this amount of quicksilver sprinkled through the cloth bag onto the *torta* depends upon the amount of silver in the ore. Toward the end of the process more mercury—about one half of the original amount—is added in order to collect the amalgam already formed. The tramping of the *torta* lasts from 30 to 35 days. Toward the end the ore is frequently tested by panning the slime and squeezing the amalgam obtained between the thumb and finger in order to judge from the resulting ball how far amalgamation has progressed. During this long period of tramping considerable water evaporates; so whenever the slime gets too sticky for the horses to work it easily small quantities of water are added. The one desirable thing is to keep the *torta* as thick as possible so that the globules of mercury, scattered through the ore by the tramping of the horses, will be as long as possible traveling to the bottom.

Finally, when the tests made by fire assay on the tailing have shown that the extraction has progressed as far as it is economical, water is added, tramping is continued for a short time to collect the amalgam, and then the charge is washed to several settling pans. At this *hacienda* concrete settlers with revolving arms, built in a pit at the head of the tail sluice, are used. The sluice is fitted with amalgamating riffles to catch quicksilver or amalgam in the tailings.

Men then sweep the patio with brooms, driving the mercury and amalgam before them until finally it goes to the settlers, where it is collected. The extraction of the silver is from 80 to 85 per cent. while the extraction on the gold is very low, only 30 to 40 per cent. This low extraction on the gold is one of the great objections to the patio process. Another disadvantage is the large number of horses required (at the Guadalupe *hacienda* 500); these must be replaced in considerably less than two years, for a young horse will only last two years and an old horse [illegible]. When the exception of the horse for the driver to ride, only unbroken horses are used; these cost at present from 18 to 20 pesos each.

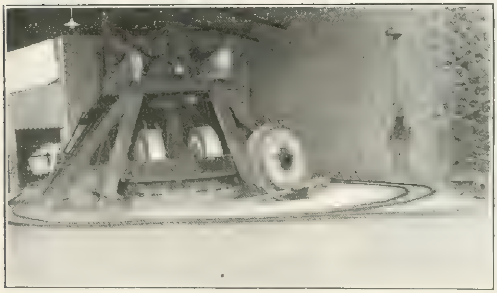
To decrease this expense due to horses the mechanical mixer was invented. This consists of a rectangular framework about 20x5 m., inside of which another framework, to which are fastened eight plows, travels back and forth as it is fed ahead by a cable and wheel. The whole is carried on wheels which run on a track placed on top of the low walls inclosing the mixer *torta*. At one end of the mixer yard is the engine which slowly moves the mixer over the *torta* by means of an endless cable. By means of the plows the *torta* is turned over, but the mixer does not scatter the mercury through the slime so thoroughly as do the horses. It is said that it takes several days longer to obtain, by means of the mechanical mixer, the same extraction as by means of horses. This is probably due to the fact that the plow simply turns over the slime so that possibly much of the mercury flows to one side as the plows pass, while the horse's hoof striking a pool of mercury scatters it as small globules through the slime. Besides, the comminution increases the amalgamating surface of the mercury and so shortens the period required for the mercury to come in contact with the different silver particles. In the mixing of the *torta* a beating action is required more than a shoveling action, but the patio process is too near the end of its existence to warrant the invention of a mechanical beater.

Although at first it took a long time to accomplish advances in this venerable process (200 years to substitute horses for men in mixing), it is not any clumsiness in mechanical details that has caused the slow decline in the process, for the visitor to a *patio* in operation soon acquires a respect for the process which he never acquires from books. Mexico can well be proud of having contributed the patio process to civilization, but as with many other things that have served efficiently, the time of the treading of the last *torta* is only a few months hence.



TORTA COVERED WITH SALT ON LEFT

HORSES TREADING; MEN TURNING A TORTA



CHILEAN MILL; GUADALUPE HACIENDA

MECHANICAL MIXER; GUADALUPE HACIENDA

The Progreso or San Francisco No. 2 Mill

The Progreso mill, which belongs to the Compañia Beneficiadora de Metales, the same company that owns the San Francisco No. 1 mill, is still using pan-amalgamation although plans are being drawn for a cyanide plant which will be submitted at the next annual meeting of the company. This mill is treating custom ore entirely, consequently the ores treated vary greatly in character, for the company receives ore from almost all the mines in the Pachuca district.

The ore comes to the mill in cars over the tramway from the different mines and is unloaded into *botes* packed by two men, as this is cheaper than installing a bin and belt-conveyer system. The ore, as it is unloaded, is sampled by hand and then dumped over grizzlies having 1¼-in. openings between bars.

There are three grizzlies each of which feeds the oversize to a 9x12-in. Blake crusher; these break the ore to 1¼-in. size. The crushed oversize and the undersize from the grizzlies fall into the battery bin and are fed by suspended Challenge feeders to fifty 1050-lb. stamps making 102 drops, 7 in. high, per min. At the stamps very little water is added (only 1.2 to 1.4 ton of water to 1 ton of ore) for no pulp thickeners are used above the pans. On the batteries a 20- or a 14-mesh screen is used according to the hardness of the ore, but most of the crushing is done in the six Kinkead mills that are used for regrinding the pulp from the batteries. On these mills 30-mesh screens are used so that the ore is finely ground as is shown by the following screen test. On 30-mesh, 0.78 per cent.; 30 to 40, 0.67 per cent.; 40 to 60, 6.53 per cent.; 60 to 80, 5.14 per cent.; and through 80-mesh, 86.88 per cent. Since in the pan-amalgamation, as well as in the cyanide process, the extraction increases with the fineness to which the ore is ground, this is a very good pulp for the process. The repair bill on the Kinkead mills is said to be small and the mills give good satisfaction.

The pulp from the Kinkead mills goes to two 8-ft. mixers where live steam sufficient to raise the temperature of the solution to 60 deg. C. is mixed with the solution, and a large excess of powdered copper sulphate and salt is added to the charge. From the mixers the pulp goes to the first of 16 five-foot pans, which overflow from one to another. At the pans the mercury is added, it taking about 5320 lb. to charge the 16 pans. But as there is always some mercury tied up in the amalgam, not only in the pans, the settlers and the amalgam traps, but also as partial retort charges left over after retorting (for only full charges weighing 2530 lb. of amalgam are retorted), it is necessary to keep from 7 to 10 tons of mercury on hand. This mercury at present comes from the La Cruz y Anexas mine in Guerrero, but formerly mercury was obtained from other Mexican quicksilver mines.

The amalgam works over into the amalgam well connected with the pan and is cleaned out frequently, the excess mercury being drained off through bags. From the pans the pulp goes to four 8-ft. settlers where it is diluted with water until there is about 4½ parts water to 1 part dry ore. These overflow from one to another, and in them amalgam and floured mercury are collected. The overflow from the last settler goes to a classifier which feeds the sands to five New Standard concentrating tables and the overflowing slime to six Johnston tables. The tailings from the concentrators go to three mercury traps in which stirrers rotate, while in the launders leading to the river copper riffles are placed. Considerable floured quicksilver together with [illegible] amalgam, is caught both in the [illegible] and in the riffles, the copper riffles gradually becoming coated with amalgam.

The bullion obtained from the retorted amalgam is generally not nearly as fine as that obtained by the cyanide process on the same ore; at this mill it varies between 900 and 990 fine, copper being the chief impurity.

The cost of pan-amalgamation is greater than cyanidation. This is due to loss of mercury and the excess of salt and copper sulphate necessarily added to the ore. Since in the pan-amalgamation process experiment has failed to show any rule governing the amount of chemicals required for different classes of ore, at a custom mill treating many different classes of ore an unusually large excess of chemicals must be used to insure good extraction.

The extraction of silver in the pan-amalgamation process compares favorably with that obtained by the cyanide process, but the gold extraction is far lower. Therefore, partly on account of the lower gold extraction, but mainly—since Pachuca ore carries but little gold—on account of the greater cost of the process, it is only a question of time before the pan-amalgamation process will succumb [illegible] [illegible] at the San Francisco No 1 mill.

[illegible]

At the La [illegible] [illegible] process is still in use; but four Pachuca tanks for agitating the pulp are being erected and in a few weeks the cyanide process will be used instead of the older process. The ore, after being crushed in breakers, is ground in Chilean mills of the Walker type. In these almost all the ore is reduced to a slime. Tests that Señor Francisco Narvaez, the manager for the company, has made indicate that the Chilean mills are more economical in crushing the ore than tube mills, so the Chilean mills will be retained when the plant is modified. The ore from the Chilean mills is dewatered; then it is charged into wooden treatment barrels where cuprous chloride, some copper sulphate, mercury and salt are added. The metallic iron in the pulp precipitates the silver and mercury from the silver and mercurous chlorides that are formed by the action of the chemicals on the silver in the ore and the mercury added to the charge; the mercury then amalgamates the precipitated silver. The resulting amalgam is allowed to accumulate in the barrel and is cleaned up once a month. When the iron in the pulp is [illegible]

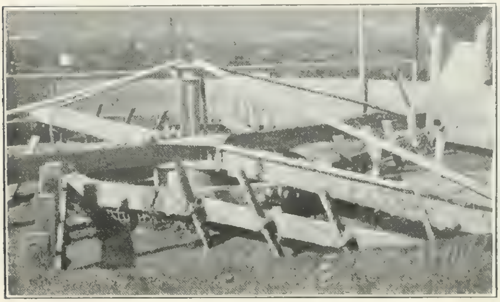
FINAL TREADING OF THE TORTA

[illegible]

LOADING TAILINGS; BLAISDELL COCOSTITLAN SYNDICATE

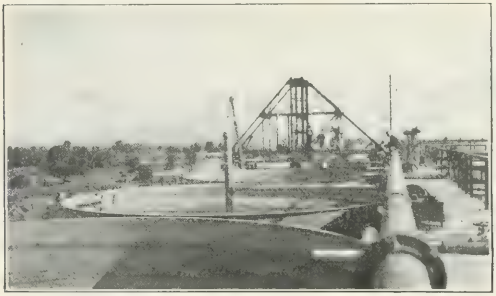
[illegible] PITS, BLAISDELL [illegible] SYNDICATE

the silver, sufficient zinc is added to complete the precipitation. Each barrel holds 4.7 tons of dry pulp. After the charge is made up the barrel is rotated for four hours. Filling and emptying takes four hours so that it takes eight hours to complete a cycle. The extraction on the silver is high, being as much as 95 per cent., but the extraction on the gold is only 35 to 75 per cent. The cost of the process is high compared with that of cyaniding. In the remodeled plant the crushing part of the mill will remain the same and only the chemical treatment will be replaced by the cyanide process.



THE PULPER; BLAISDELL COCOSTITLAN SYNDICATE

GENERAL VIEW; PULPERS ON TOWER IN DISTANCE



ADAIR-USHER AGITATOR IN FOREGROUND; BLAISDELL IN DISTANCE

GENERAL VIEW OF CYANIDE TANKS; BLAISDELL SYNDICATE

Thus we see that the older processes for treating the ores are rapidly being replaced by the cyanide process. In fact, the cyanide process is now being successfully used to re-treat the tailings made years ago in the older processes.

The Blaisdell Coscotitlan Syndicate

The Blaisdell Coscotitlan Syndicate is the company that is treating the old tailings. At its 350-ton plant below Pachuea, which has been running only a short time, the method for successfully cyaniding this tailing has been solved, and probably the company will soon increase the capacity of the plant.

The country to the west of Pachuca is quite dry, and consequently the *hacendados* owning ranches near Pachuca used the water from the Pachuca river to irrigate their ranches. But Pachuca has always been the scene of much milling and consequently this water was heavily laden with the tailing from the patio, the pan-amalgamation and the barrel-process mills. In all these processes most of the ore is ground to a slime and even the sand is very fine. Consequently the *haciendados* have had to build dams to impound the water and settle the slime and sand which was ruining their farms. Thus a shallow tailing, which has gradually encroached upon the farm land, has accumulated for years.

Over a year ago the promoters of the Blaisdell syndicate, believing in the possibility of successfully cyaniding this class of material, purchased the rights to treat the tailings of three tracts of land; on these, in four different areas, there is a total of approximately 2,000,000 tons of tailings. These accumulations taper from 7 to 2.5 ft. in depth; it is said that these tailings, of which gold comprises about one-quarter of the value, are worth about $3.75 per ton with silver at 53c. per oz. As a result of their mode of accumulation these tailings have been water-sorted into slime and sand, separated, of course, by an intervening transition area.

At present the company is treating about 250 tons of tailing a day, but the tonnage will be increased to 350 tons as soon as complete agitation is provided for all of the slimes. At present two Blaisdell movable agitators are installed, quite similar in construction to the Blaisdell excavator except that they have paddles instead of disks on the revolving arms. These will travel on a track over each line of slime tanks. Through the agitator paddles it is possible either to blow air or to spray solution so as to aid the agitation. Formerly the Adair-Usher process of agitation was tried, but with the sandy slime more violent agitation was necessary.

The tailing, as has been said, is thin and as labor is cheap the material after being loosened by a disk plow and harrow is shoveled into the cars on the auxiliary tracks that are placed along the pits. The cars are then hauled in trains of 16 cars by a small engine to the bin which is hopper-shaped and arranged with a bottom made of movable cross-slats, so that the ore does not fall directly onto the Robins belt, but can be gradually fed to it. The belt conveyer, passing up an incline, takes the ore to two cylindrical pulpers, 14 ft. diameter by 2 ft. deep. In these a circular framework, to which are fastened vertical stirrers which disintegrate the clods and vegetal growth (for on the tailing now being treated alfalfa is growing), rotates around a central discharge. The centrifugal force sends the vegetal matter to the circumference where the native attendant skims it off as it accumulates, while the slime overflows at the central discharge.

At first the tailing was pulped with water in this mixer, the whole being passed over Callow screens to remove the vegetal matter, and then the water was separated and cyanide solution added. But this did not give appreciably lower cyanide consumption, nor better extraction than pulping directly in cyanide solution, so it was discontinued and pulping with cyanide solution used. This solution titrates 0.1 per cent. KCN, which is the standard strength of solution used in the treatment. The pulp flows directly to one of the 10 flat-bottomed treatment tanks, 36 ft. diameter and 14 ft. deep, where it is given an agitation-decantation treatment lasting three days, the first agitation continuing 24 hours.

FOUNDATIONS FOR THE TREATMENT TANKS

These treatment tanks rest on a reinforced concrete foundation composed of an 8-in. cylindrical outer wall and an interior filling consisting of sand and gravel, tightly tamped in place. The outer wall is constructed of clean concrete, reinforced by a network of old boiler tubes laced together with barb wire, the wall having a bottom footing 2 ft. wide and 1 ft. thick to give a firm foundation. This was deemed necessary, owing to the fact that all foundations rest directly upon adobe soil. This foundation which was cheaply made, has worked admirably and shows no signs of weakness.

The gold and silver in the solution decanted from the slime tanks are precipitated in nine large zinc boxes. The crude precipitate is melted in steel crucibles holding a 275-lb. charge. These furnaces are fired from outside the bullion room, pinewood being the fuel used at present, but it is planned to burn oil later. The bullion ladled from these fixed steel crucibles is remelted in a small wind-furnace using coke.

The company plans to increase the capacity of the plant to 600 tons per day by adding a 250-ton sand plant. Arrangements are also being made so that in the future the pulp will flow continuously through three tanks agitated by means of rotating arms where the coarser sand, lagging behind owing to its greater specific gravity, will accumulate in the bottom or work more slowly through the system than the lighter slime. After going to classifiers so as to separate the slime, the sand will be sent to sand tanks to be leached while the overflowing slime will go to the slime tanks provided with the movable Blaisdell agitators for future agitation, washing and decantation.

The cyanide consumption at present amounts to about 2 kg. per metric ton of tailing treated, due to the fact that the tailing contains about 0.1 per cent. copper together with organic acids and a small quantity of mineral acids. Both sodium and calcium salts have been tried to neutralize these acids, but they have little effect upon the cyanide consumption. The precipitation obtained is excellent and at present the total extraction is 75 per cent., but this it is hoped will be increased when more effective agitation is obtained in the treatment tanks.

Relative Corrosion of Steel and Wrought Iron Tubing *

By [illegible] M. Howe† and [illegible] Stoughton‡

Is steel, tube steel, intrinsically and incurably materially more corrodible than wrought iron, as unprotected steel and iron are surely far more corrodible than well painted steel and iron? Or is it merely that ill made steel, and steel of unsuitable composition, are more corrodible than well made wrought iron? If the former, then in each and every test which is sufficiently wide to make reasonable allowance for the usual caprices of corrosion, tube steel must necessarily corrode and pit materially more than wrought iron. If the latter, then though in certain tests tube steel may corrode and pit more than wrought iron, either because that steel is ill made or of unsuitable composition, or because of the caprices of corrosion, yet in other tests tube steel should resist corrosion as well or better than wrought iron.

If the latter proves true, then has such a degree of skill in manufacture and inspection been reached that, in each lot of one hundred or one thousand or ten thousand steel tubes delivered, there need be no single tube which shall corrode or pit materially more than the worst tube in a like lot of wrought-iron tubes? Is steel as trustworthy as iron?

To these questions this paper seeks an answer from the evidence at hand, in view of the existing distrust of steel, indeed the general belief that steel is intrinsically and incurably far more corrodible than wrought iron. Where we touch on other questions, we do it to throw light on these.

The day has gone by when this society[1] can hear with patience that, because some steel of unknown source has misbehaved, therefore steel cannot be so made as to behave well. The serious study and great efforts made in the last decade to fit steel tubing to resist corrosion are not to be ignored. To ridicule them would be ridiculous. Have they or have they not yielded regularly a steel which resists corrosion substantially as well as wrought iron?

What we have to say is based in part on investigations which we have made on behalf of the National Tube Company, and in part on our independent inquiries along lines which suggested themselves to us while we were making those investigations. As we understand, that company is interested in overcoming what it believes to be the existing prejudice against steel tubes.

Our inquiry relates only to uncoated tubes. It does not concern itself with the relative merits of steel and iron for conduits, the life of which depends upon the integrity of their coating.

[illegible]

There is no reason why steel ought to corrode worse than wrought iron, at least no strong enough reason to call for unusually convincing evidence. The most marked constant difference between them, the presence of cinder in iron and its absence from steel, creates no such reason. In that the particles of cinder themselves resist corrosion they protect the metal beneath. But their distribution is such that this protective effect may be equalled or even outweighed by their opposite effect of hastening corrosion by difference of potential. To increase the mechanical protection by increasing the quantity of cinder should hardly be practicable, at least in case of tubes which need strength, because this would weaken the metal tangentially, i.e., transversely. In cases in which strength may profitably be sacrificed to gain incorrodibility, it may perhaps be practicable to make use of this principle. This might perhaps apply to the metal for certain tanks. The evidence may be summarized as follows:

Steel corrodes and pits less than wrought iron in our own tests lasting seven months, on 12 pieces of steel skelp in competition with 10 pieces of wrought-iron skelp from the best makers, in hot, [illegible] found extremely unfavorable to steel; in Principal T. N. Thomson's tests on three steel and three iron tubes for about a year in hot water under service conditions; and on simultaneous exposure of many steel and iron pipes to sulphuric acid coal-mine water; in the actual use of 11 steel and 8 iron tubes in railroad interlocking and signal service; in certain locomotive boiler service; and in tests in which 16 pieces of wrought-iron and steel tubing were buried in dampened ashes for 16 months.

Trials in locomotive and in stationary boiler tubing, tended to show that there was no material difference between steel and iron. A 20-month test in the Gayley blast-drying coil at the Isabella furnaces showed no difference between [illegible] uniformly.

Five tests were more or less unfavor- [illegible]

---

*From a report which will appear in full in the published proceedings of the American Society for Testing Materials. An abstract of the paper has appeared in some of the technical journals, but Professor Howe has completely recast the present article.

†Professor of metallurgy, Columbia University, New York.

‡Late adjunct professor of metallurgy, Columbia University, New York.

[1] American Society for Testing Materials.

modern steel, but to that of 1897 or earlier, and one showed a condition of affairs wholly exceptional; while the evidence in another case is obscure if not self-contradictory, and is not shown to apply to modern steel tubing. In the only test unfavorable to steel which is known to apply in modern steel tubing, on simultaneous exposure, pushed to destruction, to sulphuric acid mine water, the average life of three steel tubes was 11 per cent. less than that of three iron ones in series with them, and the life of the shortest lived steel tube was 14 per cent. less than that of the shortest lived iron tube.

This is all the evidence which we have found and received permission to cite, though we have asked manufacturers prominently and financially interested in showing that steel is worse than iron to give the addresses of those who could give us evidence. None of that which we have found but have not yet received permission to cite is unfavorable to steel.

SIGNIFICANCE OF THE TESTS

To sum this up, tube steel has corroded less than wrought iron in seven distinct sets of tests by seven different sets of observers, in seven different places. In three other sets steel and iron behaved substantially alike. Eight of these ten sets were under conditions of service, and in six of them corrosion was pushed to destruction.

In five cases steel corroded worse than wrought iron, but in the only one of these in which the steel tube is known to be modern, the difference was moderate.

Further in our own tests, steel tubing of 1906 pits very much less than that of 1897 from the same makers.

The fact that steel has behaved as well and often better than wrought iron in so large a number of tests seems to us cogent evidence that steel is not intrinsically materially more corrodible than wrought iron. The fact that in one set, modern tube steel has corroded a little worse than wrought iron does not conflict with this inference in the least.

Opposed to this evidence there is a very widespread and deep distrust of steel tubing, indeed a belief that it habitually pits deeply, and that wrought iron corrodes uniformly, a belief contradicted by the evidence. This distrust, so far as we know, is not based on any direct competitive tests between materials known to be good modern steel and wrought iron respectively; note that we restrict ourselves to known good modern tube steel, made specially to resist corrosion.

Instead, this distrust seems to rest on the results of practical experience.

PERSISTENCE OF THE DISTRUST

Most of this experience cannot have been with good modern steel tubing, but must have been with the older tubing which preceded it. Now, the present survival of this distrust in spite of the apparent great improvements in making tube steel resistant, and in spite of the evidence that it does resist as well as iron, need not surprise us in the least. Such a survival is always easy. It is especially easy under the unusual conditions of this case, viz., that the user has not been able to tell steel from iron by his own observation, and that in a large proportion of cases tubing sold as wrought iron has actually been steel. We believe that we are right in saying, that, of the three great classes of users, architects, civil engineers, and plumbers, the last only have in general attempted to learn by direct personal observation whether a given tube was steel or iron. This the plumber has thought that he could do with certainty by the threading test; but the evidence shows that this test, at least in most hands, is useless. It is beside the mark to say that he could have distinguished steel from iron by the etching test, because, as we understand, this test has not, in fact, been used to any important extent. With the best intentions steel and iron carried in stock are likely to get mixed up, unless precautions are taken to keep them separate. The fact that neither dealer or user could tell them apart has removed one usual motive for preventing errors.

This actual ignorance of users as to whether any given lot of pipe is steel or iron seems to us of value, not, of course, in showing whether steel or iron is the better, but in interpreting the existing distrust of tube steel in the face of direct cogent evidence tending strongly to show that this distrust is unjust.

The truth must fit all the facts, and no fact can be rejected simply because it does not fit our preconceived belief as to what the truth is. The truth is what the facts, all the facts, show, and not what we may in the past have thought they showed.

No matter how strong we may think the presumption created against tube steel by the very existence of the present distrust, no matter how heavy the burden of proof that we may demand of the defenders of steel, we have no right to shut our eyes to the evidence. Nobody has a right to say either that defects which may in the past have lessened tube steel's resistance cannot be cured by skill and care, or, except on valid evidence, that they have not been cured. The existence of distrust calls for caution, but does not justify incredulity, especially in view of the special conditions of this case.

The theory that steel is intrinsically and incurably more corrodible than wrought iron is contradicted flately by the evidence given. It therefore must be abandoned, unless resuscitated by correspondingly direct, convincing, and abundant counter-evidence, clearly relating to well made modern tube steel. Nobody doubts that ill made steel may misbehave. The distrust of steel may be nothing but a survival from a day when it was justified, or it may be only an unjustified inference that, because some steel corrodes badly, all must. The distrust can be explained away; the evidence cannot. Therefore, the evidence and its implications must stand until refuted.

INSPECTION INADEQUATE

Our second question now arises, "Have manufacture and inspection been so perfected that, reproducing continuously the conditions which have made so much of the steel of our present evidence as incorrodible as wrought iron, they may deliver only steel of like incorrodibility?" That they will be so perfected some day we can hardly doubt; but have they been already? To prove this so that the community can rely confidently on it, needs more evidence, especially of cases in which corrosion is pushed to destruction. We understand that such evidence is accumulating rapidly. But though not proved, it is easily made credible, indeed, to our minds on the whole probable (1) by the very fair degree of harmony among the large number of tests of modern steel reported; and (2) by the fact that out of the 22 pieces of modern steel tubing represented in three of our tests, not a single one shows any abnormal pitting, nor behaves materially worse than the worst of its iron competitors, of which those in our own test at least were from the best makers.

Purifying Rock Salt by Fusion

A company called The New Salt Syndicate has been formed in London to refine salt by a new process, by melting and separating the impurities as dross. According to the specifications of the English patent, the rock salt is melted in a horizontal furnace upon a number of trays, preferably in echelon arrangement with large spaces between the shelves. The molten salt is collected either on the bed of the furnace, or in a well directly connected with it. The salt forms a number of heaps, which are uniformly heated by the furnace gases, and as the material melts and flows down the collecting beds, fresh salt is supplied as required through charging doors in the furnace roof. The trays, or carriers, are made of firebrick and are provided with raised edges having openings at suitable points so arranged that the fluid salt flows out while the solid impurities and dross are retained.

A modified form of the furnace has only a single continuous platform, which is slightly inclined to cause drainage of the molten salt to the furnace bed. The floor of the bed inclines so that the heavier impurities gravitate away from the tap-hole. The process is now in operation in England on a large scale.

Costs and Profits on the Witwatersrand

The Methods Which Have Been Severely Criticized Compare Favorably with Those of Other Fields Where Conditions Are Still Unsettled

BY JAMES RALPH FINLAY*

The great gold-mining field, Witwatersrand, produces one-third of the world's annual yield of gold, and is so well known to the mining public and even to the public at large, that any general description of it other than such as will serve my purpose of illustrating the factors governing the cost of mining, is unnecessary.

The occurrence of the ores here bears a resemblance to that of two important districts described elsewhere in these articles, i.e., to the copper conglomerates of Lake Superior and to the Kolar mines in India. Like the Calumet conglomerate the banket beds of the Transvaal are mineralized sedimentary beds, and the value of the material worked is not far from equivalent, but the "Rand" beds are thinner, more persistent and workable over much greater areas. The Kolar mines, while on a vein of different geological origin and producing ores of much higher value, bear a considerable resemblance in the persistence and abundance of the mineralization.

Two recent papers by distinguished American engineers throw excellent light on the present condition of the industry. Ross E. Browne has written an exhaustive discussion of "Working Costs on the Mines of the Witwatersrand," (republished in the *Mining Journal*, of London, in the issues of July, 1907) and Thomas H. Leggett, (*Trans.* A. I. M. E., February, 1908), describes the "Present Mining Conditions on the Rand."

Mr. Browne sizes up average conditions for the whole district as follows:

	Per Ton Milled
Working cost	$5.85
Capital redemption	1.22
Total expense	$7.07
Yield	8.71
Profit	1.64

By capital redemption, I suppose, Mr. Browne means all capital, including probably large sums paid for mining claims. By the theory of costs used in this article such sums are profits paid to somebody by the working of ore from the land and are not, therefore, costs. Accordingly Mr. Browne's estimate of the cost of capital redemption is somewhat high; but in round numbers we shall not be far wrong if we say that the mines produce $135,000,000 in gold a year, of which at least 20 per cent., or $27,000,000 a year, is clear profit after allowing for all proper return of capital employed in operating. In round numbers this return of $27,000,000 per year represents the value of the mining claims and, capitalizing the earnings at 7 per cent. per annum, we find that the claims might be valued at about $400,000,000.

On nine representative mines in the district Mr. Browne finds the following average working conditions:

Number of stamps operating	111
Working cost per ton milled	$5.19
Percentage [illegible] by sorting [illegible] at surface and [illegible]	1[illegible]
Ratio of [illegible] developed to ore stoped	0.[illegible]
Width (thickness) of stopes in inches....	69
Continuity of reefs, normal for the banded [illegible] conglomerate.	
Average depth of mining in feet	1,[illegible]
Dip of reef	30 deg.
Hardness of ground, solid quartzite and slate.	
Cost of timber per ton of ore milled	[illegible]
Cost of coal per ton delivered at plant	$3.11
Gallons of water pumped from mine per ton of ore milled.....................	313
Duty of stamp tons milled per 24 hours	[illegible]

With the above average conditions the average costs are as follows:

Development cost per ton	$0.37	
Other mining costs..............	2.63	
Total cost per ton hoisted		$3.00
Milling, crushing and amalgamating		0.69
Cyaniding.......................		0.64
General expense at mines.......		0.25
General expense at head office...		0.18
Total		$4.76

These figures represent the costs as they would be if all the ore hoisted were milled, but as 13 per cent. is rejected by sorting, the cost as divided by the tonnage actually milled is brought up to $5.19.

A Comparison of Records

I cannot believe that these figures make a disadvantageous comparison with costs of similar operations elsewhere. This opinion is somewhat at variance with the general idea among mining men, and, as I have never been in South Africa, it is perhaps well to explain that I am going wholly upon the consideration of the basic principles involved.

Mr. Browne sees hope of reducing costs to about $3.75 per ton by increasing the efficiency of white labor, by better direction of colored labor and by reducing the cost of supplies. With this hope I certainly have no quarrel and it is probably not altogether extravagant. Considerable improvements are brought about by necessity and by long continued effort. As the grade of ore diminishes the cost is inevitably diminished by the simple process, among other things, of refusing to work ores that present difficulties beyond a certain limit. But as a matter of practical experience, taking into consideration all the ins and outs, good luck and bad accidents, it seems to me that the performance of the Rand mines is fully as good as that of other mines.

To judge better of this let us look up the life history of the greatest of the Transvaal mines, the Robinson, and see how it compares with other great mines of which we have the records.

ROBINSON GOLD MINING COMPANY TO END OF [illegible]

Tons milled	[illegible]
Total value $46,535,000 .... per ton,	$17.50
Working cost per ton	6.[illegible]
Construction and improvements....	0.78
Total cost per ton milled	7.[illegible]
Profit per ton	[illegible]
Dividends [illegible]	24,[illegible]
[illegible]	[illegible]

Nearly 60 per cent. of the entire gross revenue is shown as clear profit. Few mines of this grade can equal this showing of costs.

It would be an exceedingly laborious compilation to get the average costs in detail, so I shall content myself with giving the details in a year of which the costs approximate the average. Such a year is 1897 when the total cost was $6.00 divided between working cost at $6.25 and construction at $0.25. In this year the tonnage hoisted was 203,597 of which 23,197 was sorted out on the surface. In addition the amount sorted out underground was estimated at 60,000 tons making the total stoped about 263,500 tons. Since the sorting out of this waste underground serves no useful purpose in protecting the safety of the workings, it was sorted out entirely to avoid the expense of milling. It is probable that the sorting on the surface and stowing of waste underground cost fully as much as the tramming of ore for the mill. For comparing the work done here with certain other mines it is necessary to make these corrections.

MINING COSTS, ROBINSON GOLD MINING COMPANY

Item		Per Ton
263,500 stoped	$[illegible]	$[illegible]
263,500 trammed	[illegible]	[illegible]
203,597 hoisted	[illegible]	[illegible]
263,500 mine maintenance and [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
		$2.60

These figures [illegible] Portland mine at Cripple Creek, figured on the same basis; they are not far above those of the Tamarack, or the Calumet & Hecla, where the volume of material in the same area is more than double, and lower than equivalent work in the Mysore mine. It is to be remembered that the mining is done at the Robinson on two beds, the Main Reef Leader of a payable width of 18 in. and the South Reef of a payable width of 42 in., on which there is not room for working. The effort is to [illegible]

---

*Consulting mining engineer, 2 Rector street, New York

MILLING COSTS.

	Tons.	Total.	Per Ton.
Crushing and sorting...	203,597	$18,134	$0.09
Transport to mill......	180,400	5,465	0.03
Milling and maintenance	....	78,548	0 43
Power..		40,094	0.22
			$0 77

SECONDARY TREATMENT.

	Total.	Per Ton.
Vanning, concentration	14,966	$0.07
Cyaniding, chlorination........	126,470	0.70
		$0.77
Total treatment....................		1.54

Here we have ore worth $20 a ton treated with an extraction of 89.3 per cent. at a cost that seems low enough. A certain correspondence obtains between the value of ore treated and the cost of treatment, even by the same process. To illustrate this take the various Kolar mines for 1899 (I choose that date as being near the period in question here).

	Value.	Cost per Ton.
Ooregum, 1902, 106.000 tons.....	$15.00	$1.80
Nundydroog, 1899..............	22.70	2.19
Champion Reef, 1899	29 50	3.08
Mysore, 1899..................	31.00	2.00
Balaghat, 1899	12 40	1 90

Here it is seen that with the single exception of the Mysore, which probably had a better equipment than the others, the cost is nearly in proportion to the value. It is also plain that in all cases the Kolar costs were much higher than at the Robinson. Later, of course, they have been greatly reduced.

ROBINSON, GENERAL EXPENSE, 263,500 TONS.

	Total.	Per Ton.
General maintenance	$21,071	$0 08
General charges	73,918	0 28
Machinery, plant and buildings...	95,716	0.36
Special charges	23,531	0.09
Construction	46,038	0.18
		$0 99

If all the rock broken, therefore, were treated, we should find the following comparison with the costs as given:

	Per Ton Milled (as given).	Per Ton Mined.
Mining....................	$3.90	$2.60
Treatment..................	1 57	1.54
General expense...........	1.18	0.81
Construction.............	0.25	0.18
	$6.90	$5.13

The gradual diminution both of costs and the grade of ore is shown as follows:

	Yield per Ton.	Working Costs per Ton.
1890......................	$46.20	$10.02
1906......................	13.84	5.30

At the end of 1906, 2,180,000 tons of ore were blocked out, of which the development had been paid for by mining operations to date. The average assay value of the reserves was $14.50 per ton, and the extraction being realized was 93 per cent.; so that a net yield of $13.50 can be expected. It seems plain from the steady reduction of costs that these reserves can be mined for all working and construction costs for $5 a ton, leaving a net profit of $8.50 per ton, or $18,500,000.

Not a Record of Extravagance and Carelessness

I feel that this record of the Robinson mine shows, in a general way, the achievements and tendencies of the Rand industry; and that it is a monument, not of extravagance and carelessness, but of excellent engineering and of broad-gaged and honest management.

With this view of the cost problem on the Rand, Thomas H. Leggett is in full accord. I quote from his paper on the "Present Mining Conditions on the Rand," as follows:

"As a mining camp grows older the working costs almost invariably decrease, providing the camp maintains a healthful activity with advancing years, and this has been the case on the Witwatersrand, the result being as follows:

1898, average working-costs of 65 companies........................	25s. 1.3d.
1899, average working-costs of 42*a* companies........................	25s. 2.7d.
1906, average working-costs of 58 companies........................	22s. 1.0d.
1907, average working-costs of 56*b* companies........................	20s. 8.0d.

a The Boer war broke out in October, hence the records are incomplete.

b Two less than in 1906, due to exhaustion of the Bonanza mine and incomplete records from one other mine.

"These costs include mining, development, crushing and sorting, milling, cyaniding, maintenance and general expense, but they do not cover depreciation and amortization, these items being more properly dealt with by the directors at the end of the year. These results show the very material decrease of 4s. 6d. per ton since 1899, and are, therefore, approaching now to the 6s. reduction predicted by John Hays Hammond in 1901, but it has taken time to attain this result, as I then pointed out it would do. A comparison of the costs in 1907 with those of 1906 shows a decrease of 1s. 5d., or 34c. per ton, due chiefly to decreased wages and increased efficiency of both white and colored labor, including the Chinese in the latter category, though increased crushing capacity through the use of heavier stamps (up to 1670 lb. per stamp) and regrinding in tube mills have also aided.

"In 1906 fifty-eight companies mined and milled 13,065,624 tons of ore at a total cost of £14,411,219, while in 1907, fifty-six companies mined and milled 14,861,234 tons at a total cost of £15,351,749, being an increase of 1,795,610 tons for an increased cost of only £940,530.

"Most of these economies were attained during the latter half of 1907, after the white miners' strike, and some mines made startling reductions, as, for instance, the Robinson, which reported costs of 14s. 9d. for November, and the Glencairn, of 15s. 1d. per ton.

"Such strenuous and successful efforts are now being made to reduce still more the working costs on the Rand, that I think it safe to anticipate another large decrease for the year 1908."

Labor Cost Not Excessive

I have expressed the opinion that costs on the Rand are not essentially different from those that would be obtained were the properties situated in the United States. What about wages? The only direct information I have is the statement of Mr. Browne that whites average $4.60 a day and colored laborers $0.66 per day, and are employed in the proportion of 9.2 colored men to one white man.

Average wages about $1.18 per day; as the percentage of colored men varies, so the average wages will vary from time to time.

In my judgment the figures demonstrate that the Rand is another proof of the fact that the rate of wages does not determine the cost of labor. Criticism of the Rand has been to the effect that costs are higher there than in the United States. Mr. Browne believes that California labor paid California prices on the Rand would be cheaper than the labor actually employed by about 15 per cent. In California wages are approximately $3 per day. I have estimated average development costs at various places as follows:

	Per Foot.
Rand, average for shafts, drifts, raises, etc	$20
Kolar, average for shafts, drifts, raises, etc	22
Cripple Creek, average for shafts, drifts, raises, etc ..	14

WAGES.

	Per Day.
Rand..............................	$1.18
Kolar.............................	0 36
Cripple Creek.....................	3.40

An exact comparison cannot be made, because the rocks and conditions are different. In the Rand the rock is harder than at Cripple Creek, and the openings probably average larger, but on the other hand, there is less water to pump.

Efficiency of Labor a Function of the Cost

The point I am seeking especially to bring out is that criticism has been applied to the inefficiency of Rand labor as if it were a special case, and that because wages average low on the Rand costs ought to be correspondingly low. I contend that this assumption, if carried beyond certain narrow limits, is an incorrect one, and if established it would be in opposition to a general economic law.

President Roosevelt's great work has often been called a re-affirmation of the Decalogue. I am afraid that the conclusions I have arrived at are of the same class. You will remember the scriptural phrase, "The laborer is worthy of his hire," and the common proverb that the "Workman is known by his tools." These statements contain the essence of the problem of the cost of labor, always the fundamental and final element in the cost of anything. The gist of the whole subject was tersely stated by the first Lord Brassey, the great English contractor, who said that the same work costs the same money anywhere regardless of the price of wages. The workman, the tools and the wages go hand in hand. Good wages command through competition, effective workers. Good workmen create efficient tools.

On the other hand, it is a truism to say that high-class tools and machinery can only be used by men who have intelligence enough to secure the wages their efficiency justifies. Where a man's idea of moving dirt is to fill a basket with his hands and carry the basket on his head, his wages correspond with the fruitfulness of his idea; he earns 10c. a day. Where dirt is moved by the complex organism of modern civilized industry which applies external power through the agency of railroads and steam shovels, the men who operate the tools are better paid. The master of the industrial enterprise, which may be described as the greatest tool of all, a mechanism fashioned by the combined efforts of countless brains to direct the united efforts of men and energy to useful work, is pretty sure to be a millionaire; the man who runs the steam shovel gets $5 a day; the laborer who moves the ties in front of the steam shovel gets $2 a day. In the world's market the product is worth the same thing whether it is the result of an industrial miracle or of infinite but stupid human labor. When mankind produces efficiency it gets a due return for it, a return which is expressed pretty accurately in wages.

A Rule Without Exceptions

The only reason why these conclusions are not accepted as truisms is that people are suspicious of each other and are accustomed to doubt the fairness of the distribution of wealth. That this distribution is a matter, the fairness of which can only be guaranteed by ceaseless vigilance, it is a folly to doubt; but, on the whole, I believe everybody concerned *does* exert vigilence, a vigilance made instinctive by the fundamental laws of the evolution of life, and on the whole the distribution is pretty fair. To avoid possible errors, however, we had best perhaps not apply this generalization to work of an ephemeral character, but only to permanent or semi-permanent industries where labor has time to adjust itself to competition.

But here we have to meet the question, are not modern methods employed in South Africa and India? Have we not sent there our best engineers, our most modern machinery and our best methods? If so, then why are not the men more efficient and the wages higher? I answer that it is indeed true that we have sent many civilized appliances to those places, but not all. Among the things we have not sent are the surroundings, point of view, ambition and energy of a civilized community. The few hundred or few thousand Europeans who operate mines in Africa or India are immersed in an ocean of black humanity upon which the small foreign community has an influence, true enough, but not such an influence as to revolutionize the habits, aims and expectations of the natives.

An enterprise so situated must take into account at the beginning the state of mind of its future employees, and it would be silly to make such plans as might run counter to their prejudices; and, even if the managers had hopes of making the natives eventually as effective as Europeans, he would have to plan his operations on a different basis. As a matter of fact, such an expectation is hopeless; an individual Kafir or Hindoo may fill a certain position as effectively as an European, but to expect a large body of such people to become collectively as effective as a body of Europeans whose ideas had been trained for generations along lines making for an entirely different standard of effort, is quite absurd. A considerable body of whites may indeed supply a certain amount of mental and nervous energy to the natives which the latter could not supply for themselves, but in so doing the white men must use up energy in the direction of others that they might otherwise use in their own labors.

If a body of colored men in a colored man's country is going to turn out work under the direction of white men as cheaply as the white men can do it themselves in their own country, they must do it by working for lower wages. This is exactly what happens in every case. It is a rule to which there are no exceptions.

Alloys of Gold and Tellurium

Certain alloys of gold and tellurium have been examined by T. K. Rose.[1] Mixtures of gold and tellurium were prepared by melting tellurium, or a tellurium-gold alloy, in a clay crucible under charcoal and adding a weighed quantity of gold. The mixture was well stirred, a thermocouple inserted, and the crucible cooled without further disturbance. After solidification the crucible was broken and samples of the alloy taken for assay and examination with the microscope.

It was found that the presence of 0.05 per cent. tellurium in gold reduces its resistence to shock, making it somewhat fragile, and when more tellurium is present the alloys are very brittle. The microscope shows these alloys to consist of crystals of gold set in a greyish white eutectic alloy. As the percentage of gold falls to 60.7 per cent., the eutectic alloy increases at the expense of the metallic gold, until the latter vanishes entirely.

Gold containing 2.4 per cent. tellurium is of a pale brass yellow color when not magnified. As the tellurium increases, the color of unmagnified specimens becomes more pale. The eutectic alloy itself, which contains 60 per cent. gold, still has a faint yellowish tinge, but the [illegible] per cent. gold, is white or gray, without any tinge of yellow.

Between the alloys containing 60 per cent. and 20 per cent. gold, the compound $Au Te_2$ (gold 43.59 per cent.) separates out on cooling, leaving either the gold-rich eutectic, (60 per cent. gold), or the gold-poor eutectic, (20 per cent. gold), to subsequently solidify.

The compound $Au Te_2$ is well known to exist in nature as the minerals calaverite and sylvanite, in which part of the gold is replaced by silver. By the examination of fused mixtures of gold and tellurium, no evidence is obtained of the existence of compounds corresponding to the minerals petzite ($Ag_2 Te$ with some of the silver replaced by gold), coolgardite ($M_2 Te_3$, in which various replacements occur), [illegible]

The behavior of tellurides of gold on roasting is partly explained by the remarkably low temperatures of fusion observed in the experiments, all mixtures containing less than 60 per cent. of gold being completely fused before a red heat is reached. The production of spherical globules of gold must, therefore, accompany the roasting of gold ores containing tellurides, however carefully the operation may be carried out. Such globules will not be free from tellurium.

The main conclusions derived from a study of the results of the experiments are summarized by the author as follows:

(1) A compound, $Au Te_2$, or $Au_2 Te_4$, containing 43.59 per cent. of gold and corresponding in composition to sylvanite or calaverite, is formed when tellurium and gold are melted together in certain proportions. This compound fuses at a temperature of 452 deg. Centigrade.

(2) Two eutectic mixtures are formed, containing 60 per cent. and 20 per cent. of gold, respectively. These alloys correspond in composition to the formulas $Au Te$ and $Au Te_4$. Under the microscope they do not show the characteristic banded eutectic structure, but there are no certain indications that they are true compounds.

(3) All the alloys of gold and tellurium are brittle.

(4) All alloys of gold and tellurium, which contain less than 60 per cent. of gold, fuse at temperatures between 397 and 452 deg. Centigrade.

As a general rule, writes an authority on copper and brass, the lower the temperature at which copper is rolled and annealed, the tougher and better is the manufactured product. Also, the thinner the manufactured article, the lower must be the temperature of working.

In West Australia it is found that the grab sampling of ore as it is drawn into the cars from the chutes agrees closely with automatic sampling at the mill.

---

[1] Paper read before the Inst. Min. and Met. [illegible]

The Use of Natural Gas in the Joplin District

Methods of Utilizing Gaseous Fuel in Boiler Plants and the Relative Economy of the Steam Engine and the Internal Combustion Motor

BY DOSS BRITTAIN*

The natural gas used in the Joplin district is pumped from Liberty, Kansas, through the "Southern Trunk," a 16-in. pipe line 65 miles long, from which it is delivered to the mills and to local gas companies at the city limits. It is estimated that 20,000,000 cu.ft. per day are consumed in the district, 25 per cent. of which is used for manufacturing and domestic purposes and the remaining 75 per cent. in the concentrating plants of the lead and zinc mines. Approximately 400 companies and individual operators use natural gas. For use under boilers it is delivered at a regular summer rate of 10c. per 1000 cu.ft. and 12½c. per 1000 cu.ft. in winter. For gas engines the rate is 25c. the year round. Since the introduction of gas into the district in 1905 the service has been very satisfactory, no shut-down longer than a day having occurred.

Although there is a slight variation in the composition of natural gas furnished by the Jasper County Light and Fuel Company, which supplies the district, its average is approximately as follows: Carbon dioxide, 0.45 per cent.; ethlylene, 0.35; carbon monoxide, 0.41; marsh gas, 93.35; nitrogen, 3.41; oxygen, 0.39; hydrogen, 1.64 per cent.

For mining purposes natural gas is used in two ways: under boilers, the most common way, and in gas engines. Under boilers the advantages of natural gas, as compared with coal, are cleanliness, ease of operation and regularity of supply and heat, which gives a steady power to the machinery and reduces repair bills to a minimum. The regularity of supply eliminates all loss and inconvenience resulting from coal strikes. In efficiency, laboratory experiments at the University of Kansas indicate that in water-evaporating power, one ton of soft coal is about equal to 20,000 cu.ft. of natural gas.

To determine the number of B.t.u. per cubic foot of natural gas, experiment shows the following formula applicable for all practical purposes: B.t.u. = per cent. hydrocarbons × specific gravity of gas × 18.3.

The products of combustion of gaseous hydrocarbons, the chief constituent of natural gas, vary with the amount of oxygen available for combustion. If the supply is insufficient the carbon forms, with oxygen, carbon monoxide, with resultant loss of more than half the heat units in the carbon. With a still smaller supply of oxygen the hydrogen, with oxygen, forms steam, and the carbon is deposited as soot with more loss of heat units. For proper combustion of one cubic foot of natural gas two cubic feet of oxygen are required. Since in the use of gas under boilers the source of oxygen is the air containing 21 per cent. by volume of oxygen and 79 per cent. nitrogen, about five cubic feet of air is necessary to supply one cubic foot of oxygen, or ten cu.ft. of air for every cubic foot of gas. In actual practice, however, it has been found advisable to use from 11 to 13 parts of air to one of gas. The heating equivalent of Kansas natural gas is about 990 B.t.u., and its economy depends on the completeness of the combustion. Although 45 cu.ft. of gas per boiler horsepower hour should be the maximum consumption, few equipments consume less than 60 cu.ft. per horsepower hour.

BOILER PLANT FITTED WITH NATURAL-GAS BURNERS

Natural Gas as Boiler Fuel

Efficiency in the use of natural gas under boilers depends on the kind of burner used, the care employed in designing the installation, and on intelligent attention and regulation. Gas was first burned from the open end of the supply pipe; this was followed by the mixer type of burner, and of these a legion have appeared. While it is an easy matter to construct a burner that, under uniformity of draft, pressure, etc., will give satisfactory results, the construction of one that operates satisfactorily with these conditions continually varying is another matter. In the Joplin district four types of mixer burners have found general favor: the Roberts, Kirkwood, Gwynn and Equitable.

In the Roberts burner the gas is taken in at the side, and from a chamber surrounding a hollow cone is permitted to escape into the mixing chamber through the orifice between the small end of the cone and the shell of the burner, the flow being regulated by adjusting the cone, enlarging or contracting the orifice. Air is taken through the cone as well as through the air ports. By means of a draft through the cone this burner will, in a manner, siphon the gas into the furnace, a very low pressure being needed from the gas itself. The burner is placed in the fire door of the boiler or furnace, one in each door. The largest size is 36 in. long, 9 in. in diameter, has a 3-in. gas inlet, and yields 125 h.p. The second size is 30 in. long, 8 in. in diameter, has a 2-in. gas inlet, and produces 60 h.p. under ordinary pressure.

The Kirkwood burner consists of an outer and an inner casing, forming a circular space into which a large number of small pipes having fine holes or jets are introduced, and a nozzle. The gas is introduced into the circular space through an opening provided for that purpose and passes thence into the small straight pipes arranged spirally in the body of the burner. From these it emerges through small openings in a myriad of fine jets and mixes with the air, which is drawn into the burner. The spiral arrangement of the pipes breaks up the air and introduces the gas into it with a swirling motion. This burner works most efficiently with a gas pressure of from 2 to 8 oz., each burner evaporating the equivalent of 25 h.p. with a 2-oz. gas pressure. With a gas pressure of 6 to 8 oz. each burner will evaporate 35 h.p., if the stack draft is sufficient.

---

*Joplin, Missouri.

When more than two burners are installed under one boiler a single valve on each burner is sufficient, for when three or more burners are used, the boiler may be operated efficiently at various loads by shutting off one or more of the burners, allowing the operating burners to work at or near their ultimate capacity, at which point they are most efficient and economical. Additional valves on boilers of 100 h.p. and under are useless, for they are never used in actual practice for regulation and serve only to multiply the parts unnecessarily. Because of variations in stack draft and gas pressure, an air damper is placed at the back of each burner for regulating the amount of air admitted.

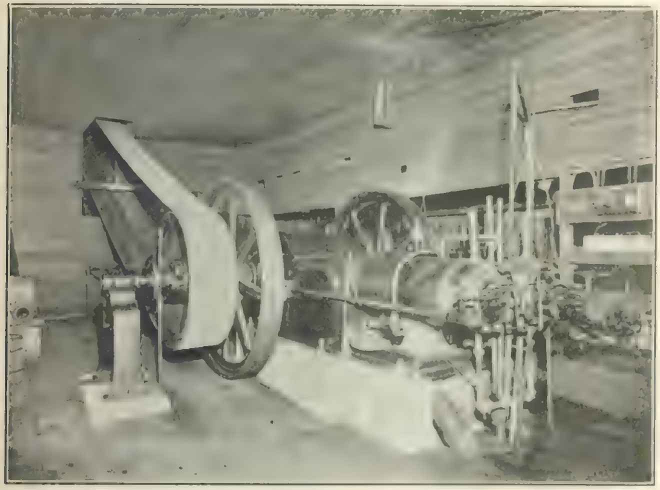
In the Gwynn burner the gas is admitted to the mixing chamber through numerous circumferentially arranged rows of openings, each row having openings of different sizes controlled by a valve, the object being to vary the quantity of gas admitted to the mixing chamber without changing the velocity of the jets. The contents of the mixing chamber are thrown into spiral or rotary motion by the manner in which the gas enters. Should the gas pressure be very low, means are provided for the production of steam or compressed air jets into the mixing chamber, whereby the air and gas may be kept at the proper velocity to insure perfect mixture. The Gwynn burner is made in three sizes, with capacities of 25 h.p., of 8 h.p. and 4 h.p., respectively.

[illegible]

In preparing a boiler plant for gas fuel the entire grate surface is covered with firebrick and clay, sand, or any material that will withstand the heat and keep the grates tight. A 4-in. brick wall is built in the door of the boiler or furnace with a 6-in. square opening for the burner, which should extend through to the inner edge of the wall. In no case should the burner be built in tight; a current of air must pass around the outside to protect the end of the burner from the intense heat. A checker wall of firebrick is built across the firebox at right angles to the burners. In short fireboxes the checker wall is not required, the bridge wall in the rear being sufficient. The checker wall should be built of open work, and when the firebox is more than 4 ft. wide, it should be double at the bottom and taper to the top; in any case it should extend to within 6 in. of the bottom of the boiler. The burners should be distributed across the front of the boiler to give as nearly as possible an even distribution of heat. In no case should the supply pipe be smaller than the size for which the burners are designed. If there are several burners, a large header should be used across the front of the boiler, the area of the header being equal [illegible] connections. A control valve should be used with each burner, so that any combination of burners can be used without interfering with the balance. The air regulator should be closed when the burner is not in use to prevent a rush of cold air to the firebox. Good draft should always be maintained, and if the boiler is working at its rating, or above, the damper should be left open; there are not many cases in which the draft is too strong to burn the gas properly.

The Equitable burner consists of an outer tube forming the main portion of the burner, and tapering slightly from the outer end to the point where the combustion occurs. Around the rear of the outer end of this tube is an annular chamber to which the gas is admitted from the top or bottom, or both. Opening from the gas chamber to the inside of the tube is an annular slot, and within the outer tube is an inner tube ground to fit, and having a series of longitudinal slots of three different lengths; wherever these slots intersect with the annular slot opening into the gas chamber, gas is permitted to flow into the inner tube. As the slots are of varying lengths the amount of gas can be regulated by an adjustment of the inner tube. Inside the tube and in front of the openings for gas is placed a small cone against which the gas impinges, causing it to mix more intimately with the air.

Whatever type of burner is used it should be watched closely, for a slight variation in conditions will necessitate adjustment. The fireman can soon determine with his eye the most satisfactory flame, and by a simple turn of the wrist can save money for his employer. The firebox should be large and the burner so set as to distribute the flame as evenly as possible. All blow-pipe effects against the shell or tubes of the boiler should be avoided. Stack temperatures should be kept as low as possible, and all leaping tongues of flame should be reduced to a clear even incandescence. The inside of the firebox should be whitewashed so as to disclose at once any deposit of soot or smoke, which is a certain indication that the fire is wrong. Patience is necessary for good results, and since no installation operates exactly as any other, experiment is the only means of determining the proper method of obtaining correct combustion. Gas is so easily applied as fuel that there is a tendency to overwork the boilers, which is a reprehensible practice, although with natural gas boilers will stand a third more overload than with coal.



TYPICAL GAS ENGINE INSTALLATION IN [illegible] MILL

[illegible]

The use of natural gas in gas engines in the Joplin district is rapidly becoming more prevalent, an estimate placing the [illegible] power in the mills at 8000 h.p. Notwithstanding the proved efficiency and economy of the gas engine, it has been slow to supplant the steam installations, for several reasons among which are the following:

(1) Ignorance of the possibilities and economies of the gas engine; (2) the possession of fairly efficient steam plants by most power users; (3) doubt as to the reliability of gas engines and prejudice against them arising out of experiences with gasolene engines. The gas engine, however, is rapidly increasing in favor and it is predicted that within a few years there will be a larger number of high-grade gas engines operating in the district than in any other equal area in the world.

Gas engines are divided into two classes, the two-cycle and the four-cycle types; about 90 per cent. of the engines now being built are of the four-cycle type. The essential difference between the two types is that in the two-cycle engine there is an explosion every revolution, while in the case of the four-cycle type an explosion occurs every two revolutions. The two-cycle engine runs more smoothly, but is from 25 to 50 per cent. less economical and is shorter lived. The type commonly used in the Joplin district is of the standard four-cycle type.

The advantage of the gas engine, as compared with the steam installation lies in its low cost of maintenance, the small amount of attention required, its efficiency and economy. With a first-class gas engine the operator is relieved of the numerous troubles incident to the operation of a steam plant, such as frozen or leaky piping, leaky and burned-out boiler tubes, boiler scale, etc. The attention required by a gas engine is usually only about half that given a steam engine, and the smaller sizes are run without an engineer. In one case a 100-h.p. gas engine was run 23½ hours per day and required only two hours of an 18-year-old boy's time to keep it in perfect order. There is a difference of opinion as to the saving in wages made possible by the substitution of gas engines for steam; some maintain that for the same capacity gas engines require more expensive attendance than steam.

In efficiency the advantage lies decidedly in favor of the gas engine. After one hundred years of experiment and investigation, the modern steam plant, as now operated with all fuel-saving devices, high-pressure water-tube boilers, economizers, superheaters, compound condensing engines, etc., requires at least 25,000 B.t.u. to produce one horsepower hour. This result is obtained by burning about 2 lb. of coal and involves a total efficiency of only 10 per cent. Producer-gas plants with internal-combustion engines have been able to increase the efficiency to 16½ per cent., producing one horsepower hour with 15,600 B.t.u., or 1.25 lb. of coal.

With Kansas natural gas a good gas engine will produce one horsepower hour with an expenditure of 10.5 cu.ft. of gas containing 10,000 B.t.u., or an efficiency of 25.5 per cent., which, it will be observed, is more than twice that of very modern steam plants using coal as fuel, and far superior to those of the average Joplin mill. With gas at $0.25 per thousand, the rate at which it is furnished for gas engines, and with a high-grade gas engine producing one horsepower hour with 10.5 cu.ft. of gas, power would cost $0.002625 per horsepower hour, while with the most modern steam power plant using coal at $2 per ton, delivered at the mill, power would cost $0.0035 per horsepower hour. The gas-engine companies guarantee power in the district, all expenses taken into consideration, at $0.003 per horsepower hour.

Short Talks on Mining Law—XI

By A. H. Ricketts*

An easement is a permanent interest in the public domain, as a right of way for the maintenance of ditches or canals, or, in the mining claim of another, as the exercise of the extralateral right, or, in the lands of another, as the right to ditches and canals which vested or accrued in a mining claimant before patent issues to the claimant of other parts of the public lands, or subsequent to the grant and before the issuance of a patent to a land-grant-aided railroad for lands within the limits of its grant. The land to which the right or privilege, as it is sometimes termed, is attached, is called the *dominant tenement* and that upon which it is imposed, the *servient tenement*. The servient owner cannot change his tenement to the prejudice of the holder of the dominant tenement. The easement is coupled with the right to enter and enjoy it at all times, in such manner as to impose as slight a burden upon the servient tenement as practicable. Its improper use or its unauthorized enlargement, or a change in the manner of its use, as from a ditch to a pipe line, may be enjoined. An easement may be acquired by virtue of a statute, grant, reservation or exception, lease, agreement, tacit consent, implication, prescription, as by the digging of a well upon public land for the collection of percolating waters or by adverse use for the period and by the performance of the acts required by the local statute of limitations. It may be assigned, released, abandoned or merged, as by the union of ownership of the two tenements. It is not the subject of patent nor of adverse proceedings in an application therefor.

Drainage and Other Easements

Drainage and other means to the complete development of a mining claim but not for discovery purposes, a right of way for the construction of ditches and canals, are instances of easements in connection with mining claims. Drainage is a term applied to the means by which a mining claim is freed of its superfluous water. A ditch may be necessary for drainage, that is, to carry off superfluous water from a lode or drift-mining claim, or on the other hand, to convey water to an hydraulic or other placer or possibly a lode-mining claim. In either case, it may be a means to a "complete development of the property." It has been held that the construction of a flume to carry away waste from a mine is not development work in the sense of annual or assessment work thereon. Drift mining, in legal nomenclature, is a method of mining the channels of extinct rivers covered in some instances to a depth of several hundred feet by lava or other matter.

The right to a ditch may arise as appurtenant to a mining claim or to a water right as a means for the transportation of water for some other beneficial purpose from the point of diversion to that of intended use. In the former case it may be or may have been initiated under the mining act, and in the latter under a local statute, or possibly both, or by adverse possessions. Congress early (1866) recognized and provided for the confirmation, as well as the establishment of water rights, and also for the payment of damages to any settler on the public domain for the damage or injury incurred by the exercise of such right. The test of the right may be said to be the priority of possession. Any patent issued by the land department must fully express all conditions imposed by the local legislation, if any, for the working of mines involving easements, drainage and other necessary means for the complete development thereof, and contain a provision that it is issued subject to the vested and accrued rights thereto in others, as provided by the mining act. It does not follow that the date of the patent is conclusive of the question of priority. For instance, a mining patent relates back to the location upon which it was based, but not to a location of the ground described in the patent, which may have been previously made and which does not appear as part of the application for patent.

Licenses

A license as it affects real property is a privilege or permit to do a particular act or, probably, a series of acts, upon the estate of another, which otherwise would be unlawful, as the deposit of waste or water upon or the erection of a flume or tramway thereon, or the running of a tunnel therein or having access to the working of one claim through the workings of another, or the taking of mineral from another's mine. No title is conferred by a license unless granted in perpetuity for a specific purpose coupled with an interest necessary for its enjoyment and use, in which event it is practically an easement.

---

*Member of the San Francisco bar, San Francisco, Cal.

A license may be written or verbal, express or implied; it may at will, expire by limitation, or be made perpetual. Generally, it may be revoked at any time, although based upon a consideration, but damages incurred by its withdrawal, even when revocable, may be recovered by the licensee if prejudicial to other rights in him. Sometimes a license to occupy a part or parts of the surface of a mining claim is granted to others for domestic or trade purposes. It then partakes of the nature of a lease and the possession of the licensee is presumed in law to be the possession of the licensor.

Leases

A lease is a written or verbal contract for the possession and use of real property or of a part or parts thereof for a definite time, or at will, for a stated consideration called rent, royalty or tribute, payable at fixed times in money, or in a part of the product or an agreed percentage of the proceeds or profits thereof, generally in gross. If net, the recital of the items which may be charged by the lessee against the gross, as the cost of extraction, reduction, etc., will avoid possible future complications between the parties. The party taking a lease is variously termed a grantee, lessee, tributor, or chlorider, according, in some instances, to whether the rent is paid in money at all events, or payment is dependable on contingencies of productions, and in some cases to geographical position.

Each mining lease has its own peculiar details and may be forefeited for a breach thereof or the forefeiture may be waived or be modified, rescinded, cancelled or abandoned. It is usually most strongly construed against the lessee, because of the nature of the property leased, particularly in the case of petroleum placer mining claims. Time is of the essence of the lease whether so expressly stated or not, as in mining leases the lessee should proceed with the utmost diligence in proceeding thereunder particularly when the rent is payable in kind.

What is called a lease by the parties thereto may not in law have that effect; as, when it is provided that the leasor shall have a certain part of the proceeds of the mineral extracted as a return for the permission for working the property, it is in effect not a lease, but a contract of labor to be performed to be paid for by a share of the profits realized from such labor. The parties to such an instrument become tenants in common (but not mining partners) in the product when extracted.

The "product" is the mineral extracted. Profit is the amount beyond the cost of production, that is, the gain which is made upon the investment when both receipts and payments are taken into [illegible] there is an excess in value, however small. [illegible] the work may ultimately result in loss, or where there is a small net profit upon the capital invested, although the latter may exceed the accumulated net profits for many years. The receipts, after deducting current expenses, are equivalent to net receipts.

The term mine, as used in a town-site act, means a paying mine, or one which there is good reason to believe exists. The term mine, as used in the mining act is synonymous with the term vein or lode, or other valuable mineral deposit, or claim or location.

Options

An option is the granting of choice or election to purchase a certain property within a certain time at an agreed price, payable at a certain time or times. If the consideration is wholly contingent upon the exercise of the choice or right of election it is merely a continuing offer of sale and may be withdrawn by the grantor at any time before acceptance by the grantee or its equivalent. Under the terms of the option, taking possession and making improvements on the property may be equivalent to an acceptance. It is usually provided in an option that if, after partial payment made, default occurs, the amount already paid shall become the property of the grantor as liquidated damages. The option may provide for immediate possession and working of the property with or without the right to reduce or appropriate the mineral taken therefrom and accounting to the grantor therefor. It is then sometimes termed a working bond.

In case the option involves a transfer of real estate, it is usual to execute contemporaneously a deed of conveyance for the same, or, if it involves the delivery of stock, to place such deed or stock properly indorsed in escrow, that is, to put the deed or stock in the hands of a third person, usually a banking house, to hold until compliance with the conditions of the option by the obligee, then delivery is to be made to him, or upon his default, returned to the obligor.

The option, when it affects the transfer of real estate, is usually placed on record. If there is no escrow and the obligee complies with the terms of the option, the option may be construed as a bond for a deed, or a contract for a delivery of the shares. A bond for a deed is a bond binding the seller to convey the property to the buyer in consideration of receiving the agreed price. Although it is a well established rule of law that title to real property does not pass until due delivery of the deed, yet the courts are not in accord whether wrongful delivery by the escrow holder to the obligee passes the [illegible] ter.

An innocent purchaser is one who buys a thing in good faith for a valuable consideration without notice or knowledge of any default or flaw in the title of the seller, or that the value of the property has been inflated, as an inducement to purchase or entering into arrangements to [illegible] nocent purchaser must establish that fact in order to maintain the contention. When a person buys property on the faith of acts or representations fraudulently made and upon which he relies, he may rescind the contract or deed.

It is usually provided in an option that time is of the essence of the contract; but that need not necessarily be expressed, for, as previously stated, time is necessarily of the essence when a thing like [illegible] value according to the effluxion of time. Where it is provided that in default of payment the property shall revert to the obligor, it is not necessary for him to rescind nor offer to return the payments previously made. Fraudulent acts and false representations by the obligor or his agent, which induce the contract, will entitle the obligee to rescind and recover back payments made; for instance, as the salting of the property. Salting consists in the surreptitious placing of valuable mineral in such form and place within the property as the characteristics of the claim may require, or in tampering with the samples taken therefrom or from or in the mill or other reduction works, with the intent to give increased apparent but misleading value to the property and so induce its sale at a price greater than its merits warrant.

It is not a fraud in a purchaser to conceal from the seller the mineral value of the land, or the output of adjoining property, provided there be no wilful misstatement of a material fact, nor any act intended to mislead the seller as to the [illegible] tion of value not fraudulently made and stated to be on information gained from others, will not avoid a contract of sale. [illegible] or repudiate the contract, restore the prop[illegible] within a reasonable time after discovery of the fraud.

Deeds

A mining claim is real estate, and it can be transferred only by operation of law, or an instrument in writing, that is, a deed of conveyance; but one who has discovered mineral may transfer his right [illegible] discovery and after location. The true name of the grantor or the grantee is not material to the validity of the grant, but [illegible] after to be formed. If several persons are named in the deed as grantors, but the deed is not executed by all of them, it is operative as to those who do. A conveyance of additional ground to or a transfer of its ground from a corporation will not pass title, nor will a mortgage or a lease be valid in the absence of the expressed assent of a majority of the holders of its stock, when such assent is required by the local statute.

While nothing passes under a deed without consideration, it is not necessary (unless required by local statute) that the true value or any consideration be named therein. The true consideration may be otherwise shown. The actual consideration may be a pecuniary one, as money, or shares of stock, or it may be for "love and affection."

If a mining claim has a known descriptive name, it may be described by that name in the deed and by proper reference to the record of the location or patent for a more particular description. It is sufficient if the property can be identified, and this may be aided by parol testimony, or by part of the description; as when the wrong legal subdivision of a public survey is given and the remaining description sufficiently identifies the land. The general rule is that when the boundaries of real estate are inconsistent with the measurements, the visible monuments prevail. But in the case of a mining claim, if the monuments show an excess of ground, the claim will be limited to the statutory extent within such boundaries. For example, in a case where a claim is described as running 1500 ft. southerly from the northern stake would end a short distance north of what is claimed as the southerly end line, or, on the other hand, where the distance named is for less than the designated distance as to another mining claim the true boundary will extend to such mining claim.

The words mining ground when used in a deed, have a technical meaning. They refer to that interest which a mere occupant of a mine has in the same. They are not the words used when a fee-simple title or leasehold interest in real estate is to be conveyed.

No precise form of deed is necessary. It is sufficient if it be clear from the language used that the grantor intended to pass the title to the property and whatever is incident or appurtenant thereto. The courts do not agree as to whether a ditch, used in connection with a mining claim, passes as an appurtenance, or should be specifically named in the deed. The deed is usually in the form of a "grant, bargain and sale deed," or "quitclaim deed." The difference between them is that while each passes whatsoever title the grantor had at the time of the sale, the former carries all the title he may afterward acquire to the property, while the latter does not. In neither case can the grantor attack the validity of the location. The courts are not in accord as to whether the failure of the grantee to make the annual expenditure on an unpatented mining claim will permit the grantor to make relocation thereof because of such delinquency.

A conveyance in the ordinary form passes all mineral, but this may be reserved. So the deed may limit the grant to the surface or mineral thereunder, in which case each becomes an independent estate. Whether the instrument conveying the right to the mineral is an irrevocable grant, or a revocable license, is determined by the language used therein. A grant of the right to enter on land for mining purposes only and to prospect and mine the same, if not exclusive in terms, will permit the grantor and his subsequent grantees to prospect and mine in the same land.

If there is no delivery of the deed, it is not valid. Valid delivery is accomplished when the acts and conduct of the grantor manifest present intent to dispose of the title conveyed and acceptance by the grantor, which latter is not necessarily explicit. The recording of the deed is evidence of its delivery, and it is presumed to have been delivered at the date of its execution.

A deed is not entitled to record until acknowledged. The acknowledgment should be that of the grantor, or of a subscribing witness. When recorded the deed serves to give constructive notice of the transfer to all the world.

A deed is valid as between the parties thereto, though not acknowledged nor recorded, and is effective against one who has actual notice of its existence.

A deed may be annulled at the instance of the grantor because of the fraud or deceit of the grantee, as by his falsely denying the existence of mineral in the land, for the purpose of inducing its sale at an inedequate price. But inadequacy of consideration alone is not sufficient ground to set aside a deed. The grantee may cause a deed to be annulled because of the fraud or deceit of the grantor, as salting the property conveyed, or fraudulent representation as to the value of the "ore in sight" (the words "ore in sight" have been held by one of the courts to mean ore-bearing rock so separated and blocked off by being worked around on two or more sides that it is subject to examination and measurement); or the deed may be annulled for failure of consideration, as that the land described in the deed had previously passed to another and the grantee took nothing thereby. No deed will be set aside for fraud unless the fraud is clearly shown.

THE PATENT.

The patent is the deed of the Government issued by the land department upon application made in conformity with the terms of the mining act and the rules and regulations thereunder promulgated and enforced by the department. It is issued for a lode or for continuous lode claims and mill sites, if owned in common, combined or separately, and for a placer or contiguous placer claims, a "known lode" and mill site, if owned in common, combined or separately. Independent patent may be issued for land within the same general area, as for a "known lode" within a patented placer claim, or as for land known to be valuable mineral land within a patented townsite, or a valid mining claim within land subsequently patented under the stone and timber act. No patent is issued for a tunnel claim as such. No prior subsisting lien is impaired by the issuance of a patent for any class of mining claims.

A lode patent conveys the right to the surface, the rights incident to common-law ownership of land and the extralaterial right, whether the latter be expressly named therein or not. A placer patent does not determine that a "known lode" subject to separate patent does not exist within the area described therein. Nor does a lode patent determine the non-existence of rights in a prior tunnel claim.

A patent relates back to the time of the location and cuts off all intervening adverse rights. It concludes, except as between the Government and those claiming under the patent, all question as to the character of the land, the validity of the location and that all the terms of the law have been complied with. The receipt issued by the receiver of the local land office in patent proceedings is substantially equivalent to the patent, at least as far as the rights of the third parties are concerned. But this receipt or certificate may be cancelled or suspended by the land department for fraud in obtaining it, or because the applicant failed to comply with the law or that the land is not of the character assigned to it. The land department loses jurisdiction over the laws when patent actually issues. While a patent is deemed the highest evidence of title and while the presumptions of law are all in its favor and can only be overcome by clear and convincing proof, still it may be attacked because issued without authority of law, as for land which has been reserved or otherwise granted, or because issued during the pendency of an "adverse claim suit," or because of the inadvertence or mistake of the land department in issuing it, or because of the fraud of the applicant in obtaining it.

If the patent is void, as when issued without authority of law, it is subject to direct and collateral attack. If voidable, as because of the wrongful classification of the land described in the patent, it is subject to direct attack only. A suit brought by the United States to annul a patent must be commenced within five years after the date of the patent. A party attacking the patent must show that he is in privity with the Government, that is, one who stands in its shoes must be able to show in his pleading and proof that he had the right to demand title from the United States, as by a valid location existing at the time the patent was issued. In other words, he must distinctly allege and clearly prove that he occupies such a position as gives him the right to control the legal title.

The patentee may be the trustee of one or more persons not named in the patent, as when one of several co-owners obtains the patent in his own name, or procures a patent for a timber or stone claim in fraud of the rights of the owner of a valid subsisting location. In such a case suit may be brought by the injured party to enforce the trust against the fraudulent patentee and compel him to make a conveyance of the title *pro tanto.* Such a suit is not an attack upon the patent but an assertion of a right thereunder. The maintenance of such a suit may be largely controlled by the question of laches of which lapse of time, acquiescence, change in the value, or character of the property, are the principal features. Yet mere lapse of time less than the period of limitations, may not bar the action, as each case depends upon its own particular facts.

Many mining claims, or more strictly speaking, many mines are held under agricultural patents issued by the Federal or State government, and it has been held that where a patent issues for public land under a law which provides for its disposition as agricultural land either to a railroad company or to pre-emption or homestead claimants and there is no reservation in the law except a general one of mineral lands, and no reservation at all in the patent, then the patent must be considered as a conclusive determination by the Government that the land is agricultural. Upon principle the rule applies with equal force to a patent of a State government. It has been expressly held that the State patent is the record of the State that the land was subject to location under the grant of the United States to the State and had been located

---

Tungsten Mining in California

SPECIAL CORRESPONDENCE

In California, tungsten ores are mined chiefly in San Bernardino county. It has recently been reported that extensive tungsten deposits have been uncovered in the Signal mining district, eight miles east of Von Trigger. In the northern part of the county wolframite and hubnerite are found; these resemble closely the ores of Osceola, Nev., and the Dragon mountains, Ariz., which carry 74.10 tungsten trioxide; 18.0, iron protoxide; 4, manganese protoxide; and 3 per cent. silica. Twelve miles north of Goff on the Mojave desert another deposit has been located.

The most important discovery in the State was made near Johannesburg in 1904. In this region the largest mine is the Papoose, of the Atolia Mining Company, of which DeGolia & Atkins, of San Francisco, are managers. It has produced over 500 tons of 70 per cent. ore and concentrates. A busy camp, Atolia, was maintained at the property, and a full crew was kept at work up to the time of the recent financial depression, when the mill was closed down.

The geology of the region near the Papoose mine is comparatively simple. The ledges which carry the mineral strike almost due east and west. They are somewhat distorted and broken, and have an average dip of about 20 deg. to the north. The country rock is grano-diorite, covered with a reddish granular soil, or wash, ranging from 6 inches to several feet in depth. To the west the ledge matter is iron-stained. To the northwest a black schist found in the gold mines of the Stringer district carries small quantities of tungsten ore. Farther to the north is the property of the Yellow Aster Gold Mining and Milling Company; it is said that tungsten ore occurs here. Two miles directly north is a peculiar rock occurrence, called Red mountain, composed of a hard, blue porphyry and coated on the exposed surfaces with an oxide of iron.

CONCENTRATOR AT [illegible]

MINING AND [illegible]

The main shaft of the Papoose has been sunk 250 ft. following the dip of the ledge; drifts have been driven at 50-ft. intervals. For safety and ventilation secondary shafts connect the drifts with the surface. Breast stoping is adapted to the mode of occurrence of the ore. From the stopes the ore and waste are received in separate [illegible]. When ore is plenty, the [illegible] waste bins are utilized in caring for the surplus ore. In the event of an excess of waste all available chutes are made use [illegible]

[illegible] great advantage in saving the expense of extensive timbering. Excepting the linings for the shafts, and that used to build the underground bins, little timbering is required. In the stopes few heavy timbers are required. It may be of interest to note that a shaft driven 1100 ft. in a neighboring gold mine does not show the least indication of the approach of water-bearing strata.

The ore, which is emptied into bins at surface, is fed into a Blake crusher, from which it falls to the supply bin. Next, by means of an automatic feeder, it is introduced into a Huntington mill, where it is crushed to 20-mesh. This material is fed to five vanners. The concentrates are loaded upon trucks and run to the drying house, where they are spread on the hot, steel floor, heated from underneath by wood fires. The moisture having been sufficiently reduced, the product is packed in heavy twilled sacks lined with duck, each sack, when full, weighing 116½ lb. The high-grade ore is sacked in 110-lb. sacks after having been sorted out of the lower grade material and cobbed. It has been found here that a higher grade concentrate can be obtained by fine grinding; the limit of efficiency is accordingly governed by the time required in attaining the purer product. Connected with the mill is a sampling plant, with wagon scales, 7x8 Dodge crusher, Chymunk grinder, and disk-pulverizer. This was added to the original plant in order to handle the custom ore offered from time to time.

Operation of Carmaux Coal Mines in France

A System of Mining Thick Seams in Slices and the Use of Hydraulic and Hand Filling to Prevent Surface Subsidence in Longwall Work

BY LUCIUS W. MAYER*

FIG. 1. A PORTION OF SAINTE MARIE NO. 1 PIT

FIG. 2. LA GRILLATIE WAS ONE OF THE FIRST PLANTS BUILT

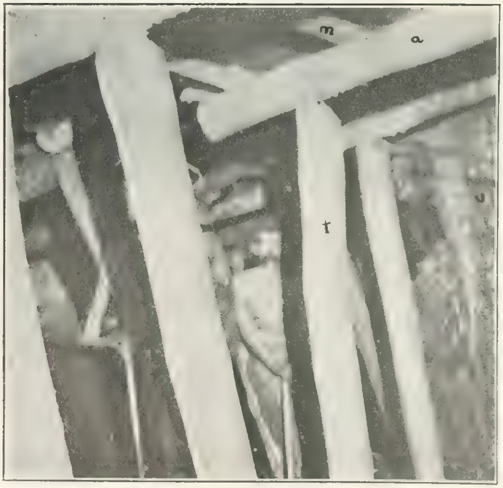


FIG. 3. THE TIMBERING IS NOT ALWAYS PLACED WITH THE GREATEST REGULARITY

FIG. 4. THE UNLOADING DEVICE IS A MECHANICALLY-OPERATED CYLINDRICAL DUMPER

The town of Carmaux is situated in the department of Le Tarn, southern France. There are about 10,000 inhabitants, who speak a patois not generally understood by the northern Frenchman. There are also a large number of Spaniards throughout this district.

Coal was first mined at Carmaux in 1247. In 1747 privileges were granted to the Marquise de Solages, whose descendants are still in possession of the mines. It was not until 1865, however, that the present company was formed, which is called Compagnie des Mines de Carmaux. In 1906, 1,110,907 tons of coal were produced by the three mines comprising the group. The product involved a gross value for the year of $2,413,146, or $2.17 per ton. The cost of producing was $1,882,576, or $1.69 per ton, and the profit $530,570, or 48c. per ton.

GEOLOGY OF THE FIELD

Fig. 5 is a geological section of a portion of the concession. There are six distinct coal seams. To the north and east, the coal rests on mica schists and gneisses which limit the coal area. At this point, the seams approach the surface. Schists and sandstones figure largely throughout the entire field, and their bedding with the coal makes elaborate washing operations necessary. The formation is of Permian and Upper Eocene age.

In certain parts, the schistose cover over the seam is of an inconsistent nature, and when exposed to the direct action of the air, on removal of the coal from under, has a propensity to swell, causing roof falls and consequent danger. In France, it appears that the precautions taken for the protection of life are greater than anywhere else, and the result is seen in the record made by the French mines in showing a low percentage of fatalities.

---

*Mining engineer, Room 617, 71 Broadway, New York City.

Above the coal-bearing formation is a cover of plastic clay and sand, of Tertiary age. This material, which averages about 50 m. in thickness, is excavated with bucket dredges and conducted to the mine openings to completely fill the space left by the coal. The seams are variable in thickness, and while the coal band itself generally attains no greater thickness than 3.80 m., it is generally found necessary to mine the intervening bands of schist and sandstone simultaneously with the coal.

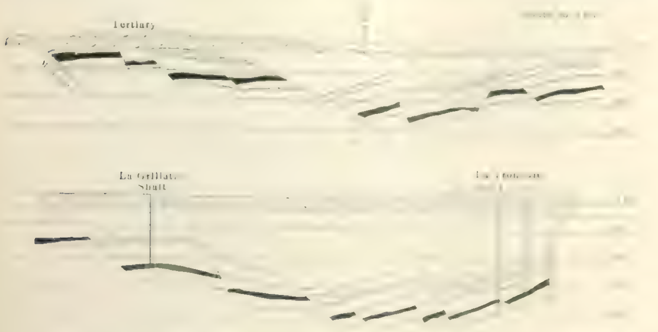


FIG. 3. GEOLOGICAL SECTION OF [illegible]

On the Carmaux company's concession there are three main shaft sites, each one having several pits. There are 3250 workmen employed at the mines, 2000 of this number being employed underground.

A peculiar condition exists in this camp, in that the miners are subject to a severe illness, known as "ankylostomiasis," produced by a worm, which, finding its way into the system, permeates the intestines. For a long time it was unknown what produced the illness, until a royal commission finally learned its cause, and now the men take an antidote regularly to counteract the action of the worm.

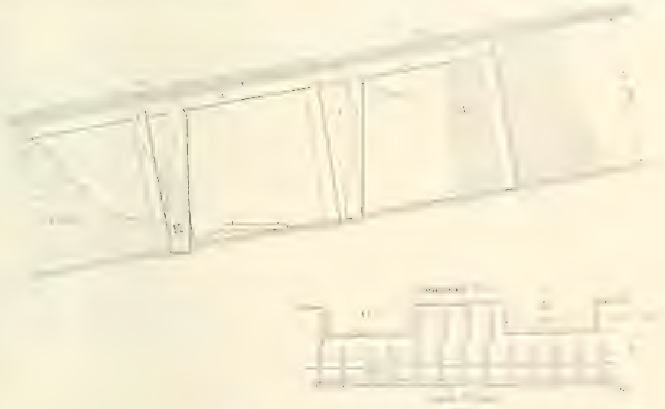
Fig. 1 shows a portion of Sainte Marie No. 1 pit; Fig. 2, La Grillatié, was one of the first plants built. The odd construction of the shaft house is noted in Fig. 2; the headframe itself is formed of tubular iron.

Dimensions of the Shafts

The two shafts at La Grillatié are 3.50 m., and 2.70 m., respectively, in diameter. There are two levels, one at 168 m. and one at 209 m. One of these shafts is elliptical in form. Two shafts at La Tronquié are 3.50 m. in diameter, while the principal pit of Sainte Marie is 4.10 m., and the second main pit 3.60 m. in diameter.

The Guides and Other Shaft Equipment

At Ste. Marie, the filling leaves the cage at 150 m., and the coal is hoisted from the 206-m. level. A number of unique arrangements are installed about these shafts. Timber guides are placed [illegible] the cage at its ends rather than at the sides. A better arrangement of space is aimed at, no room being occupied between the cages for guides. At the shaft mouth, there are no guides for a length of about 2½ ft., in order to allow the cars to pass off the cage. However, the shoes on the cage are always engaged about the guides, at some point, either above or below this 2½-ft. space. Where there is an intervening level in the shaft, and this arrange- [illegible] the cage is used, in order to have a con- [illegible]



[illegible]

guide is hung on a gate, which must be closed firmly when hoisting is going on in the shaft past this level.

Hoisting ropes are flat, and of hemp. They are generally bulky, often weighing [illegible] and 45 mm. thick. The reason for using hemp rope is not clear to me. I am told that during the first year's life of one of [illegible] cut off each month, due to stretching.

Strong safety dogs are used on the cages, but no rope-disengaging device. [illegible] ing the dogs in, and thus preventing their engagement with the guides. On descending [illegible] are again placed in position.

Ventilation and Lighting

At La Tronquié a multi-cellular centrifugal pump is working under a single lift of 400 m. At both La Grillatié and La Tronquié [illegible] are used. At Sainte Marie, a Geueste-Herscher 2-m. fan is used, which is of the exhaust type, making 170 r.p.m., using 90 h.p., and exhausting 37 cu.m. per second, with a depression not exceeding 34 mm. Alternating triphase motors operate these fans.

For lighting purposes in the mine, an [illegible] what is known as Colza oil. This lamp is shaped like a canteen, suspended from a U-shaped bracket, to which is linked a small pick. This pick, having a sharp point, is readily engaged in a timber, and the lamp thus suspended.

A mine car prevalently seen in the camp is one formed with angle-iron skeleton [illegible] which are set in this frame.

On the incline, the method of fastening [illegible] hooks, one fastened to the bottom of the car, and another short length of chain, [illegible] car. It has been found that by this arrangement, the best balance and control is obtained.

The Cylindrical Dumper

[illegible] is a mechanically-operated cylindrical dumper. This is shown in Fig. 4. [illegible] tion, a lever encircles the rim of the cyl- [illegible] there is a small solid wheel set in the lever bar. There is also a recess notched in the cylinder rim. In Fig. 4 the cylinder has revolved, and the recess has presented itself to the solid wheel. The moment that this small wheel *b* enters the recess, the cylinder ceases to turn, for the lever *a*, which controls the mechanism below, causes a disengagement of the motive medium.

When the lever, *a*, Fig. 4, is raised, the wheel, *b*, is withdrawn from the recess, and contact is formed between the cylinder and the revolving mechanism below; the cylinder again is caused to turn, the small solid wheel now riding on the rim of the cylindrical frame, *d*, Fig. 4.

Power is furnished by an electric motor, contact between the revolving mechanism and the cylinder continuing just as long as the wheel rides on the rim, during which time the lever is raised. When the recess again approaches the wheel, the latter enters the same, a complete revolution having been made.

The system of shaft signaling at these mines is an electrical arrangement similar to that used on shipboard, whereby a reply is received by means of pointers on a circular dial about 10 in. in diameter. The station tender revolving the signal lever to the order which he wishes to convey, is answered by the hoistman, who goes through a similar operation, causing a second pointer to revolve on the dial from which the original signal was given, thus informing the station tender that all is ready. The station tender now gives the final hoist signal. The Siemens-Schuckert Company, Berlin (formerly Siemens-Halske), are the largest manufacturers of such devices.

SAFETY ARRANGEMENTS

A recent invention which has been installed at various large collieries, on recommendation of the government, particularly in Germany, is the Siemens-Ilgner system of safety gears for hoisting engines. By this arrangement, the movement of the throttle is controlled by the position of the indicator, and the driver is compelled to adhere to the rate of movement of the cage, which has been prescribed for it. The behavior of the cage as it approaches the landing, and all during its flight, is in this way controlled by means of a cam of certain profile, such that the distance through which the driver can move his lever is limited. At the same time the driver is always able to draw back his lever to reduce speed.

A central power plant produces electricity for all the pits of the Carmaux company. Four engines produce 420 h.p. each. The motors are of the Siemens-Halske type; these are tri-phase 50 cycles. The voltage is transformed to 5000 from 240. This plant was completed in 1901.

A modern coke-producing plant is operated in conjunction with the mine. The central washery, built of steel, is located at the same point. The Humboldt system is in operation. Passing through this building, the method of evenly distributing the coal in the bins from above is interesting. There is a spiral-shaped launder, made of metal and about 18 in. wide, standing from the top of the bin to the bottom. The coal slides down this launder, and after coming in contact with the coal below, goes off at a tangent from the spiral conductor and is distributed in the bin.

The coke plant consists of 134 furnaces of the Coppee type; each gives over four tons of coke, after 48 hours treatment. The furnaces are in groups of eight, and produce two classes of material. One, from 0 to 12 mm. in size, is made into briquets, and 0 to 6 mm. material is used for ordinary coke. After proper coking, the entire block of burned material is shoved off the horizontal shelf in the furnace on which the coke rests. This is accomplished by a long arm with plate attachment at its end, which butts up against the block of coke and shoves it out of the furnace in its entirety.

METHOD OF MINING

The method of mining at Carmaux is extraordinary, and meets the requirements of the district admirably. Maintenance of the surface is well accomplished, as well as a high extraction of coal from the area, and safe working. A modified system of longwall is used in all the seams, and the area mined is filled with sand brought from the surface. The mining system might be termed "retreating longwall in panels with complete stowage."

It has been observed in Fig. 5 that the ground is much faulted, which fact figures in the method of mining adopted. The first step in attacking a seam is to follow in the direction of the dip, turning off roads at intervals of approximately 100 m. These roads are continued until the plane of the fault is encountered, when the blocks of coal are laid out and the ground worked on a retreat upgrade. The filling is brought in to replace the coal mined out.

It is endeavored to arrange communication with a shaft so as to allow sufficient fall for the cars of coal to go out by

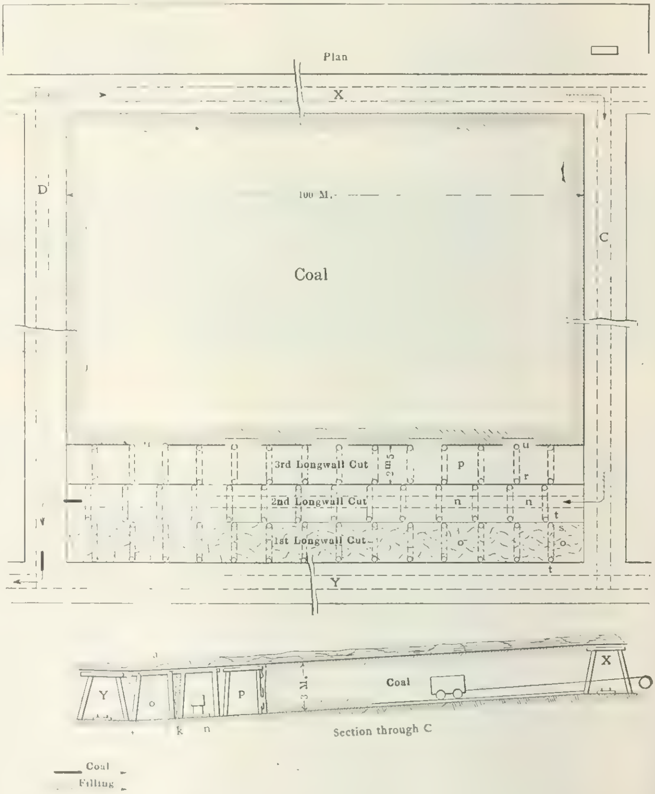


FIG. 7. GENERAL SYSTEM OF MINING A 2½ TO 4 M. SEAM

gravity, and the filling to come in from the quarry in a similar manner, from another elevation. Cars of coal coming from the mine are unloaded, and proceed immediately to the point where bucket dredges are mining the filling material; they then return to the mine down the inclines and are emptied at the face. This process is not necessarily continuous. The filling may be brought into the mine at such hours as to suit the work of coal cutting. With a few exceptions, cars in the entire process are moved by gravity force. At La Grillatié, more than a mile is traversed by a car from the time it leaves the face with coal and returns with filling. Here the coal is raised through a shaft and the cars re-enter the mine with the filling through a tunnel.

In Fig. 1, cars are shown returning to the quarry, stopping on the way to be unloaded of the coal. The method of breaking down the filling material, is to use an electrically operated dredge. According to the topography, the dredge either works as shown in the accompanying illustration, or, in another location, may work against a bank. The dredge buckets are operated by a 30-h.p. motor, the lateral movement of the dredge itself being controlled by a 10-h.p. machine. One hundred and twenty cars of ½ cu.m. capacity are filled per hour. The arm carrying the buckets is manipulated by a 7-h.p. motor.

The longwall system is operated on all the seams, in either one, two, or three slices, according to the thickness of the bed. The method of filling is either to bring the sand from the quarry dry, dumping and filling the roads at the face by hand, or else, by a system recently introduced, of flushing the sand in with water, building barriers behind the face to hold the sand intact, and allowing the water to drain off. The introduction of the filling is quite the same as previously described. I took occasion to examine a seam 4.5m. in thickness, and worked in one horizontal slice, with hydraulic filling behind the face. This is the thickest bed [illegible] tempt at the longwall system is made. It is, of course, questionable whether longwall could be operated with such a thickness without complete filling.

The mining of a 6-m. seam was also investigated, where the coal was being taken in two slices, and dry filling replacement introduced. It may be argued also that longwall would not be practical in these seams were it not for the dip of the floor, which makes this method of filling practicable.

The natural grade allows cheap haulage; the water readily drains away, and close packing of the sand is naturally accomplished. A dip of 30 deg. was met at points, but it was not uncommon to see places where the inclination approached close to horizontal.

The system of mining is generally free of dangerous features, although frequent slips of horses in the roof, due to vertical partings, are the cause of occasional accidents.

[illegible] Fig. 7, that gallery *Y* is at the lower elevation of the coal seam, a fault having cut the formation at this point. Gallery *X* is at an elevation about 50 ft. above *Y*. Incline *C* has been run to connect *X* and *Y*. Starting at the bottom of the coal, the first cut *o* is made 9 ft. wide, extending ap- [illegible] way *D* is started up the rise to block out the area. The cut *c* is not advanced in one straight sweep, but the face is at- [illegible] stantly advanced left and right.

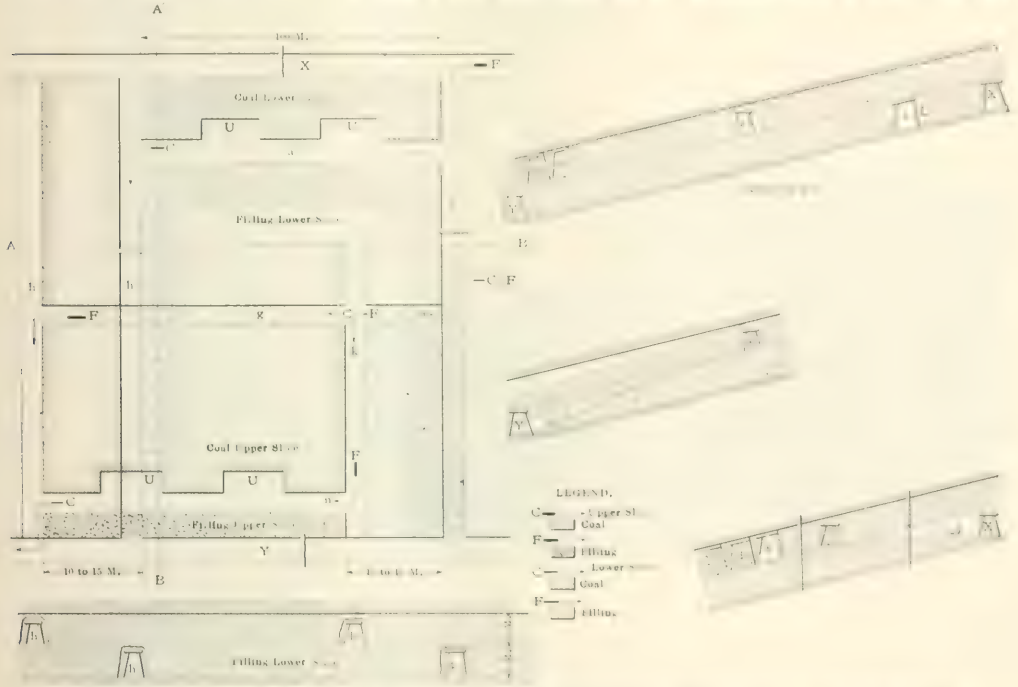


FIG. 8. GENERAL SCHEME OF MINING BY [illegible] SLICES SHOWING METHOD OF HANDLING [illegible] FILLING

[illegible]

In the ordinary longwall, the regular sets of timber are not generally employed; caps are not often used, but simply posts with a top plate, and not always placed with the greatest regularity. Here, however, the form of set shown in Fig. 3, is used, and there is little necessity for the introduction of auxiliary props. When [illegible] posts s, Fig. 6, are set perpendicular to the line of dip. Cap *a* (all figures similarly lettered) is held up temporarily for the post *t*. Prop *t* is cut longer than the vertical distance which it is supposed to occupy. It is cut by machine to the shape shown in Fig. 3 and is set by means of a lever, as shown at *z*, Fig. 6. Post *t* is not set parallel to post *s*, but with the purpose of counteracting the downward thrust of the roof. As the force acts, the post tends to the vertical, as shown in the dotted lines, and being of excessive length, a tight set-up is effected.

The track on which the cars run is continuous, back of the face. The latter is constantly advancing, until there is sufficient space ahead for another complete set of timbers, but in the interim, the posts may be set up irregularly for safety, until the distance has been made, and a complete set of timber set up in the regular form. If the face has advanced at one point in a cut-in *u*, timbers are set up to the face at this point.

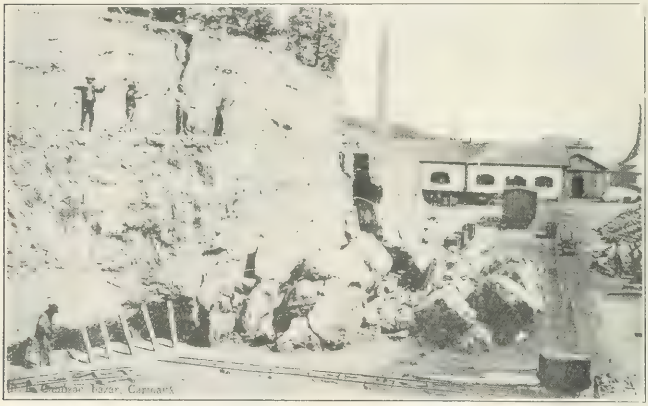


FIG. 1. OLD METHOD OF BREAKING DOWN FILLING MATERIAL

Note that the caps *a* not alone overlap the post *t*, but often overlap *s* of the post behind, as shown in Fig. 3. Post *s* is set up against the coal face as soon as the distance is made.

The distance between sets along the face varies, according to roof conditions. At certain points, the roof is particularly treacherous, and the coal brittle. In conjunction with this feature is the hight of roof, which makes it more difficult to test, so that extreme caution has to be exercised. At some places, the posts are not more than 4 ft. apart, and the lagging under the roof hardly more than 2 ft. At such points, the posts *s* were setting closely against the face, lagging was carefully placed between these posts, and the only part of the face which was unprotected, is where the miner was drawing down coal with his pick. The lagging used at the face is reused, but no other timbers are withdrawn.

Let us consider in Fig. 7, that the first longwall cut *o* has been completed. Cribs are set at intervals, and stone walls are built, as shown at *k*, in Fig. 6, behind the last row of timbers. This would be the fourth set of timbers behind the face in each case. This operation of building the wall is a regular feature, and part of the system. The purpose of same is to hold the filling intact and away from the track, which track is placed behind the third row of posts.

In Fig. 7 note that the filling will always come down gangway *C*, and after being dumped behind the face, the coal will go out to the shaft in these same cars, going down gangway *D*, along the gallery *Y*, and eventually to the level of the main roadway, communicating with the shaft. When the grades are too steep for hand control of the cars, friction devices are introduced at the head of the inclines. At one point I noticed a brake-car which was set in front of the loads to resist their movement. The mechanism was operated by a man who sat on the truck. The brake-car consisted simply of an ordinary truck, equipped with a strong brake device. This truck, on delivering its loads, was drawn to the top of the grade by horse haulage. In order to arrest the movement of the cars at certain points, specially made dagger-shaped metal sprags with cross-piece were used.

Referring again to Fig. 7, the condition existing is: Longwall cuts No. 1, *o*, and No. 2, *n*, have been completed; No. 3, *p*, is being worked. A sufficient distance has been made in *p* to allow the introduction of sets of timber. The filling is coming in regularly, and the slice *o* is practically filled. The wall *k* runs the complete length of the block. Conditions, as shown, will repeat themselves all the way up one block; one slice will be in the course of being filled, while in the second there will be a track, and in the third the work will be advancing.

Where a seam is too thick to be mined in one division, coal is taken in a number of horizontal slices. A 4½- to 6-m. seam would be mined in 2 lifts, of 2¼ to 3m. each, and a 6- to 10-m. seam, in 3 lifts. The interval of working the lifts is usually a year; that is, the mining of an upper slice follows about a year after the coal in the slice below has been worked out. Slices in any one block may be mined simultaneously.

MINING A 20 FT. SEAM

Following is a method of mining a 6-m. seam in two slices of 3m. each. It is remembered that the lower slice is not necessarily all mined out in any one block, but the upper coal is resting on the filling, which has replaced the coal removed in the lower slice. Note that in mining by this system, a number of slices are taken, and the cars must eventually gain a certain elevation before getting to the shaft. The gangways leading up to the shaft always remain at the same elevation, but the coal seam itself is attacked at the various elevations of the slices. It is at this point that the complications set in, especially where a number of slices are being operated in the same block. The method of connecting one slice with another, and eventually making the elevation which leads to the shaft, is by means of inclines. The arrangements involve more or less elaborate timbering, and an intelligent arrangement of the work, which will look to economic arrangement and non-delay of operations.

There is a certain amount of settlement which takes place when a slice has been filled, so that all the slices are not removed from their original position. This settlement aids in making connections between the slices. It also plays a very important part in the breaking up of the coal, and renders extraction easier, due to the natural parting of cleavages in the coal.

After about a year with dry filling, a complete settlement is obtained, after which an upper slice is started directly above. It may be that a lower slice is completely removed and filled before an upper one will be begun. Referring to Fig. 8, and noting the characteristics which mark the coal and the filling in each slice, it will be noticed that slice No. 1 has been mined to within a short distance of the upper gallery *X*. The letters *F* and *C*, behind the arrows, refer to filling and coal, respectively.

WORKING THE UPPER SLICE

Starting the upper slice, roads *k'* and *h'* are run 10 m. to 15 m. from the plane of the corresponding parallel roads, *k* and *h* in the lower slice. Road *k'* is run first, and when reaching a point about midway up the block [illegible] cross-road g is cut across the block. The method of working the upper coal is quite the same as work in the lower coal; in fact, the working of coal in multiple slices is exactly the same for each slice as if there were to be but one single horizontal cut; the feature lies entirely in making connections, for haulage between the elevations of the various slices, and the main road to the shaft.

It has been noted that the entire output from all the slices, whether two or three, must eventually be hauled out of a main gallery, as *Y*. Similarly, the filling has to find its way from the main gallery *X* (which in turn connects with the upper level) to the elevation of the upper slices. Various adjacent blocks of coal may be under fire at the same time, and wherever possible, communication is effected between slices of one block and the slices of another block. This effects economy in the transfer of the filling and the coal.

In Fig. 8 gangway *k* has been filled up to a certain point, and it can be seen that the filling is coming from an upper slice of an adjacent block, going down gangway *g* from *m* and continuing to the incline *k'*, and then to the longwall cut *n'* to fill *o'*. Coal is loaded in this road *n'*, in the cars which just brought in the filling, and depart for the gallery *Y* by means of an incline connecting *h'* and *Y*. This arrangement is shown, in exaggerated form by the small section to the right and center of the illustration; the coal here has settled from 30 to 50 per cent., and the filling has all been placed dry.

There is really no occasion for *g* to be run across the entire block, because the filling for *n* goes down the incline *k'*. Similarly *h'* need not be run up any further than is necessary to effect communication between *n'* and gallery *Y*. However, it is assumed that an adjacent block is being worked, or is to be worked shortly.

WORKING THREE SLICES

In working three slices the system is quite the same, except that slice No. 1 will have been completed before slice No. 2 of any block has been started.

The method of mining here described has been in practice for a long while. With the dry filling, a considerable amount of subsidence on the surface has been felt, in spite of the depth to which mining has been carried on. Recently a system of bringing in the sand with water has been adopted, after exhaustive experiments, both in foreign fields and at the local plant. An experimental plant was first built, and the amount of water required to properly flush the material, also the mechanical arrangements were tested. The system of water flushing is not in general use yet at all the mines, but wherever it has been used, the results have been extremely encouraging from every standpoint. [illegible] age in volume of the material filled hydraulically, is far less than where the filling has been effected in a dry manner, which naturally means considerably much [illegible] face subsidence is not entirely avoided [illegible] hardly noticeable, while with hand filling a distinct depression has always occurred. This work in France has been patterned, to a great extent, after the schemes carried on in the Silesian district, but here it is noted the filling is in conjunction with longwall, and not pillar work.

Gold and Silver Production in California

[illegible]

The following statement shows the production, by counties, of gold and silver in California in 1907, as reported from the mines to the United States Geological Survey. This has been prepared and is presented in advance of the annual report on California forming a portion of the gold and silver section of "Mineral Resources of the United States, 1907," now in course of publication by the Geological Survey.

PRODUCTION OF GOLD AND SILVER IN CALIFORNIA [illegible]

[illegible]	Gold.		Silver
	Fine. [illegible]	Value	Fine Ounces.
[illegible]	[illegible]	[illegible]	20,477
[illegible]	134,813	2,786,840	[illegible]
[illegible]	[illegible]	[illegible]	82,154
[illegible]	[illegible]	731	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	15,440	319,177	3,486
[illegible]	116	[illegible]	39
[illegible]	1,940	[illegible]	[illegible]
[illegible]	2,769	57,241	67,333
[illegible]	[illegible]	878,798	130,353
[illegible] and [illegible]	[illegible]	[illegible]	16,767
[illegible]	644	13,303	767
[illegible]	19,616	405,498	6,288
[illegible]	[illegible]	822	[illegible]
[illegible]	[illegible]	1,076	[illegible]
[illegible]	[illegible]	383,971	15,147
Nevada	104,591	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	5,088
[illegible]	[illegible]	[illegible]	1,436
[illegible]	[illegible]	3,836	40
[illegible]	[illegible]	790,973	3,082
[illegible]	[illegible]	158,676	[illegible]
[illegible]	[illegible]	7,455	53
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	38,133	791,997	560,926
Sierra	[illegible]	[illegible]	3,971
[illegible]	19,254	398,017	1,602
[illegible]	163	3,364	12
[illegible]	[illegible]	535,316	3,635
[illegible]	39,033	[illegible]	9,778
[illegible]	[illegible]	1,766,770	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

A comparison with the statement for [illegible] is as follows:

	1906	1907	[illegible]
Gold, [illegible]	[illegible]	[illegible] D.	[illegible]
[illegible]	$18,732,452	16,727,978 D.	$2,004,474
[illegible] fine [illegible]	1,220,641	1,138,858 D.	81,783

The decrease in gold production in 1907 [illegible] value in New York, the total amount of the precious metal production in 1907 was [illegible] from the previous year.

Base Metals in the Transvaal

[illegible]

[illegible] have bought their experience dearly and [illegible]

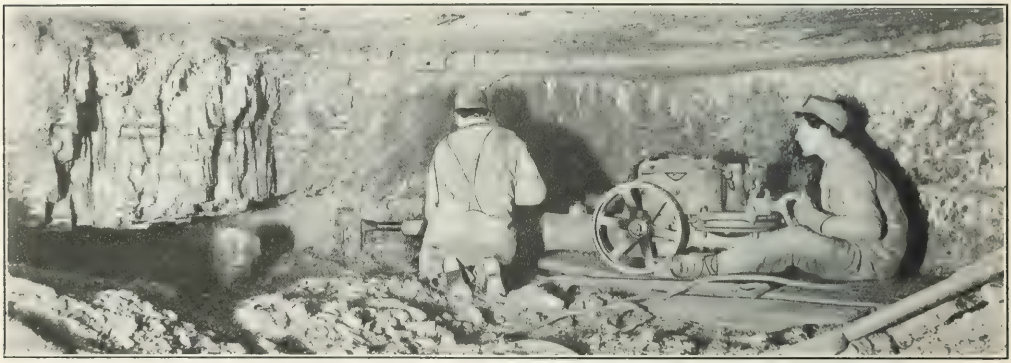
[illegible] £26,949; making £107,112 in all.

[illegible] in the northern Transvaal, which [illegible] grade ore. The most prominent tinfield [illegible] west of Warmbaths; and seeing that the Zaaiplaats State tin mine has resulted in failure with a loss of £4000 to the government, it is particularly gratifying to [illegible] that satisfactory values continue to follow exploitation in various parts of the former region. Of the character of the lodes, whose presence is frequently marked by the workings of ancient miners, little was known till the other [illegible] the outcome of his lengthy investigations. [illegible] peculiarly noteworthy. There are, it is stated, fissures of small width, mere cracks with no vein filling except some clay; there are similar fissures with some irregular pockets of vein minerals attached; there are other fissures, two or three close together, including between them impregnated country rock; there are lodes with well defined walls, showing brecciated structure and inclosing vughs [illegible] which show both walls well defined over long distances. Gangue minerals are [illegible] iron and calcium, and orthoclase. With the cassiterite are found smaller quanti-

The Pneumelectric Coal Puncher

Special Correspondence

As its name suggests, the Pneumelectric coal puncher, manufactured by the Pneumelectric Machine Company, Syracuse, N. Y., utilizes both electricity and compressed air in its operation; it is an electrically operated percussive tool. In its design is presented the culmination of ideas, which, from their conception, have differed radically from those formerly followed. The idea has been to combine within a single machine an electric motor for driving and the means for both compressing and utilizing the air. It was fundamentaly recognized that the design of a tool of this kind must be such that the destructive effect of the vibratory motion of the working parts will not be transmitted to the electrical parts, and that at the same time the force of the blow must not be sacrificed in order that this may be attained.



PNEUMELECTRIC COAL PUNCHER IN OPERATION IN MINES OF THE BERWIND WHITE COAL COMPANY, WINDBER, PENN

The machine as perfected by the Pneumelectric Machine Company, seems to embody all of the desirable features which have long been sought in a percussive tool electrically operated. By combining the well established methods of applying electricity with those of applying compressed air, the desired results have been brought about.

Flexible shafts, connecting hose, and the use of machinery entirely separate from that which does the work, have been eliminated. So also has magnetic force, which it is impossible to utilize in a manner sufficiently powerful to do the work, unless the weight of the machine becomes excessive. In the Pneumelectric machine, the motive and working parts are self-contained, the blow being as powerful as that of the well known pneumatic tools, while its destructive effect is reduced to such a degree that the repairs are less than are required by any of the machines of the electric or pneumatic type now on the market.

Essential Features of the Machine

The essential features of the Pneumelectric machine may be thus briefly summarized: It is a self-contained machine combining electricity and compressed air. The blow is produced by air, expanding under pressure. The air utilized in striking the blow is compressed at each stroke of the piston. The piston compressing the air is operated by an electric motor; the latter is an inherent part of the machine. The separate piston on which the air acts, in order to produce the blow, moves in its forward motion independently of the compressing piston. Air cushions prevent shock to the machine. No hose or flexible shafts are required. Electric power is supplied directly to the machine through a cable. Is operated on the circuits commonly found in mines and industrial plants. Has exceptionally large capacity for work and small cost for repairs. Is giving satisfactory results in the hands of the ordinary labor commonly found about mines.

The extent to which the Pneumelectric machine has been introduced has fully demonstrated its usefulnes under all conditions of mining. In hard or soft coal, thick or thin veins, bad or good roof, rolling or level bottom and narrow or wide work, it has made excellent records. Its performance under these variable conditions has been such that it can justly be classed as a machine which is entitled to consideration as one of the most important factors in a coal-mining equipment.

All of the structural details of the machine are combined into one compact, self-contained machine, which is so constructed that it closely resembles the compressed-air punchers, which have been on the market for many years. The dimensions and weight are practically the same in both machines.

The motor, which is of the ordinary series-wound type, possesses no unusual features tending to make it complicated, or requiring special generators for furnishing current; but, being designed along standard lines with particular reference to this machine, it presents features which insure the greatest simplicity and highest efficiency. The gearing by surprisingly simple means transforms the circular motion of the motor shaft into a straight-line motion for the operation of the piston rod. The space occupied is reduced to a minimum. The only unusual feature about the cylinder is that it contains two pistons instead of one. These pistons have no mechanical connection whatsoever.

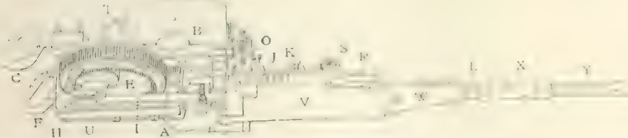
Operation of the Machine

The pinion *B* on the end of the armature shaft *A* engages with the main driving gear *C*. Through the medium of the internal gear *F*, the crank pinion *E* and the crosshead *H*, the rotating movement of the armature is changed into the reciprocating motion of the piston rod *I* and piston *J*. The latter, or rear piston, which is driven by the motor, compresses air on its backward stroke, the front piston *K*, with which it has no mechanical connection, follows simultaneously because of the vacuum produced by the recession of the piston *J*. Air is coincidentally admitted to the front side of piston *K* through the port *R*. On the rear side of piston *J*, the next to the motor, the air is compressed and just at the end of the stroke is admitted through large by-passages to the space between the two pistons. As a result, the front piston is forced forward exactly as in any compressed-air coal-cutter, but with the absence of valves. During this stroke, air is drawn into the cylinder behind the piston *J* through the main inlet valve *O*. On its forward stroke the air in front of the driven piston *K* escapes through the port *R*, but after the piston has passed and, therefore, closed the port, a sufficient amount of air remains to cushion the blow and prevent damage to the front cylinder head.

This cushion air may leak somewhat, and to prevent an insufficient supply remaining, which would have the effect of producing a partial vacuum in this space and holding the front piston on the return stroke, a small inlet valve *R* is placed in the forward part of the cylinder to allow air to flow in under these conditions and before the open port is passed.

After the front piston *K* has made its forward stroke the rear piston *J* follows, mechanically driven as before, and would compress the air which has just made the stroke of the front piston and remains between the two pistons, but for the so-called vacuum valve *S*, which allows all air between the pistons above a certain pressure to escape to the atmosphere. The placing and action of this prevents the two piston faces coming together.

The piston diameter is 6¼ in., and it has been found that a final pressure of 95 to 100 lb. in the compressing end of the cylinder is right for operation, and the clearances have been proportioned for this pressure. The motor runs at three speeds under the control of the miner, giving, respectively 180, 160 and 140 strokes per minute to the reciprocating pick. It will be noticed that the speed of travel of the motor-driven piston varies from the maximum at the middle point of the stroke, to a minimum at the ends, a fact which equalizes the motor load. The weight of the entire machine is only 800 lb. The maximum power required for the operation of the Pneumelectric machine never exceeds 7½ horsepower.



THE PNEUMELECTRIC COAL [illegible]

The Power Necessary

As power is consumed only when the air is being compressed during the backward stroke of the motor-driven piston and during the control of the machine, that required of the electric motor is constant, regardless of the character of the material in which the machine is working. Thus the maximum amount of power to be provided for the operation of a given number of machines can be accurately determined, and when installed, leaves no danger of overloading on account of requiring more power than was calculated would be necesary to cut the coal. It is, therefore, unnecessary when estimating on power requirements in connection with the Pneumelectric machine, to provide an excess for overcoming any possible deficiencies in estimates.

Inasmuch as the power for striking the blow is generated at each stroke of the machine and utilized in the cylinder in which it is developed, the operator can handle the machine to the greatest possible advantage, having perfect control over it at all times, with the assurance that each blow will have the desired effect.

[illegible] Blows in [illegible]

The compressed air, in passing from the rear to the front of the compressing piston, flows through large, short ports. The tool-carrying piston instantaneously receives the full force of the body of compressed air and is driven forward at a high rate of speed which causes the pick to strike the coal with a powerful blow. The action of the air between the two pistons is such that a powerful pushing effect is introduced, which is maintained throughout the forward movement of the compressing piston. This action is beneficial in preserving the slow, powerful, penetrating qualities of the machine when working in soft coal and maintaining a powerful force behind the tool piston when working in hard coal.

With no moving parts in the blow-producing section of the machine, except the pistons, the adaptability of this apparatus to the severe requirements can be readily appreciated. Nothing to regulate, no moving parts to wear out, no complicated valve movement and the most simple construction, permit of the machine being placed in the hands of the labor commonly found about mines with the assurance of continuous and inexpensive operation.

Ashes for Pillars in Coal Mines

In some anthracite mines of northeastern Pennsylvania ashes are being used as a flushing material, with which to fill the workings, so that safe robbing of the pillars may be carried on.

A mine just outside of Scranton, Penn., is near a big boiler plant which consumes three hundred tons of coal daily. Naturally, a large supply of ashes is created in the fire-boxes beneath the boilers. It is estimated that about fifty tons of ashes a day are sent down into the mine. Water pumped from a near-by mine is used for the flushing. Running through a wooden trough, the water reaches a tunnel that passes beneath the ash-pits. This tunnel slopes on a grade of ⅜ in. to the foot. At intervals, the ashes are shaken into it from above.

[illegible] flow of water carries the ashes to a bore hole leading down into the mine. Pipes at the bottom lead to the worked-out places which are to be filled. The ashes are carried through these pipes and are piled into the abandoned "breast," or gangway, while the water seeps and drains away. When the new ash-pillars are large enough to be safe supports, the coal is taken out.

Flushing is a costly process. The piping is worn out rapidly by the sulphur which is always present in mine water and, therefore, has to be replaced frequently. The benefits of the system are more for the future than for the present. Owing to the rapid exhaustion of the richer and more easily mined veins, it is necessary to use all means, no matter how expensive, to make the remaining coal available.

Underground Boring to Prove a Lower Coal Seam

At the Crown Pit of the Prestonhicks colliery in Scotland, the "great" seam of coal is worked beneath the Firth of Forth at a depth varying from 360 to nearly 600 ft. This seam is the topmost bed in the local coal series. It was recently found necessary to prove the under-seams so it was decided to put down a diamond-drill hole underground at a point 600 ft. below low-water mark. A position in the traveling-way, just opposite a narrow gangway connecting the traveling and haulageways, was chosen for the bore.

The road at this point was about 8 ft. wide and 10 ft. high; it was widened to 11 ft. for about 9 ft. in length; advantage was taken of the narrow gangway to the extent of 5 ft. in length. This made the place 16 ft. wide at the bore. The roof was raised 3 ft., and the pavement lowered 2 ft., the total hight being 15 ft. just above the bore.

The "Wilson" type of diamond-drill plant was used for the work, and consisted of a 4-h.p. petrol engine, vertical boring carriage, ball-bearing boring bar and a double-acting Tangye pump, fitted with water-hose connections. The rods were lifted with a hand windlass. The engine could be run at uniform speed, which was an important advantage as the nature of the coal to be cut could not be determined previous to sinking the bore. The boring was done at the rate of 150 [illegible] was consumed up to 300 ft. in depth, and from that quantity to 1 gal. per day at a depth of from 300 to 600 ft. The boring bar used was 7½ ft. long. When the strata permitted, 6 ft. of cutting was done before it was necessary to disconnect the bar to add another rod. The bore hole [illegible]

One anthracite mine raises twenty-eight times as much water as coal from the ground.

The Decision on the Hepburn Law

The United States Circuit Court in Philadelphia on Sept. 10 filed its decision in the suits brought against six anthracite-carrying roads—the Delaware & Hudson, the Delaware, Lackawanna & Western, the Lehigh Valley, the Central of New Jersey, the Erie and the Pennsylvania—for violation of the so-called commodities clause in the Interstate Commerce law, commonly known as the Hepburn act. That clause provided that from May 1, 1908, it is unlawful for any railroad company to transport from any State, Territory or the District of Columbia to any other State, Territory or the District of Columbia, or to any foreign country any article or commodity—other than timber and the manufactured products thereof—manufactured, mined or produced by it, or under its authority, or which it may own in whole or in part, or in which it may have any interest, direct or indirect, except such articles or commodities as may be necessary and intended for its use in the conduct of its business as a common carrier.

The companies contested the suit mainly on the ground that the law is unconstitutional, and the cases were heard together. A similar suit brought against the Reading company was tried separately, because the defense was based on somewhat different grounds.

Opinions were filed by Judge Gray and Judge Dallas, both concurring. Judge Buffington dissented, but filed no opinion. The decision of the court is that the commodities clause is unconstitutional and void, for the reasons set forth in the opinion, and, therefore, cannot be enforced. The Government will take an appeal to the United States Supreme Court, but until a decision is reached there, the Circuit Court opinion will stand.

The decision, written by Judge Gray, is long, and goes over the questions submitted with great care. Its leading points are covered in the following paragraphs, which are quoted from the record:

"The fundamental and underlying question which presents itself at the threshold of all the cases is whether the so-called 'commodities clause,' so far as its scope applies by the universality of its language to the cases here presented, is in excess of the legitimate authority granted to Congress by the constitution.

"This question must be considered with reference to the constitution as a whole, and in relation to the concrete facts of the several cases."

"It appears," the opinion continues, "that enormous sums have been expended by the railroads to enable them to mine, prepare and transport coal.

"This situation is not a new one, created since the passage of the act in question, but has existed for a long period of years prior thereto, and the rights and property interests acquired in conformity to the constitution and laws of Pennsylvania, and their rights had never been questioned by the courts or people of the commonwealth, but recognized and protected."

"Congress, of course, is vested," continues the opinion, "only with such legislative powers as are specifically enumerated in the constitution, together with such as are necessary and proper to carry the same into execution, and it is admitted that, if constitutional sanction exists for the passage of the law in question, it must be found in that clause of the constitution which declares that Congress shall have power to regulate commerce.

"Counsel for defendants contend that the commodity clause was not a valid exercise of that power. Fully realizing the responsibility that is imposed upon the court, we turn to this question.

"We think it may be safely said that no assertion of this power hitherto by Congress has been so far-reaching or affected in so serious a degree individual liberty and property rights enjoyed under the constitution and laws of a State.

"It is not to be denied that the right to carry coal in interstate commerce was, until the passage of the act in question, a lawful right of these defendants; that it was a common right of property, neither denied nor disputed by the common or statute law of Pennsylvania; that it was a most important property right, the enjoyment and exercise of which was neither criminal nor immoral, and subject only to any restraints imposed upon its possessors by the common or statute law of the State or by the then existing statutes of the United States, so far as they were engaged in interstate commerce.

"That this legislation is drastic and harsh does not, of course, dispose of the question of power on the part of Congress to enact it. The first inquiry to be made, therefore, is as to whether this legislation is a regulation of commerce within the true meaning of the commerce clause of the constitution. * * * *

"In the opinion of this court, the enactment in question is not a regulation of commerce, within the proper meaning of those words, as used in the commerce clause of the constitution. It seems perfectly plain that Congress cannot deprive any person of liberty or property without due process of law.

"Counsel for the Government, however, contend that any enactment of Congress which purports to regulate commerce and which actually does control, restrain or prohibit, is such an exercise of power as is subject to no limitation whatever. In other words, if it be in its form a regulation of commerce, no right of personal liberty or property can stand in the way of its enforcement. * * * *

"The constitution of the United States was intended for the common understanding of the people. Life, liberty and property are ranked together under the protection of the fifth amendment, and by the exigencies of its command a person can no more be deprived of his property than he can be deprived of his life and liberty without due process of law.

"The facts set forth in the several answers of these defendants show that no right of this property is so valuable as the right to transport it over their own roads. The coal is so situated as not to be capable of transportation without enormous loss by other roads. The exigencies of the act will compel the defendants to cease mining and transporting, while still retaining ownership, to the incalculable injury of great populations, or they will be compelled to divest themselves of title by a compulsory sale. * *

"It is to be observed that the act is in a certain sense retroactive. It affects property lawfully acquired long prior to the date of its enactment.

"From every point of view from which we have been able to approach the question, the unreasonableness and consequent invalidity of the commodity clause is apparent.

"It invades the rights of the State by striking down the liberty hitherto innocently enjoyed by its citizens, and deprives these defendants of their property contrary to the letter and spirit of the fifth amendment of the constitution.

"If the enactment in question be warranted by the commerce clause of the constitution it is hard to see what bounds may be set to the exercise of that power. It will indeed be an open door, through which the forces of a centralization hitherto unknown may enter at will, to the overthrow of that just balance between Federal and State power for which the makers of the constitution so wisely provided as an essential to the preservation of our dual form of Government.

"We confine ourselves to the concrete facts presented by the pleadings in these cases, and intimate no opinion either way as to cases where property has been acquired by the carriers subsequent to the passage of the act. For the reasons stated, therefore, these bills in equity are dismissed and the petitions for writs of mandamus on the law side of this court are denied."

The tin production of New South Wales for 1907 was valued at £293,305. This increase in production over that of 1906 is due to the increasing output from dredges. Tingha is the main producing center; 28 dredges are operating in that district.

Two of the stamp batteries at the mill of the Luipaards Vlei Estate are equipped with five stamp cam-shafts. These are employed in order to use up cam-shafts broken on the 10-stamp units.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl Street, New York

London Office: 6 Bouverie Street, London E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for August, 1908, was 50,000 *copies.*

September 5	12,000
September 12	9,500
September 19	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Conservation of Resources 583
The Decision in the Anthracite Coal Road Cases 584
Cost of Producing Copper 584
Official Reports of Costs of Producing Copper [illegible]
Flood-Gold [illegible]
*Some Metallurgical Processes at Pachuca, Mex. *Claude T. Rice* [illegible]
Relative Corrosion of Steel and Wrought Iron Tubing *Henry M. Howe and Bradley Stoughton* [illegible]
Purifying Rock Salts by Fusion [illegible]
Costs and Profits on the Witwatersrand [illegible]
Alloys of Gold and Tellurium [illegible]
*The Use of Natural Gas in the Joplin District *Doss Brittain* [illegible]
Short Talks on Mining Law—XI *A. H. Ricketts* [illegible]
Tungsten Mining in California *Special Correspondence* [illegible]
Operation of Carmaux Coal Mines, France [illegible]
Gold and Silver Production in California [illegible]
Base Metals in the Transvaal *Special Correspondence* [illegible]
*The Pneumelectric Coal Puncher *Special Correspondence* [illegible]
Ashes for Pillars in Coal Mines [illegible]
Underground Boring to Prove a Lower Coal Seam [illegible]
The Decision on the Hepburn Law [illegible]
Correspondence:
How to Sell a Mine [illegible]
The Cost of Silver-lead Smelting [illegible]
The Temagami Cobalt Mines, Ltd. [illegible]
Personals, Obituaries, Societies and Technical Schools [illegible]
Special Correspondence [illegible]
Mining News [illegible]
Markets, etc. [illegible]
*Illustrated

The Conservation of Resources

[illegible] that all of the inquiries will be answered.

Referring to the question of minerals, which interests us most, it is possible to [illegible] try's resources in coal, lignite and iron ore, but the determination of the reserves of oil, gas, and other ores is beyond the ability of all of the mining engineers and all of the mining geologists together. The dowser, or the electrical mineral indicator, who can really find ore, has not yet appeared, [illegible] ground.

The nature and extent of waste in the mining and use of mineral products, and methods of preventing or lessening the waste are good subjects for inquiry; also the more complete utilization of by-products and increased efficiency in the use of all products. But the answer to these questions is simple, viz., encourage the reading of the technical journals.

We venture to correct an academic misapprehension. Americans are commonly considered to be wasteful; this probably is the idea in Washington. We think that Americans are wasteful in some respects, but in others are paragons of economy. As consumers, we are prodigal of our wealth and scandalously wasteful; as producers, our utilitarian ideas lead us to be egregiously economical. Who does not know the captain of industry who is a skinflint in his factories, and a spendthrift in his home or his club?

[illegible] Practically we prefer to accept the unphrased definition of the operator in the field rather than the words carefully formulated by the professor in his cabinet or laboratory, because the operator has learned to appreciate many things that the professor generally fails to consider. There is much apparent waste which in reality is not waste at all. For example, remark is frequently made of the immense quantity of sulphur which is thrown away in the treatment of sulphide ores; but it is not considered that the only use for such sulphur would be the manufacture [illegible] where there is no market for sulphuric acid, nor probably will be for a time more distant than we can clearly see ahead. If the ores were reserved for an indefinite time, interest charges would overwhelm them.

In all considerations of waste, the position of capital must be held prominently in mind. Resources can be reserved if capitalization be postponed until they are within the safe margin of profitable activity, their aspect until that time being as having no relation to commerce, just as if they were undiscovered treasures of nature. Otherwise, they would be saddled with colossal accumulations of interest, to avoid which wasteful exploitation would be compelled.

This is directly in line with many of our apparent wastes. For example, regenerative furnaces have never found so wide application in the United States as in Europe. The reason is that coal is dear in Europe and comparatively cheap in the United States; in the United States the saving of fuel, immense though it be, has not been sufficient to pay the interest and fixed charges upon the greater capital required for the plant. As coal increases in value, this condition will change. Engineers have long been conversant with the increased economy of gas engines, but for a long time they did not come into extensive use because the charges on greater cost of plant offset the apparent advantage in direct operation; as the cost of plant has been reduced, gas engines have come more extensively into use.

So it is through our whole line of in- [illegible] deplore that the United States possessed no chemical manufacture worth mentioning, save the rudimentary. So recently as that the time was not ripe for its development. But since then we have seen the growth of an immense chemical industry, utilizing by-product after by-product. This is something that our in- [illegible] artificial stimulus to increase the economy [illegible] out to him that there is a chance for effecting economy in that art.

Producers and manufacturers, with the aid of engineers and their other expert assistants, are aiming all the time to realize the most possible money from their resources. The improvements of specialists in the respective arts are sooner or later communicated to the technical periodicals and the transactions of the engineering societies, whereby the knowledge is disseminated through the whole industry. Consequently, as we said above, the simple answer to these inquiries of the National Conservation Commission is the encouragement of the reading of technical periodicals. The self-interest of the producer is in the direction of economy; if his immediate interest be different from that of posterity, capitalization must be prevented.

On the other hand, as consumers Americans are shockingly wasteful. This must be recognized immediately by every investigator, and herein it appears to us is the great field for the National Conservation Commission. We disgrace ourselves by our needless sacrifice of life and limb. We waste enormously in building by uneconomical methods. We suffer annually a gigantic loss through the destruction of property by fire. We burn our coal wastefully both in factory and in household. Our people are extravagant in their food and their clothing, not in using good things, but because they deliberately throw away a large part of what they buy. If Americans were as economical as the French, the wealth that this country would attain would surpass all belief. It is economy in living that has made the French people the bankers for the world.

The Decision in the Anthracite Coal Road Cases

The decision announced by the United States Circuit Court in Philadelphia last week, in the suits brought against several anthracite-carrying railroads, is of importance to many carriers of coal besides those immediately concerned in the case. The suits were brought to recover penalties for violation of the so-called "commodities clause" of the Hepburn amendments to the Interstate Commerce law. This clause provided that no railroad engaged in interstate commerce should carry any commodity—except lumber—which it owned, or in the production or sale of which it was interested; exception being made only of materials required for the operation of the road. The legislation was drastic in its nature, providing heavy penalties for violation of its terms. While the act was general in its terms, it was evidently aimed at the ownership or control of coal mines by railroad companies, which had grown to be common in many parts of the country. In some cases this control had grown out of a desire to secure and protect the traffic of a railroad and prevent losses by competition; in others the railroads had been built to serve the coal mines and the ownership of both was common.

The commodities clause took effect May 1 last. In anticipation of that date a number of railroad companies took steps to divest themselves of the ownership of coal mines. Thus, for instance, the Baltimore & Ohio sold the stock which it held in the Consolidation Coal Company; the Rochester & Pittsburg transferred its stock holdings in a subsidiary coal and iron company; and several railroad companies in Indiana and Illinois took similar action. The anthracite carriers, however, decided to contest the law, partly because they believed they had a strong case, but more because the ownership of mines and railroads was so involved that it would be impossible to separate them without an entire reorganization of the companies.

Immediately after the date when the law took effect, the Federal authorities took steps to enforce it, the cases of the anthracite roads being selected because they were the most conspicuous offenders. Suits were brought against seven companies, and six of these cases were tried together, that against the Reading having a separate hearing, because the defense was based on different grounds from the others. The six companies, in their answers, rested generally on the claims that the act exceeded the powers vested in Congress for the regulation of commerce between the States; that the act was discriminatory in its nature, as it excepted certain commodities; and that their right to mine and carry coal was protected by special charters. There were minor claims made in the pleadings, but those named were the important points. No contest was made on the facts, which were readily admitted by the defendant companies. It was entirely a law trial, and was argued before a full bench—Judges Gray, Dallas and Buffington—two at least having a wide reputation as jurists of long experience and high standing.

The decision rendered—a summary of which is given on another page—is wholly in favor of the companies, and disposes of the commodities clause entirely, unless the Supreme Court should reverse it later The court, in its opinion, bases its decision entirely on the constitutionality of the law, the other points made by the defense being hardly considered. It holds that the legislation exceeded the powers of Congress under the Constitution, and that it sought, or would lead to, the practical confiscation of important property rights, without that "due compensation," which is required. It holds, therefore, that no penalties can be imposed, and the defendant companies are free to continue their traffic as before.

Cost of Producing Copper

The article by Mr. Townsend, published elsewhere in this issue, is in line with the series of articles by Mr. Finlay, which we have been publishing, and articles by other contributors on the cost of production. On this important subject we have presented during the current year information and data, unique in technical literature, that will be of importance in considering the financial aspect of mining and smelting enterprises.

Mr. Townsend has recognized the basic principle that the report of a stock company for a single year is inconclusive, and indeed may be misleading, but in assembling the reports of the same company for a series of years the truth is likely to appear. There is always a great temptation to managers to deceive themselves respecting the item of construction, which may be charged to capital account, but as Mr. Townsend lucidly points out, such charges are constantly recurring, and it is safest to charge construction to regular operating expense.

Mr. Townsend's article is an important contribution to an important subject, and may be profitably studied. Such an investigation and presentation of data involve an immense amount of work, far more than appears from a casual inspection of the finished product. The tabulation of such figures is not a thing that can be lightly intrusted to clerical assistance, but must be done by the author himself, or under his very close supervision. The figures given in Mr. Townsend's article have been carefully checked, and we believe they are correct.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

How To Sell a Mine

Mr. Rogers presents in the JOURNAL of Sept. 12 an interesting article in criticism of an editorial in a previous issue of the JOURNAL, but it does not seem to me that there was really anything to criticize. Obviously, the editorial was pointing out nothing but the bare outlines of the method to be followed. It goes without saying that the person who desires to sell such a property ought to be able to furnish a lucid and intelligent statement of the essential facts respecting it. We all know, as Mr. Rogers says, that one of the reasons why it is so difficult to interest capitalists in a mining venture is the inability of the vendor or promoter to make an accurate statement of the facts that are open to common observation. Many reports by *soi disant* mining engineers are no better. I have a recollection that this subject was fully discussed in an able editorial in the JOURNAL of a few years ago.

Mr. Rogers has given us a valuable article, containing a lot of new ideas, and I am sure that many readers of the JOURNAL welcome contributions from his pen upon this and allied subjects. However, the editorial in the JOURNAL of Aug. 29 was directly to the point. I hope that this will stimulate other readers of the paper to contribute their views and experiences.

WILLIAM T. MURRAY.

New York, Sept. 8, 1908.

[The editorial on mine reports, to which our correspondent refers, appeared in the JOURNAL of Aug. 18, 1906.—EDITOR.]

The Cost of Silver-lead Smelting

The article by Mr. Ingalls on the cost of silver-lead smelting, in the JOURNAL of Aug. 15, will be read by mining men with much interest. As a study of the American Smelting and Refining Company, a concern more often abused than praised, the article is a commendable attempt at treating a live subject from an impartial and conservative standpoint. From the point of view of an ore producer, however, the title of the article itself and the headline crediting the company with a profit of $2 per ton of ore smelted, both seem open to criticism as stopping short of the mark, as being too moderate in view of the information, or rather lack of information, in the company's reports.

SMELTING COSTS

The costs of smelting, as Mr. Ingalls approximates them, range from $0.00 to $1.37 per ton higher than the average costs indicated by census returns[1] covering operations in this country for the calendar year 1904.

According to the census, there were 32 establishments in the United States actively engaged in the smelting of lead ores, of which 19 were engaged in treating silver-bearing products. Seven of the 19 smelters did both smelting and refining, and are classed as refiners, making 12 establishments engaged in the smelting only of silver-lead ores. The bulk of the smelting of silver-lead ores centered in Colorado, Utah, Washington, Texas, and Montana, in the order named.

Unfortunately, the census data on lead smelting have been made intricate by being lumped together, Missouri being the only State whose returns are shown separately. But inasmuch as only nonargentiferous ores, commonly called "soft lead" ores, are smelted in Missouri, the returns from this State give a set of averages which may be applied to the ore tonnage of soft-lead smelteries elsewhere as a basis for estimating costs, and we are finally able to tabulate two sets of statistics, one set relating to the smelting and refining of silver-lead ores, the other set relating to the smelting of soft-lead ores. The figures for silver-lead ores appear here as Table A.

TABLE A.—COST OF SMELTING AND REFINING SILVER-LEAD ORES AND PRODUCTS IN THE UNITED STATES, 1904. TOTAL 19 ESTABLISHMENTS. TONS OF ORE 2,271,724.

	Total Expenses.	Cost per Ton of Ore.
Salaried officials, clerks, etc.	[illegible]	[illegible]
Wages	[illegible]	[illegible]
Rent of works	[illegible]	[illegible]
Taxes	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Contract work	[illegible]	[illegible]
Materials for smelting:		
Ores (2,271,724 tons)	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Fuel	2,762,265	1.216
[illegible]	27,366	0.012
[illegible]	28,363	0.012
All other materials	[illegible]	[illegible]
Materials for refining and [illegible]:		
[illegible]	31,722,604	[illegible]
Domestic base bullion [illegible]	49,883,791	[illegible]
Foreign base bullion (97,179 tons)	17,677,246	[illegible]
Fuel	[illegible]	[illegible]
[illegible]	36,011	[illegible]
All other materials	1,798,603	[illegible]
Freight	163,969	[illegible]
Total expenditure [illegible]	[illegible]	[illegible]

[illegible] ment costs is afforded by the same census bulletin, in a table in which the data pertaining to lead smelting and refining are rearranged so as to give two sets of figures, one set relating to plants where smelting only is carried on, the other set relating to plants doing refining as well as smelting. By using the set of figures relating to smelting, and then deducting all items relating to the soft-lead branch of the industry, as we have previously arrived at them, we obtain an estimate of the number of tons of ore treated and the working costs of the 12 establishments engaged in the smelting only of silver-lead ores. This estimate appears here as Table B.

TABLE B.—COST OF SMELTING SILVER-LEAD ORES IN THE UNITED STATES, 1904. NUMBER OF ESTABLISHMENTS, 12. TONS OF ORE, 2,122,462.

	Total Expenses.	Cost per Ton of Ore.
Salaried officials, clerks, etc.	[illegible]	[illegible]
Wages	[illegible]	[illegible]
[illegible] offices, interest, insurance, etc.	[illegible]	[illegible]
Materials for smelting:		
Ore, 2,122,462 tons	45,499,745	21.388
All other materials	3,823,389	1.801
Total expenditure (excluding ore bought)	$8,297,376	$3.909

The average cost of smelting obtained in Table B leads to the suspicion that the average for refining and smelting, shown in Table A, is too high, and that the items in Table A, entitled "All other materials," call for further explanation before being finally placed among the working costs. As likely as not, these doubtful items include products bought for treatment, but not classed as "ore," doré bars," or "base bullion." In any event, we find that the costs in Table A are increased by the cost of refining some 97,179 tons of foreign base bullion, one item to be eliminated before weighing these averages very closely.

[illegible] a side-light on the American Smelting and Refining Company, we must bear in mind that the operations of that company are not limited to the United States, but extend into Mexico, also that the company smelts some ore on a copper base. We are in the dark as to the tonnage smelted in Mexico, but the bullion output credited by statisticians to that country does not indicate a sufficient ore tonnage in comparison with that of the United States to vitiate the foregoing averages.

[illegible]

Mr. Ingalls' conclusions are summed up

---

[1] Department of Commerce and Labor, Bureau of the Census, [illegible] Copper, Lead and Zinc [illegible] Refining.

in such a way that the reader is apt to get an idea that the profits of the American Smelting and Refining Company have been derived from side issues more than from the profits on ore smelted, and that the business would not be profitable to any concern not prepared to conduct operations on the same extensive scale.

According to the census, the 32 establishments occupying the field of lead smelting during 1904, were distributed as follows: California, 1; Colorado, 7; Idaho, 1; Illinois, 3; Iowa, 1; Kansas, 1; Missouri, 8; Montana, 1; Nebraska, 1; New Jersey, 2; Pennsylvania, 1; Texas, 1; Utah, 1, Washington, 2; Wisconsin, 1; total, 32. The 32 establishments are credited with a combined capital of $63,822,810, as follows: Land, $2,958,080; buildings, $18,628,976; machinery, tools and implements, $20,941,814; cash and sundries, $21,293,940; total, $63,822,810.

The average ore producer in the West is obliged to dispose of his ore to a custom smelter. So long as the American Smelting and Refining Company had a monopoly of the custom-smelting business it could buy ore on its own terms, from which there was no appeal. Many producers are hostile to the company because they believe it has exacted extortionate profits. If they could be convinced that the company's profit is only $2 per ton of ore, they would feel better. It is only the occasional mine that pays its way, and the owner of a paying mine is so often interested in other mining properties that have not yet been brought to the point of profit that he is inclined to look upon mining as an "up-hill game" at best. On the other hand, he does not see the ore buyers taking many risks. He sees the profits of the Smelting company growing larger year by year, immense dividends paid, new plants built, old plants enlarged or remodeled, a large surplus created—all coming indirectly if not directly out of the profits on ore smelted—and he is unable to divide the probable tonnage handled by the company into its total net earnings without being convinced that the margin of profit per ton of ore is more than ample.

According to the estimate of Mr. Ingalls, the smelteries and refineries owned by the American Smelting and Refining Company must be worth in the neighborhood of $15,000,000. Adding this sum to the items shown on the company's balance sheets as "Investments," "Metal stocks," "Material and supplies," "Cash and cash items," the ore producer computes the live assets to be less than half the sum for which the company is capitalized; his computation is verified, in a way, by figures such as those of the census; his memory goes back to the company's beginnings and he wonders what invisible assets swell the company's capital on its books and enable it to pay such large dividends on its preferred and common stock.

Complaints of Ore Producers

The ore producer who sells ore to a smelting company has become accustomed to getting pay for less quantities of metals than are indicated by assay, deductions having been made for what he believes to be metallurgical losses. He has also become accustomed to being allowed lower prices for metals than those ruling in the wholesale markets of the country, deductions having been made for what he believes to cover freight or bullion, refining costs, selling commissions, etc. The deductions so made by ore buyers have always been more than ample, but no two ore buyers use exactly the same schedule, neither does any concern adopt the same schedule in dealing with all patrons. It is plain that smelting costs, metallurgical losses, freight on bullion, refining costs, interest, depreciation, profit, etc., must all be borne by the ore in some way; but by the subterfuge of deductions, a little on one metal here, a little there, and a little somewhere else, the ore buyer is able to bring the treatment charge which attracts most attention from the producer to a low point. Among complaining ore producers, the most bitter are those who market gold ores, one reason being that with no valuable metals in the ore, besides gold, there is little chance for round-about figuring, and the treatment charge stands out prominently in comparison with the treatment charges applied to ores containing other metals where a portion of the smelter's margin comes through the little deductions already mentioned.

Competition

For a long time, ore producers were in the dark as to ordinary metallurgical losses and as to the ordinary costs incident to handling the smeltery output until this is finally delivered to consumers in the form of refined metal. Mr. Ingalls has done much to throw light on these subjects. A study of these features, in connection with a study of the cost of smelting different kinds of ore, is leading a few ore producers into erecting smelting plants of their own. By buying outside ores to smelt with their own, they are becoming active competitors of the American Smelting and Refining Company. The latter company, on the other hand, is getting into the control of mines.

With a number of concerns in the country, each handling silver-lead products through the different stages from mine to consumer, the rivalry is bound to be interesting and must be of permanent benefit to the mining industry throughout the West. In any event, the smelting business hinges so closely on the development and operation of metal mines that no concern can hope to monopolize the field permanently.

George W. Riter.

Salt Lake City, Utah, Aug. 28, 1908.

[We are unable to find in Census Bulletin No. 86 the figures which Mr. Riter gives, his figures being evidently modified from its table No. 33. This table is such a jumble of the business of smelters and refiners, treating argentiferous and non-argentiferous ores, that we confess our inability to unravel it or make any extensive deductions from it. Anyway we should not think seriously of undertaking to deduce costs from a census report. Cost is an elastic term, and a precise use of it requires a definition as to whether (1) a partial cost, or (2) the whole, or real, cost is meant. Many managers deceive themselves in regard to the real cost. Mr. Ingalls was distinctly discussing the real cost of smelting, refining, etc.

The construction of new smelting works does not necessarily imply a re-investment of profits, but rather may represent a direct part of the cost of production, the depreciation of older plants being taken care of in this way. Indeed, a concern which expects to continue in its business must thus keep up its property and earning capacity. The American Smelting and Refining Company during the nine years of its existence has abandoned its Germania works, Grant works, Philadelphia works, Kansas City works, and perhaps others that we do not think of now. This does not include the many plants that were dismantled immediately upon the organization of the company. A new plant has had to be built at Murray, Utah, and the works at El Paso, Texas, and Leadville, Colo., have had to be practically rebuilt.

The worth of a business is not represented by the physical value of its plants, inventories, cash, and other tangible items. Business experience, good-will, or whatever it may be called, commands a large price. It seems to be inevitable that a new company entering a business must experience delays, disappointments and losses. At great expense an organization is perfected, the business is learned and profits begin. The ability to earn profits is properly capitalized.—Editor]

The Temagami-Cobalt Mines, Ltd.

Not long ago we referred casually in an editorial to the operations by amateurs in mining. An apt illustration of their methods has recently come to our attention in the form of a letter by Julian Hawthorne, the well known novelist, son of a more distinguished father. This letter was addressed to a member of our staff, whose name and address evidently had been secured from the catalog of his Alma Mater. Mr. Hawthorne's letter is as follows:

New York, August 21, 1908.

My dear Mr. X...:—

It is a serious thing—this that I am doing now.

After following a profession for nearly forty years—reaching the point where he really has command of his instrument and can make it produce what he will—

and when he is getting more than ever before for what he produces—then it is a serious thing for a man to turn from that work and undertake something totally different.

And the inducement must be strong that makes him quit the work that he knows like an old shoe, and take a job which is unfamiliar.

But that is what I am doing.

I have dropped literature, and taken up the development—and the exploitation—of a mine.

It had to be a good mine to turn me from my past life's work to this work. And that it is good—none better—is the conviction of myself and my associates, mature, hard-headed men of the world, who know that, in business, a mistake is a crime.

It is a conviction based, not on guesswork or enthusiasm, or even on personal knowledge derived from a year's investigation and development of the property; for men naturally think well of what has been paid for with their money, and holds their expectation of fortune;—but our conviction and confidence have a yet sounder basis. We hired professional experts, whose reports confirmed our highest anticipation; and then, on top of that, experts, employed by our rivals in business, who had heard of Temagami, came back with such tales as induced our rivals to come to us and offer to buy us out on very tempting terms.

We could have sold Temagami again and again to these customers, and made a fair fortune out of the deal. But we turned down these offers because we mean to keep Temagami for ourselves; to dig our fortunes out of it, and live on our dividends; and the only reason we now come to you is, that we have spent in the purchase of additional property all the money we can at present afford, and a small sum is needed to get to work promptly turning out our ore.

That is the sum of my message to you, but I will add a word or two.

When we decided to offer this stock to the public, question arose as to how it might best be done. There was the usual way of doing such things; and there was another way. The usual way was, to hand it over to a broker, and let him exploit it in the broker's style; for doing which, we would have to pay him exhorbitant charges. But none of us is a rich man; we are a group of private persons, more or less well off, and though we would not be "penny wise and pound foolish," we aimed to be economical where we wisely could.

So I suggested the other way. Here is my argument: "I happen to be the only one of us, whose name, advertised through my connection with literature and journalism, is widely known. I know how to write. I was also educated as an engineer, and practiced for some years; but that is not important. I am one of the Company, and for what I may do in its behalf, I shall have no broker's fees to charge. Let me write the letters to accompany our prospectus. One of the main difficulties in the way of the ordinary prospectus is, to induce people to whom it is sent, to read it; in nine cases out of ten it goes unread into the waste-paper basket. But a letter written by me and with my name signed to it, will attract the attention of curiosity,—'What can Hawthorne, the literary man, be doing with a mine?' That curiosity may save our prospectus from the waste-paper basket in five cases out of the nine. And if that be accomplished, our battle is half won; for nobody who reads our prospectus, and realizes what it means, will feel that he can quite afford to ignore it."

That was my idea, and it prevailed, with the result which is before you.

The silver mines of Ontario, in Canada, are famous, and are probably known to you; in the last four years they have proved to be the greatest and quickest producers in the world. Our property has an area of 840 acres right in the thick of the productive region. Its surface indications are identical with those of the best of its neighbors, and the assays of its ore are so attractive that it is almost imprudent to publish them.

Read our prospectus, which tells the truth, as seen by a man who knows his business; and if you require any further information, address yourself to me.

In conclusion,—because my name is prominent in this announcement, don't get the notion that I am prominent in our Company, or that Temagami's excellence is to depend on my say-so. All I have, I have invested in the enterprise; but my all was not much. But I am a writer, and was chosen to do this part of the work. I may hope, hereafter, to return to literature, and to write certain things which I have had no leisure to write in the past; but that is neither here nor there. I am a miner now; and shall stay so till Temagami has done all that we expect from it. That is all.

Sincerely yours,

[illegible]

The prospectus accompanying the above letter states that the Temagami-Cobalt Mines, Ltd., is incorporated under the laws of Maine, with a capital of $3,000,000, divided into shares of $1 each, $1,000,000 of the capital stock being in the treasury. The board of directors consists of eight, including Woodford W. Brooks, [illegible] Hawthorne. Among the other six directors there are some fairly well known names, but among the eight directors there is not one person whom we recognize as being experienced in mining, either practically or financially.

[illegible] eralities after the time-honored fashion of the amateur. Pages 1 and 2 contain a re[illegible] Cobalt district, from which the Temagami-Cobalt mines are 19 miles distant. The remaining six pages of the prospectus consist of a letter by Woodford W. Brooks addressed to Mr. Hawthorne, this letter beginning "You requested me for a statement, so here it is. It is longer than most people like to read, but as you will see, I had considerable ground to cover. While I am addressing this to you, it will be evident that it is meant for your friends whom you are desirous of interesting in our project."

For two pages and three-quarters, Mr Brooks describes the Cobalt district, incidentally touching upon the spectacular history of the Hudson Bay Company. Near the bottom of his third page, he states that just a year ago, himself and associates became interested in 240 acres of land within three miles from Temagami station. "We hardly started exploring our ground when we discovered stupendous values." Additional acreage was then acquired, the total now being 840 and as usual great emphasis is put upon the value of so large a tract of land.

"When you consider" says Mr Brooks, "that in the 40 acres of the La Rose mine they now have something like 8,000,000 [illegible]

Then follows some examples of assays. The nearest that Mr. Brooks comes to describing his mines is as follows: "We have done considerable work on these properties, many of the veins we have stripped, we dug trenches, sunk shafts, and wherever we have worked, we found [illegible] point where the orebodies can be measured up, and not until that point will have been reached, can we tell with certainty what the values will average. . . We are justified in stating that some of our claims at least, will develop into wonderful producers, . . . But we have [illegible] make specific statements. We are not as [illegible] simply that every one of our claims is [illegible] ping in all directions. We are now developing them, and we believe that our expectations will be fully realized in three or four months."

The company is offering 200,000 shares at 30 cents per share. The prospectus is not accompanied by the report of any engineer or mining geologist. Nor is there [illegible] advice.

[illegible] amateur venture in mining. It is too bad [illegible] nay giving his name, and prostituting his pen to induce his friends, acquaintances, [illegible]

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. R. Finlay, mining engineer, of New York, has gone to the West on professional business.

Robert K. Painter has returned to New York after a month spent in examining mines in Nevada.

J. Parke Channing, president of the Tennessee Copper Company, is visiting the mines and works of that company.

J. B. Hogg, of Connellsville, Penn., has been appointed mining engineer at Boswell, Penn., for the Merchants' Coal Company.

William S. Mann, general manager of the Boston & Oaxaca Mining Company, Tlacolulu, Oaxaca, Mexico, has gone to Boston on business.

Isaac Guggenheim, treasurer of the American Smelting and Refining Company, has returned to New York from a short trip to Europe.

W. T. Lewis, who has just been appointed State labor commissioner of Ohio, was for a number of years a coal miner, but is now a lawyer.

J. E. Spurr, with a corps of six assistants, is engaged in a thorough topographic and geologic survey of the properties of the Campbird mine, at Ouray, Colorado.

G. A. Denny, of London, well known for his work in the Transvaal, arrived in the City of Mexico recently. It is understood that he expects to make a long stay in Mexico.

J. W. Johnson, of the firm of Johnson & Enos, mining engineers, of Mexico City, has returned to that place from Arizona, where he has been some time on professional business.

Edwin C. Luther has resigned his position in the engineering department of the Philadelphia & Reading Coal and Iron Company, to take charge of the coal-mining interests of the Shaeffer estate.

Anson W. Allen, for 20 years past with the Pencoyd Iron Works, Pencoyd, Penn., has been appointed superintendent of the open-hearth steel furnaces of the Tennessee Coal, Iron and Railroad Company, at Ensley, Alabama.

Carl Graul, who has been chemist for the Semet-Solvay Company, at Dunbar, Penn., has been appointed superintendent of the new by-product coke plant erected at Charlotte, Ill., by the United States Steel Corporation.

Godfrey D. Doveton has joined the staff of Spurr & Cox, Inc., as metallurgical engineer, and will be exclusively associated with that organization. Mr. Doveton's address for the present will be the Mexico City office of Spurr & Cox.

J. V. Allen has been elected secretary of the Alabama Coal Operators Association, and will perform the duties of chief commissioner. His office will be in the Brown-Marx building, Birmingham. The association represents 95 per cent. of the coal production of Alabama.

Arthur C. Terrill, for the past two years professor of mining and metallurgy at the University of Oregon, has been appointed professor of metallurgy at the University of Idaho. Professor Terrill recently returned to Oregon from a trip to Seattle, Tacoma, and the Cœur d'Alenes.

Thomas A Keighley, general manager of the coal mines and coke ovens of the Shenango Furnace Company, at Wilpen, Westmoreland county, Penn., has resigned, and gone to West Virginia, where he has accepted a similar position with a concern in which his father, Fred Keighley, is one of the principal owners. A. K. Renwick has been appointed to succeed to the position vacated by Mr. Keighley, and assumes his duties at once.

Obituary

Joseph Bell, one of the pioneers in the iron business in the Wheeling, W. Va., district, died in that city, Aug. 31, aged 89 years. He entered the iron business in 1850, and was connected with various concerns. He was one of the original organizers of the Wheeling Steel and Iron Company, and a director until he resigned owing to old age.

Gardner Dexter Hiscox, a well known writer on scientific subjects, died Sept. 13, at his residence in East Orange, N. J., after a short illness. He was born in Elizabethtown, N. Y., 86 years ago, and although without college training, devoted his life to scientific work. He was best known as the author of "Compressed Air and Its Application," "Modern Steam Engineering," and "Hydraulic Engineering."

Capt. Enoch Roberts died recently in Ishpeming, Mich., aged 73 years He was born in Cornwall, England, and came to the United States when 25 years old. After a few years in the copper country of Lake Superior he was made mining captain for the Collins Iron Company, at Ishpeming. Since then he had held important positions on several large mines on the Marquette and Menominee ranges. He retired from active work about a year ago.

Charles K. Lord, who died in Philadelphia, Sept. 10, was born at Hoosick Falls. N. Y., in 1846. He served on various railroads, and was connected with the Baltimore & Ohio for 16 years. In 1896 he was chosen president of the Consolidation Coal Company, of Maryland, and held that office until his death. He was largely interested in Nevada mines, and for two years past was vice-president of the Tonopah Mining Company and president of the Tonopah & Goldfield Railroad Company.

Thomas M. Richards, who died in Philadelphia, Sept. 5, aged 73 years, was connected with the Consolidation Coal Company at Mt. Savage, Md., for a few years about 1865, but for 40 years past had been with the Reading in various capacities. He served successively as agent at Port Richmond, head of the coal department and finally as vice-president of the Philadelphia & Reading Coal and Iron Company. He organized the present coal transportation and distribution system of the Reading. He was almost the last survivor of the men who served under Franklin B. Gowen, and no one had a more extensive knowledge of the past and present conditions of the anthracite coal industry.

Societies and Technical Schools

Missouri State School of Mines—The fall term of this institution at Rolla will open Sept. 22. This will begin the thirty-seventh year of the school.

Massachusetts Institute of Technology—This institution has established advanced courses in electrical engineering, intended especially for graduate work. Several fellowships for the ensuing year have been granted.

West Virginia Mining Association—This association will meet at Charleston, Oct. 7. At a meeting of the executive committee recently, W. N. Page, of Ansted, president of the association, presided. A committee consisting of William McKell, M. T. Davis and Eli T. Connor was appointed to make the proper arrangements for the October meeting. Another committee which will assign the subjects for discussion consists of William N. Page, Neil Robinson and W. A. Ohley. At the meeting the association expects to have present Captain Desbrough, Herr Meissner and Victor Watteyne, the mining experts from England, Germany and Belgium, who are at present in the United States on the invitation of the Geological Survey. With these three distinguished foreign experts will come Doctor Holmes and Edwin W. Parker, chief statistician of the survey. It is planned by the association that the afternoon and evening of Oct. 7 will be spent in discussion of subjects pertaining to mining, and on the following day the operators will leave on an inspection trip over the Virginian railway. The party will go from Deepwater to Princeton, the present terminus of the road. At the latter point the foreign experts with the representatives of the United States Government will leave the party to make a trip through the Pocahontas field, while the operators will return to Charleston on the same day

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Indianapolis, Denver, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco.

Somebody recently started a rumor that the South Yuba Water Company did not intend cutting off the water supply of the mines at Grass Valley and Nevada City, but the superintendent of that company explains the situation briefly as follows: "If the rains are late we will be compelled to conserve the water for domestic purposes and this may mean the shutting off of the water temporarily for power purposes. We are under moral and legal obligations to supply all municipalities that are our customers in preference to the mines and other enterprises using our water for power purposes. So if it becomes absolutely necessary in order to supply the cities using our water we will have to economize by shutting off water used in propelling machinery."

A new mining camp has been established on the desert 14 miles southeast of Cima, San Bernardino county. It is called Gold Valley and a tent city has sprung up there within a few weeks. A number of veins have been located and work commenced on them. The veins are small, but the ore is of high grade. This new camp is located on the east slope of the Providence mountains, 21 miles from Fenner, on the Santa Fe and 18 miles south of Manvel. It is reported that the camp has an abundance of water and wood.

C. R. Downs, of Sutter Creek, Amador county, is bonding coal lands in the Jackson valley, though but little work has yet been done upon them. At one point this coal bed has been prospected to a limited extent on the Fitzsimmons place. Here the coal formation is met with at a depth of 50 ft., and the mineral is found to be of a grade superior to that of the mines around Ione. The vein is 11 ft. thick, and all the coal that has been mined finds a ready sale in the local markets. There is talk of running a railroad to tap the coal lands of this valley; this line would be not more than six or seven miles in length, over a comparatively level country. The coal is of low grade, but adapted for many purposes, and can be mined at small cost.

Judge Ellsworth, of Oakland, has quashed the suit of J. W. Davis, of Sacramento, against the Stillwagon Mining Company, of El Dorado county over mining property in that county worth $150,000. The decision also gives the Stillwagon company a clear title to a stamp mill and mining machinery valued at $25,000.

There is more litigation ahead in the suit involving interests in the old Socrates quicksilver mine in northern Sonoma county. Judge Kenny, of Santa Rosa, has granted the motion of C. E. Kinard, an Oakland attorney, representing the claimants of some kind of an interest, to set aside certain defaults. This is his first point gained, after all kinds of demurrers, motions, appearances and arguments. Frank A. Huntington, of San Francisco, is the principal owner of the mine.

San Diego county is now to the front in the matter of discoveries of ores other than those carrying gold. It is announced that a deposit of nickeliferous ore has been found at Boulder Creek by Meyers, Wood, Lockwood & Lynell of that place. The vein is from 3 to 4 ft. wide. A prospector named T. A. Burke, who is working for Alfred B. Lindsay, of San Diego, states that he has found a deposit of tin ore on property 10 miles from Descanso, 14 miles from the Mexican boundary line. No work has yet been done on the claim. Smith Emery & Co., chemical engineers and chemists of San Francisco, have just completed a report on the beds of palagonite paint material, found eight miles inland from Encinitas. The substance is not unlike soapstone, very fine grained and entirely free from any grit. It is considered a fine material for pigment, and 10 or 12 distinct colors, from pale lavender to deep red, are found in the strata forming the bed. Oakland capitalists have undertaken to open the beds and put up a grinding mill.

The operators of the magnesite deposits at Porterville, Tulare county, are enlisting the coöperation of the Chamber of Commerce of the county to bring to the attention of Congress the need of a duty on the substance. These mines at Porterville yield nearly all the magnesite produced in the United States, but their market is confined to the Pacific coast, since it is impossible to compete with the Grecian and Austrian product in the ex[illegible]

Goldfield, Nevada

Sept. 4—On the 600-ft. level of the Mohawk mine the orebody has been de[illegible] from $40 to $50 per ton. The big main working shaft at the Claremont mine be[illegible] is being sunk with three shifts and is pro[illegible] on the new mill is going up rapidly. The first two terraces are about three-quarters [illegible] Pachuca tanks are erected and the redwood tanks in the cyanide department are being put in.

A double-drum hoist capable of hoisting from a depth of 1000 ft. is being installed at the Florence mine. The shaft is being enlarged to three compartment by raising from the 300-ft. level. This will be the main working shaft, and is being timbered with 10x10-in. sets. This shaft will be sunk to a depth greater than any of the leases and then drifts will be driven to open up at that depth the orebodies developed in the leases. In the meantime the new mill will be started on dump ores.

The Tonopah Mining Company intended when it resumed sinking at the Mizpah shaft in Tonopah to sink this shaft only to a depth of 1300 ft., but new developments have caused the company to decide to sink it to a depth of 1500 ft. and to do the new prospecting work at that level. During the past week the shaft was sunk 18 ft., the bottom now being 1140½ ft. below the collar. There is no change in the formation

Station sets are being placed every 100 ft. below the 900-ft. level so that the levels may be started at any time. The drill-hole from the bottom of the Red Plume shaft was extended only 29 feet during the week and is now down 267 ft. below the 500-ft. level. The work is rather slow as the rock through which the drill is passing is broken up and sloughs off into the hole causing the [illegible]

Butte

[illegible] mitted to the members of the Butte Miners' Union the question as to whether or not the miners should refuse to handle any lumber used in the mines until the differences between the lumber workers [illegible] favor of the action, it would have been equivalent to declaring a strike among the miners in the Butte district, but, by a vote of nearly four to one the action was voted down. Following the refusal of the miners' union to give support, the lumbermen's union called the strike off the next day and thus averted what might have been serious trouble in the mining indu[illegible]

Difficulties with the coal miners of Wyoming and Montana are presenting a problem to the officials of the Amalgamated company in Butte. The latter part of August a conference between the coal miners and the operators of Wyoming was held in Butte for the purpose of considering the wage scale, recently reduced on an average of from 10 to 15c. per day. The conference ended in a disagreement, and on Aug. 31 the coal miners in Wyoming went out on a strike. The Montana coal miners and the operators have been in conference at Helena since Sept. 3, endeavoring to come to some agreement, but as yet no settlement has been effected. The Montana coal mines are still in operation. While much of the coal used in the Butte mines comes from Amalgamated coal properties at Belt, Mont., the greater part comes from the company's mines at Diamondville, Wyoming, which are now closed as a result of the Wyoming strike. As there is now on hand in Butte a supply of coal sufficient to last three months, no apprehension is felt as to the immediate situation.

Denver

Sept. 11—Colorado mining men, who are now holding a two days' meeting in the Chamber of Commerce, at Denver, have introduced some resolutions of great importance to the mining interests of the State. One of these calls upon the legislature to appropriate $250,000 for a mining temple, which is to be erected here on a scale commensurate with the great importance and vast proportions assumed by that industry in the State of Colorado. Another asks the State to adopt a law for the punishment of fraudulent and untrue statements in the prospectusus of mining companies; and another refers to devising means for bringing the mineral advantages of the State to the attention of the mining world in general. Among the subjects discussed were the need of stronger organization and unity among the miners of the State, and the raising by them of a fund for a system of metallurgical experiments and tests to the furtherance of better methods of ore treatment; also the support of a Colorado branch of the Mining Congress. Among other subjects under discussion was the wholesale theft of rich ores, called "high-grading," oppressive taxation on mining properties, the consolidation of operations by long transportation tunnels, and other subjects of vital importance to a State and a great city like Denver, built up by the wealth of the Rocky mountain range. The meeting is still in session.

Indianapolis

Sept. 14—As a direct result of United States Senator Hemenway's mine disaster investigation bill, a commission comprised of representatives of four nations conferred with officials of the Indiana Bituminous Operators' Association and the District Mine Workers of America, at Terre Haute, Sept. 10. The commissioners were met by a reception committee and shown every attention. The mine investigating committee is composed of the head of the explosives commission of Great Britain, the heads of the Belgian and the German mining commissions, and Dr. J. A. Holmes, of the United States Geological Survey. The Hemenway bill, passed by Congress last winter, provided for an appropriation of $150,000 to defray the cost of investigating mining conditions in the United States. The bill was prompted by the series of mine explosions and the resulting loss of life.

A special meeting of the miners and operators of the block coalfield was held in Brazil, Sept. 10, and effected an amicable settlement of the differences which threatened to result in trouble. The men filed a complaint that the operators were not moving their coal as fast as they might, according to contract, and doing this in order to keep as many men in the district as possible until the busy season opened. Investigation developed the fact that union miners from other States and districts had been flocking to the block coalfields, all of them in needy condition. These men had been given work until the mines were all so badly crowded that the operators could not move the coal. The questions whether the force of miners should be reduced 25 per cent. in these mines, allowing union miners to be thrown out of employment, or work with them and divide the time, was put squarely to the miners and they decided to let prevailing conditions continue and divide the time.

London

Sept. 5—The Dunderland Iron Ore Company has secured the consent of the debenture-holders to the proposals of the directors for raising additional capital. The company was formed in 1902 to work low-grade iron ores occurring in the northern part of Norway. A dry concentrating plant, consisting of rolls and magnetic separators of T. A. Edison's design, have been erected at the mines, and a railway some 17 miles in length has been built to the seaboard, where the briquetting plant is situated. Altogether about £1,500,000 have been expended in this venture, and further funds are required. The company has had to make many changes in the original plant, especially in connection with the fine rolls and the conveyer belts. Thomas Robins, of the Robins Conveyer Belt Company, of New York, has visited the mines and has proposed certain alterations in the conveyer system which, it is hoped, will prevent the excessive dust and spill troubles previously experienced. Besides technical troubles, the working of the mine has been hampered by labor difficulties. Up to June 30, but 67,101 tons of ore in the form of briquets have been sold at an average price of about $5.46. When the plant is improved by the reconstruction of the conveyer system, it is hoped to be able to make a profit of £63,750 per annum on an output of 300,000 tons, the estimated costs being $4.44, and the assumed selling price $5.46 per ton. The costs include carriage and freight to northeastern ports of England, but exclude general charges and insurance.

Unfortunately for the company, there has this summer been a heavy fall in the price of iron ore, and having regard to this and to the financial straits of the company, the directors have decided to shut down the mines temporarily. In the meantime, if further funds are provided, certain improvements to the plant, which past experience has shown to be necessary, will be undertaken. Whether the mines will pay under the new conditions remains to be seen. The price of iron is, of course, a vital factor; and as stated above, a price of $5.46 per ton is necessary for an estimated surplus of £64,000. The directors say that the consumption of iron ore has in the past doubled about every 14 years, and they anticipate that as the older sources of supply of iron ore of good quality give out, an appreciation in price is bound to take place. One of the largest stockholders—C. D. Rudd, of South African fame—reminded the shareholders that some of the best mines had had disappointments in their initial stages, and mentioned the case of the Simmer & Jack mine in the Transvaal, now one of the most prosperous of the gold mines of the world, a mine of which he was one of the founders. He said that he well remembered the time when a distinguished mining engineer recommended that the mine should be let out on tribute, as it would not pay if worked by a company. That mines have failed owing to want of pluck, means to push development, or remedy mistakes in design of plant, is no doubt true. It is said that the famous Mysore mine in India was at one time nearly abandoned, and that if it had not been for the courage of some shareholders in providing funds for further development, which shortly after ran into a rich shoot of ore, the mine would have been shut down. Since then, as everyone knows, the mine has had a most prosperous career. It is to be hoped that Mr. Rudd and his associates will succeed in pulling the unfortunate Dunderland mine through. The company has bought its experience dearly, but now that the difficulties connected with the technical treatment of the ore have to a great extent been surmounted, it would seem that only an improvement in the iron market is required to allow these extensive ore deposits, about the occurrence of which there seems to be no question, to be worked at a profit, bringing some return to the shareholders for the large sums that have been invested in the enterprise.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KATCHIKAN DISTRICT

Victor Copper Mining Company—This company owns a group of claims at Seal Bay, on Gravina island, 12 miles from Katchikan. It has begun work on an adit which is to run the whole width of the group, about 2500 ft., with crosscuts at intervals.

Arizona

GRAHAM COUNTY

Arizona Copper Company—Production for August amounted to 1217 tons of copper. The operation of the furnaces was frequently interrupted in order to make the necessary connection between the furnaces and the new flue. This work was completed before the end of the month.

Arkansas

FRANKLIN COUNTY

The coal miners at Denning, who struck some time ago because the operators refused to employ shot-firers, are still out. About 1000 men are idle.

California

AMADOR COUNTY

Argonaut—Some fine ore has lately been found in this mine at Jackson, and another level is being opened at 2800 ft. depth.

Bellwether—There is a hitch in the negotiations for bonding this property, as, being part of the Bright estate in process of probate, legal technicalities may delay the matter several months.

Jackson Creek—Mushett & Kelly have started work on new gravel ground in the middle fork of this creek.

BUTTE COUNTY

Big Blue Lead Mining Company—This company is taking up its options on mining ground near Bangor and has made its first payment in certain portions, and will soon begin putting in machinery.

EL DORADO COUNTY

Eureka—Unwatering the shaft of this mine has been commenced, and as soon as this is completed extensive development work will be started.

INYO COUNTY

Four Metals Mining Company—The electric power tramway towers of this company up Buena Vista mountain to Cerro Gordo have been erected to within a mile of the furnace at Keeler.

Chicago District—Gunter & Bloomdale, interested in recent discoveries in this district, have given leases on part of the property. The ore will be milled at the King Brothers plant.

MARIPOSA COUNTY

Mariposa—The building of the mill and other work connected with the opening of this mine is progressing. Part of the machinery is on the ground.

[illegible]

A. M. Gilbert, formerly of Chicago and now of Santa Barbara is reopening a number of old quartz properties with a view to making them producers again. In Graniteville district he is opening and developing the Dillon, Boston and Dower mines, some of which have been idle for 30 years. He is also having the Lecompton mine at Nevada City unwatered and has commenced operations on the Oustomah at the same place.

Dolly Madison—After considerable money had been spent in opening this mine it has been given up and the machinery has been removed.

Idaho—At the old workings of this mine, Grass Valley, the water has been removed to the depth of 1000 ft. and retimbering the shaft has commenced. The old 700 drift has been nearly all cleaned out and a new ore-shoot, never known when the mine was worked by Coleman Brothers, has been found.

Idaho-Maryland Mines Company—At this property, Grass Valley, they have discontinued taking out ore and are engaged in sinking, and driving drifts; 50 men are employed.

Lecompton—At this mine, Nevada City, Samuel Colt, superintendent, two large compressors are being installed and sinking will commence at once.

Norambagua—At this mine, Grass Valley, Samuel Colt, superintendent, a new shaft is to be started from the drain tunnel, which is 500 ft. from the surface.

South Yuba—This company is opening up some old mines in Washington district. It is operating the South Yuba, Eagle Bird and Grey Eagle mines. The new equipment is expected to increase the output, especially as there is now plenty of water power available with the [illegible]

PLACER COUNTY

Lost Emigrant—At this mine, Summit, the shaft is being sunk and preparations are being made to continue work during the winter.

[illegible]

The Western Pacific railway will open up several copper districts where prospecting has been going on for the past few years, but where there has as yet been no production. The Onion Valley mines are being developed as well as those in other districts and in many instances good showing has been made.

SAN BERNARDINO COUNTY

[illegible] 12 miles north of Cima, has been sold to Morgan & Parrott, of Pasadena.

[illegible]

[illegible] *pany*—A 200-ft. shaft has been started on [illegible] Escondido.

SHASTA COUNTY

Graham—This group of copper mines on Pitt river has been bonded by W. E. Casson, who is associated with Eastern men.

Iron Smelting—At Heroult a new 20-ton electric iron smelting furnace is now being put in. It is intended to continue the experiments further in hope of settling on something practicable.

Trinity—By an arrangement made some time ago, the Shasta King mine of the Trinity Copper Company was to deliver to the Balaklala Copper Company of Coram an average of 500 tons daily for the smelter. It is now thought that a greater quantity than this will be delivered from the Shasta King mine. R. N. Bishop has been made joint superintendent of both the Balaklala and Shasta King mines in order to carry out the contract between the companies.

[illegible]

Butte Saddle—This group at Sierra City is now under bond to Check & Aldrich who are prosecuting development work.

[illegible] company at Scales has applied to the California Debris Commission for a license to mine this property by the hydraulic process.

[illegible]

[illegible] plant has been installed at this mine and the mill is kept running on good ore.

TRINITY COUNTY

[illegible]

portant discoveries ever made in this district is that in the Fields quartz property, and development work is being vigorously carried on.

Tuolumne County

Sweeny—After long litigation the ownership of this mine is established in Charles H. Segestrom. Tonopah men will now take the mine and commence the sinking of a 100-ft. shaft. A 20-stamp mill will be erected.

Colorado

Hinsdale County

Sterling Group—It is reported that a plant of machinery has been bought and will soon be installed on the Sterling group. This group was recently purchased by F. Joubert Pienaar and at present has a fine showing for the amount of development. The mine is on the upper Cottonwood creek near the San Juan county line.

Larimer County

Northern Colorado Coal Company—Eastern capitalists have concluded the financing of the Larimer, Hahn's Peak and Pacific railroad, which will open to traffic one of the most remarkable coalfields in the United States. The district is situated near Hebron, Colo. The seam of coal lies 6 ft. beneath the surface and is said to be 40 ft. thick. The coal will be mined by stripping the surface, blasting down the coal and loading with a steam shovel.

Ouray County

Congress—Development work on this mine near Ouray has opened a promising body of copper ore.

San Juan County

Ore Shipments—Shipments from Silverton in August were 2000 tons concentrates and 1075 tons crude ore. The larger shippers were the Silver Lake, Hercules, San Antonio and Sunnyside.

Gold King—It is expected that this mine will start up about Sept. 20. The towers of the tramways are now all repaired and work is being pushed on the upper terminal as fast as possible. The tunnel is being cleaned out and retimbered where it caved near the mouth. Work is advancing on the buildings burned some time ago.

Teller County—Cripple Creek

Lonaconing—Lessees in this mine have opened a body of ore 4 ft. wide, with a small streak of rich sylvanite running through it.

Pharmacist—This company has struck a basalt dike in the mine on Bull hill, at a depth of 900 ft., which promises well. Its extent has not yet been determined.

Wrockloff—Lessees on this claim, on Bull hill, have begun to ship ore. They are preparing to extend development work.

Idaho

Shoshone County

Idora Mining Company—A lease for six months has been given to F. M. Mark, Ed. Lugen and Robert Weedy all of this district. The recent financial troubles of the company have been settled.

Aeolian Copper Mining Company—A new water-driven air compressor is about to be installed, and a long flume is in course of construction to connect the mine with Deadman gulch.

Fumerton Property—A foot of rich carbonate ore has been struck in this mine near Osburn. Development work was only commenced recently.

Bunker Hill & Sullivan—This company has just declared its regular dividend for the month of September. This involves the distribution of $75,000 among the shareholders and makes the total distributed for the year $630,000, while the grand total disbursed by the present management amounts to $10,440,000.

Vienna-International—At a meeting of the stockholders and directors held in Wallace the beginning of the week the announcement was made that the mine would resume operations in the near future. A carload of ore is now ready for shipment and there is a large amount of ore ready for stoping as soon as the operations are resumed. It is proposed to expend between $15,000 and $20,000 on improvements. A 4000-ft. flume is being constructed to connect with the waters of Placer creek.

Amazon-Dixie—A full face of ore has been opened in the adit. The ore is in the form of clean shipping galena scattered throughout the quartz, the rock being full of ore. The strike was made at a depth of about 200 ft. from the surface and at a distance of about 250 ft. from the portal of the adit.

Advance Mining Company—The annual meeting has just been held in Wallace and officers for the ensuing year elected. It was decided to let a contract for another 100 ft. of work, a contract for a similar amount having just been completed.

Nine Mile Mining Company—A foot of clean shipping galena ore has been encountered in the raise being run on this property to connect the upper and lower tunnels. In addition to this the company has also opened a good body of milling ore.

New Chicago—Small shipments of ore for testing purposes have been made to several different smelters. A large amount of ore is now on the dump, and the company is expecting to begin regular shipments when the Oregon Railroad and Navigation Company's branch road reaches the district, which will be some time this fall.

Snowstorm—It is probable this mine will resume the payments of dividends with the present month, as it is constantly making shipments to several large smelters, and is operating a large crew. Development work is progressing in the long No. 4 tunnel, but this will not terminate for several months. The mine last year paid dividends amounting to $45,000 a month.

Kootenai County

Panhandle Smelter—The first furnace will be blown in soon after Oct. 1, and the second will follow shortly. The final work of remodeling is now being done. Coke and fluxing materials are being received, and ore contracts have been let in Montana and Idaho sufficient to keep the plant supplied. It will have a capacity of 250 tons daily.

Green Monarch—A 10-drill compressor will be installed at this property on Lake Pend d'Oreille, and the mine put in shape to work regularly. Its ore will be taken by the Panhandle smelter, to which one carload has already been sent.

Indiana

Greene County

Vandalia Coal Mining Company—This company has opened two more mines, Nos. 2 and 3 having resumed operation giving employment to 500 men. Of the nine mines owned by the company seven are working now. The mines just opened have been closed since March. The company is showing greater signs of a prosperous season than any other company in the State.

Louisiana

The total production of petroleum in August from the Louisiana district is reported at 427,600 bbl., a decrease of 28,700 bbl. from July. Shipments for August were 458,098 bbl., or 30,498 bbl. in excess of the production. The number of new wells completed in August was 23, of which 14 were oil producers, one a gas producer and eight dry. There were 38 wells drilling at the close of the month.

Maryland

Garrett County

Western Maryland Coal and Coke Company—This company is contemplating the contruction of three dams along the Youghiogheny river to develop 15,000 h.p., which will be transmitted as electric power to Pittsburg, 50 miles distant. The company owns 10,000 acres of coal land on each side of the river, and the power generated will also be used in operating the different mines which the company expects to open.

Michigan

Copper

Superior—The crosscut from the tenth level is in the lode 42 ft., and the hanging wall has not yet been encountered. The formation at this point is highly mineralized and shows the same quality of rock as in the levels above.

Ojibway—Shaft No. 1 is down about 370 ft. and No. 2 has reached a depth of 425 ft. Sinking will be continued to 500 ft. when a crosscut will be driven to the lode. Barring accidents, No. 2 shaft should reach this point early in October. In the drift from the 350-ft. level of this shaft the formation was leached and broken.

Winona—The lode has been cut at the eighth level of No. 4 shaft and the rock disclosed is richer than any heretofore opened up on this property. Eight machines are in regular service sinking and drifting. The new electrically-operated hoisting plant has been tried out and is working satisfactorily.

King Philip—The crosscut at the ninth level in No. 1 shaft of this tract is in the lode and the formation is well charged with copper. No. 2 shaft is sinking below the 400-ft. level.

Isle Royale—Preparations are being made to sink a new shaft on this property. The outcropping of the Baltic lode was recently discovered on this tract and the shaft will be sunk close to this point. Operations at the south end of the mine are continuing satisfactorily and good ground is being opened up. Nos. 4 and 5 shafts are sinking below the third level and No. 6 is cutting a station for the fourth level. All the rock, accumulated on the stock piles, has been shipped to the mill and all shipments are now going directly from the underground openings.

Atlantic—The lode has again been encountered in the south drift from the twelfth level of this company's Section 16 shaft. This was accomplished after crosscutting about 25 ft. to the west, at which point the lode was well mineralized; this drift is now within 50 ft. of the Atlantic's boundary line. Drifting to the south from the thirteenth level continues and the formation is settled and well charged with copper; it is evidently a continuation of the good ground that has been opened in the level above. This shaft is sinking about 40 ft. below the seventeenth level and the ground continues fractured.

North Lake—A spur is being laid into this property and the first diamond drill outfit has gone into commission exploring virgin ground.

Michigan—The crosscut from the seventeenth level of "A" shaft has cut the Calico lode and drifting has been started from that point

Seneca—The new shaft on this tract is down about 60 ft. A new air compressor has been installed and greater progress will be made in sinking from now on; heretofore all drilling was done by hand. Diamond-drill operations are being continued.

Missouri

Zinc-lead District.

Belleville Milling Company—This company has been incorporated by C. W. Munson, J. P. Burns and others, of Joplin.

Elizabeth Mining and Development Company—This company has been incorporated by A. Lowenstein, A. J. Simpson, Joseph Walbrun and W. A. Eylenburg, of Chillicothe, Mo., and E. Tabor, of Joplin.

Center Creek—This company at Webb City has reduced the royalties on all its leases to 20 per cent., on both lead and zinc

Herald—This company has completed the incline shaft to the bottom of the ore and it is now down to a vertical depth of 308 ft. The company has started producing again.

Grace—This company has taken over the old Cliff lease from the Granby Mining and Smelting Company, and is drilling it thoroughly.

White Dog—This company has taken over the old Majestic mine north of Webb City, and has repaired the mill. It is now pumping preparatory to starting operations.

Lucky Jim—This company has started its new 250-ton mill, and is now producing steadily.

Trimore—This mine, on the Yale land in Leadville hollow, is turning out some of the richest lead seen in the district for some time. The ore is found at 36 ft. in soft ground. Shafts are going down on the Leonard and Granby lands immediately adjoining, to catch the same run.

Lucky May—This company has contracted for a 150-ton mill on its lease on the Heise land near the Morning Hour mine, south of Joplin. The shaft shows 35 ft. of ore, from 107 ft. to 142 ft. depth.

Platta—This company has begun sinking a shaft on its 10-acre lease on the McCown land at Spring City. The drill records show lead and zinc at the same level as the Delta mine.

Moses—This company has made a rich lead strike on its lease at Duenweg at 153 ft. depth, near the lines of the Log Cabin and Layers mines. Both of these are famous lead mines.

Layers—This company is sinking a second shaft on its lease on the Walker land at Duenweg.

Miami—P. W. Hennessey has leased the old Miami mine at Chitwood, north of the Anderson mine, and will work it in conjunction with the Anderson mine.

Leonard Land—The same rich run of lead ore that was struck in the Trimore mine on the Yale land, has been struck in a shaft on the Leonard land at 40 ft. depth.

Montana

[illegible]

Raven—At the annual meeting of stockholders held Tuesday the following were elected directors: John Berkin and Donald Campbell, of Butte; E. C. Frisbee, Robert A. Griffing and E. F. Rea, of Hartford, Conn.; A. B. Curtis and E. A. Slack, of Boston, Mass. The new directors will meet in Boston next week.

North Butte Extension—A. M. Andrews, treasurer, has been in the city several days on business relating to the payment of the company's indebtedness. Mr. Andrews states that he expects, on his return to New York, to complete arrangements for the refinancing of the company.

North Butte Mountain—A contract has been let to James E. Higgins, a mining engineer, of Butte, for the sinking of a 500-ft. shaft.

[illegible] the O'Rourke interest in the Pilot claim outright, the final payment having been made several days ago. George H. Stanton, counsel for the company, states that arrangements have been made whereby the capital necessary for resumption of operations on the property has been secured, and future payments on the options assured.

[illegible]

[illegible] that negotiations for the raising of $50,000 for operating purposes are practically completed. A plan to erect an 100-ton concentrator is under consideration.

Blue Bird Mine—A party of Michigan stockholders recently visited the property which is located in the Corbin district. A 5-ft. vein, carrying 5 per cent. copper, is now being worked through a winze sunk in the main tunnel at a point 1100 ft. from the portal of the tunnel. The mine is making daily shipments.

Nevada

[illegible]

Production—The tonnage from the mine was the heaviest for several months, but the grade of the ore was not as good as usual owing to the large amount of dump rock treated. The ore shipped from the Engineers lease is also not so rich as formerly, for the ore is shipped without being sorted. The total tonnage for the week was 3160 tons valued at $170,300 The Combination mill treated 630 tons of Consolidated ores. The Nevada Goldfield Reduction Company treated from: Combination Fraction, 140 tons; Mushett lease, 130; Sandstorm, 120; dump ores, 810 tons. The Western Ore Purchasing Company handled from: Mohawk Jumbo, 700 tons; Engineers lease, 200; Consolidated Red Top, 220; Florence Consoli[illegible] dump ore.

[illegible]

Florence lease on this property is in shipping ore on the 100-, 200- and 500-ft. levels. The old shaft has been enlarged to three compartments. The vein is from 3 to 7 ft. wide.

Laguna—L. L. Mushett has bought out his Kansas City partners in the Mushett lease on this property and has resumed work at this lease which has been shut down for a short time. Prospecting on the 480-ft. level will be pushed to cut a vein known to exist in the direction of the work. The last shipment of 300 tons was not especially rich, but made a creditable return. The lease has already netted more than $75,000.

Mohawk Ledge—Work on this lease is now confined to sinking. There is considerable ore in the upper levels near the east and west sidelines, but as the lease resumed work under the new vertical side and endline agreement it cannot follow this ore beyond the boundaries of its lease. Little development will be done until the shaft has been sunk to a depth of 700 feet.

Yellow Tiger—Work on the leasehold of the Elk Consolidated has been temporarily suspended for reasons unexplained. Two weeks ago a rich strike on the 600-ft level was reported and no visitors were allowed to enter the mine. The 600-ft. level which is producing a lot of water will be bulkheaded and the shaft will be sunk 200 ft. deeper before drifting on the big dike will be resumed.

Consolidated Red Top Mining and Leasing—This lease on the north end of the Red Top claim is producing 30 tons of ore per day from the 225-ft. level. The bottom of the winze which is down 35 ft. is also shipping ore. The last shipment from the lease assayed $64 gold and $3 silver per ton. On the 150-ft. level this same oreshoot has just been cut; the ore is as rich as that below. On the 300-ft. level the crosscut is in good looking quartz. A 50-h.p. electric hoist will be installed.

Atlanta—Milwaukee men have taken a lease on the Union Jack claim of the Atlanta group. The shaft which is 280 ft. will be sunk to a depth of 700 ft. before doing any lateral work. The lease has 2½ years to run.

Esmeralda County—Rawhide

A fire on Sept. 4 completely destroyed eight blocks in the business portion of Rawhide, causing a loss of between $500,000 and $750,000. Two lives were lost. All the hotels, restaurants and supply houses were burned. A relief train was run from Goldfield and Tonopah, consisting of two refrigerator cars, filled with food, and several flat cars loaded with automobiles, which were used to rush the provisions from Mina to Rawhide. Very little mining property was injured. As soon as the ashes were cool rebuilding was begun.

Nye County—Tonopah

The production for the week amounted to 6040 tons of ore, worth $160,800, distributed as follows: Tonopah Mining Company, 3450 tons; Belmont, 750; Montana-Tonopah, 1000; Midway, 100; MacNamara, 250; West End, 165; Jim Butler, 200; Tonopah Extension, 130 tons.

Tonopah Mining Company—The main three-compartment shaft is now 1180 ft. deep. Little progress was made with the drill hole in the Red Plume shaft. The bottom of the hole is now 267 ft. below the 500-ft. level. In the extreme westerly workings on the third or 340-ft. level of the Silver Top mine the new developments are very encouraging; the face of the drift now shows 4 ft. of good milling ore. A new orebody is being opened up on the 300-ft. level of the Mizpah. Recently in cutting out stopes from the west drift along the Mizpah fault a body of milling ore was found, which has been opened up for over 50 ft. This ore is 5 ft. wide. The vein is strong and well defined, and indications point to its developing into a big body. Some development work is also being done in the 500- and 800-ft. levels.

Montana-Tonopah—On the 390-ft. level the west drift on the south vein, which is now 121 ft. long, shows good milling ore in the roof, but the orebody has been faulted at this point. A winze on this vein 60 ft. from the face is 10 ft. deep, and shows 2 ft. of low-grade milling ore. A raise on this vein at another point shows 3 ft. of the same ore.

Belmont—The orebody at this mine seems to be the largest in the camp. The winze on this big vein from the 1000-ft. level is now down 87 ft. and is still all in ore, although the winze is 7 ft. wide by 20 ft. long. This orebody has been proved to be over 20 ft. wide for more than 200 ft. along the drift and for nearly 200 ft. above the 1000-ft. level.

Tonopah Extension—Only prospecting is being done on the 400- and the 770-ft. levels. The faces of both the north and the south crosscuts from the west drift on the 400-ft. level, 1000 ft. west of the shaft, are now in a promising porphyry, carrying occasional quartz stringers.

West End—The raise from the 400-ft. level, 17 ft. west of the shaft, has connected with the stope started 35 ft. above the bottom of the shaft; this raise is in good ore. The stope extends upward from this connection 16 ft., so this orebody is over 50 ft. high, with no indications of either the top or bottom in sight. Stoping continues on the vein developed on the 150-ft. level near the MacNamara line; the ore is 7 ft. wide.

MacNamara—Work is still confined to a portion of the workings on the 200-, 275- and 300-ft. levels, as the new drills have not been started as yet. Shipments during the past week were smaller than usual, as the boilers and engine were being overhauled; three cars of ore were sent to the smelter, and two cars to the mills, a total of 250 tons.

Jim Butler—Work is still confined to the levels worked from the Stone Cabin shaft. The Stone Cabin shaft was sunk 12 ft. during the week, and is now 640 ft. deep.

Oklahoma

Petroleum production in August is reported at 3,729,651 bbl. Shipments and deliveries were 3,330,609 bbl.; estimated stock at the end of the month, 52,509,931 bbl. There were 287 new wells completed during the month, of which 262 were oil producers, four gas producers and 21 dry. There were 190 new wells drilling on Aug. 31. The average production of the new wells was 99 bbl. per day.

Pennsylvania

Anthracite Coal

Warrior Run—Violation of the mine laws in three particulars were pointed out at the coroner's investigation of the slope disaster which occurred Aug. 28. The alleged violations of the mine laws were: (1), not having safety blocks at the head of the slope; (2), failure to place a headman at the top of the slope from the time men descend into the mine until all are out; (3), in hoisting more than 10 men at a time without being so requested by at least 30 of the employees of the colliery and receiving written permission from the mine inspector of the district.

Bituminous Coal

Monongahela River Consolidated—This company reports for the nine months of its fiscal year from Nov. 1 to July 31, earnings above operating expenses, $1,692,345, a decrease of $58,869. Taxes, interest, depreciation and sinking fund on coal mined amounted to $1,091,569, leaving a surplus of $600,776, a decrease of $78,358 from last year.

Coke

Fort Palmer Coal and Coke Company—The contractors have completed work on the plant of by-product coke ovens near Ligonier. There are 180 longitudinal ovens in two batteries.

McClelland-Echard Coke Company—This company, which owns the Blosser tract of coking coal near Marion, has now 24 ovens completed and 46 more under construction. The name of the company is to be changed to the Fayette-Connellsville Coke Company.

Philippine Islands

Batan Island

The government coal mine on Batan is being opened, and it is expected that shipments of 2500 tons a month can be made, beginning with October.

BENGUET

Gold production in June is reported by the following companies: Benguet Consolidated, [illegible] oz. gold and 70 lb. cyanide bullion; Bua, 133 oz. gold and 25 lb. cyanide bullion; Paracale Dredge, [illegible] oz. gold.

Headwaters Mining Company—This company has been organized to open and operate a gold mine at Antamok, in Benguet. It has bought 12 claims, on which prospecting has shown several promising veins. F. H. Higham, of Manila, is secretary.

CEBU

Insular Coal Company—This company is pushing work on its coal mine at Camansi. It has obtained a franchise to build a railroad 12 km. long, from its mines to the port of Danao.

South Dakota

CUSTER COUNTY

Kuterta—The new 30-ton [illegible] plant will shortly be in operation, and it will treat ore in connection with the 10-stamp mill. It will be in charge of C. A. [illegible]

LAWRENCE COUNTY

Golden Placer Company—At the annual meeting the following officers were chosen: F. A. Curtiss, Deadwood, president; A. S. Curtiss, Newark, N. J., vice-president; G. L. Reichhelm, Jersey City, N. J., secretary. The mine will be further developed and the capacity of the treatment plant raised to 75 tons per day.

Globe—President Morse is here to make arrangements for resuming work in the mill and mine. Some slight changes will be required in the 200-ton electrochemical plant, but the mine is already well developed.

Homestake South Extension—Ore has been encountered on the 200-ft. level in a drift. The body proves to be an orebody of some consequence and is being developed.

PENNINGTON COUNTY

Bilkan—Construction of the five-stamp plant near Rochford has commenced. It is hoped to have it in operation within a few weeks. The property is owned by some Chicago men.

Burlington—New directors have been chosen; Joseph Sharpe, of Hill City, and F. W. Wiltse, of Des Moines, Iowa, succeeded the late J. B. Taylor and C. Miller. Raymond Taylor will have charge of the property. The 170-ft. shaft will be sunk deeper.

Rochford Mining Company—The Standby mill is now running and treating about 75 tons of ore per day. This is the first run of the mill in several years. It has been thoroughly renovated and remodeled.

Wyoming

As a result of a general strike of all of the coal miners in the State, all the mines were closed down Sept. 1. So far there has been no disorder in any of the camps, and it is believed that the operators and the miners will soon reach a friendly settlement.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Sept. 5 were as follows: Coniagas, 64,700 lb.; Chambers-Ferland, 61,650; Drummond, 302,490; Kerr Lake, 82,200; La Rose, 255,700; Nipissing, 187,910; Nova Scotia, 40,500; O'Brien, 189,000; Trethewey, 120,310; total, 1,304,460 pounds.

Crown Reserve—A vein 4 in. wide rich in native silver has been struck in a crosscut 50 ft. from the main shaft. It is 20 ft. farther in the crosscut than the main vein to which it runs parallel.

Nipissing—Rich ore was encountered recently in No. 25 vein, which, at 60 ft. in depth, is 5 in. wide and is heavily shot with silver.

Right of Way—A vein 2 in. wide has been encountered 9 ft. from the shaft, from which slabs of silver have been taken. At 14 ft. another narrow vein was struck which showed native silver.

Trout Lake Smeltery—This smeltery, near North Bay, constructed at a cost of $500,000, for the treatment of Cobalt ore has been acquired by a Detroit syndicate and is now ready for operation.

ONTARIO—LARDER LAKE DISTRICT

Tourenic Mining Company—The report presented at the annual meeting held Sept. 3 showed that $6000 had been expended on development work. Two shafts are being sunk, one of which is down 60 ft. Assays at various levels show $8 to $22 in gold per ton.

ONTARIO—STURGEON LAKE DISTRICT

Frost Location—J. W. Frost, who represents a syndicate of British Columbia capitalists having iron claims north of Sturgeon lake, reports that $5000 has been expended on development work, uncovering specular hematite extending for five miles; the deposit has a depth of 25 ft. It is within 15 miles of the route of the Grand Trunk Pacific and on the completion of the road a spur will be built to the mine.

Mexico

CHIHUAHUA

[illegible] the Parral camp for the week ending Aug. 29 was approximately 8500 tons, of which [illegible] reduction plants.

[illegible] company lately suspended mining and milling operations at its Santa Marguerita properties in the Ocampo district. It is announced that work will be resumed not later than Jan. 1 under new management. The president of the company, W. C. Barnett, of Birmingham, Ala., was a visitor at the property during August.

[illegible] the affairs of this company, which owns the Quebradillas and other mines in the Parral section, is under way, and it is announced that operations will be resumed shortly.

Bravos District—Among the present active properties in this lead-silver section in the northern part of the state, reached from Moctezuma on the Mexican Central, are the following: El Rosario, Buena Vista, Quo Vadis, Detroit, Houston, Independencea and Fortuna. The first two are under the management of D. C. Sutton.

Florencia—This Santa Eulalia property, operated by S. G. Burn and R. J. de Morambert, was lately sold for a large consideration to E. M. Campbell and Indianapolis associates. Transfer has already been made and J. C. Shepherd is the superintendent in charge for the new owners. The property was held by the sellers under a working bond from Governor Creel.

GUANAJUATO

Production—Shipments of bullion from the various properties during the week ending Sept. 7 amounted to $180,000. The value of the concentrates was $100,000

Peregrina—This company, controlled by the Securities Corporation, Ltd., on Sept. 1 paid its regular semi-annual dividend of 3½ per cent. to its preferred stockholders.

OAXACA

Oaxaca Smelter—It is reported that the company has organized its force of employees, has signed a favorable contract for the low-grade ores of the Teziutlan property near Ocotlan and will soon begin operations

[illegible] properties have been examined by engineers in the interest of the El Oro Mining and Railroad Company

[illegible] the capacity of the mill at Sierra Juarez to 150 tons per day by the addition of tube mills. A cyanide annex with Pachuca tanks and filters is being installed

[illegible] Mines Prospects Development Company, which owns this property at Sierra Juarez, has started the 10-stamp mill and will install Pachuca tanks and Moore filters this fall

[illegible] between the Natividad and the Manchega, has been taken by the Mexican Mines Prospects Development Company.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 16—The coal trade in the West shows some further signs of improvement, but the advance is still slow. Steam coal is selling better at some points, but consumers seem to be very slow about putting in winter stocks.

Through all the western districts of Pennsylvania the mines have had much trouble on account of scarcity of water, resulting from the dry summer. At some mines it has been necessary to haul water in cars to supply the boilers, and almost everywhere there has been more or less trouble.

This scarcity of water extends to the anthracite region, and has interfered with operations of mines and washeries. The anthracite trade generally is quiet. Consumers seem slow to put in stocks, and there has been no cool weather yet to stir them up.

Bituminous coal trade in the East is dull, with light demand for steam coal. The call for the Coastwise trade is less than for several years at this season.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Sept. 5, in short tons:

	1907.	1908.	Changes.
Anthracite.....	3,843,354	3,435,533	D. 407,821
Bituminous..	26,289,864	22,063,146	D. 4,226,718
Coke............	9,595,475	4,613,678	D. 4,981,797
Total..........	39,728,693	30,112,357	D. 9,616,336

Total decrease this year to date was 24.2 per cent.

The weekly reports compiled by the Connellsville *Courier* show that the production of coke in the Connellsville regions for the eight months ended Aug. 31 was, approximately, 14,040,800 tons in 1907, and 5,931,300 tons in 1908; a decrease of 8,109,500 tons, or 57.8 per cent.

Coal passing through Sault Ste. Marie canals, season to Sept. 1, short tons:

	1907.	1908.	Changes.
Anthracite	877,154	901,335	I. 24,181
Bituminous...	6,328,953	4,995,541	D. 1,333,412
Total.........	7,206,107	5,896,876	D. 1,309,231

The August report shows a total of 2,027,425 tons, or 80,149 tons less than July.

New York

Anthracite

Sept. 16—The anthracite trade shows a slight improvement in a few places, but not enough to affect the trade in general. The Lake business is light, and most of the consumers seem to have sufficient stocks to meet their requirements.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Steam-size prices are unchanged: Pea, $3.25@3.50; buckwheat, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The situation in the soft-coal trade is discouraging, and practically no new business is being done at any of the consuming points along the Atlantic seaboard. Shoal-water ports seem to be indifferent regarding their winter stocks, which are usually being taken on at this time. It is doubtful if the consumers in the far East have sufficient stocks, and producers are at a loss to understand why orders are not forthcoming.

New York harbor trade is very dull and ordinary grades of coal are selling at $2.40@2.45, with better grades offered at $2.50@2.60. All-rail trade lacks interest. Cars are in good supply, and transportation from mines to tide is up to requirements.

In the Coastwise trade small vessels seem to be scarce in New York harbor, probably because they are bunched in the East. Rates for large vessels from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Portsmouth and Bath, 60c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@$1; Providence, New Bedford and the Sound, 45@50c. per ton.

Birmingham

Sept. 14—The coal miners of Alabama who were on strike for two months, are returning slowly to work again and the production in this State is improving. It will be several weeks before the output will be up to the figures desired. At some mines it was necessary to pump out water and make necessary repairs before operations could be begun. The coke ovens are being started up on all sides. The importation of coal and coke has been stopped.

Chicago

Sept. 15—The coal market continues firm, but does not strengthen noticeably. It is still too warm for domestic trade to increase and steam trade awaits a general revival of business. In Western coals the most important feature is the weakening of fine coals and the strengthening of lump and egg. Anthracite has a slight movement in city trade and scarcely any in the country.

Fairly good sales are made of lump and egg from Illinois and Indiana mines at $1.75@2.45; run-of-mine brings $1.55@1.75 and screenings, $1.25@1.45, for carlots.

Eastern coals are uneven, smokeless being plentiful as to run-of-mine and scarce as to lump, the former bringing $3.30@3.45 and the latter $4.05@4.30. Hocking is fairly firm at $3.15, and Youghiogheny moves mostly on contracts at $2.90@3.10 for ¾-in. lump. List prices on smokeless and Hocking are cut less than a few weeks ago.

Indianapolis

Sept. 15—The coal-mining industry in Indiana continues to show life and increasing activity. That the production of the mines is steadily increasing is proved by the loaded cars that fill the switches and side tracks of the coal-carrying railroads. The sale of coal is not up to expectation, but the billing out of loaded cars reflects the gradual recovery of the industry. The demand for coal from the Northwest is slow and the natural tendency this year in that section is to hold back as long as possible. The Indiana mines are in excellent condition. Labor troubles are about all settled; the differences remaining are chiefly among the officials of the local and national unions.

Pittsburg

Sept. 15—The railroad mines in the Pittsburg district are being operated this week at about 85 per cent. of capacity. A few river mines are running, but all must close in a few days unless more empty barges are received from lower ports. The drought is interfering to a certain extent in the operation of the coal mines. Prices remain $1.15 at mine, but some small producers are said to be shading by about 10c. Slack shows an improvement and the lowest price is 50c. this week.

Connellsville Coke—Production has fallen off, owing to the enforced closing of a number of ovens due to the drought. Prices for prompt shipment show some improvement. Furnace coke is $1.65@1.85 and foundry $2.10@2.25, both prompt and on contract. The *Courier* gives the production in both fields at 192,212 tons. The shipments were 7638 cars, as follows: To Pittsburg, 2983; west of Pittsburg, 4273; east of Connellsville, 382 cars.

Iron Trade Review

New York, Sept. 16—The general conditions of the iron and steel trade do not show much change. A conference of the officers of the United States Steel Corporation was held in New York this week. It was private, but President Corey announced that the reports made showed a gradual improvement.

Pig-iron sales have been fair, but the attempt to put up prices seems to have been abandoned. Southern iron is fairly well sold up for fourth quarter deliveries, and makers are asking $13 and $13.50 Birmingham for No. 2 foundry.

In finished material some contracts for cars are reported. Railroad business, as a rule, does not come forward freely. Few orders for standard rails are reported. For light-rail orders there is a good deal of competition, and some have been placed at $25, or $3 below the price of standard sections. The difference is usually the other way.

There are reports of lower prices for structural material. Contracts are being held back, probably on account of some expectation of this kind.

Pig Iron Production—The reports from the blast furnaces show that on Sept. 1 there were 179 coke and anthracite furnaces in blast, having a total weekly capacity of 313,100 tons; an increase of 28,500 tons over Aug. 1. This is the largest weekly capacity reported since Dec. 1, 1907, but is 194,700 tons less than on Sept. 1, 1907. Taking the official report for the first half of the year, the *Iron Age* estimate for July and August, and making allowance for the charcoal furnaces, the production of pig iron in the United States was, approximately, for August, 1,363,000 tons; for the eight months ended Aug. 31 it was 9,510,000 tons.

Birmingham

Sept. 14—Alabama pig iron manufacturers are in a better mood as the iron market continues to improve, the inquiry for iron for next year's delivery becomes more pronounced and the quotations stronger. There are some small-lot sales for immediate delivery while a steady buying for delivery toward the latter part of the year is noted. Practically all the manufacturers in this territory are asking $13 per ton, for No. 2 foundry, as the present price and car-lot sales have been made recently at $13.50. Some sales have been made for delivery during the first quarter of 1909 at $14 per ton, No. 2 foundry. The Sloss-Sheffield company has one furnace under repair and the Tennessee company has three at Ensley and Bessemer nearing completion and one in Oxmoor. There is not much iron in the yards in this district. The Republic company is making iron at No. 3 furnace at Thomas, but No. 1 will have to be blown out for repairs.

Chicago

Sept. 15—General conditions in the iron business are improving. The sale of pig iron is variable from day to day, but the general average is greater than in previous weeks. Northern local furnaces hold well to $17 and in some cases get 25@50c. more, while a few sales are made 25@50c. less. Southern iron holds well to $13 Birmingham ($17.35 Chicago) as a minimum, but shades this figure occasionally to compete with Valley iron, which has sold at $16.50. The average lot sold is still small, but the demand for such lots is steady. Contracts are being made to an increasing extent.

Sales of iron and steel are better; railroad supplies, structural steel and bars all show progress. Coke is firm with sales reported better, at $4.00 for first-class Connellsville.

Cleveland

Sept. 14—Shipments of iron ore from the Lake Superior region for the season to Sept. 1 were as follows, by ports, in [illegible]:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Marquette....	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The August shipments were the largest [illegible].

Philadelphia

[illegible] improve. Between new orders and the ordering of delivery of iron on old contracts, there is a steady depletion of stocks. Southern irons have ceased to be a disturbing factor. New England and eastern Pennsylvania buyers are taking larger lots for this year's delivery. Orders for next year are few, partly because of a difference of views on prices. Buyers generally do not take seriously the talk concerning advancing prices in the face of so much idle capacity. Delivery quotations are $16.50@17 for No. 2; $16 [illegible].

[illegible] placed this week.

Bars—[illegible] better at local stores, but large mill orders are exceptional.

Sheets—All mills in Pennsylvania are getting more business, but not enough to impart visible vitality.

Merchant Steel—More business is being done along several lines of merchant steel, but purchases are strictly from hand to mouth.

Plates—Rather low prices were named this week on a few inquiries for early delivery. Boiler plate is about the only [illegible].

[illegible] business presented which goes to show that after all shapes have not reached bottom prices. Inquiries are in the market for about 40,000 tons in all for early winter delivery. Local plants are now on full time again.

Scrap—Heavy melting scrap is in active demand and is bringing a fair price. Railroad scrap is dull.

Pittsburg

Sept. 16—While conditions in the iron and steel trade continue dull there is increasing evidence of an improvement in the near future. During the past few days jobbers in the various finished lines have been making inquiries as to prices and terms, with a view to replenishing their stocks; their warehouses are now practically bare. Another basis for a brighter outlook for next month is the assurance that the railroads will come into the market for their requirements for the rest of the year and also for 1909.

A meeting of the general committee of iron and steel men named by Chairman E. H. Gary, of the Steel Corporation last fall, it is reported here, is to be held in New York during the coming week, when the situation will be reviewed and the question of prices discussed. It is hinted that a temporary reduction in prices will be decided upon to bring the jobbers and other large buyers into the market. According to estimates made here this week mill operations are around 60 per cent. of capacity.

Pig Iron—The iron market does not show any material improvement, but stocks are lower than at any time this year. There are no stocks of foundry iron and at the opening of the week less than 60,000 tons of bessemer and basic iron are in stock at Valley furnaces. The bessemer average for August was $15.21, Valley, compared with $15.93 in July. This indicates that $15 at furnace can easily be done on prompt shipments. Malleable bessemer shows an improvement and is quoted this week at $14.75. Basic is down to $14.50. A number of sales of No. 2 foundry have been made during the past few days in lots of carloads to 200 tons, some at $14.50 up to $15. Gray forge is nominal at $13.50. These quotations are at Valley furnaces. The Massillon Iron and Steel Company is in the market for 4500 tons of Nos. 2, 3 and 4 foundry, October delivery.

Steel—Billets remain firm at $25, Pittsburg. Plates are strong at 1.60c. and merchant-steel bars at 1.40c.

Sheets—Some fairly large transactions are recorded this week. More mills are in operation. Black sheets continue at [illegible] gage.

[illegible] prompt shipment, $45, Pittsburg; for fu- [illegible]

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 16.

At all U. S. Ports in July and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1908..	$ 4,845,272	$ 2,916,408	Exp. $ 1,928,864
" 1907..	7,478,366	3,410,782	" 4,067,584
Year 1908..	58,363,247	29,324,304	" 29,038,943
" 1907..	43,779,098	24,879,429	" 18,899,669
Silver:			
July 1908..	4,930,746	2,982,074	Exp. 1,948,672
" 1907..	5,955,042	3,387,225	" 2,567,817
Year 1908..	30,445,291	24,123,422	" 6,321,869
" 1907..	35,174,251	25,782,836	" 9,391,415

Exports of specie from New York week ended Sept. 12: Gold, none; silver, $731,724, to London. Imports: Gold, $115,391; silver, $58,009, from South America and Mexico.

Specie holdings of the leading banks of the world, Sept. 12, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$326,511,600
England........	$190,766,840	....	190,766,840
France..........	644,041,435	$180,114,575	824,156,010
Germany.......	194,230,000	79,790,000	274,020,000
Spain...........	78,540,000	171,145,000	249,685,000
Netherlands....	38,530,000	20,300,500	58,830,500
Belgium........	20,633,335	10,316,665	30,950,000
Italy............	185,590,000	22,500,000	208,090,000
Russia..........	581,895,000	39,535,000	621,430,000
Aust.-Hungary.	239,205,000	65,745,000	304,950,000
Sweden.........	20,405,000	....	20,405,000
Norway.........	8,655,000	....	8,655,000
Switzerland....	22,780,000	....	22,780,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in France, seven months ended July 31:

	Imports.	Exports.	Excess.
Gold....	Fr.581,787,000	F.16,193,000	Imp. Fr.565,594,000
1907...	284,205,000	80,157,000	Imp. 204,048,000
Silver..	90,761,000	103,978,000	Exp. 13,217,000
1907...	99,996,000	102,503,000	Exp. 2,507,000

Imports of nickel and copper coins, 55,000 fr. in 1907, and 35,000 fr. in 1908; exports, 211,000 fr. in 1907, and 560,000 fr. this year.

Silver Market

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.	Sept.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.
10	4.8645	51⅝	23 15/16	14	4.8650	51⅝	23 15/16
11	4.8660	51⅞	23 15/16	15	4.8655	52⅛	24 1/16
12	4.8660	51⅞	23 15/16	16	4.8675	52⅛	24 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Sept. 3:

	1907.	1908.	Changes.
India.......	£8,111,834	£6,448,433	D. £1,663,401
China.......	......	516,400	I. 516,400
Straits......	598,700	90,510	D. 508,190
Total......	£8,710,534	£7,055,343	D. £1,655,191

Receipts for the week £166,000 from New York. Exports £1100 to Egypt and £141,700 to India; £142,800 in all.

Indian bazaar buying has carried the price of silver up to 24 1/16d. in London. If a good demand for spot silver should set in a sharp advance might take place, owing to the heavy short future interest, the market being heavily sold forward; but what will actually result is problematical.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Copper: London, £ per ton.	Tin: Cts. per lb.	Lead: Cts. per lb.	Spelter: New York, Cts. per lb.	Spelter: St. Louis, Cts. per lb.
10	13⅝ @13⅞	13⅜ @13⅝	60⅞	28⅛	4.52½ @4.57½	4.77½ @4.82½	4.62½ @4.67½
11	13⅝ @13⅞	13⅜ @13⅝	60⅞	28⅜	4.52½ @4.57½	4.77½ @4.82½	4.62½ @4.67½
12	13½ @13¾	13⅜ @13½	....	28⅜	4.50 @4.55	4.77½ @4.82½	4.62½ @4.67½
14	13½ @13¾	13⅜ @13½	60⅞	28½	4.50 @4.55	4.77½ @4.82½	4.62½ @4.67½
15	13½ @13¾	13⅜ @13½	61	28¾	4.47½ @4.52½	4.77½ @4.82½	4.62½ @4.67½
16	13½ @13¾	13⅜ @13½	60⅜	28¾	4.47½ @4.52	4.77½ @4.82½	4.62½ @4.67½

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Consumers appear to have satisfied their requirements for some time to come, wherefore the market has been dull and nominal since Sept. 9, but with a softer tone. Nothing but small business has been done. First hands, who sold freely during the recent past, are not ostensibly pressing copper for sale. Some of them are indeed holding aloof, but others appear to be willing to make concessions without openly breaking the market. Owing to the absence of any demand of consequence, it is difficult to gage the attitude of these sellers. Second-hand lots have been freely offered at concessions. The market closes easy at 13½@13¾c. for Lake copper; 13⅜@13½c. for electrolytic in ingots, cakes and wirebars. The average price at which business in casting copper has been done during the week is 13⅛@13¼ cents.

The increase in the statistics of 3250 tons has been foreshadowed in the London standard market for some days, and the close is lower at £60 7s. 6d. for spot, £61 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63@64; best selected, £63@64; strong sheets, £75@76.

German consumption of foreign copper, seven months ended July 31, reported by L. Vogelstein & Co.: Imports, 94,501 tons; exports, 4754; apparent consumption, 89,747 tons, an increase of 20,984 tons. Of the imports given 87,373 tons were from the United States.

Exports of copper from New York and Philadelphia for the week were 2113 long tons. Exports from Baltimore, as reported by our special correspondent, were 496 tons.

Manufactured Copper—Sheets, cold-rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 15¼c. base, carload lots at mill.

Tin—The local market followed with great hesitation the improvement shown in London early in the week, and as a matter of fact prices ruling here were right along below parity. It is not surprising, therefore, that owing to lack of support from here, London prices should show a weaker tendency at the close, the quotations being £130 15s. for spot, £132 for three months, while business is being done here at around 28¾ cents.

Lead—Fair-sized quantities of lead are being offered from St. Louis and by local speculators, and as there is no active demand, sales have been effected at steadily declining prices. The close is weak at 4.47½@4.52½c. New York.

The market in London has steadied and is holding its own fairly well, closing at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—Business in this metal has been of fair proportions. Prices have not only held, but have advanced somewhat further, the close being steady at 4.62½@4.67½c. St. Louis, 4.77½@4.82½c. New York.

Abroad the market has also shown a tendency to advance, and the close is quoted £19 10s. per ton for good ordinaries, £19 15s. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market, both in New York and abroad, is dull and uninteresting. Quotations are 8⅛@8⅜c. for Cookson's; 7⅞@8c. for Hallett's; 7⅝@7⅞c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $43 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $42.50 for domestic orders, and $41 for export. London price is £8 2s. 6d. per flask, with £8 quoted from second hands.

Platinum—Quotations by the principal dealers are: $22.50 for hard platinum, $20 for ordinary and $16 for scrap. However, offers of the metal continue to be made at $17.50@19 per ounce.

Imports and Exports of Metals

Exports and imports of metals in the United States for the seven months ended July 31 are reported as follows, in the measures usual in the trade:

	Exports.	Imports.	Excess.	
Copper, long tons	191,868	43,370	Exp.	148,498
Copper, 1907....	98,350	76,645	Exp.	21,705
Tin, long tons. ..	138	20,359	Imp.	20,221
Tin, 1907........	333	25,075	Imp.	24,742
Lead, short tons.	41,636	61,591	Imp.	19,955
Lead, 1907......	26,061	42,861	Imp.	16,800
Spelter, sh. tons.	1,991	261	Exp.	1,730
Spelter, 1907....	383	522	Imp.	139
Antimony, lb......	....	4,648,253	Imp.	4,648,253
Antimony, 1907.	....	5,141,911	Imp.	5,141,911
Platinum, oz.....	... .	18,276	Imp.	18,276
Platinum, 1907.	....	41,988	Imp.	41,988
Quicksilver, lb...	105,674	.....	Exp.	105,674
Quicksilver, '07	310,936	... ...	Exp.	310,936
Aluminum, value	$219,345	..	Exp.	$219,345
Aluminum, 1907	208,534	....	Exp.	208,534

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include re-exports of foreign material. Zinc dross exported, 14,950,325 lb. in 1907, and 12,629,976 lb. in 1908. Zinc ore exported, 11,121 tons in 1907, and 16,728 tons in 1908. Zinc ores imported, 15,940 tons calamine and 10,440 tons other ores, 26,380 tons in all; not reported last year. Antimony ore imported, 1,882,783 lb. in 1907, and 709,769 lb. this year.

Wisconsin Ore Market

Platteville, Wis., Sept. 12—The base price paid for zinc ore this week was $36@37 per ton of 60 per cent. zinc. For 80 per cent. lead ore $58@60 per ton was paid.

Shipments from the district, week ended Sept. 12:

Camps.	Zinc ore lb.	Lead ore lb.	Sulphur ore lb.
Benton...........	646,300	65,610	
Highland....	375,070		
Platteville....	279,650		
Cuba City.... .. .	348,160	139,960	
Hazel Green...... ..	243,300		
Galena.......	149,900		
Linden...	113,110		
Livingston.... ...	110,000		
Days Siding.......	88,000		
Harker....... ...	49,820	49,820	
Mineral Point..	24,000		
Total......	2,427,310	255,390	
Year to Sept. 12...	67,391,801	7,811,345	1,318,204

Shipments of zinc ore are 250 tons per week greater than a month ago. The shipment from the mines this week was over 3,000,000 lb., of which 887,330 lb. of concentrates went to the Joplin Separator Works, at Galena, to be roasted, besides 88,000 lb. to the Enterprise roaster at Platteville. Ore thus sent to the separating plants at Galena and Platteville is not credited to the district's total until re-shipped from these plants in finished form.

Missouri Ore Market

Joplin, Mo., Sept. 12—The market opened the week with $37 base warily offered, and considerable ore was picked up at this price, the market taking a sudden upward spurt Thursday to a $37.50 and $38 base, and Friday reached a $38.50 base price, with offers at $38 base declined by a number of producers. The highest price was $40 for 63 per cent. ore sold on a $37 base offering. Silicate, on the other hand, was weaker, and, while a base of $22.50 was rumored, the only known base was $20 per ton of 40 per cent. zinc, with the high price at $26.50. The average price, all grades, was $33.92. The lead market opened the week at $58, declining to $57 at the week end, with medium grades selling at $55@56, and all grades averaging $57.90 per ton. Several hundred tons of zinc ore were withdrawn from the market after it became apparent there was increased activity among the purchasing agents.

Shipments from the varous camps, week ended Sept. 12:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin.............	[illegible]	252,170	46,041
Galena	[illegible]	96,970	[illegible]
Miami.............	[illegible]	151,710	14,448
[illegible]	[illegible]	[illegible]	[illegible]
Badger	[illegible]		[illegible]
[illegible]	[illegible]	70,090	9,249
Alba-Neck	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	8,750
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	6,290	[illegible]
Aurora	[illegible]	13,760	[illegible]
Zincite	144,170	[illegible]	[illegible]
[illegible]	[illegible]	1,700	[illegible]
[illegible]	[illegible]	20,880	[illegible]
[illegible]	[illegible]		1,370
Carl Junction.	[illegible]	6,400	1,321
[illegible]	[illegible]		1,217
[illegible]	[illegible]		345
Totals	[illegible]	[illegible]	[illegible]
37 weeks	[illegible]	[illegible]	[illegible]

Zinc value, the week, [illegible]; 37 weeks, [illegible]
Lead value, the week, [illegible]; 37 weeks, [illegible]

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

	Zinc Ore.				Lead Ore.	
Month.	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February....	[illegible]	[illegible]	[illegible]	[illegible]	84.58	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April........	49.25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May.........	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	46.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	44.56	[illegible]	[illegible]	[illegible]	59.54	[illegible]
September	[illegible]		40.11		[illegible]	
October	[illegible]	......	39.83		51.40	
November	38.60		[illegible]		43.40	
December	31.50		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

Note—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ore sold.

Chemicals

[illegible] Sept. 16—In [illegible] branches of the chemical trade there is some activity, but in general the volume of business is small and irregular.

[illegible] and it is believed that prices tend to advance. Quotations are $4.65 per 100 lb. for railroads and up to $4.90 for smaller lots.

Exports of copper sulphate from the United States, seven months ended July 31 were 6,048,420 lb. in 1907, and 6,818,325 lb. in 1908; an increase of 769,905 lb. this year.

Nitrate of Soda—The market continues weak. Quotations for 95-per cent. grade, 2.20c.; 96 per cent., 5c. per 100 lb. higher.

Sulphur—Imports of sulphur into the United States, seven months ended July 31, long tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of sulphur for the seven months, 8989 tons in 1907, and 13,543 tons in 1908; increase, 4554 tons.

It is reported from Sicily that the Consorzio Obbligatorio has decided to suspend sulphur mining for three months, in order to work off part of the accumulated stocks.

Phosphates—Exports of phosphates from the United States, seven months ended July 31, long tons:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The chief exports this year were to Germany, Great Britain, France and Italy.

Exports of phosphate rock through the port of Savannah in August, reported by J. M. Lang & Co.: Great Britain, 8810; Germany, 2170; total, 10,980 long tons.

Heavy Chemicals—Imports of heavy chemicals into the United States, seven months ended July 31, in pounds:

	1907.	1908.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of acetate of lime for the seven months, 52,224,044 lb. in 1907, and 37,550,534 lb. in 1908; a decrease of 14,673,510 lb. this year.

Mining Stocks

[illegible] change this week has shown strength, but the movements still bear evidence of a professional rather than a general market.

On the Curb mining stocks were irregular, with small price changes, but some improvement on the whole. The copper shares were most in demand, with Nevada Consolidated and Cumberland-Ely the leaders. Cobalt stocks were dealt in to a considerable extent. The Nevada gold shares are not especially active.

Boston

Sept. 15—The mining-share market con- [illegible] off from a week ago, with few exceptions. Another mining dividend is announced, Utah Consolidated, and the rate is the same as the last payment, 50c. quarterly. Arizona Commercial has maintained a strong front. Declining $1 to $26.62½, it rose to $29.50 today. The bonds continue to hold well above $120.

Amalgamated is off $3.37½ net for the week to $76.37½. Butte Coalition has fallen $1.50 to $25, Calumet & Arizona, $4.50 to $118; Copper Range, $2.50 to $76.50; Isle Royale, $1.50 to $22.50; Miami, $1.50 to $10.25; North Butte, $3.50 to $83, ex-dividend. The 528,000 shares of Utah Apex were taken from the Curb Sept. 10, and put on the unlisted department of the Exchange. The price, in the meantime, has advanced from $4.37½ to $4.87½. There has been quite a change in the directorate of this company, which is composed mainly of New England men with Charles A. Morse, of New York, besides a London member.

Calumet & Hecla and Osceola were strong features today. The former rose $10 to $650 on very limited trading, and the latter rose $3 to $113.

The Boston & Corbin Company may soon release 10,000 of the 20,000 shares of treasury stock around $20 per share. The company has about $25,000 in the treasury. La Rose has been the Curb feature, selling up to $6.50 on active trading. Davis-Daly is off to $2. A change has been made in the directors, J. C. Montgomery succeeding George W. Davis, to whom there was opposition.

STOCK QUOTATIONS

NEW YORK Sept. 15

Name of Comp.	Clg.
Alaska Mine	$\frac{3}{16}$
Amalgamated	76⅜
Anaconda	46
Balaklala	‡2$\frac{1}{16}$
British Col. Cop.	7
Butte & London	....
Butte Coalition	25
Colonial Silver	½
Cum. Ely Mining	8
Davis Daly	2
Dominion Cop	1½
Douglas Copper	3½
El Rayo	3¼
Florence	4
Foster Cobalt	.65
Furnace Creek	.18
Giroux	4¼
Gold Hill	⅜
Goldfield Con.	6⅛
Granby	101
Greene Gold	¾
Greene G. & S	½
Greenw'r & D. Val.	‡.75
Guanajuato	2⅛
Guggen. Exp.	165
Hanapah	‡.20
McKinley Dar.	1
Micmac	2½
Mines Co. of Am.	1$\frac{7}{16}$
Mitchell Mining	‡¼
Mont. Sho. C	1
Nev. Utah M. & S	3$\frac{1}{16}$
Newhouse M. & S	5⅞
Nipissing Mines	8¾
Old Hundred	½
Silver Queen	1.18
Stewart	¾
Tennessee Cop'r.	38
Tri Bullion	1¼
Union Copper	
Utah Apex	4½
Utah Copper	43
Yukon Gold	4$\frac{1}{16}$

BOSTON Sept. 15

Name of Comp.	Clg.
Adventure	8
Allouez	35
Am. Zinc	24⅞
Arcadian	3¾
Arizona Com	29
Atlantic	15⅝
Bingham	.50
Boston Con	12½
Calumet & Ariz.	117
Calumet & Hecla	650
Centennial	31½
Con. Mercur	.40
Copper Range	76½
Daly West	9
Franklin	13
Greene Can	11
Isle Royal	22½
La Salle	13¾
Mass	6¾
Michigan	13¾
Mohawk	65
Nevada	15¾
North Butte*	83
Old Colony	.60
Old Dominion	41¾
Osceola	111
Parrot	27
Quincy	94
Rhode Island	4¼
Santa Fe	1¾
Shannon	15
Superior	23¾
Tamarack	75
Trinity	17¾
United Cop., com.	10⅛
U. S. Oil	†25½
U. S. Smg. & Ref.	41½
U.S.Sm. & Re., pd.	45¾
Utah Con	45½
Victoria	5
Winona	6½
Wolverine	149
Wyandotte	2½

*Ex Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	28
Am. Smelt. & Ref.	90¾
Am. Sm. & Ref., pf.	103
Bethlehem Steel	22
Colo. Fuel & Iron	34⅜
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	81½
National Lead, pf.	‡102½
Pittsburg Coal	‡11⅛
Republic I. & S.	22⅛
Republic I. & S., pf.	81
Sloss-Sheffield	63½
Standard Oil	635½
U. S. Red. & Ref.	9
U. S. Steel	46¼
U. S. Steel, pf	109⅞
Va. Car. Chem	29¾

BOSTON CURB

Ahmeek	‡100
Black Mt.	‡2½
East Butte	8⅜
Hancock Con	‡6¼
Keweenaw	5
Majestic	.61
Raven	.88
Shawmut	.27
Superior & Pitts.	14½
Troy Man.	‡.35

ST. LOUIS Sept. 12

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.04	.03
Center Cr'k	2 25	1.50
Cent. C. & C.	67 00	66.00
C.C. & C. pd.	76 00	74 00
Cent. Oil	105 00	100 00
Columbia	5 00	4 00
Con. Coal	20 00	19.00
Doe Run	125 00	110 00
Gra. Bimet.	.18	15
St. Joe	15.00	12.50

LONDON Sept. 17

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind	0 1 0
Camp Bird	0 13 9
Esperanza	3 7 0
Tomboy	1 3 9
El Oro	1 7 6
Oroville	0 11 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept 16.
Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.27
Best & Belcher	.42
Caledonia	.16
Chollar	.21
Comstock	.24
Con. Cal. & Va	.75
Crown Point	.30
Exchequer	26
Gould & Curry	08
Hale & Norcross	.28
Mexican	64
Ophir	2 00
Overman	.12
Potosi	.20
Savage	.27
Sierra Nevada	.20
Union	28
Utah	.04
Yellow Jacket	47
TONOPAH STOCKS	
Belmont	1 00
Extension	.70
Golden Anchor	02
Jim Butler	25
MacNamara	.45
Midway	31
Montana	1 15
North Star	08
Tono'h Mine of N.	7.00
West End Con	.57
GOLDFI'D STOCKS	
Adams	.04
Atlanta	.24
Booth	.42
Columbia Mt.	25
Comb. Frac	1 31
Cracker Jack	.07
Dia'dfield B. B. C.	.16
Goldfield Belmont	.15
Goldfield Daisy	.58
Great Bend	.30
Jumbo Extension	.38
Katherine	...
Kendall	.14
Lone Star	.10
May Queen	.06
Oro	.12
Red Hill	.25
Roanoke	...
Sandstorm	.25
Silver Pick	.19
St. Ives	.27
Triangle	.05
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B	.05
Gibraltar	.05
Gold Bar	.03
Homestake King	.23
Montgomery Mt.	.09
Mont. Shoshone C.	.93¾
Original Bullfrog	.01
Tramp Cons.	.16½
MANHAT'N STOCKS	
Manhattan Cons	.08
Manhat'n Dexter	.06
Jumping Jack	.03
Stray Dog	.03
MISCELLANEOUS	
Golden Boulder	.06
Bonnie Clare	.08
Lee Gold Grotto	...
Nevada Hills	1.37½
Nevada Smelting	1.10
Pittsburgh S. Pk.	.95
Round Mt. Sphinx	.10

COLO. SPRINGS Sept. 12

Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	3⅝
Dante	....
Doctor Jack Pot	6
Elkton	63½
El Paso	38½
Findlay	22
Gold Dollar	6¾
Gold Sovereign	‡3
Isabella	28
Index	....
Jennie Sample	2½
Jerry Johnson	‡4
Mary McKinney	30
Pharmacist	‡3⅛
Portland	1.04
Un. Gold Mines	‡4⅛
Vindicator	83⅛
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
Alta, Nev	Aug. 25	Sept. 15	$0.05
Belcher, Nev	Sept. 15	Oct. 6	0.10
Caledonia, Nev	Aug. 12	Sept. 2	0.05
Challenge Con., Nev	Aug. 31	Sept. 22	0.05
Con. Imperial, Nev	Sept. 29	Oct. 22	0.01
Exchequer, Nev	Aug. 11	Sept. 1	0.05
Gould & Curry, Nev	Oct. 7	Oct. 19	0.10
Hale & Norcross, N	Sept. 3	Sept. 24	0.10
Julia, Nev	Aug. 21	Sept. 14	0.03
Overman, Nev	Sept. 23	Oct. 14	0.05
Potosi, Nev	Sept. 4	Sept. 29	0.10
Savage, Nev	Aug. 27	Sept. 18	0.10
Scorpion, Nev	Aug. 11	Sept. 3	0.02
Signet	Aug. 8	Oct. 6	0 01
Talisman, Utah	Aug. 1	Aug. 18	0.02
Tomahawk, Nev	July 10	Aug. 12	0.01
Union Con., Nev	Sept. 15	Oct. 7	0.10
Utah, Nev	Aug 12	Sept. 2	0.03
Yellow Jacket, Nev	Aug. 10	Sept. 15	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55 678	31 769	25.738
February	68 835	56 000	31 852	25 855
March	67 519	55 365	31 325	25 570
April	65 462	54 505	30 253	25.133
May	65.971	52.795	30 471	24.377
June	67 090	53.663	30 893	24 760
July	68 144	53.115	31 366	24.514
August	68 745	51.683	31 637	23.858
September	67 792	.....	31 313	.....
October	62 435	.....	28 863	.....
November	58 677	.....	27 154	.....
December	54 565	.....	25 362	.....
Year	65 327	.....	30.188	.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106 739	62.386
February	24 869	12 905	25 236	13 098	107 356	58 786
March	25 065	12 704	25 560	12 875	106.594	58.761
April	24 224	12 743	25 260	12 928	98 625	58.331
May	24 048	12 598	25 072	12.788	102 375	57 387
June	21 665	12 675	24 140	12 877	97.272	57 842
July	22 130	12.702	21 923	12.933	95.016	57.989
August	18 356	13.462	19 255	13.639	79.679	60.50
September	15 565	......	16 047	......	68 375	......
October	13 169	......	13 551	......	60 717	......
November	13.391	......	13.870	.....	61 226	......
December	13 163	......	13 393	......	60 113	......
Year	20 004	......	20.661	......	87 007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908
January	41 548	27 380	July	41.091	29.207
February	42 102	28.978	August	37 667	29.942
March	41 313	30 577	September	36 689	......
April	40 938	31 702	October	32 620	......
May	43 149	30 015	November	30 833	......
June	42.120	28 024	December	27 925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6 000	3 725	19 531	14 250
March	6 000	3 838	19 703	13 975
April	6 000	3 993	19 975	13 469
May	6 000	4 253	19 688	12 938
June	5 760	4.466	20 188	12.600
July	5.288	4.447	20 350	13.000
August	5 250	4.580	19 063	13.375
September	4 813	......	19 775	......
October	4 750	......	18 531	......
November	4.376	......	17.281	......
December	3 658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6 732	4 513	6 582	4.363	27 125	20 563
February	6 814	4 788	6 664	4.638	25.938	20 875
March	6 837	4.665	6 687	4.527	26 094	21 075
April	6 685	4 645	6 535	4.495	25 900	21 344
May	6 441	4.608	6 291	4.458	25 563	19.906
June	6.419	4.543	6 269	4 393	25 469	19 000
July	6 072	4.485	5 922	4.338	23 850	19.031
August	5.701	4.702	5 551	4.556	21 969	19.350
September	5 236	......	5 086	.....	21.050	......
October	5 430	......	5 280	......	21 781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4 104	......	20 075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, SEPTEMBER 26, 1908. NO. 13.

Mercury Mines at Koniah, Asia Minor

Ancient Workings Discovered after Probably 3000 Years on Deposits of Cinnabar Ore Now Being Opened and Prepared for Operation

BY FREDERICK F. SHARPLESS

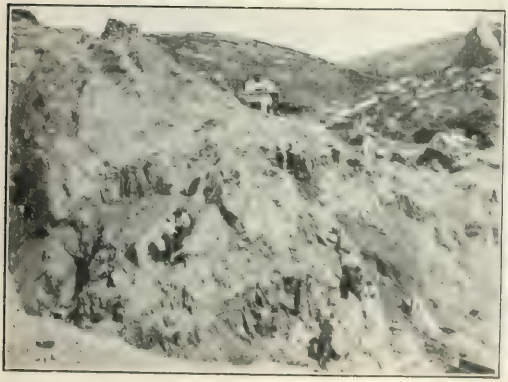
A short article in the JOURNAL of August 11 recalls an extremely interesting investigation that I made in Asia Minor during the spring of 1905, in company with the Whittall Bros., of Constantinople and Capt. Thos. Jenkins of Redruth, Cornwall.

About 400 miles by rail southeast of Constantinople, in the department of Koniah, near the old city of Iconium, now known as Koniah, the Koniah Mercury Syndicate, Ltd., is opening and operating a cinnabar deposit of considerable promise. The cinnabar occurs in veinlets, nodules and small particles in a crystalline limestone close to a talcose-schist contact at no great distance from old eruptives. The occurrence of the mineral is not uniform throughout the limestone; it appears to be present only where, or near where, the limestone is much silicified or entirely replaced by quartz, suggesting that the quartz and cinnabar had a common origin or were deposited at about the same time.

While there are a few pockets and rich patches of mineral, [illegible] [illegible] was found associated with stibnite; this [illegible]

DUMPS, KONIAH MINE

SURFACE FORMATION, KONIAH MINE



KARABOURNOU MERCURY MINE NEAR SMYRNA

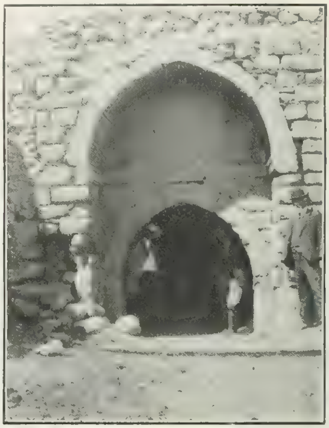
LOOKING EAST FROM KONIAH MINE

---

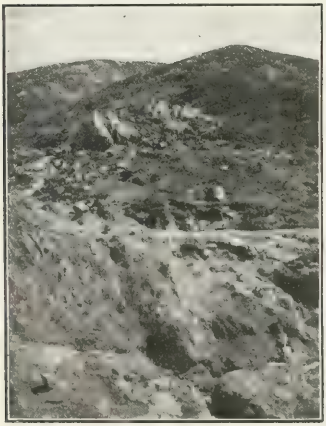
*Mining engineer, 52 Broadway, New York.

Quartz croppings and float occur at numerous points near that where work is now being prosecuted. All of this quartz contains visible cinnabar, but little is of a grade to be treated profitably. Scattered over a considerable area, however, it suggested, at the time the writer's examination was made, that where the quartz penetrates the limestone other workable deposits would be found. Subsequent developments have proved this to be the case.

WATERING TROUGH, KONIAH ROAD


ENTRANCE OF ANCIENT CARAVANSARY

VIEW IN NEIGHBORHOOD OF KONIAH


MERCURY MINE NEAR SMYRNA

KILLED BY CAVE-IN 3000 YEARS AGO

KARABOURNOU MINE

Oldest Mercury Mine

This property is probably one of the earliest mercury mines to have been worked, though the date of its early operations is not exactly known. In this connection its re-discovery and opening are interesting.

About four years ago a goatherd who kept his flocks on the almost barren hills near Koniah, corralled them at night in a limestone cave within a short distance of one of the buried cities of the Holy Land. Night after night they were taken there for protection. One night a refractory goat refused to enter the portal, and the goatherd, picking up a stone to discipline the offending animal, noticed that it was heavy and dark red in color, different from other stones around there. Laying it aside, he one day broke it open between two large stones and saw that it was a beautiful rose color on the inside. With curiosity aroused he went to an arroya below the cave to look for other similar stones; he found one more but that was all.

After his next clip was made, he went on his annual trip to Koniah to dispose of it, taking these two peculiar stones with him. The wool and the stones fell into the hands of a local merchant acting for the Whittall Bros., exporters of Constantinople, and he too, thinking the stones were curious, sent them on to the seaport, to his principals when making a shipment of wool.

One of the Messrs. Whittall is a graduate of the Royal School of Mines, and as soon as the stones fell into his hands he recognized them as high-grade cinnabar. Knowing that mercury had been found at several points in Asia Minor, Hugh Whittall, the engineer, decided that when convenient he would visit the locality. In the course of time he made the trip. With the assistance of the local agent in Koniah the goatherd was found, also the cave where the goats were kept and the ravine below it, but nothing that in any way resembled cinnabar.

The cave had the appearance of any limestone cave with sides worn smooth and the bottom covered with the dirt of centuries. The search for cinnabar was about given up when Mr. [illegible] began to [illegible] one of the walls with his sample pick. An incrustation was broken off and a tiny veinlet of something pink was seen; picking through the incrustation in various places, the same conditions were found to exist in several places. In short, the whole bed of limestone appeared to be impregnated with small seams and veinlets of cinnabar, and what had appeared to be an ordinary limestone cave resolved itself into something looking like an old mine. The property was denounced for mining purposes and instructions given for cleaning out the dirt.

Workings 3000 Years Old

When the work was started, the opening was about 15 ft. wide and it extended 50 ft. into the hill, with the roof about 10 ft. above the floor. When completely cleaned out it was found to extend a little more than 100 ft., dipping with the limestone beds at an angle of about 10 deg. from the horizontal; everywhere that the silicified limestone appeared there too was cinnabar found. When the cleaning had been done it was decided to put down a winze in the floor of the deposit to see what thickness the impregnated beds might have. The winze was started and at 6 ft. it broke into a second chamber, almost under the first, parallel with it, and of about the same dimensions except that it was nearly 250 ft. long.

If it was a surprise to find that the first cave was a mine, a greater surprise was in store in the second case. Entering through the opening in the bottom of the winze, a weird sight met the eyes of the miners. Scattered over the floor of the chamber, in all conceivable positions, were seen the remains of more than 50 human skeletons. Many of the bones were imbedded in the secondary deposit of lime on the floor. There were great quantities of stone hammers, several pottery lamps, a fair amount of charcoal, several rubbing stones and some flint arrow heads.

Primitive Methods

Mining had apparently been done by firing the barren rock, by breaking the softer portion with hammers and by gouging where there were rich seams of cinnabar. Deep grooves followed all high-grade streaks, but the tools for this work were gone.

Working out to the surface, following the floor of the second chamber, 40 or 50 ft. of caved ground was penetrated, suggesting that the miners had been entombed by a fall of rock around the portal of the opening.

Some time before this discovery, Sir W. Ramsay, the well known English archeologist, had unearthed a tablet in a neighboring buried city. This tablet was dedicated to the Phrygian goddess of the mines, Zizima. The Phrygians inhabited this part of Asia Minor 1500 years B. C., and it is quite possible that the deposit [illegible]

There is no positive evidence connecting the tablet with the mercury deposit, but on the other hand, nothing else has been found resembling a mine. The thick deposit of lime on the floor and walls of the openings, in such an arid country as this, is positive proof that the bones have been lying there a very long time, and the probability is that the deposit was a flourishing paint mine many centuries before the birth of Christ.

The Cananea Consolidated Copper Company

[illegible]

The copper production during the last week or two is satisfactory in amount, averaging about 50 tons per day. An old stack has recently been taken down back of the converters and put up at the reverberatory furnace, and the necessary connections made so that now the heat from the reverberatory that has been going to waste is being used under some extra boilers, producing steam for the main power house. The fuel oil in the reverberatory continues to give good satisfaction. The new method of feeding the blast furnaces dropping the ore directly into them through chutes from the small steel bins is a perfect success, not having given the slightest trouble. The ore charge coming from the spreading beds, where it has been carefully laid down in proper mixture, is very uniform, and consequently smelts well. The success of the reclaiming machines, which are of an entirely new design, and being tried here for the first time, is being watched with interest all over the country. These machines, with a few small changes, are working well now, and without a doubt the entire bedding-plant system, taking the ore from the railroad cars, through the sampling mill, onto the beds, reclaiming it and conveying it to the bins above the furnaces, is a success from start to finish. The amount of work the reclaimers are capable of doing is highly satisfactory, one reclaimer being able to handle [illegible] tons [illegible] daily with one white [illegible] Mexican helper on a shift.

There are four McDougal roasters being put into readiness to operate within the next few days. A portion of the fine concentrates will be treated in these roasters and from them sent directly to the reverberatory instead of as at present being put on the spreading beds.

Nothing has been heard about increasing the copper production by blowing in any additional furnaces within the near future. The force of men over the entire plant changes very little, few new men being [illegible]

The Anti-Smelter Fight in California

[illegible]

The Anti-Smelter Association, of Alameda county, which is on the opposite shore of San Francisco bay from the site of the proposed Selby smelter at Baden, is actively engaged in getting alleged facts which may prevent the completion of any smelter on San Francisco bay. The committee on information of this association has made a report in which it makes certain allegations as to what would happen in San Francisco if the smelters were put in operation.

"San Francisco lies within a ten-mile radius of the place where the smelter is to be built. According to the weather bureau, the wind during two months of the year blows from the smelter toward the city, five months of the year the prevailing wind is toward the east. In other words, for one-sixth of the time, the San Francisco peninsula would be getting the maximum destruction from the fumes, while for the balance of the year, although the damage would be lessened on account of the direction of the wind, as shown at other smelters, the danger would still be great.

"The smelter at Baden is to have a capacity of about 5000 tons of ore in 24 hours. There would be discharged into the atmosphere from this smelter every 24 hours about 1,250,000 cu.ft. of fumes containing 1500 tons of sulphur dioxide and 28 tons of arsenic trioxide. In one year there would be spread over the neighboring country over 10,000 tons of arsenic trioxide.

"The smelter at Baden would probably give employment to many men; it would create about it quite a town; would increase the shipping in and out of the port; would raise the value of the land in its proximity. Operated as they have been, what smelters have done in the past they will do in the future, and we cannot but feel that the good accomplished by the location of the smelter at this point would be far outweighed by the harm that would be done, including the disastrous action upon cemeteries, gardens, parks and the [illegible]"

This extract from the report is given merely to show what sort of opinion the smelter people have to combat in preventing adverse municipal legislation. All sorts of exaggerated statements are made public and placed before official bodies, who have no technical knowledge on the [illegible]. It [illegible] difficult to overcome prejudice inculcated by [illegible] statements. Of course the smelting company will bring in expert testimony to combat erroneous statements, but it is up-hill work to get [illegible] public sentiment.

Disposal of Gases at Selby, California

By James C. Bennett.*

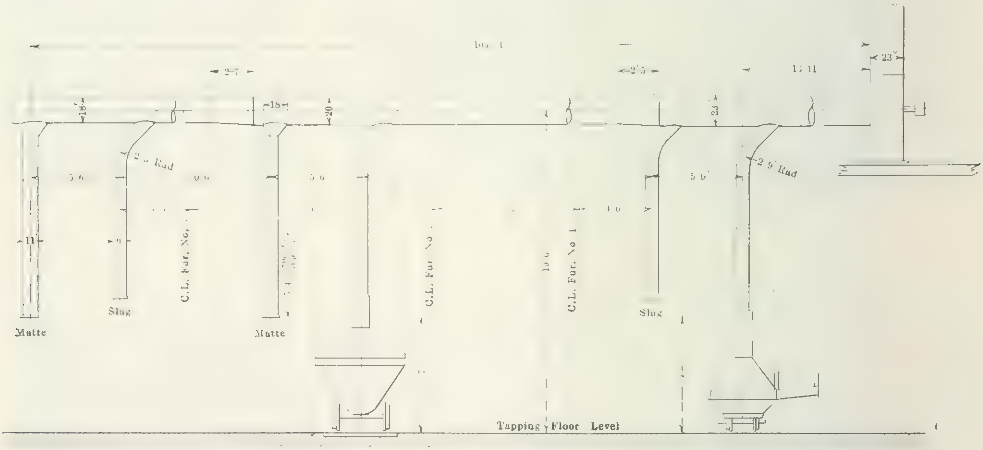
Owing to the direction of the prevailing winds during a large part of the rainy season, the Selby Smelting and Lead Company found it necessary to make provision for clearing both the feeding and tapping floors of the smoke that escaped where the molten matte and slag were exposed to the air. The first attempt was to use natural draft from chimneys, erected at the front of each furnace and leading directly upward to a point above the ridge of the roof, where they discharged into the open air. While this arrangement gave fairly good results, so far as the furnace spouts were concerned, it did not carry away the smoke liberated where the slag discharged from the settlers into the pots, and where the matte was tapped out into the matte pans.[1] It was finally decided to install an exhaust fan, and to carry branch pipes to each of the points where the gases issued, thus collecting the smoke where it originated instead of permitting it to become diffused in the atmosphere of the building; when so diffused it would be impossible to remove it by artificial means, owing to the open sides. In addition to the two branches for each furnace, provision was made for fitting a pipe over the furnace spout; but this was never installed because it was found that, with the other points cared for, the chimneys were able to remove the smoke liberated at those points.

Operation of the System

In operation, the hoods over the slag pots are raised when the pots are hauled away, to be replaced by empties. Those over the matte pans are left down so long as the matte is flowing, and until the tap hole has been plugged. The hood is then raised and is thus kept entirely out of the way until the next tapping, when it is lowered immediately after the flow of matte has started. Each hood is equipped with a counterweight, about 15 ft. distant, and is thus always convenient to reach, but never in the way of any movements about the furnaces. As shown in the accompanying drawing, the distance from the ground level to the lowest point of each hood, when raised to its extreme position, is 7 ft. This hight, in addition to affording clear head-room, permits the free handling of the long furnace bars. A detail which was considered, but not incorporated, was the equipping of each branch pipe with a valve or damper which should be automatically opened or closed with the lowering or raising of the hood. This could have been effected by a very simple arrangement and would have reduced the power consumption by 40 or 50 per cent., since it is seldom that more than three hoods are in use simultaneously. The small cover over the matte spout is not connected with the main hood, as the construction of the settler would interfere with its vertical movement. A snout projects from the slag-pot hood over the spout of the settler, and is permanently attached to the main hood. That part of the main pipe which is 18 in. in diameter is somewhat larger than necessary, but advantage was taken of some old pipe of that size on hand.

The fan is designated by its manufacturer as a "Sixty-inch planing mill exhauster." It is driven by a 10-h.p. induction motor, at 702 r.p.m., at which speed it delivers 6778 cu.ft. of air per minute, at a pressure of 2.89 oz. per sq. in., equivalent to 5 in. of water. Although no measurements have been made to determine the power consumption, it is computed to be 6.6 h.p. The fan and motor are installed in a small inclosure erected for the purpose on the shed-roof extension to the main blast-furnace building. This affords a direct and straight line of pipe, in front of the furnaces, and approximately on the level of the charging floor, from the fan to the opposite end of the building; and yet the fan and motor are easily reached for daily inspection by a runway extending out from the feeding floor. The discharge pipe is led as nearly vertical as local conditions permit, from the fan to a point 3 or 4 ft. above the highest point of the roof.

This method of clearing the furnace building of smoke has been successful from the start, and requires no further attention than oiling once a day. In view of the simple, cheap and effective nature of this plan, I have often thought that the not uncommon cases of lead-poisoning among blast-furnace workmen could be largely eliminated. This would insure better attention to the operation of the furnaces, and better general health of the men, both of which are equally valuable to the management.



ARRANGEMENT OF EXHAUST PIPES AND HOODS AT SELBY, CAL

---

*Engineer, 11 Lizzie street, San Rafael, Cal.

[1] *Eng. and Min. Journ.*, Feb. 1, 1908, p. 252.

Gold Production in Western Australia

The August production of gold from West Australian mines is reported at 136,688 oz. fine, which is 3264 oz. more than in July, but 2454 oz. less than in August, 1907. For the eight months ended Aug. 31 the total was 1,105,952 oz. fine in 1907, and 1,097,131 oz.—or $22,677,698—in 1908; a decrease of only 8821 oz. The small decrease was due largely to the condition of the large mines of the Kalgurlie district, which are making a better showing, and in most cases compensating the lower grade of the ores by more extensive mining operations.

Lead and Zinc Ores in Missouri

The Mining Districts of Southeast and Southwest Missouri. The General Character of the Ores. Methods and Costs of Mining

BY J. R. FINLAY*

Missouri is second in the list of States in the production of lead ores, and first in that of zinc ore. The mining is confined to two districts, the Southeast and the Southwest. The Southeast district produces ores from which, in round numbers, 100,000 tons of pig lead are smelted yearly; from the ores of the Southwest—or Joplin—field the product is 25,000 tons of lead and 140,000 tons of spelter.

In both fields the external conditions are favorable. Mining is conducted in the midst of the great agricultural regions of the Mississippi valley, where the cost of living is low, labor abundant, fuel and transportation cheap and markets close at hand. The internal factors also are favorable to low costs. The depths reached are not great, the orebodies are fairly large. In southeast Missouri the orebodies are persistent, though somewhat irregular, while those of the Joplin field are not only irregular but non-persistent. In both districts, however, exploration by drilling provides against underground perplexities. In both fields also, the ores are favorable for water concentration.

In the Southeast district there is, unfortunately, little to be found in the way of reports of mining companies. The following notes are from my own observation, and while I cannot vouch for the accuracy of the figures as representing any particular property, I believe that they may be taken as fairly representing the district as a whole.

Southeast Missouri Lead

Mining in southeast Missouri is based on orebodies that carry an average of about 5 per cent. in metallic lead, or a little more. The ore is called disseminated from the fact that the galena is often sprinkled through the limestone; although usually most of the lead is confined to rich streaks. The ore concentrates well and can be turned into a 65 to 70 per cent. product, with a saving of 80 per cent. Commercially speaking, therefore, the ore yields about 4 per cent. net lead. Developments have proved that the orebodies are exceedingly persistent and extensive, though they show such irregularities that it requires time to demonstrate this.

The formation lies approximately flat, though grades of from 3 to 10 per cent are not uncommon. It has, throughout the district, a gentle dip toward the southwest. The ore now being mined occurs in the lower 100 ft. of the St. Joe limestone, and often at the very bottom of this formation in contact with an underlying sandstone. Occasionally it happens that in the 100 ft. just mentioned, there are successive enrichments making workable orebodies one above the other. In this case more than one level may be necessary. But it is more common to find only one large irregular sheet of ore immediately above the sandstone, so that it can all be worked from one level; although sometimes the ore may shoot up some distance above the general level. The upper orebodies are relatively unimportant.

In the Flat River district proper, these orebodies are arranged in several parallel zones trending N. 50 minutes W. These zones lie in a space about 3½ miles wide from N.E. to S.W., and about 9 miles from N.W. to S.E. It is expected that these zones will be extended materially both to the northwest and to the southeast. I think there is also very good reason to expect that other zones will be developed southwest of those now worked. There are some indications already of three such new zones at the west end of the district.

I do not know why the ore follows this N.W.-S.E. course. I have never been able to see any system of persistent fissuring in that course. Most of the fissures have a course of E.-W. to N.E.-S.W. These fissures have a most obvious relation to the orebodies which often follow them out long distances on either side of the real ore channel.

The sketch, Fig. 1, shows this relation in plan. The ore zone may carry some lead scattered through the rock on both sides of the workable channels, which may be only 5 ft. wide. The fissures are apparently the source of the ore from which it has fed out into the surrounding rocks. The richest ore, therefore, is right at the fissure, and it fades out on either side, so that midway between fissures the ore may be too poor to work.

Fig. 2 is a longitudinal section of the ore zone across the fissures, showing this relation. The ore is workable to a thickness varying from 6 ft. to as much as 100 ft.

Exploration in the Southeast District

It will be evident from the above that the exploration of these orebodies by the sinking and drifting methods used in Western mines would be difficult and unsatisfactory. To follow the ore underground, it is almost necessary to stope the ore as you go. There is enough vertical irregularity to prevent following the ore successfully by horizontal drifts; and there is enough horizontal irregularity to make it impossible to keep in the channel, unless you are prepared to follow up each turn. If the ore rises you must be prepared to go up after it; if it sinks you must go down after it.

The problem of blocking ore out ahead has resolved itself entirely into diamond drilling from the surface. This varies in difficulty according to the depth. The formation dips slightly toward the southwest, while the surface rises a little in that direction. The southwestern part of the field is, therefore, the deepest part. In the older mines at Flat River, the depth to the sandstone is only 300 to 400 ft. In the newer mines like the Derby (Federal) and the Hoffman (St. Joe) the depth is 500 to 600 ft. In the deepest part, between Leadwood and Irondale, the depth is from 500 to 800 ft. When the depth is not over 550 ft., the drilling is all through very favorable rock; but where it is deeper, the cherty Potosi limestone comes in. This cherty formation is very hard to drill through, and it is best, whenever it is found, to use a churn drill through that formation, and then put in a diamond drill.

The drill is used first to find out in a general way, the position of the ore channel by running a line of holes N.E.-S.W. at intervals of about 200 ft. When lead ore is found that looks worth following up, holes are put in closer in the attempt to follow it in its usual N.E.-S.W. course. If ore is found in considerable amount in 15 or 20 holes, enough is blocked out to justify sinking a shaft. As a general rule it is not found desirable to try to map out the orebody accurately by drilling until some progress has been made in stoping it, and more knowledge gained about its peculiarities.

Owing to the soft nature of the richer ore streaks, the drill cores invariably give an underestimate of the value of the ore. Even where ground is most carefully drilled, the actual mining shows from 20 to 100 per cent. more lead ore than the drilling would indicate. It is very common to have blank holes in the middle of a good orebody through grinding up of the ore streaks. Owing to the irregular shape of the deposit, some poor ground is apt to run into the middle of the space occupied by the ore. For these reasons it often happens that one-half the holes, even in good stoping ground, do not indicate pay ore.

---

*Mining engineer, No. 2 Rector street, New York.

The cost of drilling for many years went constantly upward, owing to the increased price of diamonds and of labor. Where drilling could be done 10 years ago for 40 to 50c. a ft., in 1907 it cost from $1 to $1.25 per ft. In the deeper holes, where the Potosi limestone must be penetrated, the cost probably averages $1.50 per ft. Perhaps recent events have reduced these costs again.

The above description refers especially to the mines in the vicinity of Flat River only. At Bonne Terre, the orebodies are a little different, in that the longer axis there seems to extend N.E.-S.W., instead of N.W.-S.E. These orebodies are northeast from the ore zones of Flat river. It now seems very probable that a connection will be established between Bonne Terre and the Flat River orebodies.

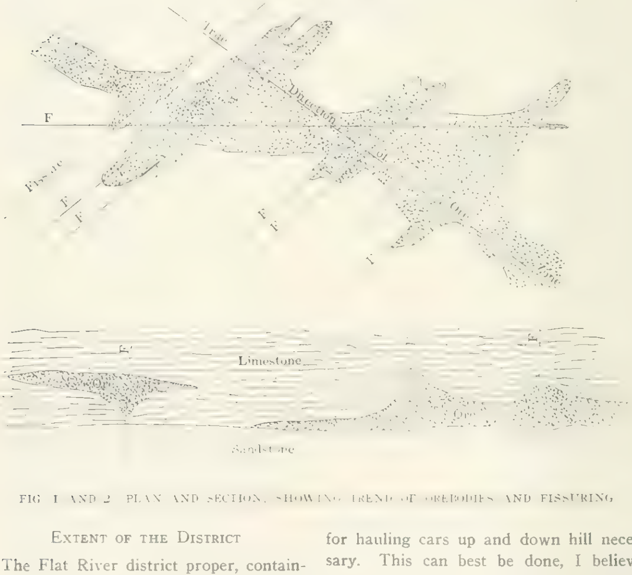


FIG. 1 AND 2. PLAN AND SECTION, SHOWING TREND OF OREBODIES AND FISSURING

Extent of the District

The Flat River district proper, containing developed mines, is a quadrilateral area of about 30 square miles, or 19,000 acres. If we extend the lines so as to take in Bonne Terre and Irondale, we get a triangular area of about 60 square miles, or 38,000 acres. This area is now producing metallic lead at the rate of about 90,000 tons a year. The output doubled between 1901 and 1907.

Outside of this area are a number of other places where ores of the same kind have been mined. At Doe Run, Fredericktown and Mine La Motte, are important occurrences which differ from the above described field only in that they are in shallower basins of limestone, which are interrupted by knobs of pre-existing granite. At Fredericktown, the ores carry, besides lead, copper, nickel and cobalt. At the North American mine at that place, considerable ore has been found that carries 5 per cent. copper, and 2.5 per cent. nickel and cobalt. Everything indicates that there are possibilities of extension in copper mining in that neighborhood. The copper ores have exactly the same structural characteristics as the orebodies above described, except that, instead of pure galena, the ore is mainly sulphides of copper, nickel and cobalt.

Problem of Mining in the Southeast District

The most difficult part of actual mining operations is the preliminary exploration by drilling. This determines the depth to which the shafts must be sunk, and their location. Usually only one level is necessary, but the fact that the ore does not lie exactly flat, makes some provision for hauling cars up and down hill necessary. This can best be done, I believe, by electric haulage. This has been installed at one of the Federal plants and is very effective. Provision must also be made sometimes for secondary pumping to raise water from depressions that may reach lower than the shaft-pumping station.

The stoping is very simple. No timbers are used. Round pillars of ore are left, containing 10 to 15 per cent. of the ore. It is often possible to leave pillars in the poorer parts of the deposit by laying out the main entries so as to follow the rich ore along the fissures. Underground diamond drilling is necessary in some mines to prospect ahead for water channels. These are open fissures that carry so much water that, if broken into carelessly, they make disastrous gushes. Some shafts are pretty wet, making 1300 to 1500 gal. of water a minute. The usual output from each shaft is about 300 tons a day. This output may be greatly exceeded, however, by the use of electric haulage so as to cover a large area from one opening. Ventilation may be secured by drilling large churn-drill holes from the surface.

The most economical power equipment used in the district is at the plant of the St. Louis Smelting and Refining Company. Here a central steam plant operates a compressor and an electric generating plant. The mill, hoists and pumps are operated by electricity. Electric trams are also used to haul the ore from various shafts to the mill.

The cost of mining, hoisting and pumping is from $1 to $1.50 per ton. To this may be added 10c. a ton for drill prospecting, and about 10c. a ton for hauling the ore to the mill. The total cost of ore is, therefore, from $1.20 to $1.70 at the mill.

The Problem of Milling the Ores

The milling practice is now pretty well established. The ore is ground to 9 mm. Everything smaller than 9 mm. is screened out as soon as the ore passes the crusher. When crushed, the ore is screened to various sizes, from 9 to 2 mm., and this product jigged. The tailings from the coarser jigs are all re-ground. The material below 2 mm. is classified and treated on Wilfley tables, as are also the re-ground tailings. Middlings from the tables are also re-ground in Huntington mills and treated on Frue vanners.

The cost of milling in a 1000-ton plant is from 30 to 75c. per ton. The cost of a concentrating mill, together with a power plant for the mines, may be estimated at $500,000 for 1000 tons capacity. The new plant built by the Federal Lead Company is expected to handle about 2400 tons a day. It is built of steel and concrete, has a large air-compressing and electric plant, and elaborate crushing and sampling arrangements. It cost $900,000.

The Problem of Smelting the Ores

Smelting may be considered either on a custom or an operating basis. The ore leaves the mill in the shape of a concentrate carrying 70 per cent. lead and 5 per cent. moisture. Freight to East St. Louis is about $1.50 per dry ton. This ore may be sold to custom smelters, who will pay for 90 per cent. of the lead at current quotations, and charge from $6 to $8 per ton smelting charges. On this basis, the cost of freight and treatment, figures as follows:

	Lead 4c.	Lead, 5c.	Lead, 6c.
Freight	$1 50	$1.50	$1 50
Treatment say	7 00	7 00	7 00
Deduction 10 per cent 140 lb.	5 60	7.00	8.40
Total	$14 10	$15.50	$16.90

On an operating basis the cost is about

$6 per ton and the loss [illegible] practice, 3 per cent.:

	Lead 40	Lead 50	Lead 60
Freight and treatment	$7.50	$7.50	$7.50
Deductions, 12 lb. lead	1.68	2.10	2.52
Total	$9.18	$9.60	$10.02

On average prices there would be a saving of about $5.50 per ton of concentrates in operating a smelter. But it must be remembered that the above costs could only be secured by a plant handling a considerable tonnage, say 3000 to 4000 tons a month.

The cost of the whole operation thus far may be figured as follows:

Prospecting	$0.10 to $0.10
Development by shafts	0.15 to 0.15
Mining	1.00 to 1.50
Transfer to mill	0.10 to 0.10
Milling	0.30 to 0.75
General expense	0.10 to 0.26
Crude ore cost	$1.75 to $2.86

The lower of the two sets of figures represents large thick orebodies, comparatively little water, cheap milling, concentration saving not over 75 per cent., and a simple and economical management. The higher figures are based on thin orebodies, a great deal of water, elaborate milling making a saving of 85 per cent., and an expensive management.

Let us follow the two sets of conditions and costs through the smelter to the production of pig lead from various grades of ore, lead being assumed at 5c. a pound.

I. MINING AND MILLING COST $1.75. EXTRACTION 75 PER CENT.

	Yield in Concentrates, Per Cent.	Smelting Cost.	Total Cost.	Cost Per Pound Lead, Cents.
With 4 per cent. ore	4.3	$0.41	$2.16	3.60
With 6 per cent. ore	6.4	0.62	2.37	2.65
With 8 per cent. ore	8.6	0.82	2.57	2.22
With 10 per cent. ore	10.8	1.03	2.78	1.85

II. MINING AND MILLING, $2.86. EXTRACTION, 85 PER CENT.

With 4 per cent. ore	4.85	$0.45	$3.31	4.90
With 6 per cent. ore	7.27	0.70	3.56	3.50
With 8 per cent. ore	9.70	0.94	3.80	2.86
With 10 per cent. ore	12.10	1.17	4.03	2.37

If all costs remain the same, except milling, we should have:

III. TOTAL COST PER POUND LEAD

	1. Saving 75 Per Cent.	2. Saving 85 Per Cent.
With 4 per cent. ore	3.60	3.95
With 6 per cent. ore	2.65	2.84
With 8 per cent. ore	2.22	2.31
With 10 per cent. ore	1.85	1.98

It appears that on any ore likely to be mined in the Flat River district cheap milling is essential to economy; and that it will not pay to increase costs to the extent of even 45c. a ton in order to obtain 10 per cent. additional recovery.

Cost of Producing Lead from Flat River District

The average cost of producing pig lead for the St. Louis market from this field [illegible] St. Joe Lead Company, which has paid [illegible] $7,000,000 in dividends [illegible] per [illegible] tons of lead. The cost, of course, fluctuates with the times. [illegible] cutting wages and curtailing construction and development; on the other hand, in boom times wages are raised and people [illegible] pansion and development. As a matter of fact, lead was sold in St. Louis from the [illegible] lb. without loss; but in the boom period of 1906-7 it is doubtful if any of the mines were [illegible].

Generalizations on Lead Mining

On [illegible] lead ores into three groups: (1) Disseminated sulphide ores that can be concentrated in a high ratio; (2) sulphides from [illegible] setting.

1. In the [illegible] that the problem of mining here, and the [illegible] Lake Superior [illegible] cases the costs for mining, milling and smelting will fall between $2 and $3 per ton [illegible] contain about three times as much lead as the Lake Superior [illegible] of copper, and the price of lead is one-third the price of copper.

2. [illegible] and of Broken Hill in Australia afford a [illegible] selection of ores. The proportion smelted [illegible] lead per ton. The Broken Hill ores aver[illegible] 0.005 oz. gold, equivalent to 272 lb. lead[1] per short ton. These figures may be compared with the equivalent of 87 lb. copper per [illegible] Butte ores for 13 years.

In the [illegible] in both places. Here again we note that [illegible] costs one-third as much, and sells for less than one-third the price.

3. I have given no clean-cut example [illegible] serves as a partial example. The mines of Tintic, Utah; Eureka, Nevada; Sta. Eu[illegible] Undoubtedly the costs are high. Handpicked ores in the Cœur d'Alene and Park [illegible] lower, but I doubt it. In Aspen they were fully as high. Smelting costs are correspondingly high. [illegible] dom mined for lead alone; the values in silver and gold are very often much higher than for lead. Undoubtedly, on the aver[illegible] often last long. For ores of this class the [illegible]

[illegible]

This district produces 60 per cent. of [illegible] therefore, bears nearly the same relation [illegible] country. Perhaps no other district of [illegible] but within this extensive field by far the [illegible] very extensive mineralized zones extend[illegible] tion. A third place that has produced extensively is in the neighborhood of Galena, Kansas. I shall attempt a general [illegible] an example the great Webb City zone.

[illegible]

---

[1] [illegible]

quarters of a mile, though it widens at one or two places to a mile and a half and narrows at other places to a quarter of a mile. In a rough way, I estimate the productive ground at 4800 acres. It would not be inaccurate to describe this entire tract as a continuous orebody although it shows great irregularities. The total production of this zone has been approximately 3,000,000 tons of zinc and lead ore, derived from mining and milling 75,000,000 tons of rock. The value actually realized has been about $90,000,000 but at present prices the amount would be much greater. The production of the zone for 1907 was 109,229 tons zinc ore worth $5,000,000, and 24,336 tons lead ore worth $1,700,000, approximately, making a total value on the ground of $6,700,000. The spelter realized from this production may be estimated at 55,000 tons, worth in St. Louis $6,390,000. The pig lead realized may be estimated at 19,000 tons worth in St. Louis $1,985,000. The average price of spelter was 5.812c. at St. Louis, and of lead 5.225c. On these prices the average yield to the miner was $45.23 for zinc ore and $68.73 for lead ore.

Geology of the Joplin District at Large

The rocks in which the ore occurs constitute a flat-lying formation of chert and limestone about 250 ft. thick. At the bottom of the formation is a persistent bed of flint about 20 ft. thick, called the Grand Falls chert. Above this is limestone containing many layers and nodules of flint. Originally this cherty limestone formation was all covered by a stratum of black shale, which occasionally contains a little coal. The greater part of this shale has been removed by erosion, but certain portions of it still remain in the form of long strips filling trough-like depressions in the underlying limestone.

The orebodies of the region are all contiguous to these areas of depressed shale, occurring either under or along the sides of the shale troughs. These troughs of shale are called, by the way, "soapstone bars." The explanation which I believe to be the true one of the occurrence, both of the shale troughs and of the ore is as follows:

The limestone, along certain lines (of an origin not at present explicable) was dissolved out while the shale formation still overlaid the entire region. The caverns formed by this dissolution finally became so large that they caved in, allowing the overlying shale to settle down into the pits thus formed to a depth of from a few feet to as much as 150 ft. below the surface of the cherty limestone formation. The dissolution of the limestone did not affect the chert beds. These were broken up during the subsidence caused by the disappearance of the lime. The result was that underneath and along the sides of the shale filling of the troughs there were great quantities of broken flint mixed with mud derived from the soft overlying shale. There were also masses of limestone, of all sizes, remaining on the sides and even in the bottom of the troughs. The limestone remnants increase in quantity as you go from the center of the trough until finally you reach the solid unaffected masses.

Ore has been deposited in the brecciated, or disturbed mass of flint and limestone boulders and clay occupying the space between the depressed shale in the center of the trough and the unaltered formation at its bottom and sides. The ore was brought in by surface waters. Naturally the deposition of ore was not uniform. It is supposed that the organic matter in the shale was the precipitating agent which caused the deposition of zinc and lead sulphates picked up by the surface waters during the process of the erosion of the Ozark plateau to the southeast. At any rate the ore is found in exceedingly irregular bodies in the broken ground along the troughs of shale, or "soapstone bars."

Naturally, channels of dissolution such as those described as causing the troughs would be of varying extent and depth. This is the case. In some of the larger channels the limestone has been removed quite to the bottom of the cherty limestone formation and the broken ground extends down to the basal member—the Grand Falls chert. This chert is a brittle stratum of flint containing innumerable crevices so that it serves as a ready channel for the circulation of water. On this account much ore has been deposited in it. It is called the "sheet ground." This sheet-ground ore, while of exactly the same composition and origin as the other ore, is distinguished from it notably in several respects. Instead of being in a mass of broken ground along the "soapstone bars" it occurs under the solid original limestone masses. Instead of being in a shapeless irregular mass, it forms a regular flat bed, like a seam of coal. Laterally its extent is variable, as also is its richness, but the mineralization is pretty uniform over extensive areas, often as much as 2000 ft. wide. It must never be forgotten, however, that the sheet ground is always attached to the *loci* of mineralization—the "soapstone bars." It forms extensive shoots under the limestone bordering the deepest and most strongly mineralized bars or channels. It often extends 1000 ft. from a bar, very rarely over 2000 feet.

Practically all of the successful sheet-ground mining to date has been confined to the great Webb City ore-channel, between Oronogo and Porto Rico. It is generally believed that the sheet ground yields about 3 per cent. of the rock mined in zinc or lead ore. The zinc ore obtained averages not far from 60 per cent. zinc; the lead ore about 80 per cent. lead. The ore is obtained by crushing and washing in concentrating mills, which save about 60 per cent. of the zinc and 90 per cent. of the lead actually contained in the rock. The total saving approximates 66⅔ per cent.

Exploration

Practically the only method now employed in searching for ore is churn drilling. The irregular deposits along the soapstone bars are apt to be quite narrow. The vertical extent is often greater than the width. Consequently, in looking for such orebodies it is necessary to drill holes pretty close together. An experienced driller can form a good idea from the kind of ground he encounters of what the chances are of finding ore. If he finds a little ore and open ground, that is, broken rudely stratified material, he will place his following holes not over 50 ft. from the first until he discovers pay ore. Then he will endeavor to follow the ore by drilling along the course of the bar. Where the bars are small and irregular, it is often necessary to drill as many as three or four holes to the acre to explore a tract thoroughly. Since the drilling costs an average of 80 to 90c. per foot and the holes will average about 175 ft. deep, we may place the cost of exploring such a tract roughly at $500 per acre.

In the sheet ground no such amount of drilling is necessary. On account of the much greater uniformity of the deposits it is often possible to explore the ground satisfactorily with only one hole to every two acres. Holes to explore this ground are drilled more than 200 ft. and the cost per hole will approximate $200. The actual cost per acre for exploring this ground is probably less than $100, but I think it should properly be about $200.

It is the almost universal custom to appraise the value of the ore only by the eye. The cuttings from the drill come out in the form of coarse angular sand which the driller washes in a bucket of water, and simply forms a judgment as to whether the sand contains pay ore or not. If the cuttings show only small amounts of ore, not enough in his judgment to pay for mining he records "a few shines of jack or lead." If he thinks the ground doubtful he writes—"shines" or "good lead" or both.

Mining Methods

The mining of this ore will be readily understood from the above description of its occurrence. Owing to the shallowness of the deposits there is no occasion whatever for large expensive shafts. As the extreme depth is only 250 ft., and the average depth in mining perhaps less than 175 ft., it is evident that a single-compartment shaft, except in the unusual contingency of encountering a very large amount of water can be sunk very cheaply. It is probable that the average shaft of the Joplin district does not cost more than $4000. Hence it is cheaper to open up the ground by numerous [illegible] than by extensive openings underground. It will also be evident that aside from the question of first cost the tramming of ore is cheaper on the surface than underground.

The effect of these considerations is that the accepted method of operating in the district is to have one mill supplied with ore from several shafts, the ore being transported to the mill by inclined tramways.

The hoisting methods of the district are unique and, considering the conditions, exceedingly satisfactory. The ore is shoveled into buckets locally called "cans" which hold about 800 lb. each. These cans are placed upon small trucks underground and run to the shafts where they are attached to the hoisting rope by a man called the "tub-hooker." The hoist is placed in a derrick or headframe vertically above the shaft, the rope passing over the sheave a few feet above the engine. The hoist man pulls the bucket up so that the bottom of it is slightly above his head. He then attaches to the bottom of the bucket a hook which, when the bucket is again lowered, dumps it into a bin. To do this, hoist his empty bucket back to position, detach the hook, and lower again, is in the hands of an expert hoistman, a matter of only a couple of seconds. In this manner it is possible to average 400 cans per shift, or 160 tons. Only two men are employed, whose combined wages are approximately $5 per day. The hoist itself costs $250. The derrick in which the hoisting is done, together with the ore bin, costs $600 more. It is evident that this method of operating, while having the appearance of crudity is exceedingly effective and cheap. The actual cost is probably not over 5c. per ton hoisted.

The mining underground involves the usual requirements of selecting the ground so as to mine out the best of the ore without leaving too much in the pillars and without making the openings too dangerous. In the "upper ground" irregular deposits, this selection opens the field for the exercise of skill. In the sheet-ground deposits the work is far more regular and certain. As a general statement, the advantages of the upper deposits in the way of richer ores and softer ground are nearly, if not quite, counterbalanced in favor of the sheet ground by the greater uniformity and persistence of the latter. There is really very little difference in the methods employed in the two kinds of mines. In the upper ground the ore is taken from large irregular chambers and in the sheet ground from flat deposits from 8 to 20 ft. thick that are as regular over considerable areas as a seam of coal. The only differences in mining between the two kinds of mines are of an unimportant nature which will be readily understood from the above description and need not be explained.

[illegible]

The visitor from outside districts is apt to be very much surprised at the crudity of the milling methods employed, and many an engineer has discovered what he believed to be a field for vast improvement by introducing better methods. Thus far nothing whatever has come of such attempts. They have usually been based upon some radical misapprehension of the conditions.

The Joplin mills confessedly only extract about 60 per cent. of the zinc ore. The proportion varies greatly at different mines. The variation, however, is not generally due to the mill practice, but to the character of the ore. The mills are suited to save only the free ore which can be easily separated from the gangue by rather coarse crushing. The remaining zinc which is inclosed in small particles in a secondary growth of flint cannot be saved except by much finer grinding and much more expensive methods for which the resulting ore extracted will not pay.

The ordinary mill consists of not more than three large Cooley jigs supplemented by one or two Wilfley tables. The Cooley jigs are of the Harz type, but contain usually from five to seven cells. The ore after being reduced to about one-half inch is next passed to the rougher jig, which catches some of the coarse lead and makes a rough concentration of the zinc ore. This is drawn as a middling product from the rougher and after being passed over a second pair of rolls, goes to a second jig called the "cleaner." The tailings from the cleaner jig are sometimes passed over a third or smaller jig for further treatment and a certain proportion of finer material is settled out for treatment on one or two Wilfley tables. The ordinary mill costs from $10,000 to $20,000 [illegible] capacity of [illegible] tons an hour. The largest mills in the district have cost about $50,000 and have a capacity of 35 tons an hour.

Losses in Mining

It must be remembered that the mining of zinc ore was first begun as an incident to lead mining, which was done at or near the surface. At first the zinc ore was sold usually at very low prices. It was cleaned on hand jigs, but later cheap and crude mills were built.

As the lead was found in small irregular patches, at or near the surface, there was no inducement to mine it on a large scale. One or two miners would work at it and pay royalties to the farmers who owned the land. Since two men could not work much land, there was no demand for leases of more than a very few acres. As lead mining gradually changed into zinc mining the small leases continued and the small mills were only expected to handle the richest pockets of "jack." In this way the business has built itself up in ever-increasing volume as a multitude of small leases. The system has all the faults that might be expected of it, but it was the one which the circumstances demanded. That it is attended by frightful losses will appear from the following summary of operating results.

Take 100 tons of ore containing 5 per cent. metallic zinc in the ground, we have the following approximate statement:

IV. COSTS AND LOSSES ON ZINC ORE

	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]
Loss in mining, 10 per cent.		[illegible]	
[illegible]	[illegible]		
[illegible]		[illegible]	
[illegible]	[illegible]		
[illegible]		[illegible]	
Smelting and amortization	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			[illegible]

This shows a recovery by mining of $450; by milling of $270; by smelting of $234.90. The approximate costs are 36.1 per cent. of the total value; the losses, 53 per cent.; the profit, 10.9 per cent. The profit on recovered value is 23 per cent., and this profit is divided as follows: Smelter, $14.25, or 26 per cent.; royalty, 15 per cent., $23.60, or 43 per cent.; mines, $17.15, or 31 per cent. of the total profit.

Joplin Cost Statements

The cost statements of the Joplin district are open to a good deal of uncertainty, on account of the lack of accurate information concerning the tonnage handled. The accompanying statement of the Grace Zinc Company illustrates the point. The cans hoisted refers in the local vocabulary to buckets, the greater portion of which are assumed to hold 1000 lb. As a matter of fact, it is known that they do not; some operators estimate that they hold 900 and others 800 lb. On either of these two assumptions the tonnage would be much greater than that taken as the basis for the cost statement. This tonnage estimate is based on the tonnage content of cars holding from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons in which the ore is hoisted to the mill. A considerable amount is rejected as waste. If we were to assume that the cans contained 800 lb. each, our tonnage would be 150,000 and the costs instead of totaling $1.41, would be reduced to $1.10. If the cans were estimated at 900 lb. each, the tonnage estimate would be almost 180,000, and the cost would fall to 95c. [illegible] the method of leasing and mining which has been adopted prevent the installation of devices by which a more accurate measure could be taken of the tonnage.

V. GRACE ZINC COMPANY.
PRODUCTION AND COST STATEMENT
APRIL 1, 1905, TO JAN. 1, 1908.

Cans hoisted	390,346
Tons dirt milled	121,291
Tons mixed ore recovered	5,307

MINING COSTS.

	Per Ton Dirt.	Per Ton Concentrates.	
Breaking ore	$0.40	$9.03	$47,939.43
Tramming	0.21	4.85	25,722.82
Hoisting	0.15	3.32	17,616.19
Pumping	0.10	2.27	12,050.81
Exploring	0.09	2.10	11,160.39
Timbering		0.09	452.18
Milling	0.23	5.33	28,304.19
General expense	0.15	3.56	18,870.34
Construction	0.08	1.74	9,248.40
Total	$1.41	$32.29	$171,364.75
Royalty paid			$38,957.55
Net value of ore			$221,230.21
Total expense			171,364.75
Net profit			$49,865.46

A more accurate statement of costs is based on the tonnage of concentrates produced. The amount of these is, of course, accurately determined. It is probable that the figures given in the accompanying statement give a fair idea of average costs for mining and milling in the Joplin district.

I have not made an estimate of the amortization charge, which should be made against such a plant as that from which the cost statement is taken. The actual cost of such a plant outside of the amounts covered by construction and exploring is probably not over $20,000. All renewals are covered in operating expense. Construction probably more than takes care of the plant itself. It is probable that a sum of $3000 a year in addition to the costs given would be an ample return on the actual plant investment. This would amount in Table V to less than $8000, and would increase the total costs per ton of dirt to $1.49, and per ton of concentrates to $34.

Assuming the last figure to represent the complete mining and milling cost, and that a concentrate containing 60 per cent. zinc is smelted at a cost of $14 a ton, with a loss of 12 per cent., we find that 1056 lb. of spelter costs $48, or 4.54c. per lb. While it is undoubtedly true that some mines at all times, and most mines for short periods, can produce spelter cheaper, I believe that the above figure is a fair average.

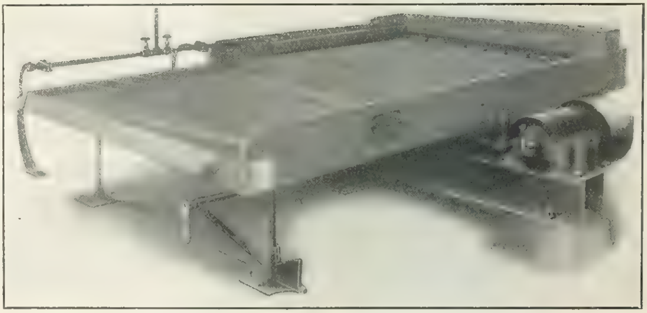
Consul-General Benjamin H. Ridgely is informed that a contract has just been let for a small American cement plant to be established near the City of Mexico for the manufacture of portland cement. This will be the first plant established in the republic for the manufacture of portland cement, although ordinary cement has been manufactured for some time.

For lubricating rock drills a light mineral oil gives satisfactory results.

Deister No. 3 Concentrating Table

The Deister No. 3 Concentrating table, 70 of which were installed at the Combination mill of the Goldfield Consolidated Mines Company, described in the JOURNAL of Sept. 5, 1908, is shown in the accompanying illustration. The table is manufactured by the Deister Concentrator Company, of Fort Wayne, Ind. It is practically rectangular, occupying a floor space of 8 ft. 6 in., by 10 ft. 6 in., and weighing crated for shipment 1600 pounds.

The driving mechanism is of the rolling contact type, and has separate adjustments for differential action and length of stroke. The principal bearings have brass bushings. The tables are made either right or left hand, and the operating adjustment is controlled by a hand-wheel at the front of the machine.



DEISTER SLIME CONCENTRATOR NO. 3

The deck is rectangular in form and is made of wood covered with lineoleum. The table differs from others of the same class in that the concentrating surface is largely without riffles, particularly the first section next to the feed box. The section at the tailings end of the table has very shallow riffles and also an increased downward slant. For giving the table the desired inclination, there are wedge adjustments controlled by a hand-wheel at two of the bases for the bearings, while the other three bases have threaded socket pins which are readily accessible.

The machine is driven by means of 14-in. tight and loose pulleys having a 4-in. driving face. The sharpness of stroke is regulated by means of an adjustable eccentric, the range of adjustment being never more than 90 deg., 45 deg. toward the table, or an equal turn in the opposite direction. The speed of the pulleys is from 285 to 300 r.p.m. The length of the stroke is regulated by raising or lowering a threaded hand-piece in the rocker arm. The shortest stroke on the No. 3 machine is usually found to be most effective.

Kelley Slag and Matte Casting Machine

By FRED G. KELLEY*

A rocking-tray slag-casting plant for handling the rich slag from copper converters has been erected by the American Smelting and Refining Company at its Garfield smelter, Utah. The mechanical principles involved, as well as the method of operation, have been known for many years, but their application and combination for this purpose is entirely novel and the plant was erected only after rigid tests had been made with an experimental apparatus, and satisfactory results obtained.

There are eight converter stands in this plant, which when operated at full capacity will produce about 320 tons of slag in each 24 hours; there is also some low-grade matte occasionally produced, which necessitated a capacity of 500 tons per 24 hours. This slag contains about 3½ per cent. copper, a corresponding proportion of gold and silver, and a large excess of iron, making its resmelting not only necessary for its metallic content, but also highly desirable for its fluxing qualities; in fact, the total value of the slag is often as much as $20 and is seldom below $10 per ton, while its favorable physical and chemical condition increases the smelting speed of a blast furnace by 10 to 20 per cent.

THE KELLEY MACHINE

Prior to the presentation of the plans of this apparatus, the management of the plant had determined to erect a system of three conveyers having heavy cast-iron molds, similar to the casting machine in use at the Washoe smelter. While this was known to be expensive to install and to operate, it offered the only method of handling the large tonnage of slag and matte. Upon receipt of the designs of my patented device, the company constructed an experimental [illegible] after demonstrating its efficiency, started the construction of a plant having twenty-four 10-ft. trays and a length of 270 ft. including the shell grid. This was completed in the latter part of February and has been in continuous operation since that time. The total cost of delivering the cold slag to the furnace bins is 11c. per ton, which figure will be much reduced when the plant is operated to its full capacity. The cost of the entire plant was about $35,000, including all bins and tracks.

---

*Mining engineer and metallurgist, Salt Lake City, Utah.

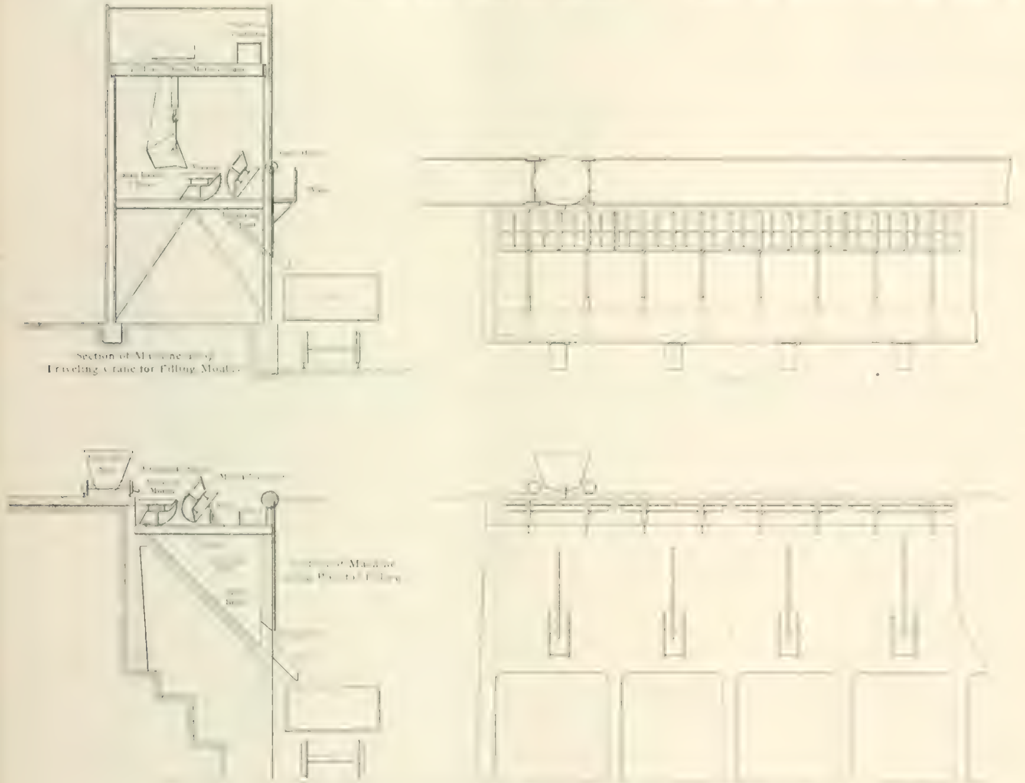
The unit tray consists of four cast-iron molds fastened by cotters to a structural steel frame, which in turn is rigidly bolted to two circular cast-iron rockers, having the line of their centers midway between the centers of gravity of the whole apparatus when it is empty and when it is filled with slag. This construction causes the molds to assume the normal horizontal position when empty and a dumping position when full and released. The tray is [illegible] long and 4 in. deep, and will [illegible] lb. of slag. Each mold is divided into four compartments by ribs 2 in. high, thus producing cakes of [illegible]

It is mounted upon two horizontal beams, below which is a brick-lined steel bin for receiving and storing the cold material, from which the latter is drawn into railway cars.

The trays are mounted adjoining each other with just sufficient clearance for independent operation, the number required [illegible] pot. There are two complete sets of 12 trays each, which are used alternately, allowing ample time for cooling without the use of water. A third set is contemplated for a reserve in case of accident or [illegible] required.

[illegible] the next charge.

The slag remains in the molds until it [illegible] is used; the latch of each tray is released, a slight push is given, and the molds tip in succession to the stop where the solidified cakes drop out. When relieved of the load the trays return automatically to the horizontal position, ready for the next charge. The molds receiving the first of the charge, which contains much [illegible]



[illegible]

[illegible]

The converter is poured into a ten-ton pot [illegible] near the bottom and a spout extending clear of the rail. This pot is taken to the [illegible] tapped by the attendant over the first mold. When the slag is flowing, the pot [illegible] speed that insures proper filling, the flow being regulated by the bar of the tapper. When the pot is empty it is taken to a jib crane which lifts the bowl from the trucks and discharges the shell upon a grid [illegible]

[illegible] beams so that no interference will occur in the next operation.

[illegible] the operations of tapping, dumping and [illegible] part of the time on the shell crane, and [illegible]

[illegible]

Lining-up Timbers in Inclined Shafts

By Benjamin H. Case*

The main shafts of Burra Burra and London mines, at Ducktown, Tenn., are both sunk in the country rock with an inclination intended to be parallel to the dip of the orebodies. This inclination is 75 deg. in both cases, and the collars of the shafts are situated about 100 ft. from the footwall at the outcrop. The first levels are 175 ft. below the surface, and succeeding levels are driven at intervals of 100 feet.

The decomposed rock extends to a depth of about 75 ft., and the shafts are timbered with square sets and lagging to this depth. Below this, 10x10-in. sills are placed adjacent to the footwall and are supported by hitches cut in the rock at the end of the shaft. Forty-pound rails are fastened to the sills, which are connected by studdles under the rails; 8x10-in. sprags are wedged from hitches in the hanging-wall against the sills, and these act as dividers.

In each shaft there are two skip-ways, 6x6 ft. in the clear, and a ladder and pipe-way at the end, 4x6 ft. in the clear. The shafts in the solid rock vary in width from 6 to 7 ft. and are about 20 ft. long. The Burra Burra shaft has reached a depth of 700 ft., and the London shaft a depth of 560 ft., measured vertically.

Timber pentices below the skip-ways at the deepest level in each shaft were formerly built for the protection of the men in sinking while mining and hoisting were going on, but the practice now is to cut through the rock in the ladder compartment and leave a solid rock pentice beneath the skip-ways.

Carrying the Line Down the Shaft

The center lines of the shafts are marked by copper plates set in the footwall sills at the collars and at each level. These plates are 3x4x½ in. thick, and have points punched in them to mark the center line. These lines are used for traversing into the mine workings, and the plates at the collars mark the zeros of coördinates for the underground surveys. This line is shown projected into one of the levels by *a—b*, Fig. 1. From the traverse line a secondary parallel line is located for sighting down the sinking compartment.

In order to locate the secondary line, the transit with an auxiliary top telescope is set up over the plate on the sill at the level from which sinking is intended. A sight is taken up the shaft, preferably to a large nail at the copper plate on the collar sill. The telescope is then reversed and a point is located in the roof of the crosscut on line at *b*, Fig. 1. The crosscut is driven with a width equal to the length of the shaft for about 35 ft. in order to provide room in the station for the handling of the waste hoisted through the sinking compartment. This allows room to establish a line 30 ft. long, which is parallel to the center line of the shaft. This arrangement is indicated in plan, at Fig. 1.

After the point *b* has been carefully placed on line, a right angle is turned toward the sinking compartment from *a*. There is a partition between the skipway and the sinking compartment, and it is necessary to cut a hole through this and sight at a plumb line. A point is thus located on the sill at *c* and permanently marked by a nail. It is most convenient to establish point *c* between the bucket skids. The horizontal distance, *a—c*, is now carefully measured; it is usually about six feet. The same distance is measured from *b* to *d*, normal to *a—b* and point *d* is permanently established in the roof of the crosscut; *c—d* is then used for locating the line down the sinking compartment.

Setting the Sills Below the Pentice

When a timber pentice is used, it is a comparatively simple matter to set the first sill below the pentice. In this case the shaft is sunk about 25 ft. below the level and the hitches for the sill *V*, Fig. 2, are cut by lining and measuring from the sill at the level. The pentice is then built above these hitches. When a rock pentice is used it must be undercut from the sinking compartment, and the shaft opened out to its full cross-sectional area. The position for the hitch in the sinking-compartment end can be conveniently located, but that in the end under the pentice must be located by carrying the line to the bottom of the shaft and squaring off to the other end. This is done by the method I shall describe, with such modifications and additions as circumstances may require. For the sake of simplifying the description, I will assume that the hitches have been cut with ample room for shifting the timber in them, and that the timber has been placed in approximate position; it is then required to shift the timber to its correct position and wedge it.

There would not be sufficient headroom to cut hitches for the sill at *V*, Fig. 2, so the one immediately below it is the first one placed. The transit is set up over point *c*, which is located, say, 0.25 ft. back from the front edge of the sill. The hight of the telescope axis above the top edge of the sill is measured and is found to be, say, 4½ ft. The auxiliary telescope, which is parallel to the main telescope, is 0.33 ft. from the latter. A sight is now taken under the waste bin to *d* and the telescope depressed until the proper inclination of the shaft, 75 deg., is read on the vertical circle. In order to sight down the shaft at this steep inclination we must use the auxiliary telescope, which is now parallel to the shaft's inclination and at a certain horizontal distance in front of the plane of the sills. From the data above given we calculate this as follows: *tan.* 15 deg. × 4.5 ft. + 0.33 ft. — 0.25 ft. = 1.29 ft.; this is the distance *e—f*, Figs. 2 and 3. By having a short graduated rod held level against the timber at *f*, the correct position of the sill will be determined when this distance is read on the rod.

The next step is to establish a point on this line at the bottom of the shaft at *g*, Figs. 2 and 3. I use as a sight a bright-headed nail driven in a block, with a strong light shed upon the nail, preferably from an acetylene lamp. The block is shifted till the intersection of the cross hairs cuts the center of the nail.

The transit is now taken down the shaft and set up over *g*, and a sight taken up the shaft to *c*. A right angle is turned and a point set on line near the other end of the shaft at *h*, Fig. 3. The transit is set up over *h* and a foresight taken to *g*; the telescope is elevated and leveled and a reading taken on a level rod held on *g*, which equals *g—p*. We will assume this to be 5 ft. A right angle is next turned toward the footwall of the shaft, and the telescopes elevated until the proper inclination of the shaft is read on the vertical circle. The line of sight of the auxiliary telescope of the instrument at *n*, is now parallel to the shaft's inclination and at a certain additional distance from the plane of the sills over that at *m*. This distance is *c—i*, Fig. 2, and is computed as follows: *c—i* = *tan.* 15 deg. × 5 ft. + 0.33 ft. — 1.67 ft., which added to *e—f*, gives us the distance *i—k*; this is 2.96 ft., Figs. 2 and 3. The sill at this end is correctly placed by moving it in the hitches until this distance is read on the rod held level at *k* with the graduated side down.

A Proposed Modification

There are two inconvenient features in the method I have attempted to describe, especially in setting timbers when the shaft has reached a considerable depth below the level. The first is that of the difficulty and danger encountered in carrying the transit up and down the rickety and shot-battered ladders, or in the bucket; the second is that of making two set-ups of the instrument on the bottom of the shaft, often covered with muck and debris, and sometimes having a sump of water at the only place a point can be conveniently located. These may both be obviated, when a depth of 50 ft. is reached, by establishing a point at right angles to the axis of the shaft on the first timber below the pentice, at the end farthest from the sinking compartment. Downward sights may then be taken at both ends of the shaft. It would, of course, be necessary to rig a platform at the end under the pentice, perhaps by hinging it to the sill and folding it back

---

*Mining and civil engineer, Copperhill, Tenn

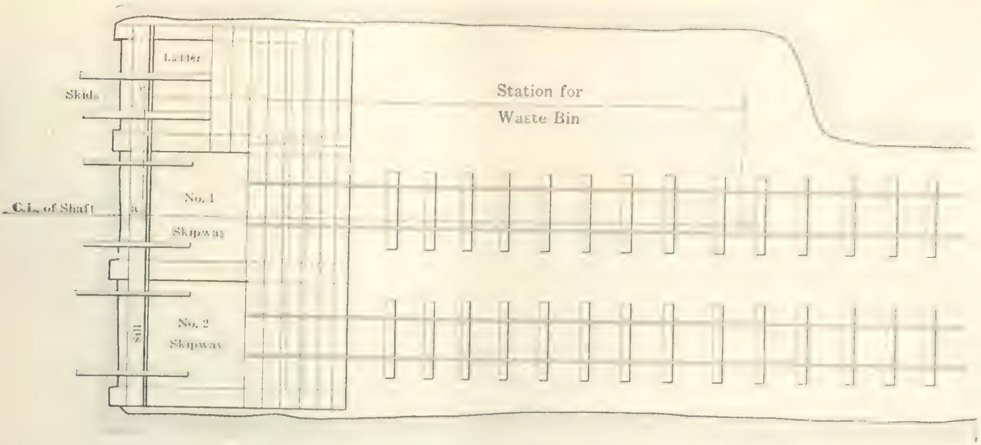
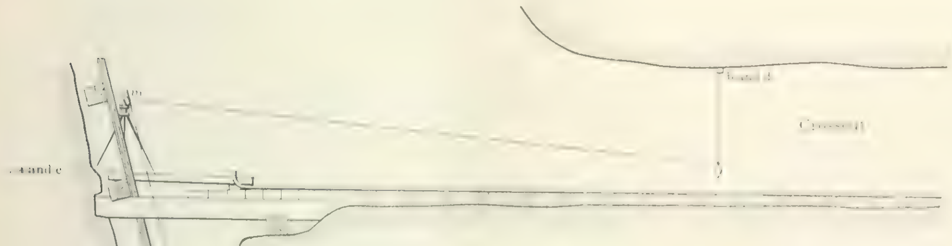


FIG. 1



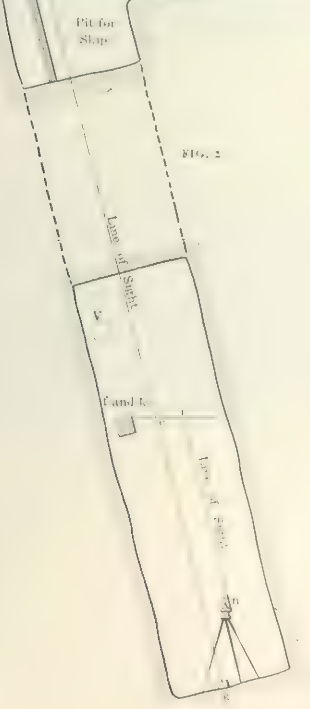


FIG. 2

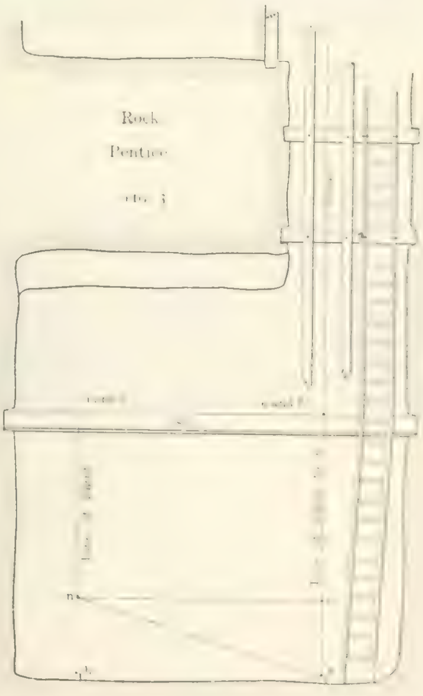


FIG. 3

against the footwall or out of the way of the blasting when not in use. I intended to try this experiment, but sinking was discontinued before I had an opportunity to do so.

Timbers are frequently set in inclined shafts with the aid of a straight-edge and clinometer. This was previously the practice in the Ducktown shafts, but the planes of the foot walls became somewhat twisted in both shafts and the method was abandoned in favor of the one described. A combination of the two may be used to advantage, but the ordinary mine timberman will do better work if the surveyor will keep a check on him. The time required is well spent when the results achieved assure smooth and true skipways down the shaft.

The proper cant of the timbers may be obtained with a clinometer, or by taking readings on the rod at the top and bottom edges of the sill. The sills are placed at intervals of 5 ft. That shown in the diagram is 25 ft. below the sill at the level. The sills between must, of course, be set after the pentice has been removed upon reaching the next level with the sinking.

American Institute of Mining Engineers

A circular from the secretary's office, under date of Aug. 31, states that the 95th meeting of the Institute will be held at Chattanooga, Tenn., beginning Oct. 1. The change of place from Birmingham, Ala., was announced previously. The headquarters will be at the Hotel Patten.

Sessions for reading and discussions of papers will be held Thursday evening, Oct. 1; Friday morning and evening, Saturday morning and, if necessary, Saturday evening. While it is impossible to say when a given paper will be presented, the following provisional statement is probably correct:

On Thursday evening, besides the formal welcome of the Institute, important addresses, explaining the present industrial conditions of the South, are expected, and the address of John Hays Hammond, president of the Council of the Institute, on "Professional Ethics," will be delivered. On Friday morning, papers relating to iron and steel will be presented, especially new and hitherto unpublished records of practice with the Gayley dry-blast process. On Friday afternoon, papers on economic geology will be presented. On Saturday, papers on other branches of mining and metallurgy, especially the preliminary paper of Mr. Aldrich, on "The Treatment of the Gold Ores of Hog Mountain, Alabama." This arrangement is subject to such changes as the immediate situation developed at the meeting may require. At present, it can only be said that, as to actual oral presentation of papers, preference will be given: (1) To those which have local interest; (2) to those of which the authors are present; and (3) to those which members present desire to discuss, and concerning which early previous notice of that desire has been given to the secretary. The following list of papers is provisionally announced:

A. Iron and Steel

1. Experience with the Gayley Dry Blast at the Warwick Iron and Steel Furnaces, Pottstown, Penn., by Edward B. Cook, Pottstown, Penn.

2. Experience with the Gayley Dry-Blast Process in the Blast Furnace and the Bessemer Converter, at the Works of the Illinois Steel Company, by Theodore W. Robinson, Chicago.

3. Mr. Gayley's Invention, by R. W. Raymond, New York.

4. Blast-Pressure at the Tuyeres and Inside the Furnace, by R. H. Sweetser, Columbus, Ohio.

5. An Unusual Blast-Furnace Product; and Nickel in Some Virginia Iron Ores, by Frank Firmstone, Easton, Penn.

6. The Relation of Slow Driving to Fuel Economy in Iron Blast-Furnace Practice, by John B. Miles, Philadelphia.

7. Report of the Institute Committee on Steel.

B. Economic Geology

8. A New Theory of the Genesis of Brown Hematite Ores, and a New Source of Sulphur Supply, by H. M. Chance, Philadelphia.

9. The Santa Rita Mining District, by John M. Sully, Silver City, N. M.

10. Clinton Iron Ores in the Birmingham District, Alabama, by Ernest F. Burchard, Washington.

11. The Clinton Iron-Ore Deposits of Stone Valley, Huntington Co., Penn., by J. J. Rutledge, Baltimore, Md.

12. The Clinton Iron-Ore Deposits of New York, by David H. Newland, Albany, N. Y.

13. Studies of Illinois Coals, by H. Foster Bain, director of State Geological Survey, Urbana, Ill.; Frank W. DeWolf, assistant State geologist; J. M. Lindgren, assistant chemist, Engineering Experiment station; Perry Barker, assistant chemist; George S. Rice, consulting engineer; J. M. Snodgrass, assistant engineer; H. C. Hoagland and A. Bement, consulting engineers; W. F. Wheeler, chemist, State Geological Survey; and C. K. Francis, research assistant in applied chemistry, University of Illinois.

14. Problems Connected with the Examination of and Report on Undeveloped Mineral Properties, by Charles Catlett, Staunton, Va.

15. The Distribution of the Elements in Igneous Rocks, by Henry S. Washington, New York.

16. Notes on Some Philippine Coal-Fields, by J. W. Dilworth, Philadelphia.

17. The Law of Fissures, by Blamey Stevens, Seattle, Wash.

C. Mining and Metallurgy

18. Pressure-Fans *versus* Exhaust-Fans, by Audley H. Stow, Maybeury, W. Va.

19. Requirements of a Breathing Apparatus for Mining Use, by Walter E. Mingram, New York.

20. Sulphur Dioxide as an Agent in Fighting Mine Fires, by Walter O. Snelling, Washington.

21. The Ilsede Hütte Iron Mines at Peine, Germany, by Lucius W. Mayer, New York.

22. Gold Dredging in the Choco, Republic of Colombia, South America, by Henry G. Granger, New York.

23. The Silver Mines of Mexico, by Albert Bordeaux, Thonon-les-Bains, France.

24. The Management of Mining Operations, by Joseph MacDonald, Guanajuato, Mexico.

25. Modern Coal-Cutting Machinery, by George S. Rice, Chicago.

26. Development, Sampling and Ore Valuation of Gold Mines, by C. Baring Horwood, Johannesburg, South Africa, and Mungo Park, Glan Ceris, North Wales.

27. The Chinese on the Rand, by T. Lane Carter, Transvaal.

28. The Kafir Mine Laborers, by T. Lane Carter, Transvaal.

29. The Treatment of the Gold Ores of Hog Mountain, Alabama, by T. H. Aldrich, Jr., Birmingham, Ala.

30. The Mining and Milling of Silver-Lead and Zinc Ores at Pierrefitte Mines, France, by William W. Van Ness, London, England.

31. The Hardinge Conical Pebble Mill, by H. W. Hardinge, New York.

32. The Wilfley Table: II., by Robert H. Richards, Boston.

33. Investigation on Jigging, by Royal P. Jarvis, Knoxville, Tenn.

34. Sulphur in Gaseous Fuels, by F. Louis Grammer, Leesburg, Va.

35. Constitution of Copper Mattes and Copper-lead Mattes, by Charles H. Fulton, Rapid City, S. D.

36. Behavior of Calcium Sulphite at Elevated Temperatures with Various Fluxes, by H. O. Hofman and W. Mostowitsch, Boston.

Local Arrangements

The arrangements for entertainment, visits and other matters are in charge of the local committee at Chattanooga, of which H. S. Chamberlain is chairman.

Consul-General Michael, of Calcutta, reports that the output of rubies in Burma during 1907 amounted to 2,128,368 trucks, valued in Magok books at $577,325. The royalty revenue for the year was $99,245. The market for rubies was fairly good the first of the year, falling away discouragingly toward the last of the year.

Jesus Maria and Flores Mills, Guanajuato

By Cyaniding the Silicious Gold-Silver Ore an Average Extraction of 86 Per Cent. Silver and 88 Per Cent. Gold Has Been Obtained

BY CLAUDE T. RICE

In this article I shall d[illegible] mills in the Guanajuato district. As is well known the ore at Guanajuato contains gold and silver in sulphides, with a silicious gangue. The first of these mills, the Jesus Maria, is more typical of the early cyanide practice in the district for the ore is crushed in water. The other mill, that of the Guanajuato Reduction and Mines Company, is typical of the most modern practice at Guanajuato.

THE JESUS MARIA MILL AT LA LUZ, GUANAJUATO

CYANIDE PLANT, JESUS MARIA MILL

[illegible] TANKS, JESUS MARIA MILL

The Jesus Maria Mill

The Jesus Maria mill, belonging to the Guanajuato Amalgamated Gold Mines Company, is situated at La Luz about six miles west of Guanajuato; it was designed by V. B. Sherrod. Work was begun in June, 1905 and the mill was completed early in 1906. The mill is unique in that it has a separate breaker house, separate battery house and separate concentrator plant. As a result the different depart- [illegible] the mill with a minimum amount of grading. The mill is treating ore from the Jesus Maria mine and from the mine dump. The mine ore is worth, with silver [illegible] 42 per cent. of the value being in silver. The mine dump ore is worth about $4 per ton so that the ore now going to the mill is worth about $6 per ton.

This is the only mill in the district that is not crushing in cyanide solution, and it is also the only one using amalgamating plates, but the company is going to change soon to crushing in cyanide solution and then the plates will be discarded. The method of treatment was in a transitory stage at the time of my visit; more sand tanks were being installed and Dorr classifiers were being put in place to make a cleaner separation of sand and slime. The [illegible] by installing filter presses.

As this is the only mill in the La Luz section of the Guanajuato district, it was designed so as to be able to do custom work. Consequently the ore is dumped into two bins, one being intended for ore from the company's mines and the other for custom ore in case any is treated. As yet the company has milled no custom ore. These bins feed to two No. 3 D Gates [illegible] sampler that cuts out 1/5; this 1/5 then goes to a small sample crusher where it is re-crushed and elevated to a Vezin sampler which cuts out about 1/20 of the [illegible] system and the broken rock from the two

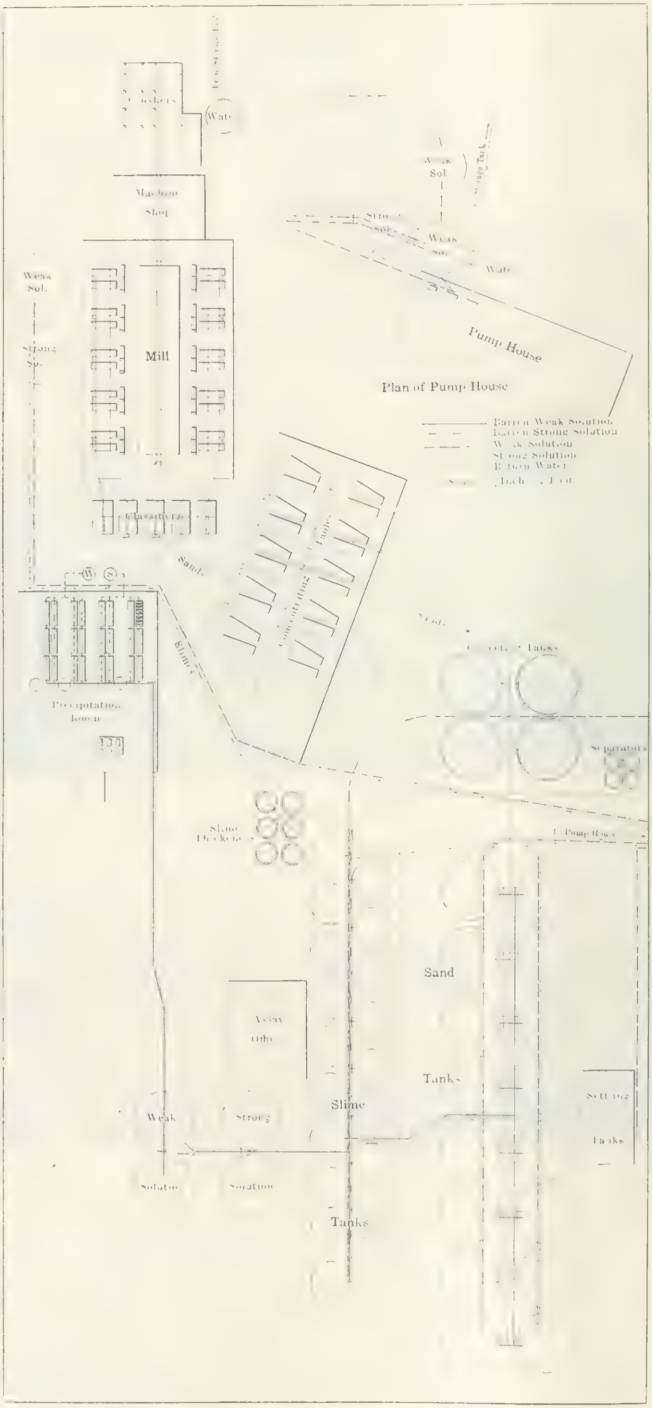
Gates crushers go to a 16-in. Robins belt conveyer, which carries the ore to a tripper that discharges into the 300-ton battery bin. The 100 stamps are arranged in two rows of 50 stamps each, placed back to back with the bin between. The ore is fed to the batteries by suspended Challenge feeders; the stamps weigh 1050 lb. and make 103 drops, 6 in. high, per minute in an Allis-Chalmers No. 120 mortar resting on a concrete mortar block; a 40-mesh screen is used on the batteries. The crushed ore flows over silver-plated copper plates. These plates have a grade of 1½ in. per foot, and are 11 ft. 4 in. long with 8 in. of riffles at the bottom to catch the quicksilver. To guard against loss of mercury or amalgam, crude mercury traps, made by nailing slats to strips of blanket, are also used in the launders that carry the pulp away from the plates.

The batteries are arranged in units of ten stamps. Two motors drive the 10 end stamps and four motors drive 20 stamps each, each set of 10 stamps being driven by a separate belt from the 20-stamp line shaft. Blanton fasteners are used on the cam shafts; the regular order of drop is used in the batteries.

The pulp from the batteries formerly went to large Dimmick classifiers where three sizes were made for concentration, but these Dimmick classifiers have now been replaced by Dorr classifiers so as to obtain a cleaner sand for leaching. The Dorr classifiers are doing fine work; the sands from the Dorr classifiers leach much faster than before and a better extraction is obtained. The overflow goes to thickeners while the underflow goes to the concentrators. In the launders in the concentrating room Hungarian riffles are used so as to catch any quicksilver or amalgam that may have passed the other devices for saving amalgam.

There are 20 No. 3 Wilfley tables in the concentrator building arranged in two terraces. The slimes separated on the Wilfley tables rejoin the sand going to the Dorr classifiers, while the middlings from the tables on the first terrace join the feed to the second-terrace tables and are concentrated. The middlings from the second-terrace tables are elevated and sent back to the first tables as a protection against carelessness on the part of the Mexican tablemen. The tailings from all the tables go to the sand plant for cyanide treatment.

About 40 per cent. of the extraction is made on the plates and concentrators, the plates furnishing about 30 per cent. of this. Not only gold, but also considerable silver is saved on the plates, showing that either considerable native silver or chlorides and bromides occur in the ore.



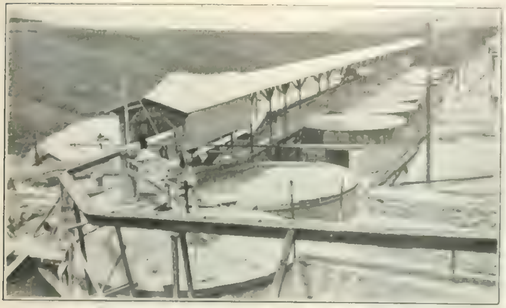
PLAN OF JESUS MARIA MILL, GUANAJUATO

CYANIDE TREATMENT

The sand, which amounts to 62 per cent. of the total ore, is charged into one [illegible] sand-collecting [illegible] [illegible] [illegible] [illegible] to keep the [illegible] agitation in order to make a final separation of the sand and slime in the collecting [illegible] [illegible]

[illegible] cars, but a Jeffrey conveying system is soon to be installed to handle the residues from the sand tanks. The discharged sand contains about 16 per cent moisture.

[illegible]



AND TANKS, [illegible] MILL

[illegible]

GENERAL VIEW, BUSTOS MILL

[illegible]

PART OF [illegible] MILL

[illegible]

cones. The sand-collecting tanks are 28x5 ft. deep, and hold about [illegible] tons of dry sand.

A collector is filled in 12 hours, after which it is allowed to drain for 12 hours; it is then discharged by shovel onto a 20-in. Robins belt conveyer, which raises the sand to the top of the 10 sand tanks (10

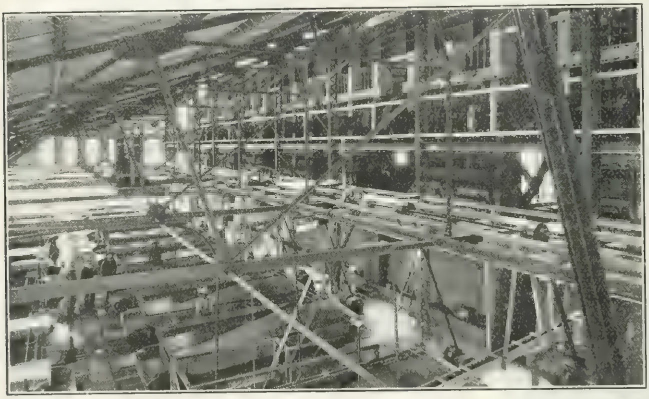
The strong solution used on the sand is [illegible] tion lasts about five days; then continuous [illegible]

[illegible]

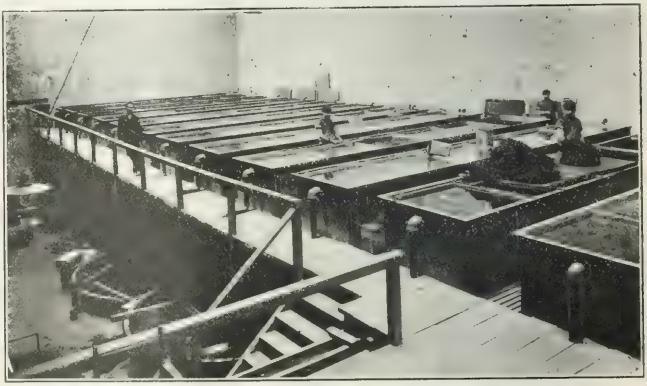
will be lengthened, and then possibly the strength of the strong solution will be reduced.

Slime Treatment at Jesus Maria

The slime from the Dimmick classifiers goes to nine Callow thickening cones. The thickened slime flows to one of the 20 slime tanks, having cone bottoms; these are the only cone tanks in the Guanajuato district. The tanks are 20 ft. diameter, 5 ft. deep to the cone, and the slope of the cone is 45 deg. These cone tanks are arranged in two rows of 10 each, and are staggered so that the main 3-in. feed pipe passes just over the inside edge of all of them. This feed pipe fills the different tanks through branch pipes passing into a 10-in. charging tube extending down the side to the bottom of the cylinder, allowing a fairly clear overflow to be obtained while the tank is charging.



STAMPS AND CONCENTRATING TABLES, BUSTOS MILL



PRECIPITATION ROOM, FLORES MILL

The slime is agitated by an air jet in the apex of the cone. A pressure of from 14 to 20 lb. per sq.in. is used for agitating these tanks and a good agitation is obtained. While the air is probably not so effectively used as in the high Pachuca tanks and the agitation is not so positive, still the large diameter of the tank allows of rapid settling and decantation so that complete dependence is not necessary on a filtering system as in the case of the Pachuca or more properly the Brown tank.

The overflow from the tank that is being charged is returned to the mill circulation. The slime, after its treatment which at present lasts 50 hours, is sent to large settlers 28 ft. deep whence it is discharged when it contains from 62 to 65 per cent. moisture. But as soon as the filter press is installed the settlers will be abandoned and the slime treatment lengthened to 75 hours.

As soon as the slime tank has received its charge, the strength of the solution is increased by adding sufficient sodium cyanide to make it titrate 0.1 KCN, the standard strength of solution used in the slime treatment. Sufficient lead acetate and 10 kg. of lime are added in order to protect the solution. The slime tanks take 12 hours to fill; then after the solution is made up the charge is agitated for 18 hours. The second agitation lasts six hours and the third wash four hours in solution titrating 0.1 KCN; each intervening settling-decanting period takes about eight hours. At present no water wash is used, but when the ore is crushed in cyanide solution, a final water wash will be given, and the agitation periods will be greatly lengthened.

The strong solution and the washes from the sand tanks go to the strong-solution head tanks which feed through butterfly valves to 12 strong-solution zinc-boxes; the weak solution and the washes from the slime tanks go to the head tanks feeding to the six weak-solution zinc-boxes. Each of these precipitation boxes has seven compartments, 30x20x20 in. in size. The precipitate during a clean-up is washed through a 60-mesh screen so as to separate the short zinc which is returned to the boxes and placed between layers of the long zinc. The precipitate is caught in a Perin filter-press having 24 frames 20 in. square and making 1-in. cakes. After being dried the precipitate is fluxed and melted in graphite crucibles, the first bars being remelted. About 360 tons of strong solution and 870 tons of weak solution per day are precipitated. The mill is crushing between 260 and 300 tons of ore per day.

The Bustos Mill

The Bustos mill, belonging to the Guanajuato Reduction and Mines Company, which was designed by the manager, Charles W. Van Law, has the peculiar feature of having the mill and cyanide plant far apart. The Bustos mill is in a dry gulch near the mines; the cyanide plant, called the Flores mill, is on the Guanajuato river where there is sufficient water to carry away the tailings. The pulp is conveyed from the Bustos to the Flores mill by an 8-in. bell and spigot cast-iron pipe 5440 ft. long.

The mill when first started, March 1, 1906, had only 80 stamps but during the last year the capacity has been increased to 500 tons per day by adding 80 stamps, another Abbé tube mill, and more Wilfley and Johnston tables. The ore treated, since it comes at present mainly from the mine dumps, is low-grade, and is therefore hand picked both at the mine and at the mill. Women, paid 50 centavos per day, do this work; traveling belts are used in both cases.

The crushers are placed in a separate crusher house and the ore is conveyed by an inclined belt conveyer to the mill building, constructed entirely of steel. After being broken in a large gyratory crusher, the ore is hand picked, and then after passing over a grizzly is recrushed in another gyratory crusher to 1⅛-in. size. The ore is then conveyed by an inclined belt conveyer to the steel battery bins having a capacity of 2500 tons. The 160 stamps are arranged back to back with the bin between. The stamps, weighing 1050 lb., make 100 drops, 7½ in.

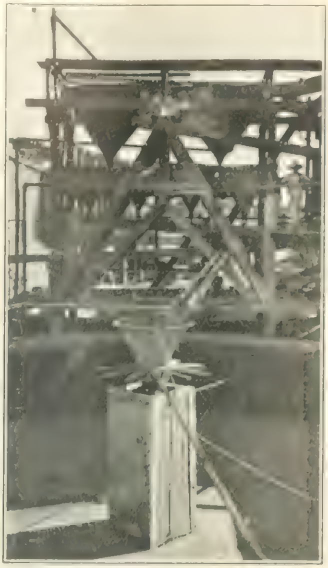
high, per minute; the mortar box is of the El Oro type and weighs 9000 lb. One-fourth of the batteries are using 20-mesh and the rest 26-mesh, No. 28 wire screens. The battery pulp, after going to settling cones to insure a thick feed, is concentrated on 32 tables all of which, with the exception of one Overstrom, are Wilfleys. The sand and middlings, amounting to 35 per cent. of the total tonnage, are recrushed in two Abbé tube mills fitted with silex linings and in which pebbles are used entirely for grinders, and then are reconcentrated upon 18 Johnston tables. The tailings then go to large cones, 20 ft. diam., where about one-half the solution (for crushing is done in solution containing 0.07 to 0.1 KCN) is removed as overflow and returned to the mill circulation, while the underflow is conveyed by the pipe-line, having a 2¼-per cent. grade, to the cyanide plant. In this pipe-line there is considerable agitation of the pulp in the solution; consequently there is some solution of the metals, especially in the case of the slime, during the passage through the pipe.

FLORES CYANIDE PLANT

The pulp from the pipe-line goes to two 8-ft. cones; the underflow from each of these large cones goes to four 4-ft. cones, where the pulp is separated into sand and slime. The sand is charged by a two-arm Butters-Mein distributor into one of three 40x8-ft. collecting tanks, having an ordinary filter bottom and slatted, central, overflow-box. The slime in the sand together with the finest sand is washed with a hose down the central box, and is then elevated by means of an air-lift pump to another series of cones where the slime and fine sand are reclassified. It takes about 36 hours to fill these tanks; they are allowed to drain 24 hours; then they are discharged onto the conveying belt which takes the sand to a Blaisdell tripper and stacker. This charges the sand into one of 15 leaching tanks, 40x8 ft. in size, having a capacity of 350 tons of dry sand. In these treatment tanks the sand is given a 20-day treatment under a 7½-ft. leaching column.

Once every 18 hours for 17 days the sand is given a bath of strong solution, titrating 0.4 per cent. KCN, the valves being closed for two hours after each bath to give good contact. At the end of that period the sand is given a continuous water wash for two days; finally, after the tank has drained for 24 hours so that the moisture is reduced to 13 per cent., the sand is sluiced out of the tanks.

The Blaisdell tripper works well. Two are used, one over each line of sand tanks. One of these is the original tripper designed at the plant and in operation before the company learned that the Blaisdell company manufactured an almost identical machine. The beaters on this machine, operated through gears by the conveying belt, break up the sand and throw it into the tank; the only shoveling [illegible] is that required to [illegible] small pile of sand that forms in the center of the tank.



SEPARATING [illegible] AND [illegible] TANK, FLORES MILL

SLIME TANK, CHARGING [illegible] FOR [illegible] CIRCULATION, FLORES MILL

The slime from the classifiers flows to two of 13 slime tanks, 30x12 ft. in size, having a capacity of 60 tons of dry slime. [illegible] bottom box, 18 in. square, extending down two-thirds of the depth of the tank and inside of which is placed a perforated wooden box 10 in. square, having a tight bottom. This allows the bubbles of air which are the main cause of disturbance in the pulp to pass out between the two boxes without disturbing the settling.

The clear overflow from these tanks, during their 12 hours of charging, is pumped back to the mill circulation. After the slime-collecting tank is filled, about 6 in. of solution is decanted off; then the solution is made up to 0.14 per cent. KCN and agitation begins. The slime treatment lasts 72 hours.

Agitation is obtained by rotating arms and by means of a 6-in. Butters pump which takes the pulp from the bottom of the tank and delivers it to the top. A 1-in. air pipe is also used to aërate the solution during agitation. The pulp is diluted 6 to 1. The first agitation, during which most of the gold and silver is dissolved, lasts 12 hours; then the solution is settled and decanted for 16 hours. The second agitation lasts two hours; second settling and decantation, 12 hours. The third agitation, two hours; settling, decantation and discharging takes 14 hours. The pulp goes to one of three settling tanks, 18x22 ft. deep, where the slime is again settled and more solution decanted. This settled pulp, containing 66 per cent. moisture, is sent to the Butters filter. But since the filtering capacity of the plant is too small to handle all the pulp, one of the other deep tanks is used as a continuous settler; the third deep tank, fitted with cocoa-matting barriers, is used for clarifying decanted solution.

The Butters filter has 75 standard-size leaves; it makes 16 cakes and filters 160 tons of dry slime [illegible] quently, as has been said, some of the slime has to be discharged from the third settler without filtering. An 8-in. Butters pump is used in connection with the filter; all valves are quick-acting lever valves, so that the Mexican labor can operate them rapidly. The length of wash is 15 min., but the slime cake from the Butters filter assays only 5 grams silver per metric ton higher than the laboratory-washed slime; the cake assays 15 grams silver less per ton than the slime discharged from the settling tanks. The pulp discharged from the Butters filter contains 41 per cent. moisture, part of which, of course, is water from the wash.

The solutions are precipitated in 15 zinc-boxes each having six 4x4x3-ft. compartments; five of these are for strong and ten for weak solution. In cleaning up, the precipitate is washed through a 40-mesh screen, and the shorts put back between layers of shavings in the first compartments of the strong-solution boxes. The [illegible] Johnson filter press where the cake is slightly dried by compressed air before the press is cleaned.

This cake of precipitate, containing approximately 50 per cent. moisture, is mixed wet, so as to avoid dust losses, with [illegible] containing 15 parts borax, 12 parts [illegible] and [illegible] parts silica, no trouble from boiling over is experienced. A Morgan clay-lined crucible is used; this costs 5 pesos less than a graphite crucible, and it lasts 1½ times as long. The pots are poured directly into the bar molds; the bullion is not remelted as is done at the other mills at Guanajuato. Both on this account and because of not drying the precipitate before mixing, a considerable saving in fuel is made. In pouring, the bar mold is placed on top of the first cone, so that slag overflows from the mold into this cone which has a clay-plugged tap hole in its side. The slag is allowed to stand in this cone for about 10 min., during which time a 2-in. shell forms; then the tap hole is opened, and the molten slag from the interior allowed to run off. By experiment it has been found that the 2-in. shell contains nearly all the matte and fine shot, but to guard against loss this slag is saved. When 10 tons have accumulated, the slag is returned to the stamp mill. The shell of matte and shot as well as the button of bullion that has formed in the bottom of the pot are mixed with some subsequent charge. The bullion obtained assays 860 fine.

The mill, as has been said, is treating 500 tons of ore per day, but as 50 per cent. of the ore at present comes from old dumps the heads are low-grade. The pulp from the mill consists of about 240 tons slime and 260 tons sand per day.

The extraction obtained on the tables is not so high as at some of the other mills, for the concentrates contain only 28 per cent. of the silver and 31 per cent. of the gold in the ore. The total extraction obtained by concentration and cyanidation is 86 per cent. on the silver and 88 per cent. on the gold, this being the average for the four months ending June 1, 1908. The cyanide consumption is 860 grams of sodium cyanide per metric ton of ore, the cyanide consumption having been cut practically in half by crushing in solution and filtering the slime. The slime and sand discharged assay less than 30 grams silver per metric ton. The cost of milling and cyaniding, including all charges, is only 3.15 pesos per metric ton.

The zinc concentrates exported from New South Wales come mainly from the Broken Hill district; in 1907 these were valued at £536,620, this being a considerable increase over the production in 1906.

The production of antimonial lead in the United States during 1907 by lead refiners was 9614 tons, as compared with [illegible] tons in 1906.

The British Institution of Mining Engineers

Special Correspondence

The Institution of Mining Engineers has been holding the annual meeting this week in Edinburgh. An important paper, entitled "Coal Dust to Date and its Treatment with Calcium Chloride," was read by Henry Hall, inspector of mines. He recommended the application of calcium chloride to roads in mines, preferring this method of laying dust to water sprinkling. The cost per 100 ft. over a width of 9 ft. would be about $1.04. In the discussion it was suggested that salt might be used in place of calcium chloride to save expense, but Mr. Hall said that the useful effect of salt was only 10 per cent. as compared with 90 per cent. from using calcium chloride.

Another interesting paper was read by George Blake Walker on "The Practical Use and Value of Colliery Rescue Apparatus and the Organization of Rescue Corps in England." In order that rescue apparatus, which depended on chemical reactions, should be efficient, it was recommended that such apparatus should be frequently examined by independent officials, and should not be left to the mine staff who might get careless about keeping the apparatus in perfect order. The question as to whether the rescue corps should be raised from employees in a colliery or whether they should be specially organized to serve a district was also considered. Experience has shown that rescue apparatus used by trained men may be of the greatest value in cases of explosion or of fire in mines. What is now required is that rescue work shall not be left to amateurs, and that in every colliery or in every colliery district there shall be a trained body of men drilled to undertake this dangerous work; otherwise the number of victims in a disaster may be increased rather than diminished.

The committee recommended that the headquarters of the Institution shall be moved from Newcastle to London. The society is mostly composed of coal-mining engineers and the removal of the headquarters from the coalfields must carry some disadvantages. It is, however, urged that important interests of the society, such for instance as those connected with legislation, would be better served by having the headquarters in the capital.

The Institution of Mining Engineers represents the coalfields of Scotland, the north of England and the Midlands, but the Welsh coalfields are not at present affiliated. The influence of the society would, of course, be far greater if it was representative of all the coal-mining districts instead of only a portion of them, and some scheme of amalgamation seems desirable in the interests of the industry. The Institution of Mining Engineers must not be confused with the Institution of Mining and Metallurgy which embraces both coal and metalliferous mining engineers, but principally the latter. That institution has always had its headquarters in London.

Sault Ste. Marie Canal Traffic

The depression in the iron industry is reflected in a striking way in the water-carried traffic from Lake Superior. The official returns give the total freight passing through the Sault Ste. Marie canals for the season to Sept. 1 as follows, in short tons:

	1907.	1908.	Changes
East-bound.	25,603,655	13,778,509	D. 11,825,146
West-bound	7,922,733	6,493,395	D 1,429,338
Total	33,526,388	20,271,904	D. 13,254,484

The decrease in east-bound freight was 46.2; in west-bound, 18; in the total traffic, 39.5 per cent. The number of vessel passages this year was 8333, showing an average cargo of 2434 tons. The mineral freights included in the totals were as follows, in net tons, except salt, which is given in barrels:

	1907.	1908.	Changes.
Coal	7,165,877	5,896,876	D 1,269,001
Iron ore	22,485,323	11,767,874	D. 10,717,449
Pig and manuf. iron	187,908	156,275	D. 31,633
Copper	42,497	51,839	I. 9,349
Building stone	320	1,019	I. 692
Salt, bbl	276,267	339,056	I 62,789

Iron ore was 58.1 per cent. of the total tonnage this year, and coal 29.1 per cent.; against 67.1 and 21.3 per cent., respectively, in 1907. The iron-ore traffic was the lightest for several years, being only a little over one-half of that reported last year.

Gold Mines of British India

The total output of the Kolar district in Mysore, India, in August was 43,766 oz. bullion, a decrease of 149 oz. from July. The monthly productions this year have shown only slight variations. For the eight months ended Aug. 31 the total was 350,244 oz. bullion in 1907, and 348,834 oz. in 1908; a decrease of 1410 oz. only. The bullion reported this year was equal to $6,489,367, or 313,951 oz. fine gold. Nearly all the gold won in the Kolar field comes from five large mines, the August returns from which are: Mysore, 17,544 oz.; Champion Reef, 10,038; Ooregum, 6994; Nundydroog, 6961; Balaghat-Mysore, 2034. About 15 per cent. of the gold production was obtained by cyaniding tailings from the stamp mills.

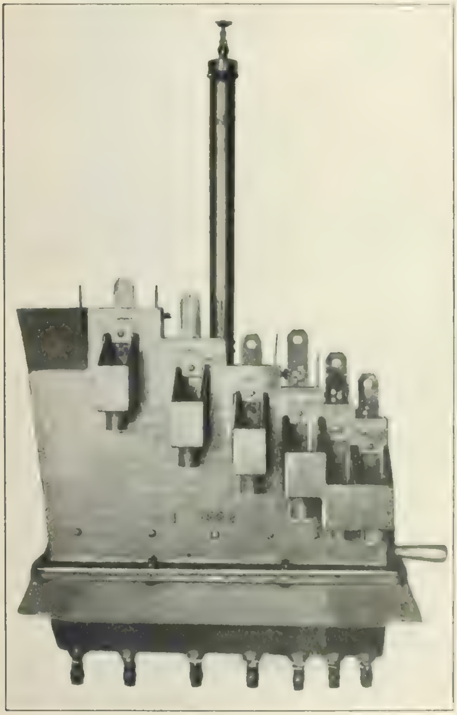
An authority states that arsenical copper should never be heated above 750 deg. C. in any part of the rolling process, whereas ordinary refined oxidized copper with 0.1 to 0.2 per cent. oxygen can be heated to 900 deg. C. without injury.

Richards Pulsator Jigs and Classifiers

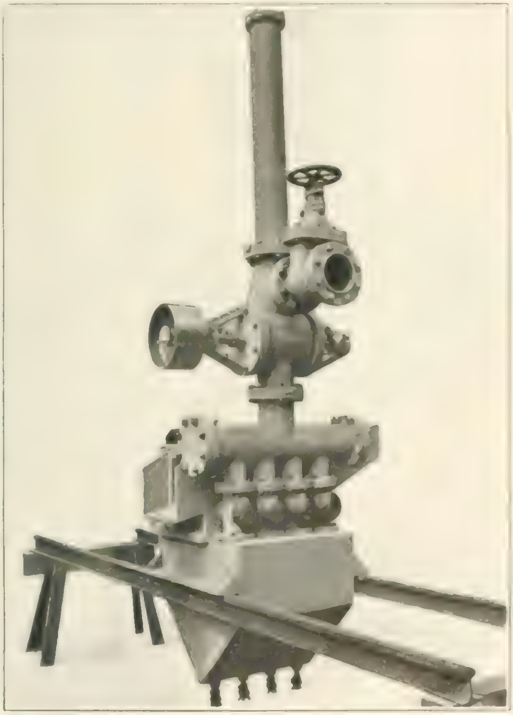
A New Principle in the Separation of Minerals, Employing Rapid Pulsations, in One Direction, of Water Delivered under Pressure

AN IMPORTANT DEVELOPMENT

The Denver Engineering Works Company is placing upon the market new types of jigs and classifiers embodying an interesting and remarkably effective principle discovered by Prof. Robert H. Richards, of the Massachusetts Institute of Technology, author of "Ore Dressing." The principle is not fully explained by the manufacturers, but the separation of the mineral particles in the remarkably smal space employed seems to be accomplished by means of rapid pulsations, without return flow, produced by repeated interruption of a current of water under pressure.



RICHARDS CLASSIFIER, INVERTED VIEW



RICHARDS JIG, SHOWING [illegible]

The Richards pulsator jig is made entirely of iron and is so small in comparison with Harz machines of the same capacity that it has the appearance of a toy. It is not claimed that the new jig can do cleaner work than the ordinary jig, but it is claimed that it will use much less water and occupy a remarkably small [illegible] use of the peculiar pulsating current of water renders it possible to make a single [illegible] of 200 sq.in. of screen surface in the ordinary jig.

The 400 ton, four-compartment jig shown in the accompanying illustration occupies a floor space only 3x5 ft. The screen surface of the little machine which handles this enormous volume of min[illegible] of the four compartments. The 90-ton Richards jig has four screens each 4 in. square or a total of 64 sq.in.; Harz jigs of 90-ton capacity would have 24 screens, each 17x30 in. or a total of 12,000 sq.in. The water used in the new jig is about 1000 gal. per ton of mineral, while the ordinary Harz jigs require 4700 gal. per ton of ore treated.

[illegible] which furnished data for the development [illegible]

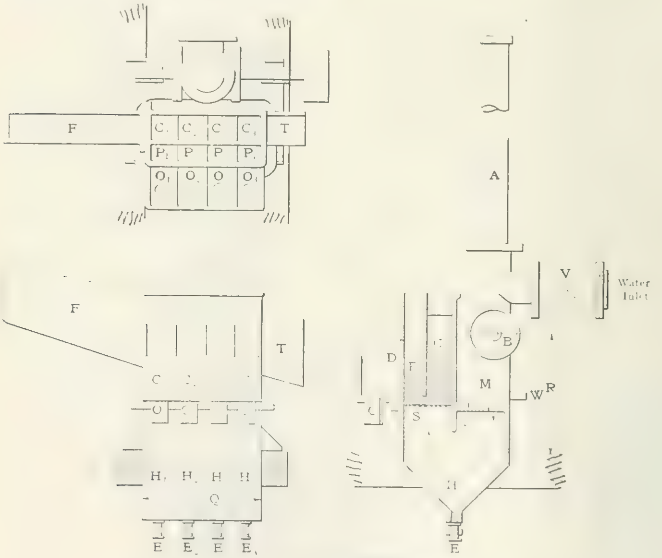
Although very unlike the ordinary jig in appearance, Prof. Richards' machine is only a modification of the Harz jig retaining all the essential features. It has no plungers and eccentrics, but it em[illegible] upon a screen as in the ordinary machine, the character of the pulsations and [illegible] product, but its division into compart[illegible] charge are the same as in the ordinary jig. Instead of the plungers which pro[illegible] Harz jig, the Richards machine has a rotary valve of peculiar design which im[illegible] supplied under a head, for ordinary ore, of [illegible] are so small the Richards jig carries twice the depth of bed employed in the ordinary jig. The usual depth of bed on the screen of a Harz jig is about 4 or 5 in.; the new jig carries from 8 to 12 in. of mineral, which is claimed to be a great advantage, obviating the necessity of frequent readjustment under varying conditions.

Method of Operation

In the accompanying illustration showing the four-compartment 90-ton jig in plan, elevation and section, the hutch *H* has the usual form, and the screen *S* is placed as in the Harz jig. The dividing plate between the pocket *P* and the compartment *C* acts as a seal or gate for the concentrates. The opening *D* is adjustable by means of vertical sliding gates to control the discharge. The manifold *M* distributes the water supplied through the valve *V* to the four compartments of the jig. The revolving pulsator valve *B* corresponds to the plunger of the ordinary machine. The screens are formed of two layers of brass-wire cloth, the lower one of four-mesh and the upper of 20-mesh cloth. The fineness of the screen prevents the separation of a hutch product except in unusual cases, all the concentrates being discharged through the side gates.

The pulp rushes through the small compartments at great speed, and the separation is effected in an incredibly short space of time. The relatively enormous capacity of the new jig is ascribed to the fact that the water pulsations are all in the same direction, upward through the screen. There is no suction or reverse impulse of water to cause a blinding of the screen and to undo the separation performed in the upstroke.

In general, the feed to the Richards pulsating jig should be screen-sized to the same ratio of maximum and minimum particles as for successful treatment in ordinary jigs. No exhaustive experiments have yet been made to determine the limits of sizing for the pulsating jigs. The 90-ton four-compartment jig, which has been in successful operation in one of the largest concentrating mills in Montana, is fed pulp not finer than one millimeter. It is believed that the smaller jigs will treat still smaller material but no trials on a commercial scale have been made. The maximum size treated in this jig is ¼ in. Material as coarse as 1 in. can be treated in the larger 9x14-in. jigs.

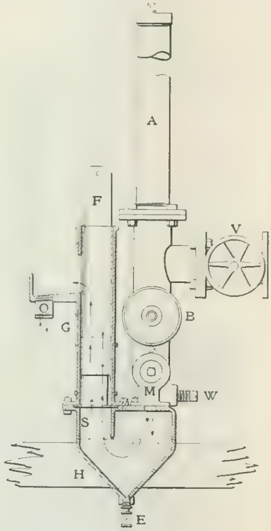


RICHARDS JIG, PLAN, SECTION AND ELEVATION

Pulsator Classifiers

The Richards classifiers embody a more radical departure in principle from the conventional spitzkasten and cone than is the case with the new and the old jig. There are two types of the Richards classifier, both employing pulsations to effect hindered settling. In the direct type the pulp enters at the top of the series of compartments, the lighter particles being lifted over the separating diaphragms, and the velocity of the current being greatest at the feed end. The action is, therefore, similar to that of the spitzkasten except that the pulsations effect a more rapid separation. The inverted type employs a screen and bed, like a jig, the pulp being fed into the bottom of the chamber in which the current velocity is lowest, and the heavier particles passing under gates from compartment to compartment and being discharged through side gates placed at successively lower elevations above the screen and bed.

It is the inverted type that embodies the most radical departure from the ordinary classifying apparatus. The pulsations in the current of hydraulic water are produced in the usual way by means of the pulsator valve. The pressure at which the water should be delivered depends upon the size and specific gravity of the particles of ore to be treated. A head of 30 ft. is required for copper ores carrying 2½-mm. grains, or for galena ores carrying 2-mm. grains, while a head of 15 ft. will suffice for ores in which the coarsest grains are 0.75 mm. in diameter (about 20-mesh). Below the rotary pulsator valve is a manifold *M* which distributes the water to the several compartments of the machine. Individual valves *W* control the flow of the pulsating current to each compartment.



VERTICAL SECTION, RICHARDS CLASSIFIER

The machine has a hutch extending below the feed spout and divided by transverse walls into several compartments. The pulsating stream of water passes through the hutch of each compartment upward through the screen. The length of each hutch compartment and corresponding classifying compartment is greater than that of any succeeding compartment, and the width of all compartments except the last is the same. Consequently the velocity of the pulsating stream of water will be relatively low at the first sieve and high at the last.

The dividing walls between the six

classifying compartments are provided with adjustable gates above the screen. The ore is fed into the feed hopper, which is also provided with a hutch and screen. Here it encounters a rising pulsating current of water which serves to agitate the ore, placing it in partial suspension and preventing clogging. From the feed hopper it passes below the gate into the first classifying compartment where it encounters a pulsating current rising slightly more rapidly than that in the hopper. This current further agitates the ore, lifts out and raises to the discharge opening the lightest particles. The heavier particles pass beneath the gate into the next compartment where the lifting power of the pulsating current is again stronger, removing the particles next in order in weight.

This process is repeated successively until in the last compartment only the heaviest particles remain. In case the ore contains particularly heavy particles the current in the last compartment may not be sufficient to lift all of the ore to the discharge opening. In this event a plug and spigot are used to remove the concentrates. All gates and discharge openings are adjustable. The sieve serves merely to support the bed of ore and to admit the rising current of water; it has no part in the classification. Particles of free mineral heavy enough to settle against the current and small enough to pass through the screen openings may find their way to the bottom of the hutch whence they may be drawn off through spigots. In general the number of particles which find their way through the screen are few and the hutch need not be drained oftener than once a day.

CAPACITY AND SIZE

The standard 4-in. six-compartment pulsator classifier has a capacity of 150 to 200 tons of ore in a properly thickened pulp per 24 hours. It delivers six different classes of product. Standard spitzkasten are seldom used for more than four different classes of discharge. One spitzkasten handling 150 tons would be of prohibitive size, and in practice two machines, each handling 75 tons per 24 hours would be used. Assuming that these two spitzkastens are set side by side, the comparison between the dimensions and weight and those of the Richards classifier would be as shown in the accompanying table:

In these figures the hight of the air column on the Richards classifier is not included, since this portion of the machine occupies a space which would otherwise be unused.

The Richards pulsator classifier has already been adopted by about 20 well known companies, including the Boston & Montana Consolidated Copper and Silver Mining Company, Great Falls, Mont., the St. Joseph Lead Company, Flat River, Mo., and the Federal Mining and Smelting Company, Wallace, Idaho. Not only is a relatively great capacity claimed for the machine, but it is also said to effect a great increase in the capacity of vanners and tables treating the classified product. At one installation five reciprocating tables and one vanner are sufficient to handle daily 200 tons of ore crushed to pass 2½ mm. and classified by a Richards machine. It is also claimed that the introduction of the classifier in this installation effected a reduction of the loss in the tailings of exactly one-half.

COMPARISON OF RICHARDS AND HARZ JIGS, CAPACITY 90 TONS PER DAY.

Type of Machine.	Number of Machines Required	Floor Space	Weight	Water.	[illegible]	Horse-power	Screen Area.
Richards	1 Single 4-Comp	8 sq. ft.	1,500 lb.	80,000 gal.	1	1	64 sq. [illegible]
Harz	3 Double 4-Comp.	530 sq. ft.	30,000 lb.	425,000 gal.	[illegible]	6	12,000 sq. [illegible]

COMPARISON OF RICHARDS CLASSIFIER AND SPITZKASTEN FOR A DUTY OF 150 TONS PER 24 HOURS.

	No. of Products.	Total Weight.	Length Over-all	Hight Over-all	Maximum Width Over-all	Maximum Fall Feed to Lowest Discharge
Richards Pulsator Classifier.	6	2,000 lb.	6 ft.	[illegible]	2 ft.	2 ft.
Spitzkasten.	4	17,400 lb.	10 ft.	[illegible]	[illegible]	[illegible]

Coal Car Distribution and the Ownership of Coal Cars

A case of importance to many coal companies was decided by the United States Circuit Court of Appeals at Richmond, Va., Sept. 17. The complainant in the case, the Pitcairn Coal Company, brought charges against the Baltimore & Ohio Railroad Company of discrimination in the distribution of empty cars to coal mines on its line. The complaint was supported by the Interstate Commerce Commission, but its action was practically set aside by the district court, to which an appeal was taken. On further appeal the higher court now reverses that decision and supports the original charges of discrimination.

Stripped of its technicalities, the main point at issue related to the ownership of cars by coal companies. It appears to have been the custom on the Baltimore & Ohio to deliver such empty cars to the companies owning them, and not to count them in making up its assignment of cars to the various coal companies on its line. The Court of Appeals holds, in effect, that such a method constituted undue discrimination under the terms of the law. To make an equitable division, all cars handled must be counted, no matter what their ownership, and the distribution must be made *pro rata* to all the mines, on the same basis; no difference to be made to those mines owning their own cars.

Commenting on the requirements of the law for equal treatment and service, the decision says: "This is a wise provision, and in the absence of such legislation a common carrier could build up one class of shippers and utterly destroy and tear down another. The statute puts upon the carrier the plain duty of furnishing a fair and equal distribution of car facilities, and this duty cannot be evaded by the carrier claiming that it is not the owner of a portion of the cars carried over its lines.

"If a carrier by contractual arrangement operates individual cars belonging to mine owners such arrangement cannot relieve the carrier of the duty of furnishing equal facilities to all shippers similarly situated. To adopt any other rule would make it possible for wealthy mine owners to purchase car equipment and utilize car equipment to such an extent as to practically deprive other mine owners of means of transportation.

"The defendant mine owners insist that in the purchase of individual cars they have expended large amounts of money, which become a part of their investment, and should be treated as such, and it would be unfair to require a carrier to charge such cars against the percentage, but this is a matter which cannot be considered, inasmuch as the statute was not enacted for the purpose of promoting the interests of any one mine owner. There is nothing in the act prohibiting a carrier from making any arrangement it may choose regarding the ownership of cars operated on its lines, but the carrier cannot make such arrangements as will by indirection accomplish that which is in violation of the statute."

West African Gold Production

[illegible] reports gold production in August at [illegible] than in July, and 160 oz. more than in August, 1907. For the eight months ended Aug. 31 the total production was 194,385 oz. bullion in 1907, and 199,401 oz. in 1908; an increase of 5016 oz. The bullion re- [illegible] or 187,208 oz. fine gold.

Operating a Nova Scotia Coal Mine

Rules Governing Shot-firing Are So Efficient, When Rigidly Enforced, that 150,000 Shots Have Been Fired without Causing an Accident

BY H. E. COLL*

Owing to the large number of seams worked, and the dips ranging from flat to 80 deg., no two mines in the Pictou county field are worked alike. We also find in each mine different methods of working the coal. This is due to local ridges and basins accompanied by pinches and rolls, which necessitates some modifications of the general method.

The highest bed worked in the field is the MacKay seam, from which the Nova Scotia Steel and Coal Company obtains 150 tons per day at the Marsh mine located about the center of the eastern section.

The next seam in the series is the one worked at the Vale mine, of the Acadia Coal Company, located at Thorburn; as these two seams are worked by the same methods a description of the latter will answer the purpose.

A slope was driven on the dip of the coal, at 29 deg. for the first 500 ft., and then flattening off until at 2400 ft. a local basin was reached and the main landing put in. As development continued, it became apparent that other basins existed to the right and left, and slopes were driven down to run this coal. That on the right-hand side is about worked out, but on the left side recent work has proved that this slope is on the main dip of the field, in a southwesterly direction with an average grade of 6 degrees.

The coal is 3 ft. 6 in. high, and has practically no parting on either top or bottom. It is hard and tightly set, and contains no bands or impurities. The roof is flinty shale up to 2 ft. 6 in. thickness, and parts readily. Lying above this is a splinty shale, from 10 to 20 ft. in thickness. This crushes and squeezes on the least pressure from the upper strata, and as there is 700 ft. of cover on the dip workings, the pressure is considerable. Levels are driven off the main dip, to the left and right at intervals of 600 ft. When the levels are driven in 400 ft., the first balance is driven up directly on the rise of the coal, and bords or rooms are turned off and driven on 50-ft. centers. These bords are from 200 to 300 ft. deep, and as soon as driven in, the pillars are started back.

ALLAN SHAFT AND TIPPLE OF ACADIA COAL COMPANY, STELLARTON, NOVA SCOTIA

METHOD OF CONVEYING THE COAL

The coal is lowered to the level from the bords by a cage, which is balanced on a drum by a carriage containing sufficient weight to pull an empty box. The drum is controlled by a brake, operated by a boy. When the cage lands at a bord, the empty is shoved into the bord and turned over on its side and the loaded box pushed past onto the cage. The brakeholder lifts the brake and the cage lowers to the level, where the box is run into the turnout and from there is hauled by horses in trips of six boxes, to the level landing.

The diameter of the brake drum is dependent upon the length of the balance, angle of dip and weight of box to be handled. They are built up with segments of 3-in. spruce, having beveled edges so as to make close joints. In the center of the drum is a 3-in. hardwood flange which keeps the two ropes separated, and on the cage end of the drum is placed the brake band. The balance box has a 16-in. track gage, and is made of two 4x1-in. bars bent so as to form a carriage which carries sufficient cast-iron weights of 125 lb. each, to overbalance the empty box. The frame is mounted on 12-in. wheels so that the weight travels very close to the rails.

The wagon, or, as it is locally termed, "box" used, weighs 750 lb. and holds 1540 lb. of coal. The level landing holds 12 loads, or two horse trips. On the main dip a pair of "Lidgerwood" 10x12-in. friction-drum engines operated by compressed air, haul the boxes in trips of 12, up to the main landing, a distance of 3000 ft. From here the boxes are hauled by horse 700 ft. to the main landing, where they are attached in trips of six to the main slope ropes. The main dip faces are now 1⅛ miles from the slope mouth.

HOURS OF LABOR

All mine employees are lowered into

---

*Mining engineer with Acadia Coal Company, Ltd., Stellartown, Nova Scotia.

the mine between 6 and 6:50 a.m. Each "rake" takes eight minutes to land at the bottom of the slope. The average time the miners and loaders reach their faces and are ready to commence work is 7:15 a.m. Owing to the size of seam, method of mining and local conditions, the miner leaves but little coal from the previous day, so that by the time he gets the first box landed it is 8 o'clock.

Only one miner and loader work at each face, and they mine and load an average of four boxes in the morning and three in the afternoon. The miner quits about 2:30 p.m., leaving one box of coal for the loader to fill out and making his actual working time at the face 6¾ hours, and the loader's time, 7½ hours. During this time the miner cuts an average of 0.68 ton per hour, and the loader fills 0.61 ton per hour, making a total for the day's work of 9.16 tons of coal. Taking the average for 1907, the miner had an earning capacity of 34c. per hour, and the loader 22c. per hour.

[illegible]

AMOUNT OF POWDER USED

Previous to this year, black powder has been used, the shots being fired by a squib. In January, a Government-permitted explosive was adopted after 6 months' experimenting with various explosives. The men made strong objection to any change as there was considerable difference in the price, but this was offset by the strength of the new explosive, and the result is shown by the following table:

	Black Powder	New Explosive
No. tons of coal per lb. explosive	1.424	3.09
No. tons of coal per wkg. face per day	1.938	1.60
Powder cost per ton of coal	12 cents	10½ cents

The difference in tonnage per working face was really due to more pillar work being done in 1907, thus reducing the amount of coal per pound of powder. The decrease in the cost per ton to the miner, together with the high increase in the factor of safety are the main features which have convinced both management and miners that there is no comparison [illegible] a high explosive. The latter is used in an [illegible] tery placed in the nearest crosscut. A miss-shot is extremely rare, but when it does occur, the rules in force fully protect the miner. The powder has the following composition:

[illegible]

The following regulations governing the use of explosives have been adopted by the Acadia Coal Company and have been approved by the Mines Department of Nova Scotia.

[illegible]

1. When a miner holding a shot-firer's certificate is given permission to fire his own shots, before firing, he must carefully examine the place where the shot is to be placed, and if he discovers any noxious gases, defects in the roof, or danger from any other source, no shots must be fired until such danger is removed.

2. No shot must be fired until the face is either sheared, mined, or undercut, not less than 3 ft. deep, the full size of the place, or having an open end equal to the same, without special permission.

3. No shot must be fired when the borehole used for firing extends beyond such mining, shearing, undercutting, or open end. All holes found beyond such mining, shearing, or open end, will be termed fast shots.

4. No shot must be fired with the timbering at a greater distance from the working face than 8 ft., or closer if required by the management, or by a special permit that timbering may be a greater distance from the working face.

5. He must return immediately to each shot after it fires, and if he should find [illegible] working.

6. When a "bench" shot has been fired, the miner must immediately proceed to turn over the coal or load it out.

[illegible] working face, until such time as he receives permission from and is accompanied by the examiner of that section.

[illegible] longer period than 30 min. before being fired.

9. If, owing to an insufficient charge of powder, a face shall be "hung up," all the coal to the depth of that shot must be mined out by hand-pick or machine, unless [illegible] shot.

10. No miner or shot-firer shall leave any charged hole in his working face when quitting work for the day.

11. [illegible] such manner that when fired it will be liable to shoot into either roof or bottom [illegible]

12. [illegible] requires to be set or replaced, he must not leave the place until such requirement [illegible]

13. He shall also set sufficient hoisting props when required to do so, and to work his place in a safe and proper manner.

14. [illegible] wires shall be first connected to the fuse wire, and the connection to the battery shall be made only by the person who has made the connection to the fuse wire.

[illegible]

insure each person being in a safe place before any shot shall be connected up to a battery.

16. No battery shall be tested or tried at any point outside of the lamp station.

17. No batteries shall be permitted to be used by any other than one holding shot-firer's papers.

18. No person shall be permitted to fire shots without permission from the examiner or official in charge of the mine.

Over 150,000 shots have been fired since these rules went into effect, and so far not one accident has occurred in connection with the use of explosives. These rules are rigidly enforced, and any violation is immediately followed by prosecution under the Mines Act.

Longwall

During the past year two sections each of 600 ft. length of face, have been laid out for longwall working, and it is the intention to substitute this method for the bord-and-pillar as soon as possible. The greatest difficulty is in getting the miners to work longwall as they are unfamiliar with the method and are not inclined to take up anything new. The work has progressed far enough to prove that the coal can be mined with one-half the present amount of powder, and all the coal extracted, instead of the 85 per cent. which they are now getting. The intention is to allow the roof to bend and rest on the packing and prevent any actual break. A straight face 60 ft. long is being worked on the strike line and gates placed every 30 ft. deliver to a balance. It will probably be found necessary to bring over a number of English longwall miners in order to get the method firmly established.

Water

The mine water amounts to an average of 350,000 gal. per twenty-four hours. This is handled by a pair of 12¾ and 22¾x7x24-in. Knowles compound duplex pumps; steam driven and located on the 1800-ft. level, where also is located the main dam or sump. Into this latter, the 200,000 gal. from the east sinking pump is discharged. This latter sinking pump is a Knowles single pump, 18x8x18 in., and discharges through a 3-in. line 2000 ft. long. On the west side sinking, a 6x3x9-in. Cameron pump is located at the No. 6 level and acts as a relay to a 6x4x10-in. Jeanesville sinking pump placed at the No. 8 level. This water amounts to 50,000 gal. per twenty-four hours, and is pumped 5000 ft. against a head of 450 ft. All the sinking pumps are operated by compressed air. It is proposed in the future to establish a main pumping plant at the No. 6 level and drain all the west side water to this point by means of an open ditch.

The plant would be operated by either compressed air or electricity and would discharge through a borehole to the surface, against a 700-ft. head. There would be an immense saving in doing away with the long line, for at present over half the water is pumped more than a mile to the surface.

Lights

Safety lamps of the Muessler type are in use, but a new equipment of the Ackroyd & Best safety lamps having a magnetic lock and electrically ignited, is being installed. Strict rules are in force governing the use of safety lamps, and violations are prosecuted under the Mines Act.

Mine Officials

The mine officials consist of a mine manager, underground manager, two overmen, examiner and three shot-firers, or eight officials for 300 mine employees, giving an output of 450 tons per day. At first sight, this number of officials seems excessive, but as they are held responsible for the discipline of the mine and performance of work in accordance with the rules and regulations, any less number could not give adequate protection to the men and the company. Two of these officials are on night shift. That this safeguarding pays is shown by the fact that there has not been a fatality in this mine during the past five years. The Vale mine, like others in the district, suffers from the loss of time by the employees, which constitutes at the present time the most serious drawback to the coal-mining industry.

During 1907 the average number of days worked per month, per employee was 20, while the average number of days worked per month, per miner was a little less than 19. In other words they lost a full week each month, or each month equaled a loss in tonnage of 2428 tons. For the year 1907, the pay-day drunks, picnics and fishing trips cost the Vale miners, in wages lost, over $20,000 and meant a 25,000-ton loss in production to the company. While this is bad yet the men at this plant are not such heavy offenders as at many other plants in the Province.

Surface Plant

The boiler plant consists of three 200-h.p. Sterling boilers and one 50-h.p. tubular boiler. They are hand-fired, using culm coal, the hoist of coal per ton burned averaging 7.75 tons. The hoisting engines are 16x36-in. Walker build, geared 2 to 1 to an 8-ft. diameter drum, which carries two 1-in. by 2800-ft. ropes. The trips are hoisted at an average speed of 1000 ft. per minute. Ventilation is furnished by a 28-ft. diameter Walker fan, direct connected to a 24x24-in. Walker engine, giving 40,000 cu.ft. of air per min. on a water gage of 3 in. Compressed air is furnished by an 18x20¼x24-in. straight-line Ingersoll-Sergeant compressor. This machine never stops except for about six hours on Sunday.

On the bankhead, the coal is dumped over a bar screen and the nut and culm are taken out. The lump travels over a belt 30 ft. long by 5 ft. wide, and is cleaned of all stone and refuse before dropping into the car. The mine has a fairly steady market for run-of-mine, lump and nut. The worst of the culm is consumed for power at the plant. A railroad, six miles long, owned by the coal company, connects with the Intercolonial railroad, at New Glasgow.

Mining Exhibit at the Franco-British Exposition

Special Correspondence

Within the city limits of London, having a population of about five million people who can reach the gates for 6c. or less, and enter for 25c., is an exhibition which is remarkable for the sincerity with which it portrays existing conditions. The result is a daily attendance beyond all reasonable expectation. An enormous crowd daily visits the exhibits from English and French colonial possessions and becomes better acquainted with the natural wealth of these newer countries, especially their mineral resources. Algeria exhibits the products of her mines, clays, building and ornamental stones. Australia has a great building in which her mineral wealth is exhibited, including everything from historical gold nuggets to the common low-grade metalliferous ores. The materials used for structural work are also shown.

Canada holds the place of honor. The mineral collection is the one made for the St. Louis exposition, but it has been kept up to date and is spread out over twice the space occupied when exhibited in the United States. The gold exhibits from the Klondike and British Columbia are beautifully displayed and much effort has been used to show the later developments of low-grade copper ores on the west coast. Mica, asbestos, graphite and corundum are shown in all stages of preparation and here again is evidence of the importance, to a new country, of advertising its structural materials in order to show what each district can furnish in the way of valuable clays and stones. Finally, the section of fuels includes even exhibits of the peat developments near Toronto and illustrates the intelligent utilization of this material. Petroleum in Canada and discoveries of natural gas in British Columbia are illustrated by samples and diagrams. The exhibits tend to show a more general and a more intelligent use of the humbler minerals and the tendency to future exploitation west of the Canadian Rockies.

Colliery Notes

Safety lamps should [illegible] gas, but foul air. The use of lamps [illegible] go out when the atmosphere is foul should be made compulsory.

With a main- and tail-rope [illegible] is convenient to have special [illegible] at different points in the mine to couple up the ropes in case of accident.

If deep shafts are sunk with their longer axis in the line of full dip, [illegible] can be obtained in sinking, draining and securing the sides, especially in bad ground.

The percentage of coal, at present considered unrecoverable, and left in the ground in the various mining districts of the United States varies from 40 to 60 per cent.

The security of a winding rope may be increased to a great extent by giving the top end which passes through the drum-lagging two or three turns around the drum shaft.

Some of the advantages of steel for mine props are: (1) it is fire proof; (2) it is available for all parts of the mine; (3) it occupies little room; (4) it will bear a pressure of sixteen hundred pounds to the square inch.

The coefficient of friction between a greased wire rope and a wood lagged drum is about 0.35, which means that the coil on the drum would enable a pull of 1 lb. to resist a strain of 9 lb.; two coils 9x9 lb.; three coils 9x9x9 lb.; and four coils 9x9x9x9, or 6561 pounds.

Corrosion and internal abrasion of winding ropes generally go together and are due to the neglect of proper cleaning and lubrication. The wires of a rope move slightly and rub against each other, and efficient lubrication is, therefore, just as necessary as it is in the case of the moving parts of a machine.

With wide drums where a number of connecting sockets have to come upon the drum, the rope often coils unevenly; if the sockets form a bulge and disturb the even laying of the rope, this may be overcome by a guide consisting of two upright spindles with rollers, between which the rope runs, mounted on a slide bar worked by hand.

When working longwall, where the roof is stronger than the floor, the roadways are likely to heave from the pressure of the roof on the pack walls. Great care must be exercised in this matter. The miner should be instructed to watch for any indications of heaving so as to be able to take prompt measures to prevent serious damage to the road.

It must not be forgotten that when superheated steam is used there will be greater expansion in the steam pipes, and provision must be made accordingly. This is owing to the higher temperature of the steam. Copper pipes must not be used. Copper with a tensile strength of 31 tons [illegible] deg. F. and is quite unreliable for bends.

[illegible] securing the sides of rectangular shafts. With good workmanship, and if treated [illegible] and platforms, power pipes and cables, the separation of compartments and wood bratticing are all easily accomplished in [illegible]

The principal advantages resulting from the use of machinery in the preparation of coke are, a direct saving per oven; the machine operates independent of weather conditions; reduction in the number of laborers at the plant; greater uniformity of product and more uniform operation of the plant; saving in time; saving of water and heat; the avoidance of black ends and the ability to handle any depth of charge.

While the strength of wire-wound steam hose is [illegible] apt to cause the wire to cut into the hose. [illegible] the wire and makes the hose hard to handle. Cotton or marline covering put on loose, to permit the hose to expand, [illegible] the best steam hose [illegible] increased strength and is not heated by the steam.

[illegible] should be used in [illegible] mines where sprinkling is practiced, to [illegible] The percentage of saturation may be the same throughout the workings, but as the weight of water vapor carried by the air in different parts of the mine varies in accord with the heat of the mine, the number of grains of water carried per cubic foot of air may vary from 4 to 13 grains.

Too much care cannot be exercised in the selection, design and application of rope cappings. An excellent capping is the forged-steel conical socket, in which the prepared end of the rope is secured [illegible] When properly and carefully made, this capping possesses a strength greater than the rope to which it is fitted; it must, however, be properly made. The Berk capping is also excellent as it can be taken apart at any time and the rope inspected right up to its actual extremity.

When unloading concrete, it should be dumped, not dropped, as the latter process is apt to separate the stones from the mortar. Concrete, if properly handled, can be dumped from some hight without being harmed. A wooden or iron chute gives good results when conveying concrete from a hight. It should be equipped with a gate at its lower end; behind this stopping the concrete remains until required, when the gate is opened and the [illegible] also be provided with a portable frame so [illegible]

In the matter of safeguarding the lives of its workmen the United States enjoys [illegible] Germany, Great Britain, France and Belgium has been considerably lessened with the increase of scientific knowledge, the [illegible] jured in the coal mines of the United States, the total number killed being 2061. Since 1889 no less than 22,840 men have been killed in colliery accidents. As many fatalities have occurred during the last six years as during the preceding eleven years, and while the rate per 1000 employed varied in the years 1895-1899 from 2.34 to 2.98, in the period 1903-1906 it ranged between the limits of 3.14 and 3.53. Contrast these figures with the corresponding returns from European coal-producing countries, [illegible]

France (1901-1905)	0.91
Belgium (1902-1906)	1.00
Great Britain (1902-1906)	[illegible]
Prussia [illegible]	[illegible]

Liveing's electrical indicator, an apparatus for the detection of firedamp, is [illegible] electric current which flows to two [illegible] gauze with a glass at the end next the center of the box; the other is inclosed in glass. The box is filled with the mixture by means of openings placed in the top of the box. In the center of the box is placed a movable block with sloping surfaces, to which white paper is attached. A scale is placed from one of the spirals to the center of the box, and this is observed through a glass pane placed in the lid of the box. The principle of this apparatus depends on the combustion of the firedamp raising the [illegible] causing it to glow more brightly. The electric current is generated by rapidly turning a handle, and the spirals become heated to redness. The spiral inclosed by the wire gauze to which the mixture gains access, glows more brightly than the one at the opposite end of the box when firedamp is present. This brighter glow illuminates the sloping surface of the movable block more than the other side, and to make the two surfaces equally illuminated the block is drawn nearer to the spiral inclosed in the glass. The scale shows the distance the block has been moved, and indicates the percentage of firedamp. As little as one-quarter of one per cent. of firedamp has been detected by this apparatus.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

John A. Hill, Pres. and Treas. Robert McKean, Sec.

505 Pearl Street, New York.

London Office: 6 Bouverie Street, London, E. C., Eng.

Cable Address "Engminjork, N. Y."

Subscription payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

September 5	12,000
September 12	9,500
September 19	9,500
September 26	9,800

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
  The Metal Markets 628
  The Temagami-Cobalt Mines, Limited 628
  The Use of Privately Owned Coal Cars 629
  The Mining Laws of Oklahoma . 629
*Mercury Mines at Koniah, Asia Minor. *Frederick F. Sharpless* 601
The Cananea Consolidated Copper Company . . . *Special Correspondence* 603
The Anti Smelter Fight in California. *Special Correspondence* 603
Disposal of Gases at Selby, California. *James C. Bennett* 604
Gold Production in Western Australia 604
Lead and Zinc Ores in Missouri. *J. R. Finlay* 605
*Dexter No. 3 Concentrating Table. 610
*Kelley Slag and Matte Casting Machine. *Fred. G. Kelley* 610
*Lining-up Timbers in Inclined Shafts. *Benjamin H. Case* 612
American Institute of Mining Engineers 614
*Jesus Maria and Flores Mills, Guanajuato. . . . *Claude T. Rice* 615
The British Institute of Mining Engineers. . . . *Special Correspondence* 620
Sault Ste. Marie Canal Traffic.......... 620
Gold Mines of British India........... 620
*Richards Pulsator Jigs and Classifiers. *Editorial Correspondence* 621
Coal Car Distribution and the Ownership of Coal Cars.................. 623
West African Gold Production......... 623
*Operating a Nova Scotia Coal Mine. *H. E. Coll* 624
Mining Exhibit at the Franco-British Exposition. . . . *Special Correspondence* 625
Colliery Notes........................ 627
Correspondence.
  Pyritic Origin of Iron Ore Deposits. *Godfrey L. Cabot* 630
  The Temagami-Cobalt Mines, Limited. *Ricketts & Banks* 631
  Sampling by Machine. .*E. P. Mathewson* 631
Errata 631
Transvaal Gold Production............ 631
New Publications. 632
Patents 633
Personals, Obituaries, Societies and Technical Schools. . . 634
Special Correspondence . 635
Mining News 637
Markets, etc......................... 641

**Illustrated.*

The Metal Markets

At the end of the third quarter of 1908 the metal markets offer no hope for the quick return of a high scale of prices that has all along been optimistically anticipated. Hope deferred maketh the heart sick, wherefore the situation is now accepted with more calm and resignation, although there are some who are still looking for a boom which is now scheduled to happen "after the election." The fact is that trade in nearly all industries is still suffering from the set-back that began in the early part of 1907. During the last summer, business has been on the upward course, but the improvement has been slow, very slow, and nothing like what the promoters of the recent boom in the stock market succeeded in making many persons believe. Manufacturers in most branches report a decided increase in inquiries, but not yet the materialization of much new business, though it is hoped that the latter is coming, and probably it is. Indeed, it has already been experienced in some lines of manufacture, and some idle works have been put in operation, but there are still large numbers of unemployed men in all of our cities and many other evidences that business is still slack.

With these conditions, it seems irrational to hope that the prices for the metals will soon return to points higher than the averages of recent years. Even now, the prices for copper, lead and spelter have risen so high above the nadirs of the autumn of 1907, that they are not very far below the averages of the last 10 years in each case. These three metals have been acting in much the same way, which, of course, is to be expected. They are consumed in substantially the same channels, and in each case large stocks of unsold metal had accumulated, which in each case also were for the most part held by strong hands. The record of the last six months in these metals has been fitful periods of strength and then recessions, the producers having plenty of the metals to sell and the consumers having no great avidity to buy continuously or in any great quantity. Consequently, copper, lead and spelter have fluctuated within a narrow range, and the outlook for the near future appears to be for a continuance of the same kind of a market.

The iron and steel markets are in very much the same condition as those for the other metals. Consumers and manufacturers report an increase in business, but it is slow, and most of them still hesitate to buy material far ahead of their needs. The only conspicuous exception is found in the case of the agricultural implement makers, who are generally busy; and this seems to imply prosperity—or at least an absence of depression—among the farmers. The railroads have not bought, and are not yet buying, any material beyond what they need for immediate and urgent repairs. Building projects are increasing in number, but are very slow in reaching the contract stage; and many are held back in the expectation of lower prices. The very moderate cut in prices of finished steel made some months ago has had little effect on the market.

Eminent authorities in the trade have predicted several times a speedy return of business to "the normal level"—that is to the level reached in the early part of 1907. From time to time, however, the date for recovery has been put ahead, until now the prophets are divided between "after election" and "next year." Of course, exact statistics are not to be had; but the best opinion is that a general average of the condition of the iron and steel plants of the country would show that they are working to about 60 per cent. of their capacity, and that this is an improvement of about 10 per cent since last March, when 50 per cent., or a little less, was the average.

The Temagami-Cobalt Mines, Limited

Last week we referred to the efforts of Julian Hawthorne, a well known literary gentleman, to sell the stock of a mining company, and printed a letter that he has been circulating. Since then a later circular letter by him has come to our attention. We enjoy this as a literary gem, but our admiration is tempered by the necessity for calling attention to the rules of the game, one of which is that the names of professional men should not be used without authority.

In his circular letter of Aug. 21, Mr. Hawthorne stated that his company hired professional experts, whose reports, directly or indirectly, led to offers to buy out the company on very tempting terms. "We could have sold Temagami again and again to these customers, and made [illegible] Hawthorne.

In his later circular letter, Mr. Hawthorne begins, "It is evident that I should have been more [illegible] a few days ago [illegible] that various capitalists offered to buy us out. Several of my friends, noticing that paragraph, have written me, asking for details as to those intending purchasers and their offers. There seems to be no reason why I should withhold this information.

"We employed, for our samples and assays, the firm of Ricketts & Banks, of New York. They had no sooner got an insight into our property that they [illegible] determined and persistent an effort to [illegible] us out, that we had trouble in getting rid of them.

"The largest mine operator in South Africa (and that is saying a good deal) is the Gold Fields Limited of London. W. F. Wilkinson, their mining engineer, who talks of 500-per cent. dividends without a change in his voice, visited Temagami at the instance of his people and [illegible] to us here and asked us what terms we would make for it. After some shuffling of the cards, he led his trump—anything in reason for a majority interest. We explained that we were playing another sort of game and we parted with assurance of mutual esteem."

These ideas would look very well in a novel, but we fear that the professional mining man will not recognize the methods described. Ricketts & Banks, who can speak for themselves, as they do elsewhere in this issue, never made any examination of the property. They contemplated making such an examination in behalf of a client who had in view the purchase of an interest if the report were favorable; but the negotiations did not [illegible] causing the examination to be [illegible]. Mr. Hawthorne [illegible] prehension as to this when he drafted his second circular letter, he soon ceased to be, because he received direct information as to the facts. Of course the [illegible] of a lot of circular letters is purely mechanical, but there was a [illegible] addressing a letter under date of Sept. 17 to Dr. P. D. Ricketts, in which the misstatement as to his firm is made, in spite of the fact that the firm had brought the matter to Mr. Hawthorne's attention a fortnight previous, and requested the discontinuance of this circular letter.

[illegible] him. However, we know Mr. Wilkinson as a canny engineer, and we have never heard him talk of 500-per cent. dividends without a change in his voice. He may [illegible] opine that if he could, he would now be rivaling Caruso on the operatic stage [illegible]

Mr. Hawthorne says he knows that he is going to make his fortune from his investment in this enterprise. He says that he has put into it all that he had. It is unwise to put all of the eggs in one basket, but we hope that the mine will come up to Mr. Hawthorne's fondest expectations. He says that, being an engineer and knowing something of mines, this one would stand for a $20,000,000 capitalization. At the end of his letter it appears that all of this "much ado" pertains to the selling of about 40,000 shares at 40c. per share, or a total of $16,000. For anything we know they may be dirt-cheap at the price, but certainly Mr. Hawthorne should refrain from the careless use of engineers' names, without seriously considering whether it would be doing an injustice.

The Emma Mine

An item of interest, recently communicated by our Salt Lake correspondent, pertains to the purchase by Jesse Knight, of Provo, of the old Emma mine, at Alta, in Little Cottonwood Cañon. This was one of the famous mines of Utah in its early days as a mining country, and was the subject of a spectacular sale to British capitalists, a colossal failure, and a sickening scandal, in which a formerly well known promoter, Baron Grant, figured prominently.

The Emma mine was discovered in 1870. [illegible] lake of mineral of vast extent"—which yielded a clear profit of nearly $120 per ton on shipments of ore to Swansea, "gave an impetus to mining in Utah that surpasses all other efforts made in that direction put together." The quotations are from a contemporaneous writer. During six months of the first year of its operation the Emma [illegible] tons of galena ore, averaging 35 per cent lead and $182 silver per ton. The mine was sold to an English company for £1,000,000, a price which was contemporane[illegible] the actual value.

The operation of many of the mines [illegible] in 1873 by the panic, from which all industries in the United States suffered. The British companies suffered the worst and most of them fell into serious financial difficulties. The Emma mine continued to be the largest shipper of ore from the Cottonwoods, but at the end of the year it was practically exhausted and never afterward was it of importance, except as a memory. It has been a hope in the Cottonwoods lasting to this day that someone would discover an ore deposit like the famous Emma bonanza. The latter was a pear-shape body of rich ore, which suddenly came to an end. One of the hypotheses was that it was the upper part of an ore shoot that had been cut off by a fault, and that future prospecting would find the continuation of the ore shoot thrown aside upon the other side of the fault. However, prospecting never so resulted, but apparently it was not done extensively or systematically.

The discovery of the conditions at the Emma mine has always appeared to us to be one of the most engaging problems for the modern mining geologist. We hope that Mr. Knight will secure the best expert that is available, and commission him to study the matter.

Although the price for spelter continues comparatively low, the value of zinc ore still rules at a level that deprives the smelters of profit. Upon this condition the miners are to be congratulated, inasmuch as the effect of adverse industrial conditions is thereby greatly tempered. The situation is not so comfortable to the smelters. Last week spelter sold at 4.05c., St. Louis, while the average base price for ore was $37.50. The continuance of the extremely low margin between spelter and ore indicates that the low prices have cut off supplies of ore from the Rocky [illegible] the smelters to maintain the price for [illegible] cure what they need. The Joplin output has held up surprisingly well during 1908 at prices materially less than $40 for zinc ore and $60 for lead ore. During the first [illegible]

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Pyritic Origin of Iron Ore Deposits

I have read with much interest the article by H. Martyn Chance, in the Journal of August 29, the gist of which seems to be that the great ore deposits of Lake Superior are derived from bisulphide of iron, and not, as heretofore supposed, from the bicarbonate.

If his supposition is correct, we should naturally expect various things, which we do not find, for instance, strontianite, gypsum and barytes, in enormous quantity, to account for the amount of sulphuric acid which has been formed. I look in vain in his article for one syllable as to the presence of sulphates in or near these great deposits.

If the iron deposits have been formed from the bisulphide of iron, from what was the bisulphide of iron formed? As Mr. Chance justly remarks, it is the commonly accepted belief among geologists and chemists, that the presence of bisulphide of iron in the interior of the earth implies the previous presence of organic matter, and, when the ore deposits are on such an immense scale as on the shores of Lake Superior, according to his theory, there must have been originally immense quantities of organic matter. Iron is one of the most universally distributed of the elements.

It is a curious fact that the specific gravity of the earth itself is approximately that of oxide of iron and it has been surmissed that oxide of iron is the chief ingredient of its mass. This coincidence, of course, may be explained on other grounds, i.e., either that the interior of the earth is greatly compressed by the immense pressure, which very greatly exceeds anything that can be obtained experimentally on the surface of the earth, or that other elements, heavier than the average specific gravity of the crust of the earth, exist in larger percentage, at greater depths beneath the surface, far below human ken.

Reduction of Iron

Be this as it may, we have reason to believe that various minerals containing iron, may be reduced by the action of organic matter, dissolved by meteoric waters in the form of ferrous bicarbonate, and carried away in solution until they meet some substance that causes their precipitation. One such substance appears to be coal. The so-called brasses, which so plentifully abound in coal are bisulphide of iron in the triclinic form known as marcasite, and it may be conjectured that the sulphur is derived from the organic matter itself. Whether these deposits are formed directly from oxidation of ferrous bicarbonate, or indirectly by the previous precipitation of such in the form of sulphide, and by the oxidation of this sulphide we must presuppose a great amount of organic matter. We do know that organic matter exists, and was formed, at least as far back as the very beginning of the Silurian epoch; but the amount of organic matter to explain the presence of these immense bodies of iron ore, seems to me, in the light of our present knowledge, immensely greater, if we suppose that the iron is formed from the sulphide, than if we cling to the old theory that it was formed directly from the carbonate.

Quantity of Organic Matter Required

We may reasonably conjecture that, had there never been any organic matter on the earth, all of the iron in the earth would be in the form of sesquioxide and its many combinations with other chemical substances. To reduce the sesquioxide to ferrous oxide requires but a very small portion of its weight in the shape of organic matter; for instance, two parts by weight of hydrogen, or six parts by weight of carbon, will reduce 160 parts by weight of ferric oxide to ferrous oxide.

Carbon and hydrogen make up together approximately half the weight of organic matter apart from the water which it contains. On the other hand, bisulphide of iron contains more sulphur than iron, whether in the form of pyrites, or marcasite, and the percentage of sulphur in organic matter is very small. The old theory presupposes the presence of an amount of organic matter considerably less than a tenth of that of the iron ore.

Mr. Chance's theory presupposes the presence of an amount of organic matter 40 or 50 times as great as the immense mass of iron ore that we find on Lake Superior. Under these circumstances, while not denying the probabality that a portion of this iron ore was deposited from a solution of ferrous sulphate, it seems reasonable to suppose that by far the greater portion was deposited from a solution of ferrous bicarbonate.

The reactions that Mr. Chance gives to show the possible processes by which bisulphide of iron may be converted in the interior of the earth, or upon its surface, into sesquioxide or sesquihydrate, are interesting, and doubtless represent to a certain extent, reactions which actually take place, but they do not give an adequate idea of the immense complexity of such reactions. As a matter of fact, there are present, besides the combinations he mentions, a vast number of substances, which enter into the chemical processes by which iron oxide is deposited; for instance, carbonates of lime and of magnesium, and the great number of combinations of alumina.

What has Become of the Sulphur?

The free sulphuric acid, formed by the oxidation of bisulphide of iron, attacks to a greater or less degree almost all minerals, excepting silica, and forms sulphate of aluminum, sulphate of calcium, etc. Soluble sulphates, such as sulphate of alumina and calcium, might naturally be leached out of the rocks by meteoric waters, but it seems hardly likely that with such an immense formation of sulphuric acid we should not find somewhere great deposits of strontianite or heavyspar. The sulphate of calcium also is only slightly soluble and we should naturally expect some deposits of gypsum.

The carbonic-acid gas, which is the chief reagent that the old theory presupposes, is present in immense quantity in the atmosphere, constituting about one part in 2500 parts of the total volume of the atmosphere. In combination with organic matter, this acid can, in the lapse of time, reduce the iron to the ferrous condition, and dissolve the iron from the numerous minerals of which it is an ingredient, in the form of ferrous bicarbonate, and this solution when exposed to the air, gives off, in the first place, some carbonic-acid gas, and in the second place, absorbs oxygen from the air. This oxidizes the iron to the condition of sesquioxide, which has no affinity for carbonic-acid gas, and cannot, under ordinary conditions, at least, exist in chemical combination with it. Hence a solution of iron in carbonic-acid gas will deposit sesquihydrate of iron when exposed to the air, and this may subsequently, by pressure and heat, be converted into sesquioxide.

It seems, therefore, to me, that it will be needful to adduce more evidence than is contained in Mr. Chance's article, to prove to the satisfaction of the scientific world that the greater part of the Lake Superior iron ore has resulted from the oxidation of pyrites and not from the oxidation of ferrous bicarbonate.

Godfrey L. Cabot.

Boston, Mass., Aug. 31, 1908.

The Temagami-Cobalt Mines, Limited

The following correspondence may be of interest and we should like to have it appear, as we are constantly receiving letters from parties who are under the impression that we have examined and are familiar with the property of the Temagami-Cobalt Mines, Ltd.

New York, Sept. 4, 1908.

Julian Hawthorne, Esq.,

Dear Sir: Our attention has been drawn by several parties, correspondents and clients of ours to whom you have written, to letters of yours embodying the following statement:

"We employed, for our samples and assays, the firm of Ricketts & Banks, of New York. They had no sooner got an insight into our property than they made so determined and persistent an effort to buy us out, that we had trouble in getting rid of them. They brought forward a capitalist—a member of the Tiffany firm—ready to pay a big sum down, and all the cash we needed for development—in return for a three-fifths interest in Temagami. We told them that we would consider no terms involving surrender by us of the control of the property; and when they found we meant it, they dropped out."

We presume this statement relates to certain negotiations undertaken by us at the request of Dr. Wm. J. Morton, which called for an investment of $30,000 by a client of our firm in a property described to us by Dr. Morton, provided an examination of the property by us proved that the local conditions and ore values warranted such payment. Dr. Morton objected to our doing certain work necessary to enable us to thoroughly test the property and withdrew the proposition after we had arranged with our client to make such advance subject to our examination being sufficiently satisfactory; consequently the matter dropped.

If the statement in your letter above mentioned refers to the negotiations with Dr. Morton, we must say that it misrepresents the facts and casts a reflection on our professional integrity that we cannot and will not permit. Under these circumstances, we are compelled to write our friends and clients and inform them of the exact conditions involved and state that we know nothing of the property other than told us by the owner, and that all samples assayed by us were submitted by him. We are sending Dr. Morton a copy of this letter and must insist that the reference to us be at once withdrawn.

Yours very truly,

Ricketts & Banks.

We sent a copy of the above letter to Dr. Wm. J. Morton, and recited to him our only connection with the matter as stated therein. Dr. Morton replied: "I entirely agree with you in the position you have taken. Your interest in the matter and your final decision were, as you say, to be based upon a personal examination by yourselves. I am sure Mr. Hawthorne has to this extent misapprehended the facts and I have written to him along the lines above outlined."

Finally we received the following letter from Mr. Hawthorne:

New York, Sept. 21, '08.

Messrs. Ricketts & Banks,

Gentlemen: Upon my return to the city, I find your favor of the 4th instant.

Doctor Morton spoke to me of these negotiations. I mentioned them in an offhand way in my letters, without seriously considering as to whether by mentioning your name, I would be really doing you an injustice. Let me assure you, this was not the intention. I could have easily gotten along without mentioning any names, and in order to avoid any criticism in this regard, I shall certainly be careful in the future.

It is hardly necessary to add that I shall eliminate the mention of your firm in any further correspondence.

Yours very truly,

Julian Hawthorne.

The above correspondence covers the matter so fully that no further statement from us appears to be necessary.

Ricketts & Banks.

New York, Sept. 22, 1908.

Sampling by Machine

Referring to John A. Church's communication in the Journal of Aug. 29, p. 431, and to my communication to the Journal, Aug. 15, p. 338, I wish to say that Mr. Church, apparently, has not read the latter article carefully.

He takes for granted that three mills are referred to in my table, whereas it is distinctly stated that there are only two mills, and that the sampling is compared in columns *A* and *B* and the assaying compared in columns *B* and *C*. Also the statement is made that the sampling machines, represented by columns *A* and *B* were both of the same type and had all of the improvements referred to.

Mr. Church omitted to read the whole of the opening paragraph of my article, for my intention was to refer him to sampling works in the Rocky Mountain region of the United States. There are several types of mechanical samplers used in the region referred to that are giving satisfaction. It would not be fair to describe one to the detriment of another, as most of them are of patented design and consequently the owners of the patents would feel aggrieved if severely criticized; they are the ones, also, who should laud their own products. This is the reason also why no particular description has been made of the Anaconda sampling works (or the other one referred to) because being patented the owner of the patent is expected to advertise his own [illegible]

The description referred to (of the Anaconda Works) was not prepared for the purpose of giving technical details of the construction, but merely to save time in explaining the general features of the plant to non-technical visitors.

As to "questionable progress," and the article by Mr. Brunton, published in 188[illegible] [illegible] I think Mr. Brunton should be called on to explain, but I will say this: At the time the article was written the standard method of sampling was the old "quartering" method.

In comparing sampling results the percentage of difference on low-grade ores is not a good criterion, as it exaggerates very greatly differences that would ordinarily be considered excellent checks.

I might add that each cut of the stream for sampling took out 20 per cent. at mills *A* and *B*.

E. P. Mathewson.

Anaconda, Mont., Sept. 11, 1908.

Errata

In Professor Howe's paper, on "The Shape of the Iron Blast Furnace," in the Journal of Sept. 12, pp. 507 to 511, Fig. 3, No. 3, for Coignet read Coingt; page 511, second column, fifth paragraph, last line, for No. 6 read No. 7; Fig. 5, No. 14, for Glendon No. 4, 1862, read Glendon [illegible]

Transvaal Gold Production

The Transvaal returns for August make a new record. The total output for the month was 587,813 oz. fine gold, which was 3358 oz. more than in July, and 33,786 oz. more than in August of last year. For the eight months ended Aug. 31 the total was 4,226,470 oz. in 1907, and 4,572,225 oz.—or $94,507,891—in 1908; an increase of 345,755 oz. this year.

The unskilled labor return shows that there were employed in the mines on Aug. 31 a total of 17,000 Chinese and 133,548 Kafirs. This was a decrease of 1407 Chinese, but an increase of 1209 Kafirs during the month. Over two-thirds of the Chinese employed in the Transvaal have been sent back since the anti-Chinese law was passed.

The best calculations for the prevention of creeps or squeezes in coal seams are only guesses in the end, but if careful thought is given to the depth from the surface, the crushing strength of the coal, the strength of the roof, the hight of the coal, the crushing strength of the floor, and the character of the seam, flat or inclined, a possible disaster may be avoided.

New Publications

SALPETER UND SEIN ERSATZ. By Konrad W. Jurisch. Pp. 350, illustrated. 7x10 in.; paper, 10 marks. Leipzig, 1908: S. Hirzel.

TRANSVAAL CHAMBER OF MINES EIGHTEENTH ANNUAL REPORT FOR THE YEAR 1907. Pp. 551, illustrated. 7x10 in.; cloth. Johannesburg, So. Afr., 1908: The Transvaal Leader.

GENERAL INDEX OF STAHL UND EISEN FOR THE YEARS 188[illegible] TO 1906. Prepared by Ernst [illegible]. Pp. 570. 7x10 in.; half leather. Dusseldorf, 1908: Stahl und Eisen.

HIGH SPEED DYNAMO ELECTRIC MACHINERY. By H. M. Hobart and A. G. Ellis. Pp. 520, illustrated. 6x9¼ in.; cloth, $6. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

DIE BEDEUTUNG DER CHEMISCHEN TECHNIK FUR DAS DEUTSCHE WIRTSCHAFTSLEBEN. Vol. VIII. By Dr. H. Grossmann. Pp. 140. 6½x9½ in.; paper, 4.50 marks. Halle a. S., 1907: Wilhelm Knapp.

BALDWIN ON HEATING; OR, STEAM HEATING FOR BUILDINGS REVISED. By William J. Baldwin. Pp. 404; illustrated. 5x7½ in.; cloth, $2.50. New York, 1908: John Wiley & Sons, London: Chapman & Hall, Ltd.

MITTEILUNGEN AUS DEM EISENHÜTTENMANNISCHEN INSTITUT DER KONIGL. TECHN. HOCHSCHULE AACHEN. Vol. I. By Prof. Dr. F. Wust. Pp. 172, illustrated. 8x11 in.; paper, 12 marks. Halle a. S., 1908: Wilhelm Knapp.

MITTEILUNGEN AUS DEM EISENHÜTTENMANNISCHEN INSTITUT DER KONIGL. TECHN. HOCHSCHULE AACHEN. Vol. II. By Prof. Dr. F. Wust. Pp. 172, illustrated. 8x11 in.; paper, 14 marks. Halle a. S., 1908: Wilhelm Knapp.

WEST VIRGINIA ANNUAL REPORT OF THE DEPARTMENT OF MINES FOR THE YEAR ENDING JUNE 30, 1907. By James W. Paul, Chief of the Department of Mines. Pp. 511. 6x9-in.; paper. Charleston, So. Car., 1908: Tribune Printing Company.

THE IRON ORES OF THE IRON SPRINGS DISTRICT, SOUTHERN UTAH. By C. K. Leith and E. C. Harder. Bulletin No. 338, United States Geological Survey. Pp. 102, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

THE MINING INDUSTRY IN NORTH CAROLINA DURING 1906. By Joseph Hyde Pratt. North Carolina Geological and Economic Survey. Economic Paper No. 14. Pp. 144; illustrated. 6½x10 in.; paper. Raleigh, 1907: E. M. Uzzell & Co.

THE BUILDING MECHANICS' READY REFERENCE. CEMENT WORKERS' AND PLASTERERS' EDITION. By H. G. Richey. Pp. 458; illustrated. 4¼x7 in.; leather, $1.50. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1907. Part I. Metals and Nonmetals, except Fuels. C. W. Hayes and Waldemar Lindgren, geologists in charge. Bulletin No. 340, United States Geological Survey. Pp. 482, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

HINTS ON AMALGAMATION AND THE GENERAL CARE OF GOLD MILLS. By W. J. Adams. Pp. 120, illustrated. 4¾x6¾ in.; leather, $3. San Francisco, 1908: Mining and Scientific Press.

Contents: General Process. Care of Quicksilver. Cleaning-up. Retorting and Melting. Concentration. Sampling. Conclusion. Addenda.

FOURTH REPORT OF THE DIRECTOR OF THE SCIENCE DIVISION, INCLUDING THE SIXTY-FIRST REPORT OF THE STATE MUSEUM, THE TWENTY-SEVENTH REPORT OF THE STATE GEOLOGIST, AND THE REPORT OF THE STATE PALEONTOLOGIST FOR 1907. Bulletin No. 428, University of the State of New York, Education Department, August 1, 1908. Pp. 203, illustrated. 6x9 in.; paper. Albany, 1908: University of the State of New York.

A DICTIONARY OF SPANISH-AMERICAN MINING, METALLURGICAL AND APPLIED TERMS. By Edward Halse. Pp. 379, illustrated. 5¼x7¾ in.; cloth, $3.50. London, 1908; Charles Griddin & Co., Ltd. Philadelphia: J. B. Lippincott Company.

This is the best book of its kind that we have seen. So far as we have examined its pages, we have found it thoroughly satisfactory. Its author is a distinguished mining engineer, who has had an extensive experience in Spanish-speaking countries, wherefore he was well qualified to produce the excellent book that he has done.

SECOND REPORT ON THE WATER POWERS OF GEORGIA. By B. M. Hall and M. R. Hall. Geological Survey of Georgia. Bulletin No. 16. Pp. 424; illustrated. 7x10 in.; cloth. Atlanta, Ga., 1908: The Franklin-Turner Company.

This report, which was prepared by the Georgia Survey in conjunction with the United States Geological Survey, goes at length and with much detail into the topography and general geology of the water sheds and drainage basins of the State, the available power to be derived from the streams and rivers. Georgia is well provided with water powers, the utilization of which ought to be of material assistance in making it a great manufacturing State.

PRACTICAL METALLURGY. By Thomas Turner. Pp. 103; illustrated. 5¼x8 in.; cloth, $1.25. London, 1908: Charles Griffin & Co., Ltd.; Philadelphia, J. B. Lippincott Company.

Contents: Sampling and weighing. Metals and alloys. Oxidation and reduction. Examination of fireclay. Slags and fluxes. Examination of fuel. Iron ores. Determination of muffle temperatures. Silver, and silver assay. Assay of silver bullion. Assay of silver ores. Gold assay. Assay of gold ores. Properties of mercury. The micro-structure of metals. Iron and steel. Electro-metallurgy.

This is rather a text-book on assaying than a treatise on metallurgy, and in view of the superfluity of more elaborate works upon the subject, this latest publication does not appear to serve any useful purpose, especially since it is of an unsatisfactory character.

CANADA'S FERTILE NORTHLAND. Edited by Capt. Ernest J. Chambers. Published by the Canadian Department of the Interior, Hon. Frank Oliver, Minister. Pp. 155, illustrated; accompanied by atlas. 6½x10 in.; cloth. Ottawa, 1908: Government Printing Bureau.

This is a collection of evidence intended to show the possibilities of the northern part of Canada and its resources as an agricultural, lumbering and mining country. The region includes the northern portion of the provinces of Quebec, Ontario, Saskatchewan, Alberta and British Columbia, and the territories of Ungava, Mackenzie and the Yukon. Part of this territory has already become known from its mineral resources and developments; but a large part has hardly been explored. The report has gathered all available information, and is accompanied by a number of excellent maps.

MOODY'S MANUAL OF RAILROADS AND CORPORATION SECURITIES. Ninth annual number. 1908. Edited by Louis W. Holschuh. Pp. 2864; 6x9 in., cloth. New York: Moody Manual Company.

This new edition of this manual, which has well earned its place as an authority on corporation statistics, appears with several improvements. Among these we note the increase in number of industrial reports; more extended accounts of bond issues; and especially numerous additions to the list of mining companies. The insertion of a number of maps is also a welcome feature. In every respect it is evident that great care has been taken in making the compilation of reports, and in presenting the condensed information in the best and clearest manner. An excellent feature is the completeness of the general index and its arrangement. The "Manual" in its previous editions has proved an exceedingly useful compilation, and the present edition is even better than its predecessors. The publishers have also made arrangements to issue a monthly guide as a supplement to the yearly volume, giving each month later information as it becomes accessible.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALLOYS Improvements in and Relating to Aluminum Alloys. Centralstelle für Wissenschaftlich Technische Untersuchungen G.m.b.H., Neubabelsberg, near Berlin, Germany. (Brit. No. 26,322 of 1907.)

COAL AND COKE

COAL WASHER and Ore Concentrator. Alonzo C. Campbell, Asheville, N. C. (U. S. No. 898,314; Sept. 8, 1908.)

COKE DRAWING APPARATUS Fred H. Daniels, Axel F. Backlin, and Idoff Ecklund, Worcester, Mass., assignors to H. C. Frick Coke Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 893,453; July 14, 1908.)

COKE OVEN Mathew E. Rothberg, Pittsburg, Penn., assignor to The Coal and Coke By Products Company, a Corporation of West Virginia. (U. S. No. 893,017; July 14, 1908.)

COPPER

ELECTROLYTIC COPPER Method of Rendering Electrolytic Copper Homogeneous. Marcel A. Jullien and Emile L. Dessolle, Levallois-Perret, France. (U. S. No. 897,291; Sept. 1, 1908.)

GOLD AND SILVER

AMALGAMATOR Benjamin F. Geigher, Los Angeles, Cal. (U. S. No. 897,975; Sept. 8, 1908.)

AMALGAMATOR Eugene Stevens, Boulder, Colo. (U. S. No. 896,169; August 18, 1908.)

CYANIDATION Improvements in the Recovery of Gold from Cyanide Solutions. Sherard O. Cowper-Coles, London. (Brit. No. 11,297 of 1907.)

ELECTROLYTIC RECOVERY Apparatus for the Recovery of Precious Metals from Slimes, etc. Alphonsus J. Forget, Los Angeles, Cal. (U. S. No. 893,472; July 14, 1908.)

METALLURGICAL APPARATUS William A. Merralls, San Francisco, Cal. (U. S. No. 898,415; Sept. 8, 1908.)

RECOVERY FROM SOLUTIONS Method of Recovering Metal Values from Solutions. Wilbur A. Hendryx, Denver, Colo. (U. S. No. 893,581; July 14, 1908.)

STAMP MILL. Rotary Stamp Mill. Philip J. Lonergan, Denver, Colo. (U. S. No. 897,214; Aug. 25, 1908.)

STAMP-MILL. William A. Merralls, San Francisco, Cal. (U. S. No. 898,414; Sept. 8, 1908.)

IRON AND STEEL

BLAST FURNACE Furnace Bosh Jacket and Bosh Plate. Frank C. Roberts, Philadelphia, Penn. (U. S. No. 897,016; Aug. 25, 1908.)

BLAST-FURNACE GASES—Apparatus for Washing Iron Blast Furnace-Gases. Benjamin H. Thwaite, Westminster, London, England. (U. S. No. 896,175; August 18, 1908.)

BLAST FURNACE OPERATION Improved Means for Drawing Away Heat to Protect the Brickwork of Certain Parts of Blast-Furnaces. Lawrence F. Gjers, Middlesborough-on-Tees, Eng. (Brit. No. 13,456 of 1907.)

CHARGING APPARATUS for Blast Furnaces. Martin J. Shannon, Steelton, Penn. (U. S. No. 898,071; Sept. 8, 1908.)

CHARGING APPARATUS for Blast Furnaces. Martin J. Shannon, Steelton, Penn. (U. S. No. 898,012; Sept. 8, 1908.)

DRY AIR BLAST Method of Drying Air for Blast Furnaces. David L. Day, Washington, D. C. (U. S. No. 897,756; Sept. 1, 1908.)

FERRO-ALLOYS Process of Producing Ferro Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, Chicago, Ill., a Corporation of West Virginia. (U. S. No. 898,173; Sept. 8, 1908.)

SMELTING Process of Smelting Iron. Marcus Ruthenburg, Philadelphia, Penn. (U. S. No. 898,068; Sept. 8, 1908.)

ZINC

RECUPERATIVE FURNACE. Nicholas L. Heinz, La Salle, Ill. (U. S. No. 898,410; Sept. 8, 1908.)

RECUPERATIVE SPELTER FURNACE Nicholas L. Heinz, La Salle, Ill. (U. S. No. 898,409; Sept. 8, 1908.)

MINING—GENERAL

BLASTING Torch for Igniting Blast Fuses. John Craighton, Deer Lodge, Mont. (U. S. No. 893,309; July 14, 1908.)

MINE SUPPORTS—An Improved Process or Device for Withdrawing the Supporting Timbers, Props or the Like, in Coal and Other Mines. Robert Mellor, Fenton, Eng. (Brit. No. 22,998 of 1907.)

ORE DRESSING

CONCENTRATING APPARATUS Wilton E. Darrow, Sutter Creek, Cal. (U. S. No. 898,331; Sept. 8, 1908.)

DRY ORE CONCENTRATOR Frederick F. McKinley, Guthrie, Okla., assignor, by mesne assignments, to The Desert Gold Machine Company, Wichita, Kan., a Corporation of Arizona. (U. S. No. 897,223; Aug. 25, 1908.)

FILTER Continuous Filter. Robert Schorr, San Francisco, Cal. (U. S. No. 893,104; July 14, 1908.)

FILTERING APPARATUS. Elisha J. White, Guanajuato, Mexico. (U. S. No. 894,444; July 28, 1908.)

FILTERING APPARATUS Vacuum Filtering Apparatus. Charles Butters, Berkeley, Cal. (U. S. No. 896,360; August 18, 1908.)

FILTER FRAME. Galen H. Clevenger, Palo Alto, Cal., assignor to The Butters Patent Vacuum Filter Company, Inc., a Corporation of Nevada. (U. S. No. 896,436; August 18, 1908.)

ORE-CONCENTRATOR. Emil Deister, Fort Wayne, Ind., assignor to The Deister Concentrator Company, a Corporation of Indiana. (U. S. No. 895,167; Aug. 4, 1908.)

ORE-CONCENTRATING TABLE. Emil Deister, Fort Wayne, Ind., assignor to The Deister Concentrator Company, a Corporation of Indiana. (U. S. No. 895,168; August 4, 1908.)

ORE-CRUSHING MACHINE. Frederick R. Pettengill, Burbank, Cal., assignor to Samuel L. Kistler, Los Angeles, Cal. (U. S. No. 893,540; July 14, 1908.)

ORE DRIER Daniel J. MacLeod, Merchantville, N. J. (U. S. No. 893,338; July 14, 1908.)

ORE-GRINDING MILL Charles D. McLure, St. Louis, Mo. (U. S. No. 893,535; July 14, 1908.)

ORE SEPARATING or Concentrating Machine. Walter R. Lins, Philadelphia, Penn. (U. S. No. 898,119; Sept. 8, 1908.)

ORE SEPARATOR Joseph G. Evans, Baker City, Ore. (U. S. No. 896,978; Aug. 25, 1908.)

ORE TREATMENT Apparatus for Treating Ores. Duncan N. Hood, New York, N. Y., assignor to Hood Process Company, a Corporation of Arizona. (U. S. No. 893,2[illegible]; July 14, 1908.)

PULVERIZER Machine for Pulverizing Ore. Frederick W. Thomson, Fort William, Ontario, Canada. (U. S. No. 896,954; Aug. 25, 1908.)

SEPARATOR Hydraulic Separator and Classifier. Charles F. Seymour, Placerville, Cal., assignor of one-fourth to Lawrence E. King, Reno, Nev. (U. S. No. 896,471; August 18, 1908.)

SEPARATING TABLE. Henry M. Sutton, Walter L. Steele and Edwin G. Steele, Dallas, Tex. (U. S. No. 898,[illegible]; Sept. 8, 1908.)

TREATING COMMINUTED SOLIDS with Liquids. Alfred Adair, Johannesburg, Transvaal. (U. S. No. 894,417; July 28, 1908.)

METALLURGY—GENERAL

CONVERTING PROCESS Improvements in and Relating to Apparatus for Converting Metals. Richard Lewis Lloyd, Cananea, Mexico. (Brit. No. 15,963 of 1907.)

CONVERTING PROCESS Improvements in and Relating to the Art of Converting Metals. Richard Lewis Lloyd, Cananea, Mexico. (Brit. No. 15,962 of 1907.)

EXTRACTION—Process of Extracting Metals from Ores. James H. Reid, Newark, N. J., assignor to Electric Smelters, Limited, Ottawa, Canada, a Corporation of Canada. (U. S. No. 896,24[illegible]; August 18, 1908.)

FURNACE-PORT-COOLING MEANS. Frank E. Parks and Harry A. Deuel, Pueblo, Colo. (U. S. No. 896,937; August 25, 1908.)

SMELTING PROCESS. Alexander R. McKenzie, Great Falls, Mont. (U. S. No. 897,993; Sept. 8, 1908.)

MINING MACHINERY AND APPARATUS

CAISSON—Extension Mining-Caisson. Willis W. Beeson, Redwood City, Cal. (U. S. No. 898,174; Sept. 8, 1908.)

MINER'S CAP and Lamp. Lewis W. Cogswell and James D. Abel, Taylorville, Ill. (U. S. No. 897,588; Sept. 1, 1908.)

MINE PROPS—Improvements in and Relating to Adjustable Mining Props. Otto Nootbaar, Remscheid, Germany. (Brit. No. 6138 of 1908.)

MINING CARTRIDGES Improvements in or Appertaining to Cartridges for Mining and Like Purposes. Edward Purcell and Samuel Purcell, Pontefract, Yorkshire, Eng. (Brit. No. 1384 of 1908.)

ROCK-DRILL. Robert H. Anderson, Germiston, Transvaal. (U. S. No. 897,336; Sept. 1, 1908.)

ROCK-DRILLING ENGINE Gas-Operated Rock-Drilling Engine. Rolland S. Trott, Denver, Colo. (U. S. No. 896,777; Aug. 25, 1908.)

ROCK DRILLING MACHINES—Improvements in Rock-Drilling Machines. James E. H. Grose, Witwatersrand, Transvaal. (Brit. No. 22,636 of 1907.)

ROCK DRILL SHARPENING MACHINE Charles H. Shaw, Denver, Colo. (U. S. No. 896,166; August 18, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

DUST ARRESTER [illegible] Sicka and John P. Collins, Butte, Mont., assignors of one-third to William M. Kirkpatrick, Butte, Mont. (U. S. No. 895,693; August 11, 1908.)

EXTRACTION—Apparatus for Extracting Metals from Ores. James H. Reid, Newark, N. J., assignor to Electric Smelters, Limited, Ottawa, Canada, a Corporation of Canada. (U. S. No. 896,24[illegible]; August 18, 1908.)

GAS-FIRED FURNACES Improvements in, or Relating to Gas-Fired Furnaces. Dr. [illegible], Germany. (Brit. No. [illegible] of 1907.)

LABORATORY APPARATUS New or Improved Support for Laboratory Crucibles, Basins and the Like. George T. Holloway, London, W. C. (Brit. No. 12,787 of 1907.)

ROASTING FURNACE [illegible] L. Adey, Denver, Colo. (U. S. No. 898,024; Sept. 8, 1908.)

ROASTING FURNACE Furnace for Roasting [illegible] Ores. [illegible]dorf, near Berlin, Germany. (Brit. No. 15,941 of 1907.)

ROTARY ROASTING FURNACE [illegible]

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

W. H. Cunningham, of Beaumont, Tex., has gone to Colombia, South America, to superintend drilling operations for oil there.

M. M. Sinclair, an Australian mining engineer, has been appointed manager of the Usutu tin mines in Swaziland, South Africa.

Harry A. Lee, mining engineer, of Denver, Colo., spent a short time in New York last week, leaving Sept. 17 for Salt Lake City.

Henry F. Lefevre, mining engineer, was recently in Virginia City, Nev., making some cyanide investigations at the Butters plant there.

A. P. Roach, recently with the Rio Bravo Oil Company, at Welch, La., has been appointed superintendent of the Imperial Oil Company, of California.

Edgar B. Van Osdel, of Spokane, Wash., has been appointed professor of chemistry in McMinville College, McMinville, Oregon, and has removed to that place.

Robert K. Painter has been appointed manager of the Benson Mines Company, at Benson Mines, St. Lawrence county, N. Y., and has taken charge of the mines.

Eric E. Watson, late general manager and metallurgist of the Queensland Smelting Company, has left Australia for London, where he intends to stay for some time.

B. B. Thayer, of the Amalgamated Copper Company, who has been making a periodical tour of inspection in the West, is expected to return to New York about Oct. 1.

L. A. McElroy, of Erie, Penn., is president of the Manitoba Rolling Mills Company, which has completed and started up a rolling mill at Winnipeg, the first in western Canada.

Chester Peck, recently of Everett, Penn., has been appointed superintendent of the Ivanhoe Furnace Company, of Ivanhoe, Va., to succeed J. W. Reese, who has resigned.

H. Koppers, inventor of the Koppers by-product coke oven, arrived at Joliet, Ill., recently, from England, to inspect the new coke plant of the Illinois Steel Company at that place.

Juan Felix Brandes has returned to Denver from a professional trip to California and Mexico and is proceeding to Europe, particularly London and Paris, where he will be until the end of the year.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, who recently returned from an examination of gold properties in Arizona, is now making an extensive examination of new copper properties in Ontario.

Allan Gibb, chief engineer for R. Williams & Co., of London, who is in charge of the developments of the great copper mines of Katanga, Africa, has arrived at New York, his purpose being to visit the important copper mining and smelting districts of the United States.

T. Lane Carter, of Johannesburg, Transvaal, was in New York this week. He expects to remain in the United States for about two months, visiting several of the leading mining districts. Mr. Carter is a well known American mining engineer, who has been on the Rand for many years.

E. C. Knight, a member of the Southern Department executive committe in charge of the Mexican smelting plants of the American Smelting and Refining Company, who for 12 years has been identified with the Guggenheim interests in Mexico, has resigned and will leave Mexico in October for Vancouver, B. C., where he has acquired an interest in the Vancouver Lumber Company, and where he will hereafter make his home.

Obituary

William J. Moorhead, of Pittsburg, died suddenly Sept. 9, while on a visit to Boston. He was born in 1839, and was for many years prominent in the iron trade. He was founder and head of the firm of Moorhead Brothers & Co., which was merged in the Jones & Laughlin Steel Company a few years ago.

Samuel J. Ritchie, of Akron, Ohio, died suddenly while on a visit to Charleston, W. Va., Sept. 19. He was connected with the first discovery of nickel in the Sudbury district in Ontario, and later was involved in extended litigation over the ownership of the property opened and operated by the Canadian Copper Company.

A. D. Gambell, one of the pioneer miners of Colorado, died recently. It is told of him that he first brought prominently into general notice, through an argument with Horace Greeley, the fact that gold had been discovered and was being actually mined in Colorado. Later Mr. Gambell went to Wyoming and there discovered and located a large iron-ore deposit.

Alfred Smith, who died in Kingston, Penn., Sept. 19, aged 58 years, was born in New York, but went to the anthracite country when a boy. Beginning as a miner, he rose to be general superintendent of the Wyoming Valley Coal Company. After holding that position over 20 years, he became district superintendent for the Delaware, Lackawanna & Western Company, holding that position until his death.

Nicholas Finn, who died at Leadville, Colo., Sept. 18, was one of the pioneer operators in that district. He was born in Ireland, but came to the United States when a boy, living for some years in Syracuse, N. Y. He settled in Leadville in 1879 and with his partner established the Cummings & Finn smelting plant. He acquired much mining property in the district. In recent years he lost a large part of his property, though he still owned interests in several mines.

Societies and Technical Schools

Coke Oven and By-products Association—Steps are being taken to organize this association in England. It is to be composed of engineers, managers and owners of by-product coke ovens, and its object will be the discussion and solution of problems connected with such plants.

Colorado Mining Congress—The convention of Colorado mining men held this week in Denver, several subjects were ably dealt with: Professor George, State geologist, called the earnest attention of the meeting to what might be accomplished by the coöperation of Colorado mining men with the United States Geological Survey. An organizing committ was appointed whose province will be to do energetic work toward insuring a strong branch of the American Mining Congress, similar to those established in Bisbee, Spokane, Seattle and Salt Lake City; a committee was also appointed whose work will be to offset the energetic efforts of Salt Lake City to have the permanent headquarters of the American Mining Congress removed to that city. Resolutions were passed approving of the ideas of the officers of the American Mining Congress that a mining temple, to cost $1,000,000, should be built. The proposition will probably go to the next State legislature, asking for an appropriation of $250,000 as a starter for this much-needed building. It is unfortunately improbable that this will be granted, and it will then devolve upon the rich men of Colorado, all of whom, directly or indirectly, have derived their wealth from the mines, to assist substantially in erecting this building. That they will eventually wake up and do this is more than probable.

Strong resolutions were adopted, urging the importance of securing the headquarters of the mining congress for Denver, and stating the probability of its going to Salt Lake.

From the above it is apparent that some little feeling has entered into the competition, and though Denver has the great advantage of being selected by the Portland convention of the American Mining Congress as the home of the proposed temple, her citizens have so far apparently contented themselves with passing resolutions, while those of Salt Lake are coming down handsomely with the needed coin.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco.

Sept. 16—The Gwin mine in Calaveras county, one of the famous old Mother Lode mines, has been closed down and the pumps have been removed. The mine will be allowed to fill with water, and all operations will cease. This mine yielded millions of dollars to the Gwin family in the early days of quartz mining, and finally, owing to a breakage of the pumps, filled with water, in which condition it lay for a number of years. Finally F. F. Thomas, the present president and manager, with David McClure, now the superintendent, organized a company to work it, and sunk a new vertical shaft for that purpose instead of trying to repair the old one. The company is called the Gwin Mine Development Company, of which J. J. Crawford, ex-State mineralogist, of California, is secretary. The operations were highly successful, and the property was equipped with a 100-stamp mill, compressors, and all suitable machinery. The production was large until about three years ago, since which time they have been prospecting, and during this period incurred some debts. On Aug. 24 the power company shut off the water. Some of the stockholders declined to pay further assessments, so the mine was closed down. The probability now is that an entire reorganization of the company will be effected and the debts paid. When this is done the mine will be pumped out and operations resumed. Other companies offer to furnish power.

On the Merced river, Merced county, not far from the Mariposa county line, a dredge company has commenced operations this month. The dredge is operated by electric power generated with the use of oil as fuel, the power plant being about two miles from the dredge, which is located on the Montgomery land about 1½ miles below the town of Snelling. The dredging company has acquired 400 acres of mining ground along the Merced river. This is the first practical attempt at gold dredging in that part of the State.

The City of Oroville, Butte county, has obtained an injunction from the Superior Court against the Indiana Gold Dredging Company to prevent the company from further depositing tailings in the river channel, and endangering the city during flood periods. The Feather river makes an abrupt turn just below Oroville, where it is from 800 to 1200 ft. wide, and the dredge company has piled up an embankment from 10 to 30 ft. high and 70 to 210 ft. in width, narrowing the river bed to 300 ft. Oroville is building a levee to protect itself from such floods as occurred there in March, 1907, and it is thought the dredge embankment will cause the waters to cut out and undermine the levee. The dredge company has stopped work pending a settlement. The case has been transferred to the United States Court in San Francisco.

The Solano Wonder mine near Brownsville, Yuba county, discovered some months ago by "cow county" men, on patented land, owned by J. C. Campbell, and over which there was some litigation, continues—somewhat contrary to expectation—to yield well. When first found some phenomenally rich ore was taken out. A full crew of men has been engaged for some time sinking the shaft, and the vein continues in depth, and it looks now as if it would be a permanent mine carrying high values. No machinery has yet been installed, but the mine is free of water, so that shaft-sinking is easy.

Salt Lake City

Sept. 17—Options held by the Utah Consolidated Mining Company on lands near Tooele, Tooele county, expire on Sept. 30, and it is presumed, therefore, that the result of the negotiations which have been pending for some time for a 5-year extension of its smelter contract with the American Smelters Securities Company will have been known. Unless the contract is given new life, the Utah Consolidated will proceed with its plans to erect a smeltery of its own near Tooele; which would mean also that the smelter at Garfield would have another formidable competitor in the Utah field for custom ores. At the present time, the Utah Consolidated Company is shipping 800 tons of ore to the Garfield smeltery per day, under the provisions of a contract which originally was to have run [illegible] making it optional with the mining company to keep it in force for two years, provided that within six months notice was served on the management of the smeltery for the additional time, which has been done. It is said that the contract has been taken on such a favorable basis to the mining company that the smeltery officials are not eager to renew it for the long term. However, it may be done to avoid the entrance of another competitor.

Newly acquired surface rights have cost [illegible] 500; the Puritan Gold and Copper Company receiving $5000 and the Little Eddy Mining Company $12,500, the property involved in the transaction being situated in Bingham. The area is to be utilized as a dumping place for overburden removed from the Bingham deposits of copper-bearing porphyry ore; also to provide room for additional trackage in contemplation of the enlargement of the Garfield concentrator to the capacity of 8000 tons per day. Work on the enlargements will probably begin early next year.

The new lead smeltery of the Tintic Smelting Company has been pronounced a success, and from the two furnaces 40 tons of bullion is being produced daily. The third furnace will go into commission in October.

Tintic mining companies have posted September dividends as follows: Colorado, $120,000; Uncle Sam Consolidated, $25,000; May Day, $12,000.

Butte

[illegible] holders of the Davis-Daly Estates Copper Company, held Sept. 5, to consider the reorganization offer of the Raborg syndicate, 310,000 shares out of 600,000 issued were represented and voted in favor of accepting the syndicate offer. This is but 53 per cent. of the stock, whereas the syndicate offer contemplated an acceptance by at least 65 per cent. It is stated, however, that the syndicate will waive the 65-per cent. vote which they were entitled to under the offer and carry out the contract, giving the dissenting stockholders one member on the board of directors of the new company.

[illegible] weeks the coal miners of northern Wyoming employed in the mines at Carney, Monarch and Sheridan, returned to work yesterday pending the settlement of the strike. It is expected that the coal miners in the southern part of the State will also start work in a few days, thus temporarily averting labor troubles which threatened to affect seriously the mining industry in Butte and bring about a coal shortage.

The Montana Railway Commission, re- [illegible] ore-shipment rates, has rendered its first decision. The decision affects ore rates from points on the line of the Northern Pacific railway, the rates to Butte being reduced 30 per cent. and those to East Helena 17 per cent. As a result of this decision the smelters at Butte and at Helena are put on an equal basis, removing the advantage formerly held by the East Helena smelter.

Denver

Sept. 18—Work in the tungsten mines of Boulder county, which was temporarily suspended owing to the low price of that metal, is being resumed, and the number of men employed shows a steady increase.

In the Cripple Creek district, the legality of taxation of non-producing mining property has been in dispute for five years, the same revolving around the question of what is meant by the word "locality" in that section of the State law governing the assessment of mining property, the owners of which claim very properly that the same valuation should not be placed on their non-productive ground as on that which is producing. If the property were taxed on a valuation based on the price it would bring at a forced sale, it would be fair, and there would be no kick coming from the owners. A test case has just been tried in which seven companies were the plaintiffs, the result being awaited by 60 other companies who, it is said, will bring similar actions. The judge decided against the defendant county commissioners, whose assessor levied the tax, and reduced the same from $570 to $118 per acre.

The El Paso Consolidated Gold Mining Company, which paid regular dividends up to the time the mine was flooded, has just declared a dividend of one cent per share, amounting to $24,500, payable Sept. 25, the first dividend since June, 1907.

Two suits have been filed in the district court of Teller county by the Jennie Sample Consolidated Mining Company, of Cripple Creek, against Mrs. Cone, the owner of the Ophir claim. Damages are asked in the sum of $125,000 for alleged illegal extraction of ore. Another suit of a similar title for $200,000 brought by the same people, has been pending for some time, making a total of $325,000 demanded.

In the two mines known as the Millionaire and the Smuggler, at Aspen, strikes of phenomenally rich and large bodies of silver-lead ore are reported. Details are not available at this writing.

In the Central City district, the old Buell mine is being unwatered by Colonel Martin, one of the chief owners. The property embraces about 5000 linear feet of veins, and was opened in 1871 at a point under Gregory street and gulch, in Central City, and at a depth of 100 ft., the first body of rich ore was struck. Several tons of this ore was sent across the water to Swansea at that time, and brought $300 a ton in gold, and up to 1880 the property is said to have yielded $800,000. The shaft, which is being unwatered, is about 600 ft. deep, and is situated near the entrance of the adit level, the mill being built over the shaft. A very large amount of ore ground will be available as soon as this important work is accomplished.

The arrangements for recommencing the drivage of the Newhouse tunnel are not yet completed, as some of the mine-owners who should come into this great unwatering scheme are still holding out, and have not agreed to the arrangement proposed by the tunnel manager. However, the Chamber of Commerce has taken up the matter, and is using its influence to persuade these people to act for the general welfare of the district, as well as their own, and it is probable that the great work of pushing the tunnel ahead will be commenced before the end of the year.

Toronto

Sept. 18—Since 1904 to date dividends aggregating $6,061,520 have been paid by 13 Cobalt companies as follows: Nipissing, $2,260,000; Temiskaming & Hudson Bay, $937,266; Kerr Lake, $750,000; Coniagas, $680,000; McKinley-Darragh, $354,346; Silver Queen, $270,000; Buffalo, $267,000; Crown Reserve, $142,000; Trethewey, $120,908; Right of Way, $105,000; Temiskaming, $80,000; City of Cobalt, $50,000; Foster, $45,000; Total, $6,061,520.

At the annual meeting of the Canadian Manufacturers' Association held at Montreal commencing, Sept. 15, an important step was taken toward the establishment of a national system of technical education.

The report of the Technical Education committee, presented by Dr. Morley Wickett, of Toronto, recommended the appointment, by the association, of a commission of three to visit the leading European countries and the United States, and inspect the principal industrial schools and technical colleges to gain an insight into their methods, subsequently familiarizing themselves with the industrial requirements of different Canadian localities and ascertaining how far these could be met by the adaptation of foreign methods. They would then be able to formulate a general system of industrial education. The cost of such a commission for two years was estimated at $25,000, of which it was proposed that the association should provide $5000, leaving the remainder to be raised by the provinces. The report was adopted and $5000 voted toward the expense of the commission. Negotiations with the provincial governments for carrying the project into effect will be undertaken.

London

Sept. 11—The British Association has been holding its annual meeting during the past week in Dublin, and as usual a large number of papers dealing with every branch of science were presented. The work of the association is conducted in sections, of which the following is a list: Mathematics and physics, chemistry, geology, zoology, geography, economic science and statistics, engineering, anthropology, physiology, botany, education, science. The president for the year was Dr. Francis Darwin, the distinguished botanist. Addresses were given by the presidents of the different sections among which that of Prof. John Joby, the president of the section devoted to geology, who took as his text "Uranium and Geology," was not the least important. Another valuable address of special interest to mining engineers was that given by Dugald Clark, whose subject was "Thermodynamics and the Internal Combustion Engine."

It was announced that the next meeting of the association would be held at Winnipeg, Manitoba, in 1909, with Prof. J. J. Thomson as president.

The report for the year 1907 of the Minerals Separation, Ltd., and the chairman's address give information as to the progress made with the flotation process that the company owns. The principal business has been conducted at Broken Hill, Australia, where not only the dumps but also the crude ore has been treated. At the Central mine one of the plants treated between November, 1907, and June, 1908, 100,000 tons of tailings producing somewhat over 36,000 tons of concentrates assaying 15.3 oz. silver, 11 per cent. lead and 45.1 per cent. zinc, with a recovery in marketable form and without any retreatment whatever of 73 per cent. of the silver, 66 per cent. of the lead and 83 per cent. of the zinc in the original material. The average cost of treatment is given at $1.68 per ton made up as follows: Tramming 11.76c.; recrushing and grinding, 36.48c.; flotation process, 97.92c.; handling concentrates, 12.96c.; handling residues, 8.88c. The cost of a 250-ton per day unit, attached to a milling plant, for the treatment of tailings and slimes delivered direct (no further grinding machinery being necessary) is estimated at £6000. The estimate for a 250-ton per day plant to treat crude ore from the mine with crushing and regrinding machinery is £14,000. The company has also had operations in Bolivia where an attempt was made to treat a dump of tin ore by a dry-table process. This venture was, however, not successful. A considerable portion of the report is given up to discussing the question of patent rights and the litigation that has been and is still going on with the British Ore Concentration Syndicate and the Ore Concentration Company, which are interested in Elmore's patents. The action brought by the British Ore Concentration Syndicate was decided in favor of Minerals Separation, Ltd., and the plaintiffs have given notice of appeal to a higher court. A third action in which the company is involved is one attacking the Elmore vacuum process as an infringement of its patent. This action has still to be tried.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Republic Iron and Steel Company—Work at No. 1 iron mine, at Raimund, has been suspended pending improvements in the mine. A new heading will be driven, the whole mine will be retimbered with creosoted timber, a steel tipple will be installed, as well as a large crusher. The improvements will require about 60 days to complete. It is understood that none of the men at work in the mines will be laid off, as the new mine at Spaulding has been started up and many of the men have been transferred to that mine.

Tennessee Coal Iron and Railroad Company—It is announced that further improvements are to be made at the steel works at Ensley. Three new blast furnaces, each with a capacity of 100 tons per day, will be built to take the place of three of the old ones. A 600-ton mixer is to be installed in the steel works. Some minor improvements will also be made.

Arizona

GILA COUNTY

Miami—The stockholders of this company and the holders of rights subscribed for 83,000 shares of the new issue of stock, leaving 17,000 shares to be taken by the underwriters. It is explained that the reason why the entire 100,000 shares were not taken by the stockholders is that about a week before the closing of the subscription, the General Development Company, which holds 100,000 shares of Miami, voted to distribute the rights on this stock among its stockholders. Many of the latter were absent in Europe, and inasmuch as the rights could not be extended, in some cases they expired without the holders being able to subscribe. F. W. Estabrook, of Nashua, N. H., has been elected a director of the Miami company to represent the Boston interests, which now own about 250,000 shares.

GRAHAM COUNTY

Detroit Copper Mining Company—The damage suit of the Chase creek property holders against this company, of Morenci, is being tried at Tucson on change of venue from Graham county. The suit is to recover damages done by the breaking of the dam at the concentrator during a heavy rain. An enormous amount of water was thrown into Chase creek, and Clifton, a town four miles below Morenci, [illegible] lower [illegible]. The company is represented at the trial by C. E. Mills, Gus Hunt, superintendent of the concentrator, and Thomas Donahey, [illegible].

California

AMADOR COUNTY

[illegible] Mining Company—[illegible]ing of the shaft of this mine has lowered the water to 400 ft.

[illegible] Queen [illegible]—Doyle & [illegible] have taken a lease on this mine and a tunnel is being run in search of "pockets."

Mitchell—In this property, under bond to Mr. Crammer, ore of good grade has been found at 200 ft. depth.

BUTTE COUNTY

Banner—A body of high-grade ore is reported found in this mine, six miles from Oroville.

Big Blue Lead Mining Company—The company is ready to take up its options on the land, which means the beginning of operations on a large scale.

CALAVERAS COUNTY

[illegible]—Local men have started work on this mine at Mokelumne Hill, which has been idle for a year past. There is a 10-stamp mill on the property.

Middle [illegible]—A strike of high-grade ore has been made in this mine near the Carlton mine.

Newman—This old mine near West Point has been opened and the tunnels and shafts are being cleaned out and repaired.

EL DORADO COUNTY

[illegible]—[illegible] Georgetown, [illegible] Wingfield & Nixon, of Nevada, has had a new steam hoist installed; a mill is being planned.

[illegible]—A new [illegible] has been installed at this property, with [illegible].

FRESNO COUNTY

[illegible] 45 miles east of Sanger, men have been set at work on the Delilah mine, under Supt. W. A. Macdonald. The Sampson [illegible] worked.

KERN COUNTY

[illegible]

[illegible] royalty. At the Indian Tom mine, a [illegible]

MODOC COUNTY

Fort Bidwell Consolidated Mines Company—The Fort Bidwell and the Mountain View companies have consolidated under this name. Active work has com[illegible] erected.

NEVADA COUNTY

Birchville—At this mine, Graniteville, D. Medlin, superintendent, a 5-stamp mill is being erected.

Bear River Consolidated Tunnel Company—This company having completed the 500 ft. of tunnel, now receives a full one-half interest in the six claims. The company will incorporate and put in the necessary machinery.

[illegible]—The large [illegible] depth of 1300 ft. on the incline has been finished in the Prescott Hill shaft and the huge electric pump will now be put in place.

[illegible]—This mine [illegible] been sold to San Francisco men, who will now develop it.

[illegible]—Two large [illegible] compressors have been ordered by Supt. Samuel Colt, one for the Lecompton mine, at Nevada City, and the other for the Norambagua mine, Grass Valley. The mines are being reopened.

PLACER COUNTY

Forest Hill Divide—The development in the Fletcher or Dardanelles mine at Last Chance, and the Paragon mine at Bath, are attracting attention to both the Forest Hill and Upper Divides.

[illegible]

[illegible] shortness of water supply with the exception of continuing the old Eureka Hill tunnel, with two shifts of miners.

Arcadia Group—This group, recently taken over by E. W. King, W. G. Dever[illegible] high-grade ore.

SAN BERNARDINO COUNTY

[illegible] northeast slope of Mount San Bernardino have excited the mining communities at Victorville and Hesperia.

Fremont—At this mine, 18 miles north-[illegible] uncovered; an abundant supply of water is also furnished, a great item in that section.

Sierra County

Howland Flat—The owners of El Oro Dredge Company are operating the Howland Flat mine at this place and have placed orders for a mill.

Bellevue—Twenty-two men are now breasting out high-grade gravel from this drift mine.

Buttes Saddle—At this mine, Sierra City, Chick & Aldrich, who have it under bond, have 14 men driving tunnels and repairing tramway.

Siskiyou County

Black Bear—At this mine, Ben Daggett, superintendent, they are about to sink a new shaft to open up the old rich pay shoot known to exist in the property.

Trinity County

Venecia Mining Company—This new incorporation has been found to work the Venecia mine in Eastman gulch.

Brown Bear—The recent rich find in the China tunnel of this property at Deadwood, is in virgin ground, and is expected to place the old mine again in the position of being a heavy producer.

Tuolumne County

Densmore—At this mine, Columbia, A. J. Crowell, superintendent, a new shaft is being sunk which will be put down to 300 ft. before drifting commences.

Seminole—This mine has been purchased by H. B. Lind and associates, who intend putting in a modern mill with concentrators.

Yuba County

Little Bessie—This mine at Browns valley has been bonded to J. C. Campbell and is to be reopened and thoroughly developed.

Colorado

Lake County—Leadville

Dinero Tunnel—At the beginning of the week the tunnel caught the outer edge of one of the veins. The vein matter shows considerable native silver mixed with the sulphides. The vein was caught a little more than 3400 ft. from the portal. The tunnel is being driven ahead to get to the other side of the vein and when this is accomplished it is likely that the management will develop it both sides before driving the tunnel ahead to the other vein. The tunnel has been working steadily for 18 months.

Huckleberry—The lessees started to sink a winze from the bottom of the tunnel level and had only reached a distance of 40 ft. when an excellent body of ore was caught; 20 ft. had been passed with the ore still in sight. The main body of the ore runs $40 per ton, but it has a rich streak which assays about $150 per ton; this ore is being sacked.

Manhattan—This property, Willis gulch, is being developed by tunnel; a few days ago a vein 14 in. wide was caught, and is now being followed. The ore is free gold milling. The company will install a stamp mill in the spring.

Helena—The sinking of the Helena shaft, Iowa gulch, proceeds; at the 600-ft. mark several streaks of high-grade galena have been found, an indication that before the shaft reaches its objective point, 800 ft, the ore horizon will be caught.

Maumee—A 4-ft. body of ore was opened in the shaft, Mosquito range, during the week; it will average 2½ oz. gold per ton. The ore resembles that taken from the famous London mine, which is close to the Maumee. A good plant of machinery has been installed on the property and work will be continued throughout the winter.

Bix Six—Sufficient work has now been done on the recent strike, Breece hill, to prove that it is an ore shoot and not a pocket. The lessees are shipping steadily 30 tons daily and sacking the high-grade ore which still holds up to 37½ oz. gold per ton. This orebody is the same as that opened in the Penn a few years ago.

American—This property, Iowa gulch, is close to the Lilian and a few months ago was leased to Pasco and associates. A new shaft was started and at a depth of 75 ft. an excellent body of iron carbonates was opened; shipments are now going out regularly. When this iron orebody is sufficiently developed, it is the intention of the lessees to sink the shaft deeper.

San Juan County

Bagley Funnel—This adit, in the Animas Forks district, has cut the Red Cloud vein at a distance of 4800 ft. from the entrance. Drifting is now being done on the vein, which is about 12 ft. wide.

Hamlet—Development work is showing good results, and the mill is to be started up soon.

Kittimac—The new mill building at this mine is nearly finished, and the machinery is beginning to arrive.

Georgia

Bartow County.

The mining of bauxite is to begin soon on a tract of 1500 acres recently bought by A. D. Greenfield, of Atlanta, Ga., and others. They intend also to put up a plant for the manufacture of alum and other products.

Indiana

State Senator Ralph W. Moss, of Clay county, has prepared a bill which he will introduce at the extraordinary session of the Indiana Legislature. It provides for the repeal of the section of a law enacted by the last Legislature making it unlawful to use a drill more than 2½ in. in diameter. This regulation has been found to be unsatisfactory in the block coalfield. It is claimed that the block coal requires a heavier shot to do effective mining.

Greene County

So serious has become the condition of the 2000 unemployed miners in the Linton field, that steps have been taken for their relief. It has been decided that the former rules of the miners' organization limiting the number of men to be employed, should be abandoned in behalf of the unemployed men who have been idle since March. It is the first time in the history of the organization that these rules have been abandoned, and the matter is one of great importance Resolutions were unanimously adopted setting aside for the present former working conditions as to the number of places to be given them, and the number of turns in a room, for a limited time, and that men now idle shall be allowed to work with other men, when it is satisfactory to the man now at work

Vigo County

George W. Purcell, commissioner of labor for Indiana has tendered his services in the Hudson mine dispute. The operators claim that an adjustment would be speedily reached if President Lewis would do his part. The issue is wholly between the National and district officers rather than a question between employers and employees. However, both operators and miners have agreed that any assistance rendered by Commissioner Purcell will be acceptable.

Michigan

Copper

Lake—A station for the second level has been cut at a depth of 300 ft. from surface. Drifting to the south from the first level continues, and the drift is breasted in the same rich formation that has characterized it from the beginning.

Atlantic—Preparations are about completed for this company to begin small rock shipments to its mill. The south drift from the 13th level is opening up the same kind of ground that was disclosed in the level above and the two levels will be able to furnish a limited tonnage of a good grade of stamp rock. This, together with the revenue derived by leasing portions of its stamp mill will help the Atlantic company in its development work.

Quincy—The structural steel for the new shaft house on the site of No. 2 shaft has been erected, and the building is being sheathed. This shaft house will have embodied in it all the new devices for the economical handling of rock, and will be the largest in the Lake district.

Adventure—Diamond drilling continues at this property, and a vertical hole is now being put down to intercept the various lodes encountered by the other drill holes. With this information at hand, some definite action in regard to sinking a new shaft to work these new finds will, in all probability, be taken.

Ojibway—The railway spur has been completed to the shaft sites of this property.

Michigan—In the drift from the 17th level of "A" shaft some rich ground has been encountered. Diamond drilling continues on the lands of this company, and some promising formations have been cut.

Hancock—This company has run into good ground in the crosscut from the 13th level toward the new shaft. Sinking continues at No. 2 shaft, which is down about 1250 ft., the formation being exceedingly hard, but showing some copper.

Calumet & Hecla—This company has discontinued all exploratory work in Ontonagon county for the present.

Montana

BUTTE DISTRICT

Anaconda Company—The hoisting engine from the Red Metal company's Cora mine is being moved to the Belmont mine of the Anaconda company, where it will be installed. The engine is good for 3000 ft. and was originally installed at the Granite Bimetallic mine at Phillipsburg.

British-Butte—The hull of the new 2500-cu.yd. Risdon gold dredge has been completed.

Butte & Ballaklava—The shaft has reached a depth of 940 ft. It is stated that sinking will continue to the 1000-ft. level, where more development work will be done.

FERGUS COUNTY

Gold Reef Mine—This property, owned by John A. Drake, is situated at Gilt Edge and is being worked by leasers. At the mine and mill a recent increase in the number of men employed brings the total up to 60. About 200 tons of ore are being extracted and treated daily

JEFFERSON COUNTY

[illegible] The company recently made final payment [illegible] to the heirs of the [illegible] for their interest in a group of claims in the Boomerang district. The company has held the Baltimore mine under lease [illegible] Butte and Anaconda smelters [illegible] down a year ago little development work has been done on the property. [illegible] are now completed for the development of the property on an extensive scale.

LEWIS & CLARK COUNTY

Alfonso Lacasse, John Lacasse, Napoleon Lacasse, C. A. Davis and C. M. Van Leuvin, all of Missoula, have recently purchased a group of gold claims near York and expect to begin operations at once. The property is equipped with a hydro-electric plant, compressor plant and electric hoist.

[illegible] months ago a vein carrying good copper ore was encountered in a 40-ft. shaft on this property. The shaft was sunk primarily for the purpose of increasing the air supply. A long tunnel is now being run which it is expected will cut the vein at a point 200 ft. below the shaft. The tunnel has been driven a distance of 250 feet.

[illegible]

[illegible] depth of 500 ft. The vein has been cut on this level and drifting is in progress

Nevada

[illegible]

Production—The receipts from local producers this week amounted to 2552 tons valued at $170,250. This is exclusive of 40 tons of concentrates retreated at the Kinkead mill valued at $400 per ton and 35 tons of $150 ore from the Great Western mine at Hornsilver. The Combination mill treated 560 tons of consolidated ores. The Western Ore Purchasing Company handled from the Mohawk Jumbo 26 tons; Engineers Lease 329 tons; Consolidated Assay Office 40 tons; Consolidated Red Top 61 tons; Rogers 6 tons; Florence Consolidated 58 tons; Kinkead concentrates 84 tons; Little Florence 99 tons; Volk-Florence dump 12 tons; The Nevada Goldfield Reduction Works treated the following ores: Combination Fraction 528 tons; Sandstorm 49 tons; Baby Florence 20 tons; Mohawk Jumbo 40 tons; Higginson 18 tons; Florence Annex 12 tons; Begole Syndicate 360 tons.

Florence Consolidated—The January lease on the Cornishman claim of the Florence has encountered ore on the 172-ft. level in the south drift. The vein is 9 ft. wide between walls and is all of a shipping grade. This lease was formerly operated by January Jones.

Florence Jumbo—This lease on the Florence, otherwise known as the Von Polenz lease, has installed a new electric hoist to handle the ore from the working level at the 355-ft. point. The old gasolene hoist will not be removed but will be used in case of accident.

[illegible] the 250-ft. level is now in 70 ft. It will be continued to the side line. Three shifts are at work sinking the shaft

Baby Florence—This lease on the Florence Goldfield Company's ground has [illegible]

[illegible] ditional 60 days, 50 ft. of ground was surrendered on the north end of the block to the Zinn Florence.

Lone Star—The old Truax lease on the Lone Star, which has been idle two years after producing $19,000 of ore, has been taken over by the Goldfield Star Mining and Leasing Company which will at once begin active operations. The new lease runs until Jan. 1, 1910

ESMERALDA COUNTY—HORNSILVER

Great Western—Arrangements have been made by the Great Western to have its low-grade ores treated at the Tonopah Belmont Development Company's mill at Miller's. The ore carries chiefly silver but a saving of 95 per cent. is guaranteed. A very satisfactory rate has been given by the railroad, but the wagon haul from Hornsilver to the railroad at Cuprite will cost $6 per ton.

[illegible]

Sulphur Group—The sulphur group recently acquired by California parties is being vigorously developed. A trench 15 ft. wide and in places 16 ft. deep has been run 350 ft. across the deposit showing a high grade of sulphur all the way

[illegible]

Output—The production of the Tonopah mines this week amounted to 6040 tons of ore of an estimated value of $160,800, the shipping ore averaging $60 per ton and the mill ore averaging $25 per ton as follows: Tonopah Mining 3450 tons; Belmont, 750 tons; Montana Tonopah, 1000 tons; Midway, 100 tons; MacNamara, 250 tons; West End, 165 tons; Jim Butler, 200 tons; Tonopah Extension, 130 tons.

WHITE PINE COUNTY—ELY

Giroux Consolidated—The Alpha shaft has reached a depth of 1200 ft and work of cutting a large station has begun The winze from the 1100-ft level is 90 ft deep and is still in the orebody

[illegible]

[illegible] Ophir amounted to 124 cars of ore worth $23.50 per ton from the 2100-ft. level and 338 cars from the 2200-ft level worth $30.23 per ton.

[illegible] is being rehabilitated after a long idleness

[illegible]

ft. long. When the Crown Point struck bonanza ore in the early seventies the Yellow Jacket sunk to the 1300-ft. level and drifted to catch this shoot, which however, did not extend into the Yellow Jacket ground. This new ground contains a large amount of mill ore which will yield a profit with the present milling methods.

Ohio

COLUMBIANA COUNTY

West Point Coal and Coke Company—This company has nearly completed the preliminary work which it is doing at its new mine near Lisbon. The mine will begin producing coal in October.

Pennsylvania

BITUMINOUS COAL

Cresson & Clearfield—This company has let the contract for 125 coke ovens to Colangelo & Scudder, of Latrobe. They will be built at Frugality, in Cambria county.

Carnegie Coal Company—This company has bought a tract of 3000 acres of coal land in Washington township, Greene county, from J. V. Thompson and others. The land adjoins a tract recently bought by the Emerald Coke Company.

Emerald Coke Company—In addition to the lands recently noted as purchased, this company has bought 5000 acres in Washington, Morgan and Franklin townhsips in Greene county. The property acquired is in Buffs Creek valley, and adjoins the property of the Pittsburg-Buffalo company. It is considered an extension of the real Connellsville seam under the Monongahela river and into the southwestern counties of the State. Plans are being made for the development of the land. Julian Kennedy, of Pittsburg, is president of the company.

South Dakota

LAWRENCE COUNTY

Minnesota Mines Company—An addition to the treatment plant is to be made which will give a total capacity of nearly 150 tons daily. The present capacity is 80 tons.

Ohio Beaver Creek—G. W. Inglis has been appointed receiver to straighten out local tangles. It is expected that the company will not commence hydraulic work until spring.

Oro Hondo—J. W. Sparks, of Philadelphia has paid off the indebtedness in full and is about ready to resume work. Henry J. Mayham, of New York, originally promoted the company.

Lucky Strike—Work has been resumed on Elk creek. The 200-ft. shaft will be sunk another 100 ft. for the present and later to the 400-ft. level and 600 ft. of drift work will be prosecuted.

Tinton—Steady shipments are being made to London of tin concentrates and the company is planning the erection of a smelter to treat the concentrates on the ground.

PENNINGTON COUNTY

Truax Group—The ground has been purchased by the Wolftone company, of Leadville, and will be worked for its tungsten product. The Black Metal Company, of Boulder, Colo., was the seller.

Golden Summit—Men are at work preparing the shaft for widening and retimbering, after which it will be sunk deeper and the property operated jointly with the Gold Medal ground.

Forest City—The shaft is being unwatered and the Cleveland owners are going ahead with plans to work the ground at once, and mine the gold ore exposed.

Utah

BEAVER COUNTY

Horn Silver—This property is shipping to the Tintic smelter about 40 tons of lead ore per day.

King David—Next to the Newhouse Mines and Smelters Corporation, this company is conducting the most vigorous development campaign in Beaver county. A double compartment shaft is being sunk.

Utah-United Copper—This company was recently organized and absorbed the skylark Copper and Wasatch Mining and Milling companies. The management has outlined a vigorous development campaign and is installing steam hoisting equipment.

SALT LAKE COUNTY

Bingham Central Standard—An important body of lead ore has been opened in this property near the sidelines of the Bingham-New Haven mine. The ore carries lead, copper and some gold.

North Utah Mining—Negotiations have been practically concluded for the absorption of the New Red Wing, Vespasian-Hoogley and Butler-Liberal mines in Bingham.

Pittsburg Consolidated—Shareholders of this corporation have ratified a deal whereby the property of the Pioneer Consolidated Mining Company, in American Fork cañon has been absorbed. Development is being done through a tunnel. Considerable high-grade lead-silver ore has been shipped from these properties.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Sept. 12 were as follows: Cobalt Central, 49,290 lb.; City of Cobalt, 254,380; Drummond, 660,011; La Rose, 267,280; Nipissing, 304,100; Nova Scotia, 40,500; O'Brien, 257,680; Right of Way, 113,090; Temiskaming, 102,940. Total, 2,008,760 pounds.

Chambers-Ferland—Three shafts have been sunk and much surface work has been done. No. 1 shaft is down 100 ft., with drifts running north 65 ft. and south 53 ft. One stope has been carried 45 ft. in the north drift and another 25 ft. in the south drift. Seven tons of high-grade ore are sacked for shipment. Shaft No. 2 is down 100 ft. and a crosscut westward has been started at 80 ft. to tap a vein 40 ft. distant which is a continuation of a rich La Rose vein. Shaft No. 3 is down 22 ft. Veins 6 and 7, also La Rose veins, will be worked from this shaft.

Mexico

CHIHUAHUA

Carizo—It is reported at Chihuahua that M. G. Garner has recently made important gold discoveries near Carizo in the vicinity of the famous Lluvia de Oro mine. A number of denouncements have been recorded and development is under way.

Galena—This company is said to have closed a contract for the shipment of 6000 tons of zinc ore to the works of the United Zinc and Chemical Company, at Iola, Kan. The present output consists of about 4 cars of concentrates weekly.

Dolores—A recent bullion shipment marketed through the Banco Minero, Chihuahua, consisted of 84 bars, of a value of 146,000 pesos. The monthly bullion output of this company ranges from $70,000 to $90,000.

SONORA

Caracahui Mountain Copper Company—This company has installed a 40-h.p. hoisting plant and is enlarging its small prospect shaft to one of two compartments. The shaft will be continued to 500 ft. depth. The lode varies in width from 3 to 5 ft. and carries copper, gold and silver. Other properties in the district are showing increased activity.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—This company reports for the half-year ended May 31 a production of 2,529,779 oz. silver and 36,140 tons of lead. In all, 262,165 tons of ore were treated by the concentration plant. The zinc concentration plant is doing well, turning out concentrates running 45 per cent. zinc. The company has made contracts with other Barrier range companies to buy 2000 tons of ore and concentrates weekly. The directors have decided, in view of the success of the present zinc plant, to put up a plant costing about £100,000, and having a capacity of 8000 tons of spelter yearly. The net profit of operations for the half-year was £22,776. The expenditures for new construction were £30,462 in all.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept 23—The coal trade in the West continues slow, and no further improvement is manifest. Continued warm weather has held back domestic trade, and the demand for steam coal is no better. Lake trade shows no sign of the usual season-end rush, the upper Lake docks being apparently supplied with all they need, or very nearly so.

In the East the bituminous trade is quiet, as it has been for some time. Steam coal demand does not increase, and the Coastwise trade is dull for the season. Anthracite business is quiet, the warm weather having held back buyers of domestic supplies.

Throughout Pennsylvania, both in the anthracite and bituminous regions, the mines continue to be embarrassed by short water supplies resulting from the long drought.

The decision of the Court of Appeals in the car discrimination case, noted elsewhere, will be of importance to many coal companies.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Sept. 12, in short tons:

	1907.	1908.	Changes.
Anthracite.....	3,957,648	3,512,441	D. 445,207
Bituminous.....	27,155,938	22,657,420	D. 4,498,518
Coke............	9,868,460	4,752,098	D. 5,116,362
Total..........	40,982,046	30,921,959	D. 10,060,087

Total decrease this year to date was 24.5 per cent.

Coal shipments, Southwestern Interstate Coal Operators' Association, six months ended June 30, short tons:

	1907	1908	Changes
Missouri..	1,378,169	1,010,121	D. 368,048
Kansas...	3,104,682	2,156,708	D. 947,974
Arkansas.	1,121,552	783,381	D. 338,171
Oklahoma	1,372,248	1,006,034	D. 366,214
Total	6,976,651	4,956,244	D. 2,020,407

The mines were idle this year in April and May, while the wage question was unsettled.

Coal receipts at Boston, eight months ended Aug. 31, reported by Chamber of Commerce:

	1907	1908	Changes
Anthracite....	1,401,282	1,148,876	D. 252,406
Bituminous.....	2,188,064	2,122,917	D. 65,147
Total domestic....	3,589,346	3,271,793	D. 317,553
Foreign..........	357,705	268,300	D. 89,405
Total	3,947,051	3,540,093	D. 406,958

The foreign coal is nearly all from Nova Scotia.

Shipments of Monongahela River Consolidated mines, nine months from Nov. 1 [illegible] short tons:

	1907	1908	Changes
River coal	3,744,182	3,979,679	I. 235,497
Rail coal	1,442,478	1,018,450	D. 424,028
Total	5,186,660	4,998,129	D. 188,531

The total decrease, wholly in rail shipments, was 3.6 per cent.

Coal tonnage, Chesapeake & Ohio Railway, month of July, short tons:

	Coal.	Coke.	Total.
New River	536,240	14,912	551,152
Kanawha	405,095	1,472	406,567
Kentucky	19,210		19,210
Connecting lines	16,202	5,965	22,167
Total	976,747	22,349	999,096
Total, 1907...........	933,758	40,393	974,151

Deliveries this year, to points west of mines, 508,977 tons coal, 13,543 coke; points east, 125,117 tons coal and 8306 coke; tidewater, 341,990 tons coal; anthracite to line points, 663 tons.

New York

Anthracite

Sept. 23—In the hard-coal trade prepared sizes are quite active, but small steam sizes seem to be in sufficient supply to meet all demands. All-rail trade is taking considerable coal, but in New York harbor consumers are not taking as much as was expected.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Steam-size prices are unchanged: Pea, $3.25@3.50; buckwheat, $2.35@2.50; buckwheat No. 2, or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The situation has not improved and business is extremely dull. The demand is spasmodic and no steady change for the better is expected in the trade. Dealers [illegible] preference shown by consumers in the shoal-water ports who are usually calling vigorously for coal at this time.

New York harbor trade is practically at a standstill and ordinary grades of coal are selling at $2.40@2.45 with better grades offered at $2.50@2.60. Cars are in good supply, but transportation from mines to tide is slow.

In the Coastwise trade small vessels [illegible] number of large vessels have chartered for South American ports. Freight rates seem a little firmer, but no change of importance has taken place. Rates for large [illegible] Philadelphia [illegible] Salem and Portland [illegible] Portsmouth and Bath [illegible] Newburyport, Gardiner and Bangor, [illegible] New Bedford, Providence, [illegible] and the Sound ports [illegible]

Birmingham

[illegible] good improvement over the past week's output. Despite the fact that a number of coal miners are leaving the district, having fears that their applications for work might be turned down, a large number of men are going to work. Every ton of coal that is being mined in this State is being used as quickly as it can be loaded. So far the railroads have given prompt handling of the product. The Tennessee Coal, Iron and Railroad Company, the largest coal-producing concern in the district, has every one of its mines in operation again.

Commercial coal companies have succeeded in securing some large orders to be delivered during the fall. Inquiries are in hand. There will be some further development in the State this year and early in the coming spring. The Little Cahaba Coal Company has purchased adjoining properties, taking over the Coleanor company. The transaction involves a working mine and several hundred acres of good coal lands. The State of Alabama recently disposed of some of its coal-land acreage, the money realized going to the university fund.

Chicago

[illegible] oppress the coal market, which remains fairly firm but does not progress. Steam coals are quiet and domestic business depends on the weather. Anthracite is dull, the movement in country trade being very light.

Illinois and Indiana coals show a fairly even demand, all sizes, well distributed over Chicago territory. The steam trade runs a little more to fine coals than a week ago. Lump and egg bring $1.75@2.50; run-of-mine, $1.50@1.75; screenings $1.25@1.45, for car-lots. The supply is large and leads to some sacrifice sales to escape demurrage.

[illegible] which continues scarce, and $3.30@3.45 for run-of-mine, which is in large supply. [illegible] eny on contracts is steady at $2.00@[illegible] [illegible] siderable free anthracite in the market, at [illegible]

Indianapolis

Sept. 21—The last week has emphasized the slowness of recovery which has characterized the coal business during the past six months. Operators say it is not safe to judge the immediate future by the dullness of the past week. The present conditions have been helped by unprecedented warm weather and the continued drought throughout the country. Several mines have been closed down for lack of water to run the machinery. The railroads and lake vessels are experiencing some trouble—the first on account of scarcity of water for their engines and the latter on account of smoke and fog on the lakes occasioned by forest fires. It is expected that the demand from the Northwest will be brisk the last week of September since it is customary on Oct. 1 to advance prices at the mines.

Pittsburg

Sept. 22—The drought has completely tied up the river coal mines and the railroad mines are handicapped to a certain extent. Fully 85 per cent. of the railroad mines in the Pittsburg district are running, but the bulk of the product is going to Lake ports for northwestern shipment. Prices remain on the basis of $1.15 per ton for mine-run coal at the mine. Slack has improved owing to the increased demand from the mills and quotations are from 60@70c. per ton. The Pickands-Magee Coal and Coke Company announced this week the absorption of the Crown Coal Company, of Toronto, Ontario. The company will use the yards of this concern as a distributing point for coal and coke. William McComb, of Pittsburg, is in charge of the new interest. A Canadian charter has been applied for and when it is received officers will be elected.

Connellsville Coke—There is no change in prices. Foundry coke on contract is $1.65@1.85, but these prices can be shaded for prompt shipment. Foundry coke is firm at $2.10@2.25 at oven. Some fair contracts were received this week. The *Courier* gives production for the week in both fields at 105,074 tons. The shipments were 7817 cars, as follows: To Pittsburg, 3091; to points west of Pittsburg, 4343; to points east of Connellsville, 383 cars.

Foreign Coal Trade

German Coal Production—Coal production in Germany, seven months ended July 31, metric tons:

	1907.	1908.	Changes.
Coal	82,358,080	85,906,847	I. 3,548,767
Brown coal	34,967,329	37,649,385	I. 2,682,056
Total mined	117,325,409	123,556,232	I. 6,230,823
Coke made	12,519,546	12,338,053	D. 181,493
Briquets made	9,206,438	10,388,395	I. 1,181,957

Of the briquets reported this year 8,074,922 tons were made of brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, seven months ended July 31, metric tons:

Imports	1907	1908.	Changes
Coal	7,213,152	6,552,707	D. 660,445
Brown coal	5,178,135	5,078,517	D. 99,618
Total coal	12,391,287	11,631,224	D. 760,063
Coke	304,890	314,525	I. 9,635
Briquets	101,191	107,359	I 6,168
Exports:			
Coal	11,253,163	11,463,981	I. 210,818
Brown coal	11,468	15,578	I. 4,110
Total coal	11,264,631	11,479,559	I. 214,928
Coke	2,145,484	2,113,090	D. 32,394
Briquets	670,474	924,459	I. 253,985

Coke exports this year included 11,352 tons to the United States.

Austrian Coal Production—Coal production in Austria, half-year ended June 30, metric tons:

	Coal.	Brown Coal.	Total.
Coal mined	6,990,299	13,478,409	20,468,708
Coke made	946,154	18,079	964,233
Briquets made	72,416	95,305	167,721

Production in the second quarter of the year was considerably less than in the first quarter.

Spanish Coal Imports—Imports of coal into Spain, seven months ended July 31, were 1,120,655 metric tons, a decrease of 16,453 tons from last year. Imports of coke, 171,658 tons, an increase of 28,767 tons.

Coal in Chile—The Sociedad Nacional de Minera reports the consumption of coal in Chile, during the last five years, as follows, in metric tons:

Year.	Foreign.	Domestic.
1903	797,634	51,000
1904	822,471	61,624
1905	1,179,058	673,927
1906	1,019,834	932,488
1907	1,489,154	832,612

The State railways of Chile consume annually from 350,000 to 400,000 metric tons of coal of which about one-half is imported.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Sept. 12: Best Welsh steam, $3.84; seconds, $3.60; thirds, $3.36; dry coals, $3.66; best Monmouthshire, $3.36; seconds, $3.18; best small steam, $1.98; seconds, $1.74. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 23—The iron and steel markets have been somewhat irregular. In some quarters there is evident a disposition to hold back both new orders and specifications on contracts; on the other hand more business is reported in the West, and jobbers have shown more disposition to fill up their stocks, which have been low for some time. Railroad orders are still held back, but there is more inclination to contract for structural steel. In this line there are current reports of shading on prices, which it is impossible to verify. Fabricating companies, however, have taken orders at a price which seems to imply material at a cost less than present nominal prices.

Pig iron selling has been slow, and most of it in small quantities for this year's delivery. There are inquiries for 1909 delivery, but sellers are not disposed to take present prices, and very few orders have been placed. The Southern furnaces are the best sold up, and therefore are the firmest on prices.

Birmingham

Sept. 21—There is a fairly good demand for iron. One of the larger companies in the district reports being out of the market entirely as far as deliveries are concerned for this year, except to protect some regular customers. Quotations are firm, the average price being around $13 per ton, No. 2 foundry. Some sales, small lots immediate delivery, have been made at a better price, while some larger orders with plenty of time for delivery have been accepted under the $13 rate.

The Woodstock Iron Company has blown in its large furnace at Anniston. The Sloss-Sheffield company will have its Philadelphia furnace at Florence ready by the end of this week, it is expected, and a week or two later may be ready with the Lady Ensley furnace at Sheffield. The Tennessee company will have a couple of iron-makers ready for operation by October.

All contracts for iron are being filled just as quickly as possible. The railroads are adding to their forces in order to handle the improving traffic in both iron and raw material.

Baltimore

Sept. 21—Exports for the past week included 1259 tons tinplate bars to Liverpool, and 601,027 lb. tin scrap to Rotterdam.

Chicago

Sept. 22—Sales of pig iron are mainly for small amounts but the flow of orders is steady. The open quotations of $16.50 for Northern and $12.50 for Southern No. 2 iron do not stimulate the average buyer to further contracts than his needs for the rest of the year will warrant, except in a few cases. Nor are sellers anxious to go into 1909 business to any extent, both sides appearing to be willing to wait for political developments in November. Northern sells for $16.50@17 and Southern for $12.50@13 Birmingham ($16.85@17.35 Chicago), bringing the two practically on a parity, the lower prices obtaining on this year's business and the higher on 1909 contracts.

In iron and steel products the tone of the market is stronger, the demand for railroad supplies and structural materials being moderately good and other lines showing a beginning of recovery from summer dullness. Coke remains quiet at $4.90 for first-class Connellsville.

Cleveland

Sept. 21—The Lake trade [illegible] improve as the season draws toward its close. The coal trade is quiet, and there are no indications of the rush which usually comes at the end of the season. Ore trade is still limited, and unless there is more call for shipments to furnaces, the docks will be unable to store more ore. Contract tonnage is more than sufficient to take care of the shipments, and there is no call for wild boats.

Philadelphia

Sept. 23—The pig iron market [illegible] to have lapsed into dullness again. Small orders come in, but the large buyers have evidently made up their minds to wait until after election before placing contracts for next year. Makers are not chasing up 1909 orders at present quotations, and buyers are not disposed to go higher as yet. The only people who want much iron just now are the cast-pipe makers, and they want low priced irons for the most part. The effort to stop shaded prices is not altogether successful. Two furnaces in this territory are arranging to go into blast soon, and others would like to, but are not clear as to prospects. No. 2X foundry may be quoted around $16.50@16.75; No. 2 plain, 25c. lower. Basic, for which there is some inquiry, can be had at about $15.50, with forge about the same.

Steel Billets—Orders, which showed a little better last week, have dropped off again. Quotations are unchanged, and rumors of concessions are not heard.

Bars—Store trade is fair, and there are small orders. The mills would like to see some large ones, but do not get them.

Sheets—Demand is better in a small way, but no large requirements are coming forward.

Plates—There is less call for plates and the market is not so good. Small tonnages for early delivery are the rule everywhere. There is a lot of talk about cutting prices, and some of it is probably true.

Structural Material—Some [illegible] orders in this territory have come in. The local building requirements are small as yet. There is talk of some large orders, but they are held back till the future is clearer, apparently. Everybody seems to have the Wall Street scare and to be waiting.

Scrap—Heavy melting steel [illegible] but dealers and buyers are at odds about prices. Other kinds are quiet.

Pittsburg

Sept. 22—There has been but little change in the situation. Some new business has been placed and there are indications of large transactions before the end of the month. The National Tube [illegible] capacity. In nearly all lines of finished products there has been an increase and there are no indications of a decline, although some consumers have shown a disposition to hold off a little longer. The Republic Iron and Steel Company started its Bessemer steel plant on Sunday night and this week is operating about 65 per cent. of its capacity. The Carnegie Steel Company has put on some additional mills at its Homestead works and is operating a larger percentage of its capacity than at any time this year. All the plants of the Steel Corporation in the Pittsburg district, including the American Steel and Wire Company, the American Sheet and Tin Plate Company and the American Bridge Company are running on about the same basis as last week, a trifle over 50 per cent.

Pig Iron—The market continues dull, with no buying of large tonnages. The Massillon Iron and Steel Company, which was in the market last week for 4500 tons of Nos. 2, 3 and 4 foundry iron, has closed for the entire tonnage for October delivery at a price based on $14.50, Valley furnace, for No. 2. The Marion Steam Shovel Company closed for 4000 tons of basic iron for delivery next month. Other sales have been for small lots and there were few of them. Prices today for early delivery are as follows: Standard bessemer, $15; malleable bessemer, $14.75; basic, $14.50; No. 2 foundry, $14.50; gray forge, $13.50, all at Valley furnace, with 90c. added for Pittsburg delivery. Of the 19 merchant blast furnaces in the valleys, 10 are in operation this week. The stocks of bessemer and basic reported a week ago at 60,000 tons have increased to [illegible]

Steel—A few odd lots of billets were sold within the past few days at the regular price of $25, Pittsburg. Merchant-steel bars remain at 1.40c. and iron bars the same. At the bi-monthly examination of the sales sheets under the Amalgamated Association scale the average price of iron bars for the past two months was 1.30c. and as a result the pay of the puddlers was cut 12½c. to $5.25 per ton. Plates remain firm at 1.60c.

[illegible] improve and more mills are in operation. Prices unchanged, black sheets 2.50c. and [illegible]

[illegible] changed; 80 per cent. ferro for prompt [illegible]

Foreign Trade in Iron and Steel

[illegible] iron and steel, including machinery, from the United States for the seven months ended July 31, are valued by the Bureau of Statistics of the Department of Com-[illegible]

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Decreases are shown in all items ex-[illegible]

[illegible] iron and steel, including machinery, from the United States for the seven months ended July 31 are valued at $25,402,464 in 1907, and $11,993,105 in 1908; a decrease of $13,409,359. Leading items of import for the seven months, long tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The only increase shown here was that in tinplates. The largest decrease was in pig iron.

[illegible] ports of iron ore in the United States for the seven months ended July 31 are reported as follows, in long tons:

	1907	1908	Changes
Exports	[illegible]	[illegible]	[illegible]
Imports	[illegible]	[illegible]	[illegible]

Imports of manganese ore for the [illegible] 118,632 tons in 1908; increase, 5813 tons.

Foreign Iron Trade

[illegible] exports of iron ore in Germany, six months ended June 30, metric tons:

	[illegible]	[illegible]	[illegible]
Imports	[illegible]	[illegible]	[illegible]
Exports	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Imports of manganese ore, 174,547 tons in 1907, and 180,092 in 1908; exports, 1862 tons in 1907, and 1000 in 1908. Net imports this year, 178,230 tons.

[illegible] iron ore into Great Britain for the eight [illegible] tons in 1907, and 3,014,400 tons in 1908, a decrease of 1,501,841 tons, or 27.7 per cent. Of the imports this year 2,002,011 tons, or 74.1 per cent. of the whole, were from Spain.

[illegible] and steel and their products from Great Britain for the seven months ended July 31 valued by Board of Trade returns as [illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Total quantities of iron and steel, 3,167,204 tons in 1907, and 2,437,952 in 1908; decrease, 729,252 tons. Exports of pig iron to the United States this year

The quantity of Banka tin to be offered by auction in Holland in 1909 has been fixed at 180,000 pikuls.

Lead—There has been little demand during this week and some lots in second hands have been pressed for sale, and in consequence prices have declined somewhat. The close is 4.47½@4.50 New York. Missouri brands at St. Louis are quoted at 4.32½@4.35c.

The London market is a trifle lower and closes with Spanish lead at £13 1s. 3d. and English lead at £13 3s. 9d.

Spelter—A fair business has been done in this metal at slightly lower prices. At the close we quote 4.60@4.62½c. St. Louis, and 4.75@4.77½c. New York.

Abroad, the market continues strong, and at the close good ordinaries are quoted at £19 12s. 6d. and specials at £19 17s. 6d. per ton.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

German Zinc Trade—Paul Speier, Breslau, reports imports and exports of spelter and zinc products in Germany for the seven months ended July 31, in metric tons:

	Imports.		Exports.	
	1907.	1908.	1907.	1908.
Spelter	18,210	15,702	36,472	37,072
Zinc sheets	74	224	10,825	9,447
Zinc scrap	656	904	4,017	.3,188
Zinc dust	530	672	1,313	1,435
Zinc pigments	4,745	4,388	15,959	14,928
Zinc ore	101,312	106,874	18,880	17,920

Zinc pigments include zinc-white and zinc sulphide.

Other Metals

Antimony—The market, both in New York and abroad is weak, and there is considerable pressure to sell. Quotations are 8@8¼c. for Cookson's, 7¾@8c. for Hallett's, and 7⅜@7½c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is $43 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $42 for domestic orders, and $40 for export. London price is £8 2s. 6d. per flask, with £8 quoted from second hands.

Platinum—Offers of metal continue to be made at $17.50@19. The principal dealers, however, continue to quote $22.50 for hard platnium, $20 for ordinary, $16 for scrap. It is understood that only limited quantities are to be had at the lower prices.

Missouri Ore Market

Joplin, Mo., Sept. 19—The highest price paid for ore was $40, on a base price of $38 per ton of 60 per cent. zinc, medium and lower grades grading down to a $37 base price. The demand has been apparently strong, yet the shipment is decreased, a result of the withdrawal from the market of several thousand tons, which is being held for a further advance in price. The average price, all grades, is $34.78. The highest price paid for lead ore was for mineral loaded from last week's purchase, which sold at $58, while the highest offering of this week was $57, and the week-end market was without strength at $56. The average price, all grades, was $55.92 per ton. Zinc silicates dropped to a base price of $19 per ton of 40 per cent. zinc, but one bin registered 49 per cent. and brought $28 per ton.

Shipments of zinc and lead ore from the district for week ended Sept. 19:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,922,210	239,670	$59,429
Joplin	2,350,540	397,090	54,802
Galena	773,270	172,710	18,841
Alba-Neck	615,070	6,900	11,263
Spurgeon	495,370	58,240	9,301
Aurora	486,850	9,000	8,161
Miami	410,760	124,510	8,951
Prosperity	189,330	114,640	6,668
Badger	313,280	22,140	6,593
Granby	430,000	16,000	5,460
Duenweg	171,520	94,340	5,064
Carthage	153,320	......	2,813
Quapaw	184,760	.....	2,771
Zincite	85,700	......	1,585
Cave Springs	63,540	.....	1,144
Sarcoxie	59,390	......	1,068
Playter	58,760	......	999
Carl Junction	39,600	3,830	859
Totals	9,803,220	1,259,070	$205,772
38 weeks	360,961,120	55,370,990	$7,616,64

Zinc value, the week, $170,571; 38 weeks, $6,082,496
Lead value, the week, 35,201; 38 weeks, 1,534,149

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

	ZINC ORE.				LEAD ORE.	
Month.	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	.	40.11	.....	53.52	. .
October	41.75	......	39.83	......	51.40	.
November	38.60	....	35.19	......	43.40	
December	31.50	.....	30.87	......	37.71	. .
Year	$44.36	...	$43.68	......	$68.90	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Wisconsin Ore Market

Platteville, Wis., Sept. 19—The highest price paid this week for zinc ore was $38, on a basis of $37.50 per ton of 60 per cent. zinc. The highest price paid for lead ore was $58 per ton. Shipments for week ended Sept. 19 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Cuba City	1,483,940	....	....
Hazel Green	424,390	....	....
Benton	301,310	63,390	....
Platteville	284,000	45,200	334,000
Galena	176,000	....	....
Days Siding	151,800	....	....
Livingston	80,000	..... .	....
Strawbridge	70,000	24,000	....
Highland	443,600	....	....
Linden	119,600	.....	. .....
Total	3,534,640	132,590	334,000
Year to Sept. 19	70,926,501	7,943,935	1,652,204

In addition to the above there was shipped to the Joplin Separator Works, at Galena, 163,950 lb. zinc concentrates.

Chemicals

New York, Sept. 23—The market, as a whole, is steady and prices are firm. The volume of business has not increased except in spots. The feature of the week was an advance in the price of bleaching powder. Other heavy chemicals show no change.

Copper Sulphate—Demand steady and prices unchanged at $4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate of Soda—The market is easy and consumers are inclined to hold off. Quotations are 2.25c. for spot and delivery in 1908 and 1909. It is reported that offerings have been made at lower prices for prompt delivery.

Mining Stocks

New York, Sept. 23—The week on the Stock Exchange began badly with a general break in prices, nominally because of an unfavorable political outlook, involving possible further anti-corporation legislation. With one or two slight reactions the downward movement continued, culminating on Sept. 22 with a wild market and very heavy sales at still declining prices. The close of the day, however, was marked by an upward reaction, amounting to several points for the more active stocks.

The market has had all the marks of a movement chiefly professional, and the public has not been concerned to any great extent. The object of the movement is not altogether clear, but it looks as if large operators had concluded that quotations were too high, and had decided on a break, hoping to bring in outside buyers at lower prices. Political effect, also, may have been considered.

The Curb was also excited and irregular, following the lead of the Exchange. Prices are generally lower, the copper shares leading in the movement.

Talk of possible gold exports to Europe—which did not materialize—had little effect. There was $500,000 gold sent to Argentina on London orders, and $1,000,000 to Canada.

27,212 tons, a decrease of [illegible]

Imports of iron and steel, and of machinery into Great Britain for the seven months were:

	1907	1908	Changes
Iron and steel.	£ 3,915,314	£ 4,336,487	I. £ 421,173
Machinery ...	3,249,747	3,080,301	D. 169,446
Total.... ,...	£ 7,165,061	£ 7,416,788	I. £ 251,727

The total quantities of iron and steel were 501,868 tons in 1907, and 608,347 in 1908, an increase of 106,479 tons.

Imports of iron ores into Great Britain, seven months ended July 31, were 4,722,503 long tons in 1907, and 3,467,235 in 1908; decrease, 1,255,268 tons. Of the imports this year 2,055,071 tons were from Spain.

Petroleum Exports

Exports of mineral oils from the United States, eight months ended Aug. 31, in gallons:

	1907	1908
Crude.	56,595,682	56,783,722
Naphtha..........	18,080,614	22,021,855
Illuminating .	550,752,903	711,083,831
Lubricating. .	97,652,288	91,484,175
Residuum	47,449,039	45,708,728
Total	770,530,526	926,082,311

Paraffin is included in lubricating oils. The total exports this year show an increase of 155,531,785 gal., or 20.2 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 23

At all U. S. Ports in August and year

Metal.	Exports.	Imports.		Excess
Gold				
Aug. 1908..	$ 6,597,101	$ 4,257,255	Exp	$ 2,339,846
" 1907..	4,596,879	3,223,772	"	1,373,107
Year 1908..	64,960,348	33,614,330	"	31,346,018
" 1907..	48,375,977	28,103,201	"	20,272,776
Silver				
Aug. 1908..	4,130,853	3,194,426	Exp	936,427
" 1907..	6,748,085	4,882,622	"	1,865,463
Year 1908..	34,576,144	27,375,355	"	7,200,789
" 1907..	41,922,336	30,665,458	"	11,256,878

Exports of specie from New York week ended Sept. 19: Gold, none; silver, $507,682, nearly all to London. Imports: Gold $105,944, from Japan and the West Indies; silver, $90,586, from Australia, Mexico and Central America.

Foreign trade of the United States, eight months ended Aug. 31, valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1907	1908
Exports	$1,196,270,374	$1,091,408,803
Imports...... ..	1,001,707,119	700,138,794
Excess, exports.....	$ 194,563,255	$ 391,270,009
Add excess of exports, silver		7,200,789
Add excess of exports, gold.		31,346,018
Total export balance		$ 429,816,816

Gold and silver movement in detail is given in the table at the head of this column.

Specie holdings of the leading banks of the world, Sept. 19, are reported as below, in dollars:

	Gold	Silver	Total.
Ass'd New York			$32[illegible]
England	$191,920,460		191,920,460
France	64[illegible]	$180,052,045	[illegible]
Germany	2[illegible]1,940,000	[illegible]3,[illegible]45,000	2[illegible]
Spain	78,500,000	170,110,000	24[illegible]
Netherlands....	38,842,500	19,[illegible]67,500	[illegible]
Belgium	20,100,000	10,050,000	[illegible]
Italy	185,590,000	22,300,000	20[illegible]
Russia	[illegible]	39,535,000	[illegible]
Aust.-Hungary	239,205,000	65,745,000	304[illegible]
Sweden	20,405,000		20,405,000
Norway	8,655,000		8,655,000
Switzerland.	22,780,000	.	22,780,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.	Sept.	Sterling Exchange.	Silver: New York, Cents.	Silver: London, Pence.
17	4.8675	52	24[illegible]	21	4.8640	52	24[illegible]
18	4.8675	52	24	22	4.8670	52	24
19	4.8635	52	24	23	4.8670	52	24

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver closes at 24d. in London. No substantial improvement in silver can be accomplished until the stocks in London and the East are absorbed. These stocks are considered rather large at the present time.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Sept. 10:

	1907.	1908.	Changes.
India.......	£8,710,764	£6,458,533	D. £2,252,231
China	......	516,400	I. 516,400
Straits	598,700	90,510	D. 508,190
Total. . .	£9,309,464	£7,065,443	D. £2,244,021

Receipts for the week, £6000 from Chile, £7000 from the West Indies, £115,500 from New York; £128,500 in all. Exports, £10,100 to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS

Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Copper: London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter: New York, Cts. per lb.	Spelter: St. Louis, Cts. per lb.
17	13[illegible] @13[illegible]	13[illegible] @13[illegible]	60[illegible]	28[illegible]	4.47½ @4.50	4.77½ @4.80	4.62[illegible] @4.6[illegible]
18	13[illegible] @13[illegible]	13[illegible] @13[illegible]	59[illegible]	28[illegible]	4.47½ @4.50	4.77[illegible] @4.80	4.62[illegible] @4.6[illegible]
19	13 @13[illegible]	13[illegible] @13[illegible]		28[illegible]	4.47½ @4.50	4.77½ @4.80	4.62[illegible] @4.65
21	13[illegible] @13[illegible]	13[illegible] @13[illegible]	59[illegible]	28[illegible]	4.47 @4.50	4.7[illegible] @4.77½	4.60 @4.62
22	13[illegible] @13[illegible]	13 @13[illegible]	59	28[illegible]	4.47½ @4.50	4.75 @4.77½	4.60 @4.6[illegible]
23	13[illegible] @13[illegible]	13 @13[illegible]	59	28[illegible]	4.47½ @4.50	4.75 @4.7[illegible]	4.60 @4.62

[illegible] sumers, basis, New York, cash. The price of [illegible] The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western [illegible]

Copper—The dullness which was so strongly manifested during the week ending with Sept. 16 has been even more pronounced since then. Transactions, both for domestic and for foreign accounts, have been confined to small lots, ordinarily considered retail business, and resales by second hands. The big selling agencies have been generally holding aloof, not merely waiting for consumers to meet their views, but rather waiting for them to come forward with the intention of buying at any price. In spite of all allurements, however, they have continued to be conspicuous by their absence. The demand being so insignificant, the offering of very small lots has made an impression, under which the market has sagged. The close is easy at 13¼@13½c. for Lake, and 13⅛@13¼c. for electrolytic in ingots, cakes and wirebars. The average for casting during the week has been about 13c., the market being 12⅞@13c. at the close, which was easy.

The market for standard copper in London has been weak, in sympathy with the decline in our stock market here, and closes at £1 lower than last week, with £[illegible] three months.

Refined and manufactured [illegible] quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s. @£75 10s.

Exports of copper from New York and Philadelphia for the week were 5721 long tons. Exports from Baltimore, as reported by our special correspondent, were 1846 tons.

Manufactured Copper—[illegible] rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 15¼c. base, carload lots at mill.

[illegible] very steady throughout the week, the var[illegible]

In the domestic market a little more interest was shown on the part of buyers, but actual business has been of small pro[illegible]

[illegible] metal equivalent, for the eight months [illegible] tons.

Boston

Sept. 22—Copper shares have suffered in common with other shares. Prices are off from $2 to over $7 for the week, not including Calumet & Hecla, which is off $20. There is no particular reason for this, except that the trend of the market is downward. There has been more or less forced selling, but no prolonged liquidation. Recoveries, when they come, are short. There have been no important happenings, prices seeking a lower level each day with increased activity the lower prices go.

Amalgamated has suffered a $7.50 decline, touching $69, from which it rebounded to above $71 in quick order. North Butte went off $6.25 to $75.75, recovering to $78. Outside of Amalgamated this has been the most active stock on the list. Copper Range is off $6.25 to $70.25.

There is talk of a possible acquisition of the Rhode Island by Franklin, with additional territory from the St. Mary's Mineral Land Company. This will mean an additional capital issue by the Franklin.

Underwriters of the Miami 100,000 shares of stock had to take only 17,000 shares. Boston interests in this company have a director in the person of F. W. Estabrook. Application has been made to list the new North Lake Mining Company's shares on the Stock Exchange.

The Curb shares also show general declines for the week, with no special feature. The Keweenaw Copper Company may bond its railroad to raise money for development purposes.

STOCK QUOTATIONS

NEW YORK Sept. 22

Name of Comp.	Clg.
Alaska Mine	½
Amalgamated	71¼
Anaconda	40¾
Balaklala	‡2 1/16
British Col. Cop.	6
Butte & London	....
Butte Coalition	22¼
Colonial Silver	
Cum. Ely Mining	7⅜
Davis Daly	1⅞
Dominion Cop	11/16
Douglas Copper	3½
El Rayo	3¼
Florence	3½
Foster Cobalt	.60
Furnace Creek	.15
Giroux	3¼
Gold Hill	⅜
Goldfield Con	5 1/16
Granby	99
Greene Gold	¾
Greene G. & S	½
Greenw'r & D.Val.	‡75
Guanajuato	2⅛
Guggen. Exp.	‡165
Hanapah	‡20
McKinley Dar.	.96
Micmac	2
Mines Co. of Am.	1¼
Mitchell Mining	½
Mont. Sho C.	1
Nev. Utah M. & S	2 1/16
Newhouse M. & S	5⅛
Nipissing Mines	8¼
Old Hundred	½
Silver Queen	1 08
Stewart	11/16
Tennessee Cop'r.	38
Tri-Bullion	1/16
Union Copper	[illegible]
Utah Apex	4½
Utah Copper	39
Yukon Gold	4 1/16

BOSTON Sept. 22

Name of Comp.	Clg.
Adventure	7
Allouez	33½
Am. Zinc	22¾
Arcadian	3½
Arizona Com.	26¾
Atlantic	16
Bingham	‡50
Boston Con.	12
Calumet & Ariz.	113¾
Calumet & Hecla	630
Centennial	28½
Con. Mercur	.40
Copper Range	70¼
Daly-West	9
Franklin	11½
Greene—Can	9¾
Isle Royal	20
La Salle	13
Mass	5¾
Michigan	13
Mohawk	58½
Nevada	14¼
North Butte	78
Old Colony	‡60
Old Dominion	38½
Osceola	105
Parrot	25½
Quincy	89
Rhode Island	4½
Santa Fe	1¼
Shannon	14
Superior	21¾
Tamarack	70
Trinity	15½
United Cop., com.	10¼
U. S. Oil	23
U. S. Smg. & Ref.	38¼
U S.Sm. & Re. pd	44
Utah Con	41¼
Victoria	4
Winona	5½
Wolverine*	137
Wyandotte	2⅛

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	26
Am. Smelt. & Ref.	81½
Am. Sm. & Ref., pf.	100
Bethlehem Steel	19
Colo. Fuel & Iron	31⅞
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	77
National Lead, pf.	102
Pittsburg Coal	10⅛
Republic I. & S.	20½
Republic I. & S., pf.	75⅞
Sloss Sheffield	59
Standard Oil	620
U. S. Red. & Ref.	‡9
U. S. Steel	42⅛
U. S. Steel, pf	107¼
Va. Car. Chem	28

BOSTON CURB

Ahmeek	100
Black Mt	‡2¾
East Butte	7⅛
Hancock Con.	6½
Keweenaw	4¼
Majestic	.67
Raven	.84
Shawmut	.19
Superior & Pitts.	13⅛
Troy Man	‡.35

ST. LOUIS Sept. 19

N. of Com.	High.	Low.
Adams	.40	30
Am. Nettie	.05	.03
Center Cr'k	2.25	1.75
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	76.00	74.00
Cent. Oil	110.00	100.00
Columbia	5.00	4.00
Con. Coal	20.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	13.00

LONDON Sept. 23

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 0
Esperanza	3 2 6
Tomboy	1 2 6
El Oro	1 7 0
Oroville	0 12 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 23.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.26
Best & Belcher	.44
Caledonia	.12
Chollar	18
Comstock	‡24
Con. Cal. & Va.	84
Crown Point	.27
Exchequer	.25
Gould & Curry	.10
Hale & Norcross	.28
Mexican	.74
Ophir	1.92
Overman	.14
Potosi	.21
Savage	.30
Sierra Nevada	.22
Union	.33
Utah	.05
Yellow Jacket	.50
TONOPAH STOCKS	
Belmont	1.02
Extension	.62
Golden Anchor	02
Jim Butler	.23
MacNamara	.47
Midway	29
Montana	1.00
North Star	.07
Tono'h Mine of N.	7.00
West End Con.	49
GOLDFI'D STOCKS	
Adams	04
Atlanta	21
Booth	.35
Columbia Mt.	.22
Comb. Frac	1 24
Cracker Jack	.07
Dia'dfield B. B. C.	.14
Goldfield Belmont	.15
Goldfield Daisy	.63
Great Bend	.27
Jumbo Extension	.32
Katherine	...
Kendall	.14
Lone Star	.09
May Queen	06
Ore	.11
Red Hill	21
Roanoke	...
Sandstorm	.23

Name of Comp.	Clg.
Silver Pick	.16
St. Ives	25
Triangle	05
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B.	.04
Gibraltar	.04
Gold Bar	.03
Homestake King	.25
Montgomery Mt.	.09
Mont. Shoshone C.	.81½
Original Bullfrog	.01
Tramp Cons.	.15
MANHAT'N STOCKS	
Manhattan Cons.	.06
Manhat'n Dexter	.05
Jumping Jack	.03
Stray Dog	.03
MISCELLANEOUS	
Golden Boulder	06
Bonnie Clare	06
Lee Gold Grotto	...
Nevada Hills	1.12½
Nevada Smelting	1.00
Pittsburgh S. Pk.	96
Round Mt. Sphinx	.18

COLO. SPRINGS Sept. 19

Name of Comp.	Clg.
Acacia	6⅛
Black Bell	....
C. C. Con.	3¾
Dante	....
Doctor Jack Pot	6¼
Elkton	63½
El Paso	38
Findlay	‡22
Gold Dollar	7
Gold Sovereign	‡3
Isabella	28
Index	....
Jennie Sample	‡2½
Jerry Johnson	‡4
Mary McKinney	31
Pharmacist	‡3⅛
Portland	1.04
Un. Gold Mines	‡4⅛
Vindicator	83⅞
Work	7¾

Assessments

Company.	Delinq.	Sale.	Amt.
Belcher, Nev.	Sept. 15	Oct. 6	$0.10
Challenge Con., Nev.	Aug. 31	Sept. 22	0.05
Con. Imperial, Nev.	Sept. 29	Oct. 22	0.01
Gould & Curry, Nev.	Oct. 7	Oct. 19	0.10
Nevada Fairview	Sept. 14	Oct. 26	0.005
Nonpareil, Utah	Sept. 15	Oct. 15	0.01
Overman, Nev.	Sept. 23	Oct. 14	0.05
Potosi, Nev.	Sept. 4	Sept. 29	0.10
Savage, Nev.	Aug. 27	Sept. 18	0.10
Scorpion, Nev.	Aug. 11	Sept. 3	0.02
Sierra Nevada, Nev.	Oct. 14	Nov. 4	0.10
Signet	Aug. 8	Oct. 6	0 01
Union Con., Nev	Sept. 15	Oct. 7	0.10
Utah, Nev.	Aug. 12	Sept. 2	0.03
Wabash, Utah	Sept. 15	Oct. 8	0.07
West Quincy, Utah	Sept. 12	Oct. 1	0.03
Wheeler, Utah	Oct. 5	Oct. 23	0.01
Yellow Jacket, Nev.	Aug. 10	Sept. 15	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13.726	24.825	13 901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12 704	25.560	12 875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24 048	12 598	25.072	12.788	102.375	57.387
June	21.665	12 675	24.140	12.877	97.272	57.842
July	22 130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	......	16.047	......	68.375	......
October	13.169	......	13.551	......	60.717	......
November	13.391	......	13.870	......	61.226	......
December	13 163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87.007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	......
April	40.938	31.702	October	32.620	......
May	43.149	30 015	November	30.833	......
June	42.120	28 024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	......	19.775	......
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	......	5.086	......	21.050	....
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4 104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, OCTOBER 3, 1908. NO. 14.

Cyanidation of Silver Ores, Pachuca, Mexico

The Ore Is Completely Slimed, and at the Mills Now Building Air Agitation Is to Be Used and the Ore Only Roughly Concentrated

BY CLAUDE T. RICE

At Pachuca the first cyanide mills began to treat ore early in 1907. They were the Loreto mill, belonging to the Compañia Minera de Real del Monte y Pachuca, and the San Francisco No. 1 mill, belonging to the Compañia Beneficiadora de Metales. Since then the Guerrero mill, belonging to the Real del Monte y Pachuca company, and the Blaisdell Coscotitlan plant for cyaniding the old tailings have been built. The cyanide mill at the San Rafael is almost completed, and the cyanide addition to the La Union Hacienda is almost finished. So the period of cyanidation has reached Pachuca in earnest.

Pachuca has had the benefit of the earlier experience in the cyanidation of Mexican silver ores so that the cyanide plant exemplify the latest practice in the cyanidation of silver ores. What experience indicated at El Oro and Guanajuato has been taken as a starting point; consequently the mills have all been designed for complete sliming of the ores and for filtering of the pulp. At the cyanide mills of the Real del Monte y Pachuca company where the slime is treated by mechanical agitation ample provision is made for concentrating the sulphide in the ore, but at the San Francisco mill where air agitation is used little trouble has been experienced from foul solution, although the ore is only roughly concentrated. Therefore at the latest cyanide mills which are going to use the Pachuca tank for agitation provision is made for only a rough concentration of the sulphide.

[illegible]

The Pachuca tank is the contribution of Pachuca to Western cyanidation. It was invented by F. C. Brown when manager of the Komata Reefs Gold mines, Ltd., in New Zealand, and first used in that country. A. Grothe introduced it at Pachuca, and has modified it somewhat; to him great credit is due for his boldness since it was the success attending its use at Pachuca which has brought the tank into prominence in America. At present the Brown or Pachuca tank is being installed at El Oro, Mexico, Goldfield, Nevada, and other places.

The ore at Pachuca carries only 5 grams of gold per kilogram of silver so that Pachuca [illegible] approach to a purely silver ore that is being cyanided. The ore milled in the district averages about 700 grams silver and 3.5 grams gold per metric ton. The gangue is silicious. The silver occurs as chloride or bromide in the oxidized ore and mainly as argentite in the unoxidized ore; few other sulphides of silver are found at Pachuca. Some of the ore carries a considerable amount of manganese and a little copper. The fact that much new construction is being done at the mills, even when silver is only 52c. per oz. speaks well not only for the Pachuca [illegible]

The Compañia Minera de Real del Monte y Pachuca has two mills, the Loreto [illegible] Pachuca and the Guerrero [illegible] [illegible] have given so much trouble that the new management has had to re-erect the stamps; at the same time the crushing [illegible] lines of treatment used at the Guerrero mill. At the Guerrero mill the ore is crushed in stages until all the ore is reduced to a slime but before each recrushing the ore is concentrated so as to remove the sulphides as coarse as possible. The concentration is modeled after that at the Utah Copper Company's mill at Garfield, Utah. The intermediate grinding is done with Chilean mills crushing through a 40-mesh screen; the final sliming is done in tube mills.

On account of the unsettled condition at the Loreto mill where, during the remodeling of the batteries the ore coming from the breakers, has to be crushed in Chilean mills, the practice at the Guerrero mill will be described, and then details of the filtering at the Loreto will be given, since at the time of my visit the filtering [illegible] pleted.

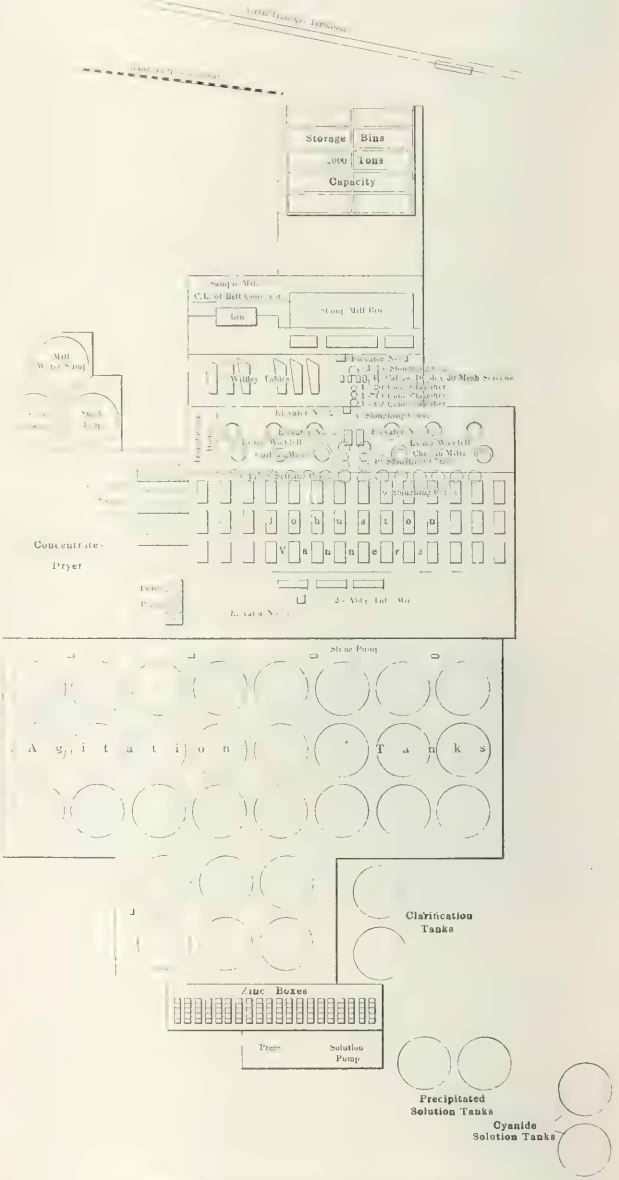
[illegible] Mill

Before being sent to the Guerrero mill, all the ore is sorted so as to remove the waste and all ore assaying more than 2 kg. silver per ton. From the Cabrera and [illegible] ore is brought by an aërial tramway. The ore is dumped into a 2000-ton wooden bin divided into 10 different compartments so as to keep the ore from the different mines separate for, owing to internal conditions under which the company is now operating, the mill must be operated almost as if it were a custom mill. The ore from the bin is trammed to the sampling department where after being crushed in a 10x15-in. breaker it goes to a Snyder sampler which removes 1/10; this 1/10 then goes to a set of 14x27-in. rolls, and, after being recrushed another 1/10 is taken out by the second Snyder sampler; this 1/10 after being recrushed by 12x20-in. rolls goes to the third Snyder sampler, which removes the final sample, a 1/10 of 1/10 of 1/10 of the ore crushed in the mill.

The rejects from each of the samplers falls upon the inclined Robins belt conveyer that takes the ore to a movable tripper over the battery bins; these have a capacity of 400 tons. These bins feed by suspended Challenge feeders to eight 5-stamp batteries arranged in units of 20, each 10 stamps being driven by its own belt from the unit line-shaft. These stamps weigh 1050 lb., and make 106 drops, 7 in. high per min. The ore is crushed in cyanide solution titrating 0.05 per cent. KCN; an 8-mesh No. 24 wire screen is used on the battery. At present owing to the coarseness of the screens from 10 to 12 tons of solution are used per ton of ore. The mortar-block is made of concrete, and the battery posts rest in specially designed cast-iron shoes, the details of which are shown in an accompanying drawing.

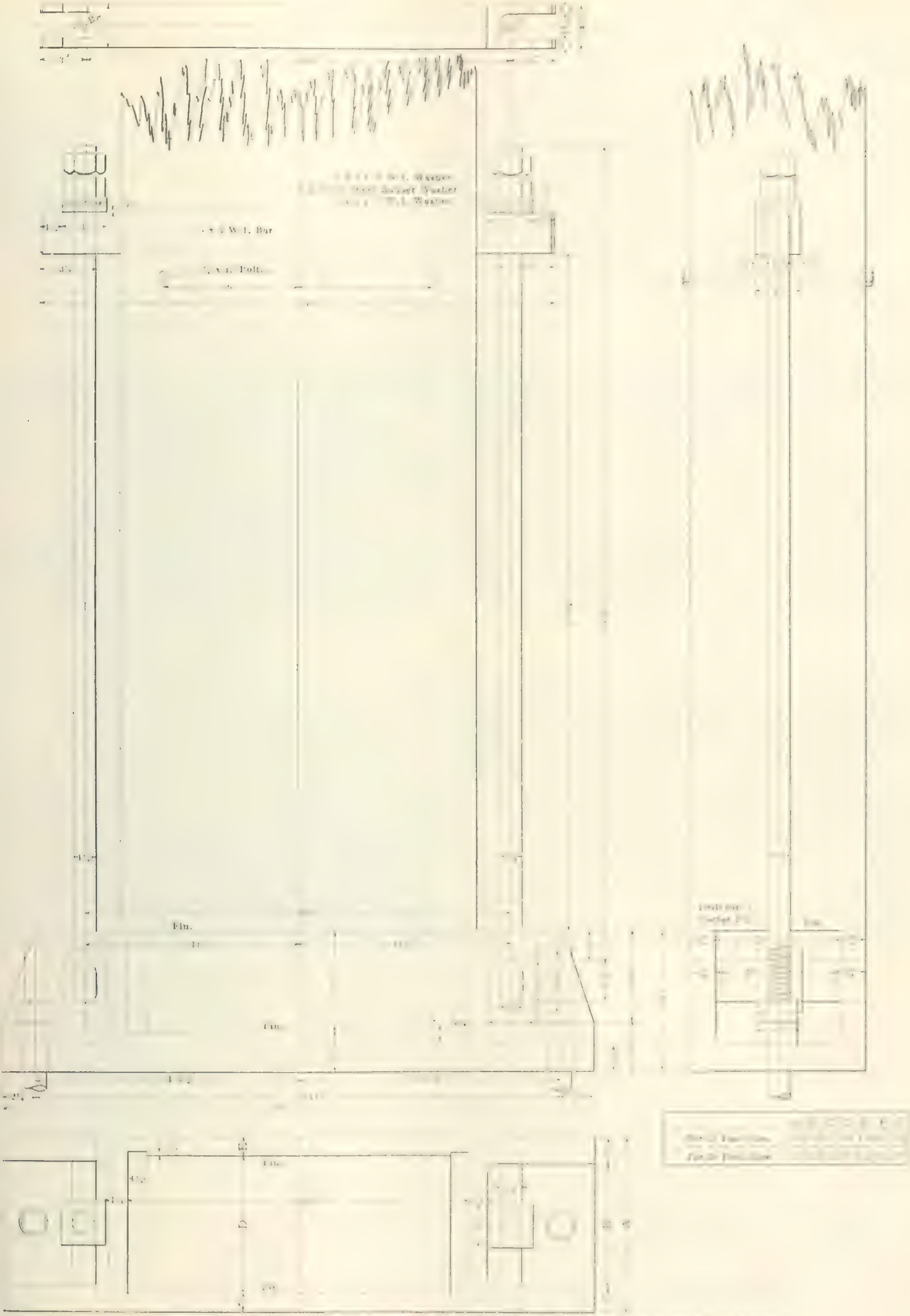
This battery-post shoe is made much heavier and stronger than the shoes usually furnished by stamp-mill manufacturers. The shoe has been designed so that the holding-down bolts can be easily replaced. These holding-down bolts are smaller than the anchor bolts, and are so proportioned that they should be the first part to break. This construction avoids the breaking of parts hard to replace.

The pulp from the batteries flows to an 8x16-in. bucket elevator which raises it to the 6-ft. sloughing-off cone; the overflow from that cone goes to the Callow cones above the slime vanners, while the underflow goes to two duplex Callow screens, on which a 40-mesh cloth made from No. 36 steel wire is used. At present in the cyanide solution these screens last only two weeks, but as yet the management has not had time to experiment with different sizes of wire in order to try to lengthen the life of these screens. The oversize from the Callow screens goes to six 6-ft. Evans-Waddell Chilean mills crushing through 0.018-in. diagonally punched rolled-steel screens; the undersize goes to two hydraulic classifiers, the diameter of one being 30 in., that of the other 40 in. The underflow from the first classifier goes to four Wilfley tables, while the overflow goes to the larger cone. The slime overflow from the second classifier goes to the Callow cones above the slime vanners; the underflow goes to three Wilfley tables. The tailings from both sets of Wilfley tables then flow to the Chilean mills.



PLAN OF GUERRERO MILL REAL DEL MONTE

The Chilean mills run at 35 r.p.m., and the plows are set so as to give as big a splash against the screens as possible. The reground pulp from the Chilean mills is raised by a bucket elevator to two sets of hydraulic classifiers, each set consisting of one 40-in. and one 60-in. cone. The underflow from the first cones goes to five Wilfley tables, and after being concentrated, returns to the Chilean mills; the overflow from the first goes to the second cone. The underflow from the second cone goes to 12 Johnston tables

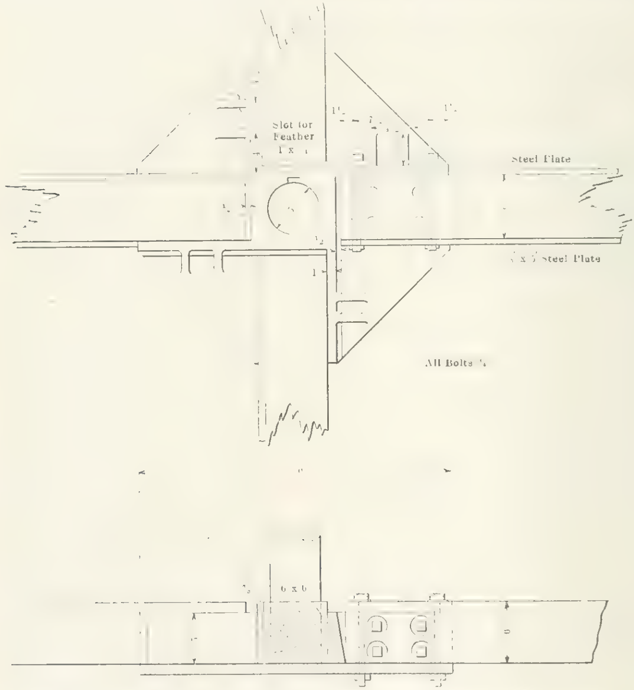


DETAILS OF CAST IRON BATTERY-POST SHOE-PLATE, REAL DEL MONTE [illegible] COMPANY treating this sand product, while the overflow goes to the Callow cones above the slime vanners.

The Dorr Classifiers

The tailings from the sand vanners go to two Dorr classifiers where the sand is separated and fed to three Abbé tube mills. The discharge from these tube mills is returned by bucket elevators to the Dorr classifiers. The slime overflowing from the Dorr classifiers goes direct to the cyanide plant.

The slime from both the first and second set of cone classifiers, as has been said, flows to 14 eight-foot Callow cones which feed the 30 Johnston tables treating slime; the tailings from these tables join the slime from the Dorr classifiers and go to the slime tanks for treatment. The overflow from the Callow cones is pumped back and serves as feed water for the batteries, the Wilfley and the Johnston tables, and also is used as pressure water in the hydraulic classifiers.



DETAILS OF CAST-IRON STAR FOR AGITATOR HAVING REINFORCED WOODEN ARMS. PACHUCA Y REAL DEL MONTE COMPANY

In July the Guerrero mill was treating about 250 tons per day, but by the end of September, when all the machinery indicated in the accompanying flow-sheet is installed, the mill will be crushing 300 tons of ore per day.

The amount of the sand returned to the Chilean mills is regulated by means of the upward current in the hydraulic classifiers; the size of the sand sent to the sand vanners is similarly controlled. At present this current is fixed to send to the slime vanners all particles that will pass a 100-mesh screen. Therefore at this mill the ore is crushed fine enough to pass a 100-mesh screen, before the final concentration, and so most of the sulphide in the ore is removed before the slime goes to the cyanide plant. The concentration ratio varies between 100 to 1 and 30 to 1. These concentrates, which assay from 8 to 40 kilograms silver and from 40 to 200 grams gold per metric ton, carry about 10 per cent. zinc, 1 to 4 per cent. lead, 0.8 to 1 per cent. copper and 20 per cent. insoluble, the rest is mainly iron sulphide together with a very small amount of arsenic and antimony. About 45 per cent. of the extraction is obtained by concentration.

The Dorr classifiers do excellent work and feed to the tube mills a pulp carrying only 45 per cent. moisture; the launders that lead from the Dorrs to the tube mills are given a grade of 3 in. per foot so that the thick pulp will readily flow through them. As at this mill the main object of the use of the Dorr classifier is to obtain a thick feed not necessarily free from slime, the water jets for washing the sand are not used. Consequently an output of from 150 to 200 tons of sand per day can be obtained from each separator if desired. When using the water jet the output is greatly reduced, but 75 tons of slime-free sand can be obtained in 24 hours.

Silex liners are used in the Abbé mills, not because of preference, but because of necessity; with these Abbé mills, 4½x16½ ft. in size, great trouble has been experienced owing to the breaking of the heads near the trunnions. This the company has remedied by casting, at its machine-shop, heavier heads. The spiral feed is highly recommended by V. B Sherrod, consulting metallurgist to the Real del Monte y Pachuca company, but it would appear that the heads of this tube mill need to be made stronger. Danish pebbles are used for grinders, and about 800 kg. of pebbles per week are fed to each tube mill.

Cyanide Plant of the Guerrero Mill

The treatment tanks have flat bottoms. There are 24 of these, 10x30 ft. deep; mechanical agitation is used. Two of these tanks at present are used as collecting tanks, but the slime can be charged directly into any one of them as they are all equipped with central charging boxes extending down 18 in. into the tank. These consist of an outer solid box and perforated inner feed box, being similar to the charging boxes used by the El Oro Mining and Railway Company except that the outer box is not given the inward slant used at El Oro to concentrate the feed current. The slime pulp is agitated both by mechanical agitators (making 6 r.p.m.) and by 6-in. John A. Traylor & Co. centrifugal pumps, one pump being installed for each six tanks. But, as the main advantage of these pumps appears to be to aërate the solution, in the future three small air-jets will be placed in the bottom to affect the aëration; then the pumps will be used only to pump and transfer the slime, for the shafts wear out rapidly. That the main effect of the pump agitation is aëration has been proved by the fact that for several days after the use of the pumps is discontinued the extraction will remain as high as before; then as the air is exhausted the extraction decreases.

The mechanical agitators are of the four-arm type, each arm being of a different length; these arms rotate at a hight of 14 in. above the bottom. The agitator shaft rests in a ball-bearing footstep, the slime being kept out of the bearing by means of a cleverly placed upward current of solution. The details of the star for fastening the arms to the shaft are shown in an accompanying drawing.

Cyanide Treatment at Guerrero Mill

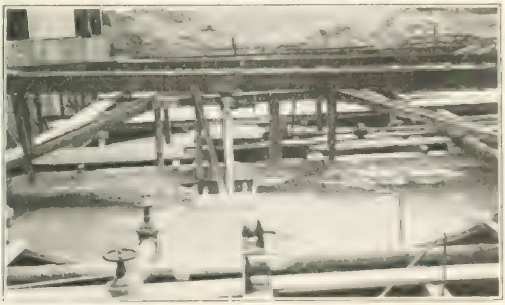
The solution, which overflows from the tank while the charge is being collected, is pumped back to the batteries. At present collecting takes 5 to 6 hours, for the treatment tanks hold about 50 tons of dry slime since during agitation a dilution of 3½ to 1 is used. When the charge has been collected, sodium cyanide is added sufficient to bring the solution up to the equivalent of 0.2 per cent. KCN.

The first agitation lasts 36 hours; then the charge is settled for 4 hours. Decantation requires only 1 to 2 hours, for the slime at Pachuca settles quickly, taking about one-half the time necessary to settle the slime at Guanajuato. This possibly is due to the fact that at Guanajuato much of the ore is at least partially oxidized so that a more flocculent slime would be expected than at Pachuca where most of the ore milled is sulphide ore. After decantation, the pulp is agitated with unprecipitated solution titrating 0.15 per cent KCN; ⅓ kg. of lead acetate per ton of dry slime is added during the first agitation. The second agitation lasts 8 hours. Then, after settling and decanting for 6 hours, the charge is given three agitations of 4 hours each with barren solution titrating 0.15 per cent. KCN; a period of 6 hours for settling and decantation, of course, intervenes between each agitation. Then the tank is filled with water, and the charge is given a final agitation of 4 hours. After the water wash the slime is allowed to settle for 24 hours, then the water is decanted. Finally the settled pulp, which contains 50 per cent. moisture, is stirred up with the agitators and discharged to the creek.

THE LORETO MILL

[illegible]

SAN FRANCISCO NO. 1 MILL


[illegible]

The solution from the first three agitations is precipitated, but the last two barren-solution washes are not precipitated. [illegible] agitating the next slime charge: the water [illegible] decanted solution flows to an intermediate clarifying tank. The slime that settles in this tank is returned for treatment; the overflowing solution goes to six clarifying tanks, and from these it is decanted to the zinc-boxes for precipitation. At present about 1200 tons of solution are precipitated per day, for each day 1/10 of the mill solution goes to the precipitation boxes.

The precipitation room contains 16 zinc-boxes, each having 5 compartments, 3x4x2 ft. deep; these have a flat, trough bottom having a maximum depth of 6 in. at the center below the screen and of only 1 in. at each side. Fourteen of these boxes are used for precipitating standard solution, and two for mill solution. In cleaning up, an 18x18-in. Shriver filter-press making 24 cakes, 2 in. thick, is used to filter all precipitate that passes a 40-mesh screen. The precipitate is partially dried by compressed air in the press, and then is sent to the Loreto mill for melting. The short zinc is returned in a little tray to the first compartments of the stronger-solution zinc-boxes for no zinc shaving is used in the first compartments.

The cyanide consumption is 1.2 kg. sodium cyanide per ton of ore treated; the consumption of zinc is 1.4 kg. per ton, and the consumption of lead acetate is 0.33 kg. per ton; about 2.5 kg. of lime are used per ton of ore treated, 1.5 kg. being [illegible] first agitation to aid in settling. The extraction is estimated at 85 to 90 per cent., but as yet the extraction at this mill is not accurately known.

The Butters filter at the Guerrero mill will soon be running; then the cyanide treatment will be similar to that at present used at the Loreto mill. The slime treatment, which now lasts 5 days will then be shortened to 72 hours.

[illegible]

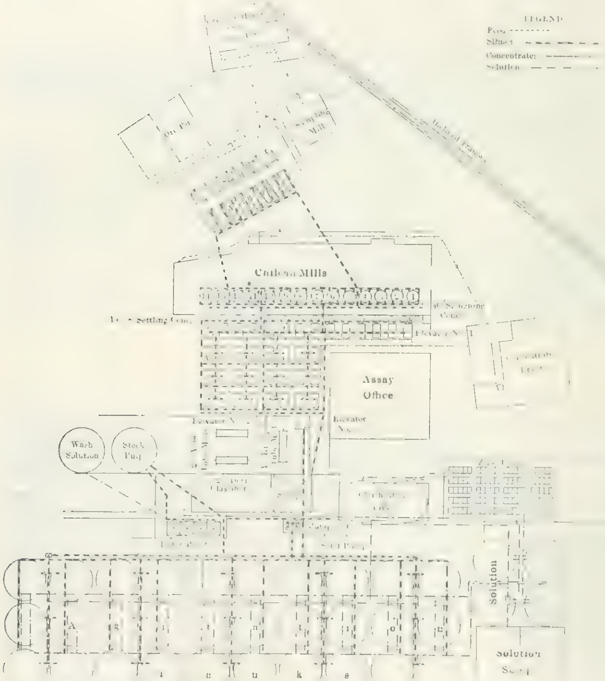
The crushing equipment at the Loreto mill consists of five 7x9-in. Blake breakers, 40 stamps weighing 1050 lb. each, 14 old-fashioned Chilean mills, probably to be [illegible] three tube mills, two Abbé and one Krupp. The concentration is done on 38 Johnston tables.

The ore is crushed in cyanide solution titrating 0.05 per cent. KCN, and is concentrated on the Johnston tables before going to the tube mills to be completely slimed. Dorr classifiers are used for separating from the slime the sand that goes to the tube mills; these work as satisfactorily at the Loreto mill as at the Guerrero mill.

The slime is collected in agitation tanks similar to those at the Guerrero mill; at present [illegible] charge. The excess solution is decanted off; then the tank is filled with standard solution titrating 0.15 per cent. KCN; during the first agitation 1/3 kg. of lead acetate per ton of dry slime and sufficient sodium cyanide to bring the strength of the solution up to 0.2 per cent. KCN are added. The first agitation lasts 36 hours; settling and decanting takes about 6 hours more. The second agitation with solution titrating 0.15 per cent. KCN lasts 6 hours; after decantation a third agitation lasting 6 hours is given. The charge is then pumped to the Butters filter plant, the filter having 104 standard-size leaves. A cake forms quickly as there is much granular slime in the pulp; consequently the cake is easily and quickly washed. A cake 1 in. thick is formed, and is discharged either by air or water, generally by using both. The cycle lasts 2 hours, the cake being formed in 45 minutes. Mill solution titrating 0.05 KCN is used for washing, and finally clean water sufficient to displace the mill solution is sucked through the cake. The tailings from the Loreto mill at present assay 90 grams silver and 0.3 grams gold per ton.

The Loreto mill is equipped with an old refinery, but this will be remodeled as soon as the company decides whether to use the electrolytic or sulphuric-acid process for parting the gold and silver. At present the precipitate is dried and fluxed loose in No. 300 graphite crucibles. This is melted once, poured into bars, and shipped at present as a doré bar 950 fine. The company is experimenting with oil and coke-fired furnaces for melting. The oil costs more, but owing to its greater convenience, smaller dust loss, and other advantages it seems preferable to coke. A briquetting machine is being installed; in the future the partially dried precipitate and the flux will be briquetted.

The Loreto plant is treating at present only 120 tons of ore per day, but its full capacity is 300 tons. This ore comes both from the Barron and the Camelia mine, but owing to the high cost of transportation from the Barron, it is probable that the company will soon build a cyanide mill near the Barron mine to treat that ore. The Guerrero mill is treating 250 tons at present, but it will be treating 300 tons by October 1. Even then the milling capacity of the Real del Monte y Pachuca company will be too small for the mines now operating, and, as the company reopens other mines either the capacity of these mills will have to be increased considerably or more mills must be built.



PLAN OF LORETO MILL, PACHUCA

San Francisco No. 1 Mill

The San Francisco No. 1 mill, situated near the Maravillas and the San Rafael mines, is treating exclusively custom ores, mainly from these two mines; the tonnage treated is about 500 tons per week. The mill was originally a pan-amalgamation mill similar to the No. 2 or Progreso mill belonging to the same company, but in 1906 A. Grothe, then general manager for the San Francisco company, began to remodel the mill so as to use the cyanide process. A tube mill was added to slime the ore, and Brown tanks for agitating the slime.

The ore is first broken in two 12x15-in. Dodge breakers to about 1-in. size, and then goes to a 350-ton bin above the stamp-batteries. This feeds by suspended Challenge feeders to 30 stamps, weighing 1050 lb., that make 104 drops, 6½ in. high, per min. The ore is crushed through a 20-mesh screen in solution titrating 0.25 per cent. KCN. As a thick pulp is made by the batteries owing to the fact that only two tons of water are used per ton of ore, the pulp from each five stamps flows directly to a Wilfley table, no dewatering being necessary. The tailings go to two Frenier sand pumps and are raised to the classifying cones. The overflowing slime from these cones goes to the Pachuca tanks while the underflow goes to the tube-mill thickening cone. From the thickening cone the underflow, containing about 50 per cent. moisture, goes to the tube mill; the overflow returns to the classifying cones.

The tube mill is a Krupp No. 8A, being 4 m. long by 1.3 m. diameter. It runs at 29 r.p.m. and has El Oro cast-steel liners. Quartz ore and Danish pebbles are used as grinders, for when pebbles are used a lining is formed which protects the liners better than when quartz alone is used. One ton of quartz and 125 kg. of pebbles are added twice a week to the mill so as to keep it approximately half full of grinders.

The pulp from the tube mill is returned to the tube-mill cone, and as the coarse sand is reground, 80 per cent. of the pulp going to the Pachuca tanks will pass a 200-mesh screen.

The overflow from the classifying cones flows to one of the five Pachuca tanks where it is collected until the tank contains a charge of from 60 to 70 tons of dry slime. The overflowing solution from the Pachuca tanks goes to four settling tanks in which it is clarified; then it flows to a fifth tank from which it is pumped back to the batteries. The slime that accumulates in the clarifying tanks is pumped back to the agitation tanks and re-treated.

The pulp is agitated at a dilution approaching as nearly as possible two parts solution to one part slime. At the beginning of the agitation 20 kg. of lead acetate and sodium cyanide sufficient to raise the solution to a strength titrating 0.45 per cent. KCN are added. The slime is agitated 48 hours; then it is discharged to the tank feeding to the Butters filters, this taking 2 hours. Sometimes when time permits the tank, after agitation is finished, is allowed to settle 6 to 12 hours, and 4 or 5 ft. of solution is decanted off, but with most of the Pachuca ores, although generally they are quick settling, filtering is faster than decantation.

Five Brown or Pachuca tanks 44 ft. 8 in. high by 14 ft. 10 in. diameter are used. The tank has a cone bottom whose slope is 60 deg., consequently the cylindrical part of the tank is about 31 ft. high. In the center of the tank and extending from about 18 in. above the charging level to the same distance from the bottom, is the central air-lift tube having a diameter about one-tenth that of the outer tank. Into the bottom of this inner tube is led the compressed-air pipe which is used to give an upward motion through this central tube. Connection is made at the bottom of the cone with the 4-in. Butters centrifugal pump used to transfer the pulp to the filter-feed tank. At the beginning of agitation a pressure of about 50 to 60 lb. per sq.in. is used. When a good agitation has been started the pressure is decreased to about 25 lb. per sq.in., for experiment has shown that with this hight of tank about 25 lb. per sq.in. is the most economic pressure. Between the air compressor and the agitation vats there are five large air receivers; these are installed so as to enable short shutdowns of the compressor without derangement to the agitation.

PACHUCA TANKS SAN FRANCISCO NO. 1 MILL

Power [illegible] in Pachuca Tanks

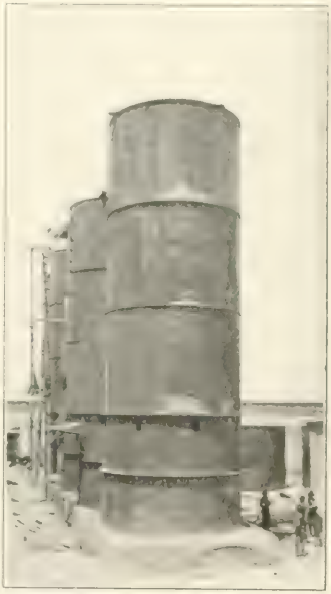
The amount of power required to agitate the tanks at this plant has not been accurately determined as yet, but from some tests it appears that the power consumed varies between 1 and 1.5 h.p. per tank according to whether one or three tanks are being agitated, the greater the number the less being the power required. F. C. Brown, of New Zealand, the inventor of the tank, states that when agitating eight tanks 40 ft. high by 10 ft. diam., each charged with 30 to 40 tons of sandy slime, the power required was from 3/4 to 1 h.p., since from 10 to 13 cu.ft. of free air at 25 lb. per sq.in. were required per minute to agitate each tank. Finally he has decreased this to 12 cu.ft. of free air at 22 lb. per sq.in. pressure. In a tank 37 ft. high and 7 ft. 6 in. diameter only 4 to 6 cu.ft. of free air at 22 lb. per sq.in. pressure per min. (from 1/3 to 1/2 h.p.) were required to agitate a charge of 15 tons of dry slimes; when the same amount of finely ground concentrate was agitated in the same tank 15 to 20 cu. ft. of free air per min. at 26 lb. per sq.in. pressure (1 1/2 to 2 h.p.) were required. As a result of these tests the Komata Reefs company is going to cyanide its concentrates. With ten tanks, 40 ft. high by 10 ft. diam., when all were in agitation, each being charged with 35 tons of dry concentrate, 88 cu.ft. of free air at 22 lb. per sq.in. (1.5 h.p. per tank) were required. With a 13x55-ft. tank, charged with 75 tons of dry slime, 32 cu.ft. of free air at 32 lb. per sq.in. (1 3/4 h.p.) were required.

In the Pachuca tank sufficient air, and to be run most efficiently only sufficient air, to keep the cone clear of slime should be used. Consequently with a heavier, quicker settling slime, like a slimed concentrate, more air is required than with a slow-settling slime. The amount of air required seems to vary with the square of the diameter rather than with the hight so that a narrow, tall tank is more economical than a shallow, wide tank. The degree of dilution should be about 2 to 1. The great advantage of the Pachuca tank is that it furnishes a positive agitation with a very low consumption of power.

The tanks at the San Francisco mill have worked so well that five are being installed at the La Union *hacienda* and ten at the San Rafael mill both at Pachuca. At the new Esperanza mill at El Oro, Mexico, to be erected to treat the mine ore and old sand tailings 12 Pachuca tanks have been ordered, while at the new Goldfield Consolidated mill in Nevada ten Pachuca tanks are being erected. All of these tanks are of the standard size, approximately 15x45 ft. high. Throughout Mexico one sees many small Pachuca tanks used experimentally both on slimes and on concentrates. These tanks seem especially adapted to agitating quick-settling ores like fine-ground concentrates, for with these tanks by increasing the pressure of the agitating air almost anything can be kept in agitation.

The slime from the Pachuca tanks at the San Francisco mill is filtered in two Butters filters. Moore, Blaisdell and Butters leaves have been tried on these filters, but all seemed to work equally well. It takes about 18 to 20 hours to filter a charge of about 70 tons, it being necessary to form eight cakes. A cake 1 1/4 to 1 1/2 in. thick is formed in about an hour; then a weak-solution wash is given for 30 min. and a water wash for 10 min.; all the filtrate is sent to the four sand-filter tanks that feed the zinc-boxes.

There are ten zinc-boxes, each having five compartments 3x3x2 1/2 ft. deep; the bottoms of these boxes slope only to one side. In cleaning up, the precipitate is worked through a 60-mesh screen and the short zinc returned to the boxes. The precipitate goes to the filter-press; the cake is partially dried by air in the press. But before being fluxed the precipitate is thoroughly dried in pans. The bullion obtained assays 950 fine.


PACHUCA TANKS AT LA UNION HACIENDA

The mill is treating ores containing much manganese, and a little copper, lead, zinc and iron. These increase the difficulty of obtaining good extraction. A saving of about 90 per cent. is made when agitating 60 tons at a charge and 85 per cent. when agitating 70 tons at a charge. The ore treated assays from 700 to 1000 grams silver and 3.5 to 5 grams gold per metric ton.

The power required to run the crushing [illegible] 200-h.p motor, while a 75 h.p. motor runs the whole cyanide plant.

The San Rafael Mill

At the San Rafael the new 250-ton mill, now being erected, is to use Pachuca tanks for agitation. This mill will have 60 stamps, 20 weighing 1250 and 40 weighing 900 lb., which will crush through a 20-mesh screen. The sand will be reground in three Krupp mills 20 ft. long by 4 ft. diameter, and the slime will be treated in 10 Pachuca tanks, 15x45 ft. high, it being the intention to use a 48-hr. agitation and to treat a charge of from 70 to 80 tons. A Burt clarifier will be used for clarifying the overflowing solutions from the tanks while two Moore filters, having 100 leaves each, will be used to filter the slime. At present only Wilfley tables will be installed, but space is being left for Johnston tables in case that they are required. Tests upon the ore indicate an extraction of from 85 to 90 per cent. without close concentration.

Three Dorr classifiers will be used for separating the sand going to the tube mills, and three Dorr thickeners will be used for thickening the slimes going to the Pachuca tanks. These thickeners consist of a tank having a flat conical bottom on which the slime settles and along which it is scraped by a series of rotating plows that convey the slime toward the central discharge at the bottom of the cone. This slime thickener is used at Pluma, South Dakota, and is said to work very satisfactorily. At La Union mill also, Pachuca tanks are being installed to cyanide the ore without any previous concentration.

In conclusion I wish to thank George A. Camphius, superintendent of San Francisco No. 1 mill, V. B. Sherrod and A. Grothe for kindness shown me while I was preparing this article.

Gold Dredging in French Guiana

Special Correspondence

During 1907, French Guiana exported 4160 kg. of gold. Although a considerable part of this output comes from the ordinary sluices, a substantial part has been produced by dredging alluvial deposits.

At present the Placer Elysée, located in the region of the middle Mana, is worked by two dredges (Cie. Minière et de Dragages de Guyane). The first, made by Werf, Conrad, of Haarlem, Holland, is small and has an actual capacity of only 200 cu.m. per day; it served mainly to prove the possibility of dredging this placer ground on a large scale. The other dredge is larger and was built by Messrs. Lobnitz, of Glasgow. It was put into commission in December, 1907. Its main features are as follows: the ladder is fitted with 33 buckets, 3 cu.ft. each and is of the open-connected type. The buckets run at a speed of 15 per minute. The trommel or revolving screen is 7 m. long by 1.30 m. in diameter. There are 10 gold-saving tables fitted with cocoa matting and expanded metal. The actual capacity of this dredge is about 700 cu.m. per day, but owing the the shallowness of the marsh and the difficulty of properly clearing the way, the dredge is not able to handle this amount.

Gold dredging in Guiana seems to be more successful in working the beds of the rivers. In view of this two modern gold dredges are to be shipped soon to French Guiana to work on the deposits of the Sparwin river, a tributary of the Maroni (Sté. Anonyme du Sparwin) and of the Courcibo river, a tributary of the Sinnamary (Cie. Coloniale de Dragages Auriféres). They are of the open-link continuous bucket type, with 4.5-cu.ft. buckets designed to work at a depth of 9 m. The pontoon and gantries are entirely made of steel. A special feature of these dredges is a double revolving screen, 33 ft. long, intended to disintegrate thoroughly the clayey alluvials which are met with in Guiana. Besides the ordinary spray pipe leading from the centrifugal pump, two rows of monitors, fed by a Knowles pressure pump, will help to desintegrate the gravel. To prevent clay from sticking on the Turner gold-saving tables a special water jet has been arranged over the tables. This new device is the result of extensive experiments made on the Guiana alluvials by the inventor Mr. Potterau, who designed the dredges with Fraser & Chalmers, Ltd., of London and Paris.

Homestake Mining Company

This company, as is well known, owns a very large low-grade deposit of gold ore in the Black Hills district of South Dakota. Its operations are an example of the successful and profitable working of such ores. The present report covers the year ended May 31, 1908. For that period the total ore milled was 1,450,900 tons, the average return in bullion being equal to $3.251 per ton treated.

The accounts are stated in such a way that it is difficult to separate the costs. Analyzing them as far as possible, the results of the year's operations appear as follows:

	Amount	Per Ton
Proceeds of bullion saved....	$4,717,746	$3.251
Foundry and miscellaneous.	91,759	0.064
Total receipts...............	$4,809,505	$3.315
Mining expenses..............	$2,378,944	$1.640
Milling expenses..............	861,943	0.594
Foundry and miscellaneous..	115,590	0.081
Bullion freight...............	8,705	0.006
Taxes.........................	74,729	0.051
General expenses, etc........	164,823	0.113
Total expenses	$3,604,734	$2.485
Net earnings for the year..	$1,204,771	$0.830

Mining expenses were 66, and milling, 23.9 per cent. of the total expenses for the year. The expenses were 74.0 per cent. of the earnings.

The income account in the same way works out as follows:

Net earnings as above..............	$1,204,771
Balance from previous year.......	32,636
Bills payable..........................	100,000
Total..................................	$1,337,407
Interest and discount..............	$ 10,941
Slimes plant construction.........	86,548
Bills payable paid....................	250,000
Dividends paid........................	546,000
Total payments......................	$ 893,489
Balance at close of year...........	$ 443,918

The dividends paid were 2.5 per cent. on the stock. Dividends were suspended during the first part of the year on account of the fire in the mine, which stopped production for several months.

The report of Superintendent T. J. Grier says: "The Homestake adds another fiscal year to its life, and has long since fully recovered from the effects of its recent contact with fire and water. Development work resumed some months ago continues to give satisfactory results and to insure longevity to the mine. We reached the ore a short time ago in a westerly crosscut on the 1550 level at the Ellison shaft and are now crosscutting it. The west side of the same shaft at the 1700 level is likewise in the same vein, which will be crosscut as soon as the station is opened at that point. At the Golden Prospect shaft an additional 100 ft. in depth has been attained, making it 1000 ft. deep. At the Golden Star shaft we are raising from the 1250 level.

"The plant generally is in fine condition and is running smoothly in every department, with ore reserves in sight for a couple of decades."

Cyanide Practice in Mexico

Special Correspondence

In a recent discussion by the Chemical, Metallurgical and Mining Society, of South Africa, on his paper on "Some Features of Silver-ore Treatment in Mexico," W. A. Caldecott described the chemical investigations upon which part of his paper was based, and closed with some interesting general remarks. Speaking as one of the leading Rand metallurgists, lately returned from a visit to America, he expressed the opinion that cyanide treatment in Mexico —though admitting the danger of generalizations in so wide and varied a territory—left wide scope for improvement on scientific lines.

He deplored the small amount of published data available, dealing with technical matters in that country. Incidentally, Mr. Caldecott suggested that the use of warm cyanide solutions, tried on the Rand with promise of successful application, might be advantageous in the treatment of Mexican silver ores; though the extensive use of electricity would be a circumstance liable to increase the cost of the scheme as opposed to the Rand with its available condensed steam.

Present Condition of Mining in Mexico

The Fall in the Prices of Metals Has Greatly Affected Prosperity but It Has Stimulated Increased Effort to Reduce Costs of Production

BY FRANKLIN WHEATON SMITH

The mining industry in Mexico, no less than in other parts of the world, has felt keenly the effects of last year's financial cyclone. The general collapse of the metal market struck a harder blow to the general prosperity of the country than to that of the United States, for Mexico is still first of all a mining country.

Of the causes of the preëminence of mining, some are fundamental, others are due to present conditions. Two of the first are the very great mineral wealth of the country, and the comparatively large portion of its area unsuited to agriculture. Of the other causes, one is the concentration of the land in the hands of a few families. This, with the practical absence of land taxation that has made such concentration possible, does not tend to advance agricultural methods.

Mexico's agricultural possibilities are great, and it will be well for the republic when agriculture and not mining becomes the leading industry. The breaking up of the large land holdings by a system of land taxation and the development and education of the small independent farmer (a host that must be "humored, ah, slowly toward the light") would create a prosperous stratum in society where now there is abject poverty, and in proportion to its conservative prosperity would be impervious to a flood of panic. The present policy of the government seems to tend in this direction. What would be the mental attitude of business today if the United States were primarily a mining country?

Mexico a Mining Camp

Where all the land's a mining camp, each operating property brings local prosperity in proportion to the amount of labor it employs and the quantity of local produce that it consumes, and in the broader world each exercises a direct influence on the business of the distributing centers and the railroads. The Mexican Central has published the statement that 48 per cent. of its freight traffic is due directly or indirectly to the mining industry.

A rough estimate places Mexico's metal production for 1907 at $95,000,000. Of this silver represents about 45 per cent.; copper, 25 per cent.; gold, nearly 20 per cent.; lead, 8 per cent., and other metals, the remaining 2 per cent. In other words, commodity metals formed 80 per cent. of the product of the leading industry of the republic, and the market price of all of them recently underwent severe and simultaneous shrinkage.

In his message to Congress on April 1, 1908, President Diaz referred to the business depression, commented on "the contrast between the prosperity of the national treasury and the stringency which for some months past has prevailed in the business world," and said further:

"In my last message I alluded to the troubled condition of foreign financial centers which had produced a certain torpor in some lines of our industrial activity. At the same time there occurred a heavy decline in the prices of almost all our exportable products, owing largely to critical conditions in the markets where they are usually in demand, as well as other circumstances such as those that affect the price of silver, which is the most important of the articles in question. Naturally these disturbing factors have been felt with greater or less intensity in all lines of business, occasioning a stringency which, though attended with hardships, is also self-remedying, thanks to the natural conservatism which in general characterizes the commercial community of Mexico."

The Low Price of Silver

When this message was written the price of silver was 55⅜c. Its average for the first ten months of 1907 was 67.068c. per fine ounce; for the nine months from Nov. 1, 1907, to Aug. 1, 1908, it was 54.929c., and for the week ending Aug. 19, 51.33c. These figures carry their own commentary. One company reporting net earnings of $215,000, estimates that the drop in silver cost it $38,000 in reduced profits. Another, not yet earning profits, sees a badly needed income from high-grade shipments and concentrates, reduced by about $5000 a month.

Without doubt many of the smaller properties, owned by weak companies, have closed down; others are unable to ship ore that a year ago would have yielded a fair profit. But so far as known, none of the larger companies has found it necessary to suspend operations as did the Greene-Cananea, the greatest of Mexican copper producers, a year ago. That this suspension, disastrous as it was to local business and to stock values, was a wisely planned move, there can be no doubt. It enabled the management to make needed changes in system and equipment and to perfect plans for more economical operation, some of which were laid months before under a prior management. The results of the future will show how wise a move it was.

Foreign Capital

The mining industry of Mexico is practically wholly dependent on foreign capital for its power to expand. It was impossible that the world-wide depression should fail to make itself felt in the republic. Two years ago the mental attitude was, "How much can we make?"; recently it has been, "How can we avoid loss?"; and when capital is in *that* frame of mind, it is in no mood to undertake new enterprises. Early in the summer, as conditions were beginning to recover, a new factor was introduced. A long and elaborate new mining law was drafted, containing some excellent provisions, but also four articles which at once produced most vehement discussion. They forbade foreigners owning mines in the border States and foreign corporations owning them in any part of the Republic. The alleged reason was that these provisions would prevent "trusts" from dominating the industry and also make wildcatting impossible.

Neither wildcatters nor "trusts" were heard in the ensuing discussion, but the legitimate mining industry expressed itself through the Chamber of Mines and through the columns of a leading paper, that usually is exceedingly circumspect in its comments on Mexican affairs. The discussion did not turn on any alleged injustice or oppression that the new law would cause, for no such objections could be urged against it. "Unnecessary" and "inexpedient" indicate the line of argument, and the points were well taken.

Mexico is not yet strong enough to undertake unaided its own development. Foreign capital, particularly American and English, looks favorably on it as a field for investment. It is a fact that much English capital prefers Mexico to the United States, partly for the very reason that would be abolished by the passage of this law. It [illegible] ably it will not. The harm it has done so far [illegible] ap- [illegible] vestors not perfectly informed about the situation. It is impossible to estimate the [illegible] passage. Undoubtedly it has scared off some investors, but it is probable that its effect so far has been overestimated. "Inexpedient" is the worst that can be said of it; if passed, it will injure mining in that [illegible] temperance bill, but if it is passed it will not constitute a valid reason for advising against investment in Mexican mines.

---

*Mining engineer, Bisbee, Arizona

Lower Cost of Production

Every hard times has its influence, both constructive and destructive. On constructive lines, every advance in metallurgy means a lower cost of production; every company forced by low prices to realize that intensive methods have their place in mining no less than in agriculture and manufacture, adds a little to the stable foundation of prosperity. On the other side, many of the deserving, but weak, will suffer, but every wildcat down and done for means so much less yowling from the advertising chimney-tops of an unenlightened press, and for this boon our not-small thanks.

The advance in metallurgical practice, particularly in the cyanidation of silver enabling more mines to treat their product on the ground, has in very great measure increased the earning power of mines in good times and their endurance in bad. The low price of silver, while sorely felt by many individual properties, has not the prostrating effect on the industry in would have had if there had been no improvement in method during the past five years.

The government is stable and will continue so. Labor is cheap, and when under proper management, judging by cost of results (dollar for dollar, not man for man), is more efficient than American labor. Peon temperament and economic conditions make it improbable that powerful and coherent labor unions will ever be formed. It is a dangerous policy for a foreign company to place in charge of its work a man ignorant of the language, laws and customs of the country. Whether or not this leads to disaster depends on the man himself, and as much on temperament and personality as on ability. One not infrequently hears that readiness to scratch the itching palm is a prime requisite for doing business in Mexico. It is a woful mistake. Dishonest officials exist, of course, but with the great majority courtesy will gain its ends better than corruption, and frankness than fraud.

Conditions Improving

General conditions are improving, despite a depressed market. There is a reasonable profit for legitimate mining in Mexico today. It is fair to expect a gradual improvement in prices. That which has affected the price of products has affected the price of mines, and low prices mean better chances for moderate capital that wants prospects, or partially developed properties; that has faith in the markets of the future and is not scared by a bogy of today; not scared, but merely made conservative and so led to examine with greater care the properties offered. Careful selection means fewer failures; success in a district means more investment there, and thus the situation contains the seed of its own regeneration.

The Scotch Shale Oil Industry

The distillation of oil from shale in Scotland is one of the very few industries of the kind that have survived the competition of petroleum. Though their industry is comparatively a small one, the Scotch shale-oil companies have succeeded in holding their trade and in making sufficient profits to pay dividends on their stocks year after year. They have done this by close and careful working, reducing expenses to the lowest possible point, and saving all the by-products.

The custom in the trade is to sell illuminating oil on yearly contracts, usually made in August. This year the contract price is 12.5c. per gallon, a reduction of 0.5c. from last year. Lubricating oils are sold on the open market, in competition with imported oils, and the present price is $2.40 per ton below that realized a year ago. To offset these lower prices, however, coal is cheaper, and mining costs are lower than last year, the shale-miners' wages being regulated by the coal-mining scale. Moreover, there has been an increase in the price of sulphate of ammonia, the most important by-product.

Notwithstanding the lower prices of oil, the Scotch companies have the prospect of another good year. It is an interesting case of a small industry not only holding its own, but prospering, in the face of what is apparently an overwhelming competition.

Effect of Borax in Assaying

J. E. Clennell (*Journ. Chem. Met. and Min. Soc. of South Africa*, April, 1908) has contributed to the discussion of G. B. Hogenraad's paper in the Aug., 1907, number of the above journal, by submitting the results of some experiments. Mr. Hogenraad believed that the low results and poor slags obtained by him in assay a silicious ore were due to the large amounts of borax used in the flux. On the other hand, the author believes that the use of borax was not the cause of the losses in gold and silver, but were due to insufficient litharge in the charge, or to an excess of charcoal, rendering the charge somewhat infusible, thus causing mechanical losses. As a result of a course of experiments the following points were observed:

(1) A large excess of borax gives a hard, stony slag, difficult to separate clean from the lead button. In hammering out the button the slag flies to pieces violently, carrying with it a portion of the lead, some part of which is sure to be lost unless extreme care is taken in collecting all the fragments. This may possibly be a cause of some of the observed losses of borax.

(2) When no borax at all was added, the button usually separated quite clean from the slag, which was amber-cooled, and while cooling, a scum of straw-colored crystals collected on the surface. The addition of borax rendered the charge distinctly more fusible; this seems to be contrary to Mr. Hogenraad's view, as he apparently ascribes the sticking of the lead to the mold to the extreme fluidity of the non-borax slag. The author is inclined to draw the opposite conclusion; the fact that the lead leaves the pot before the slag, would seem to show that the latter was not sufficiently fluid.

(3) The non-borax flux was considerably more deliquescent than the ordinary borax flux; this, however, causes no inconvenience, unless the fusions are left in the molds for several hours.

(4) The use of a small quantity of borax in the charge, that is, 5 to 10 grams per a.t. of ore, gives a uniform, fusible slag without a noticeable amount of the scum previously mentioned; the buttons may be detached from the slag by a slight blow, and do not adhere to the slag.

An average of 297 assays without the use of borax gave 18.169 dwt., while 297 assays using the same flux with the addition of borax gave 18.185 dwt. gold. The ore on which the tests were made was similar in character to the Rand banket, being practically free from iron pyrites, although carrying considerable quantities of iron as black oxide. The most satisfactory fluxes were as follows:

Flux: Parts by Weight.	Mine and Mill.	Cyanide Originals and Slimes.	Cyanide Residues.
Bicarbonate of soda	2500	2400	3600
Fused borax glass	200	200	400
Litharge	2500	2400	3600
Charcoal	60	50	60
Weight of Charge.			
Ore for assay	1 a. t.	2 a. t.	4 a. t
Flux (grams)	120	200	300
Cover of soda (grams)	10	15	20
Lead button obtained (grams)	30	40	45

These charges were partly determined by the stock of fluxes and crucibles available and might be modified under other conditions.

Progress of the Dry-air Blast

In addition to the installations recently noted, licenses to use plant for drying the air for blast furnaces under the Gayley patents have just been taken out for nine furnaces, as follows: Toledo Furnace Company, Toledo, O., two stacks; Federal Furnace Company, Chicago, two stacks; Northwestern Iron Company, Mayville, Wis., two stacks; Youngstown Sheet and Tube Company, Youngstown, O., two stacks; Cleveland-Cliffs Iron Company, Marquette, Mich., one stack. The United States Steel Corporation has also ordered the installation of a drying plant for the bessemer steel converters at the South works of the Illinois Steel Company.

Nacozari Mining District, Sonora, Mexico

A Region Which Formerly Yielded Gold, Silver and Lead, and Now Promises to Become One of the Chief Copper Camps of the Republic

BY B. E. RUSSELL*

The town of Nacozari is situated at the southern terminus of the Nacozari railroad by which it is connected to the Arizona Sonora line at Douglas and Agua Prieta, 77 miles distant. The railroad facilities are limited to this road at present, but the grade of the Cananea & Yaqui River or Randolph lines of the Southern Pacific has been opened for about 20 miles south of Nacozari toward the connection with the Guaymas line of the same system. The Nacozari railroad connects at Douglas with the El Paso & Southwestern, which runs from there to Benson, Ariz., and El Paso, Texas; while the Southern Pacific extension from Nacozari will give a seaport terminal on the Pacific ocean at Guaymas, about 200 miles distant.

Nacozari lies about 65 miles southeast of the camp of Cananea. The town lies on the creek of the same name which forms the headwaters of the Moctezuma river flowing into the Yaqui river and [illegible] the Gulf of California, and comprising the general route followed by the surveys of the Southern Pacific lines. At Nacozari are situated the works of the Moctezuma Copper Company, a public library, a hotel, a store, offices and private residences of that company. The original reduction works consisted of a concentrator which is still in operation, and a smelter that has been idle since the completion of the railroad about four years ago. Since that time the concentrates and [illegible] have been shipped to the Old Dominion and Copper Queen plants in Arizona. The material for the old works, together with the equipment for the five-mile narrow-gage road connecting them with the Pilares mine was shipped into the camp from Naco, Ariz., by freight teams before the completion of the Nacozari railroad.

About a year ago plans for a new concentrator were started, and the mill, a model of reinforced concrete and steel construction, has since been completed. [illegible] 750 tons daily [illegible] [illegible] [illegible] [illegible] [illegible] 20,000 tons per month, producing about 11,000,000 lb. refined copper annually; this figure can be increased to 35,000,000 lb. by [illegible]

Power for the mine, mill and lighting [illegible] tezuma Copper Company has two plants. The old plant is equipped with Crossley [illegible] alternating-current electric generators. [illegible] h.p. Sterling boilers and three 1000-kw. [illegible] direct connected with three-phase alternating-current electric generators, stepping [illegible]

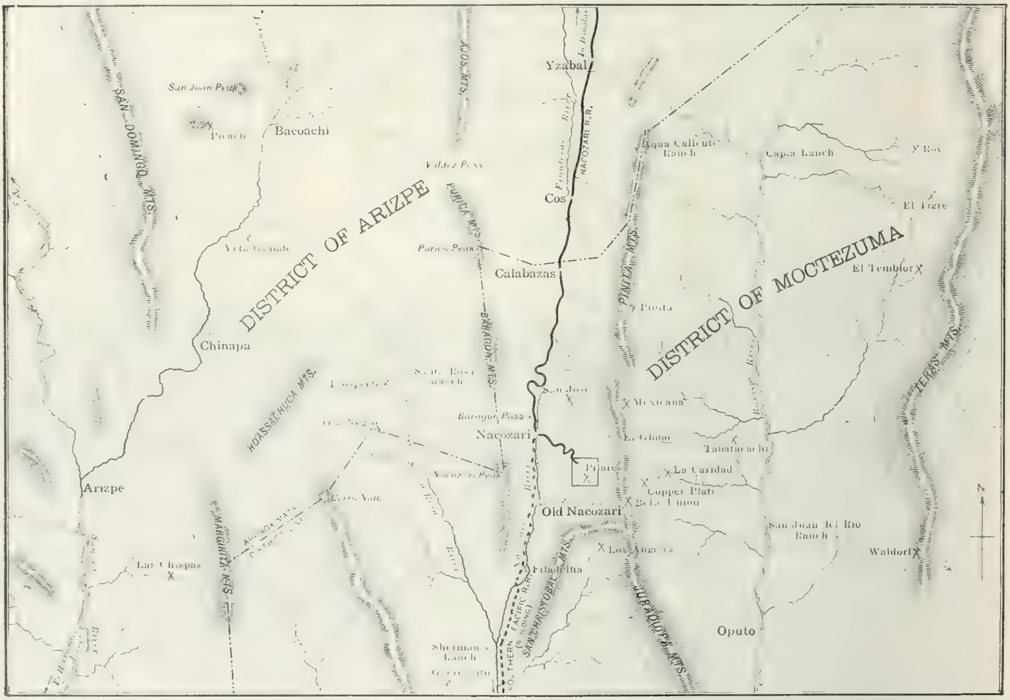
PILARES MINING CAMP, [illegible]

---

*Mining engineer, Nacozari, Sonora, Mex.

lighting for the town and the mine while the other provides power for the new concentrator.

The narrow-gage railroad connecting the concentrators with the Pilares mine is laid with 85-lb. steel, and ballasted with slag and gravel. The rolling stock consists of two 50-ton Baldwin locomotives and 25- and 30-ton Ingoldsby side-dump reinforced-steel cars.



MAP OF THE MINERAL DISTRICTS AROUND NACOZARI, SONORA

Early Mining

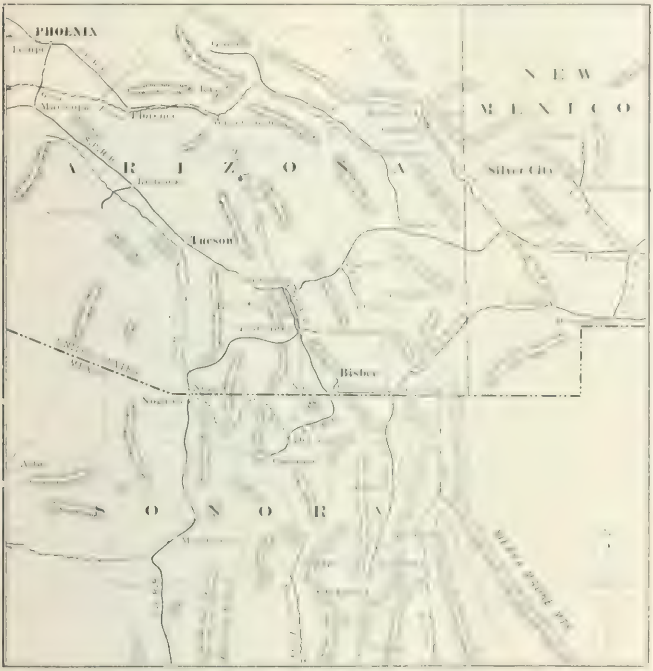
The earliest known mining in this section was done by the Spanish priests, whose records refer to work being prosecuted as long ago as the year 1600. Since that time it continued in a desultory fashion until the advent of the Americans in recent years. Some of the early writings that have come down to us through church records speak of the fabulous richness of the mines, the most noted of which was the Huacal, in which the bullion was supposed to have been walled up when the Indians made it too warm for the clergy. Humboldt speaks of having come up the Nacozari cañon and of hearing of this mine, but he did not visit it. However much or little truth there was in their accounts, the fact remains that except where water drove out the ancients, the "modèrnos" have thus far been unable to work successfully properties abandoned long ago. The smelter dumps which I have sampled never yielded more than a few ounces in silver. The arrástra dumps, however, show a higher value; old tailings have been shipped to the smelters with good results. The process used in the arrástras was very much like pan-amalgamation. The ancients do not seem to have used the patio to any extent, if at all. In their adobe smelters they worked the baser ores of silver and lead, but what method they used in parting these two metals is uncertain. The copper ores that have brought the camp into prominence in later years were avoided by the *antiguos* except when very rich in silver.

The Ore Deposits

For convenience in classification, without any particular reference to geological conditions the district may be divided into four general belts or mineral-bearing zones. The first and most important is on the line of the Pilares uplift and covers a large territory extending from a short distance east of Nacozari in a general southeast direction for about 10 miles. The second starts at a point about four miles north of Nacozari, near the railroad, and continues for about eight miles to a connection with the first belt. The third follows the general trend of the Nacozari mountains, starting at a point about 10 miles northwest of the town at the foot of the Purica range and continuing south for 10 or 12 miles. The fourth is a more or less isolated belt lying about 15 miles west of Nacozari on which work is being resumed after 20 years of somnolence. In addition, the districts of Tabotacachi and Cumpas may be included, which, while not in the Nacozari district proper, are dependent on the camp for materials and shipping facilities.

The Pilares uplift, as it is called locally, derives its name from the Pilares mine of the Moctezuma Copper Company which has attained the greatest development of any property in the Nacozari district. This property is opened to a depth of about 700 ft. below the crest of the ridge in which the orebodies apex, or to the 600-ft. level below the collar of the main shaft, besides a surface tunnel and a second shaft from the surface that is now being sunk below the 600-ft. level, the level of the Porvenir tunnel. From the railroad yards at the mouth of the tunnel to the Pilares shaft, a distance of about 5000 ft., the railroad cars are handled by motors which bring them to the chutes, where they are loaded and then taken back to the mouth of the tunnel to be transferred to the concentrator by the narrow-gage road.

The Pilares orebodies are worked on the "filled stope" method, the only timber used being that needed for chute mouths and shaft sets. The stopes, some of which cover as much as 30,000 sq.ft., are opened for their full extent and then back-stoped. Enough ore is drawn from the stopes to keep the back at a convenient distance for working, and the balance is left to be drawn off when the orebodies above have been worked out. All the men except the mine foremen and timbermen are Mexicans and the work is done on the contract system, the holes being pointed by the foremen and measured up and paid for according to the amount drilled and the character of the ground.



MAP OF SOUTHERN ARIZONA AND NORTHEAST SONORA

At intervals raises are run through the orebodies and down these the overflow of ore is shoveled to drop to the loading chutes at the tunnel level, or to be transferred to other chutes leading to this level, as the case may be. Under this system the probable cost of the ore per ton at the mouth of the tunnel is about 1.60 pesos.

ORIGIN OF THE ORE

In an article in the JOURNAL of Dec. 8, 1906, Professor Emmons says in regard to the geological conditions at the Pilares mine: "The rock forming the groundmass of Paulina hill is a fine-grained andesite very much altered. It forms, in a great part, an eruptive breccia in which the matrix and inclosing fragments are of the same material, and it often shows a distinctly bedded structure. The ore is essentially a breccia of which pyrite, chalcopyrite and quartz constitute the original cementing material, for, although much of the more massive material is impregnated with metallic sulphides, this impregnation has thus far proved commercially negligible. The primary ore minerals are pyrite and chalcopyrite, the products of secondary enrichment being bornite and chalcocite. The whole mass of Pilares mountain between the two shafts (a distance of about 2200 ft.) is more or less impregnated with ore, although not always of a grade that will pay to work under existing circumstances."

Professor Emmons accredits the formation of the ore or its zone of greatest enrichment to the presence of two fault planes, one running north and south and the other running east and west, the two intersecting about 30 ft. east of the shaft. In this hypothesis he is borne out, I believe, by Doctor Ricketts.

No development work has been done below the tunnel, but diamond drills have explored the country to a depth of something like 1000 ft. below this level. What the results were are not known except to the company officials, but since the concentrator was started after the diamond drill work had been finished, it is reasonable to suppose that results were satisfactory.

[illegible] PROPERTIES

The Pilares breccia next shows about a mile to the southeast in the workings of the Nacozari Consolidated Copper Company. This company is driving a crosscut tunnel to tap at depth the iron gossan showing in three places on the La Galera and Copper King claims. The company's main working tunnel is now in about 200 ft. and another 50 ft. will tap one of the silver-lead veins that traverse the country in a general east and west direction and lead into the Pilares breccia at the eastern termination. Until a few months ago no work had been done on the properties controlled by the Nacozari Consolidated Copper Company for nearly 20 years; then ore was shipped from the surface workings that carried 10 per cent. copper, 20 per cent. lead and 400 oz. silver.

West and southwest of this ground considerable work was done on the narrow stringers of high-grade lead-silver ore by both ancient and modern miners; but nothing of commercial importance has been developed. In this part of the district the best known properties are the San Pedro, the San Pablo, and the Moody. The San Pedro was recently leased by the Moctezuma Copper Company to Messrs. Ish, Camp, Alexander and associates, and ore is being extracted from between the 200- and 300-ft. levels. The San Pablo was worked a number of years ago, the ore being treated by lixiviation, but this did not prove a success and the mine has been closed since that time. The Moody was made the base of a stock company some time ago and work was prosecuted in a desultory fashion for a while, but nothing has been accomplished there. These silver-lead veins gain in size and in percentage of copper as they approach the Pilares uplift, but fall off correspondingly in their silver and lead contents.

The next property on which any work of interest has been done is the Bella Union lying about five miles southeast of the Pilares. This property has been worked only in the oxidized zone and the richer ores have been packed out by leasers.

About two miles to the south of the Bella Union the Los Angeles mine of the Arizona Mining and Trading Company has been developed to a depth of about 100 ft.; but water has proved a disturbing factor, and little of interest can be expected from this place until the mine is equipped to handle the flow. The ore body shows very little on the surface, but what drifting has been done gives promise of opening up a large deposit of ore. In this property the ore is as free from the gangue as the Pilares ore, but unlike that ore it comes in bunches of almost solid pyrite, chalcopyrite, zinc blende and galena, not intermixed to any extent and all carrying good proportions of silver.

To the north of the Bella Union is located the Copper Plate group on which some surface development has been done, and on which the showing strongly resembles that of the Pilares mine. About two miles east of the Copper Plate group the Caridad mine has been partially developed and several thousand tons of copper ore have been blocked out. The great tract of country covered by this Pilares uplift in the monzonite renders more than a mere mention of a few properties an absolute impossibility.

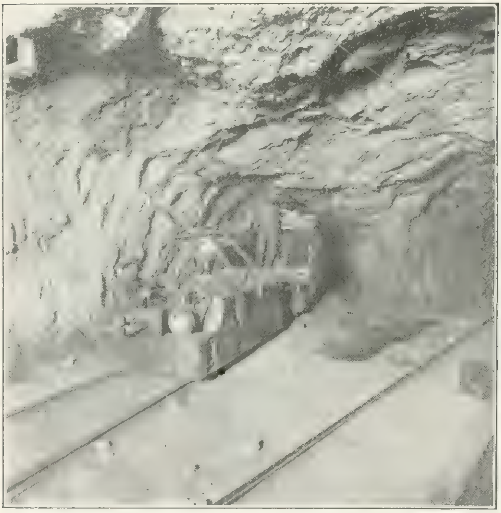
Second Mineral Belt

The second belt consists of a stretch of country about 10 miles long by one mile wide, of which the main mass is andesite of varying ages and accompanied by porphyry and diorite. This andesite is altered to a rock having the appearance of kaolin, in places traversed by seams of quartz and in others heavily impregnated with iron plainly discernable. In a few gashes and cross fissures the ores have been concentrated by surface action, and this action is also apparent in the dikes in places, but this does not follow the zones of silicification, it being rather the opposite. The ores in these places carry more gold than silver, and are accompanied by heavy oxide of iron. Such spots of enrichment are analogous to placer deposits, and have never gone to any depth, although productive of considerable ore running into the fancy figures.

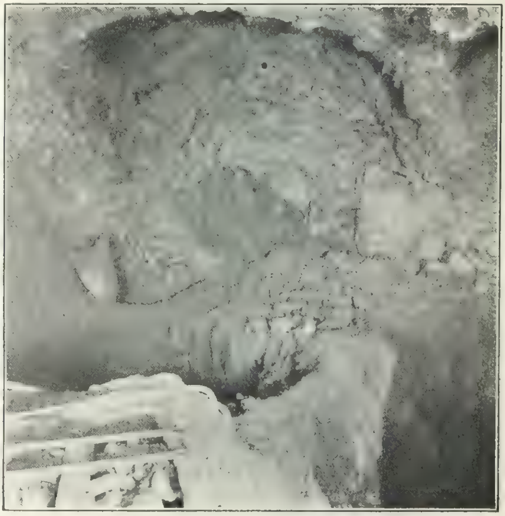
At the northwestern extremity of this belt is the Churunibabi mine of the Moctezuma Copper Company. This property was worked by the *antiguos* in years past, later by Suits & Riordan, and finally by the Moctezuma Copper Company, for its silicious ores. The property has been opened to the 500-ft. level where a heavy flow of water was struck; since that time work has been confined to the dumps and surface cuts. Development work on the mine has been limited to one of the three lodes traversing it, and in the opinion of those conversant with local conditions, it should still produce ore, probably far in excess of that mined in the past.

The next property of note to the southeast is the San José, now being worked by the San José Reduction Company, of Oakland, Cal. This property was originally worked by the ancients for the high-grade ore near the surface, and was taken up by Suits & Riordan about 10 years ago. They did considerable development work, opening up a large tonnage of $12 free-milling gold-silver rock, in addition to that extracted by them and treated in the old San Miguel mill. The property was sold to a French company who, after a period of mistakes during which they put a 10-stamp mill on the property, gave up work about seven years ago. The San José company took over the 13 claims, comprising the present property and covering about 180 acres, nearly a year ago. The addition of 15 stamps to the mill together with cyanide tanks to treat the ore crushed is reported to be planned for the immediate future. The orebodies have been opened on the vein for nearly 2000 ft., and to a depth in places of about 400 feet.

The next property now being worked in this belt on its southeast continuation is the La Mexicana mine, of the Dawson Mining Company. This property was lately taken over by the company which is now installing a 35-ton Lane slow-speed mill. Heretofore it has been worked by the Mexican owners who treated the ore in arrastras. The development on the property has not as yet attained a point which justifies a permanent reduction plant, but the ore is very evenly disseminated in a rhyolite dike upward of 5 ft. wide for a distance of about 600 ft. A shaft sunk on the vein for a depth of 75 ft. below the original outcrop shows high-grade milling ore carrying gold and silver, with no base metals.



MOTOR WITH LOADED TRAIN, PORVENIR TUNNEL



ORE CHUTE, PILARES MINE

Traversing the belt and running with it are numerous dikes of rhyolite of considerable strength and permanence, some of them being continuous on the surface for miles. They are accompanied in places of greatest silicification by lime spar, although this rule is not by any means absolute.

Gold and silver predominate in the ores of this portion of the district, the ores generally occurring in an oxidized state, although where the dikes have attained a structure approximating quartz the ores occur as sulphide. The ores are found in the dikes with no apparent regularity as to the position on the walls or in the ground mass. The dikes themselves, however, never lose their identity as rhyolite, for in their places of greatest enrichment the phenocrysts of alkali feldspar are

The last property before reaching the Gran Republico fault is the El Globo, where a 1300-ft. crosscut has been run into the hill to get under the surface workings above. This tunnel has 300 ft. yet to run, which will give it a depth of 1000 ft. below the outcrop. A gash vein or fissure in the rhyolite produced some ore in the upper workings, and the shaft at that point was sunk to a depth of about 380 ft. The property is equipped with a 15-

stamp mill with two Wilfley tables and cyanide tanks. It is connected by a 12-mile wagon road with the town of Nacozari. The mine is situated on a high hill known as the Huacal mountain, the main mass of which is andesite traversed by rhyolite dikes in which the flow lines are plainly discernable.

[illegible]

VANNER FLOOR AND CALLOW SCREENS, MOCTEZUMA MILL, NACOZARI

THIRD MINERAL BELT

The third belt has received very little attention as yet, the work consisting mainly of prospect holes sunk by the owners of the ground. At its north extremity some development has been done in an isolated body of andesite that has produced high-grade galena ores carrying considerable silver, but the formation is very open, and until the permanent zone is reached it will be impossible to say what can be expected. On the contact between the andesite and granite some isolated bunches of silver sulphides have been found that carry as high as 8000 oz. in silver and 80 oz. in gold, and a tunnel now being run to tap this contact at depth on the Gran Luz claim will be watched with much interest. For some distance to the south of this portion of the belt the formation consists of lime and granite or syenite that has thus far yielded no permanent mineral, although along the contact the surface is copper-stained in places. Continuing to the south and almost due west of Nacozari, several large denouncements have been made by the Calumet & Arizona Mining Company and others. Work has been confined to surface tunnels and shafts, but nothing of a permanent nature has been done. Diamond drills are now in transit, and work will be instituted shortly with them on the Isabel property of C. N. Lindley. To the south of these properties and on the east slope of old Nacozari mountain the formation changes again to lime and granite; in this belt considerable work has been done from ancient to modern times on the Fortuna mine of the Moctezuma Copper Company. The ore is very base, carrying copper and silver with considerable zinc. The property is now being worked by leasers.

South of this belt some work has been done in the andesite by the Filadelfia Mining Company. The work consists of a tunnel driven in from the level of the Nacozari river on an impregnation of the andesite by sulphides of copper and iron. This property covers a lime andesite contact and promises to be of much importance in the future. The Moctezuma Copper Company is also preparing to do some work in this section on a concession that has still two years to run.

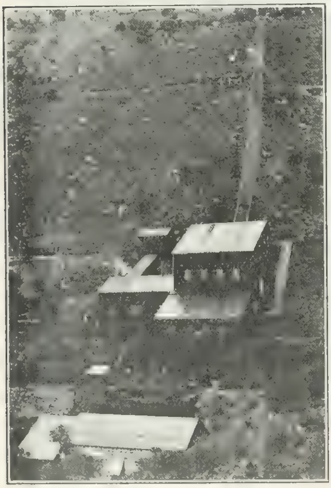
The fourth portion of the district which I have mentioned as lying about 15 miles [illegible] of Nacozari has no direct connection with the rest of the district. About [illegible] years ago the district was worked by [illegible] and associates, and the ores partly treated there and partly shipped to Benson, Ariz. The district takes its name from the principal mine worked at [illegible]. The ores were worked for their silver, and carried also lead, iron and zinc with some silica. These ores did not adapt themselves to the chlorination process installed there, and in the face of the transportation difficulties work was stopped, and the mines allowed to revert to the government. A few months ago the mines were re-denounced by Dr. L. L. Miner and associates [illegible] with good results and the prospects of an early resumption of the former activities in that section are very bright. The veins are fissures in the andesite and are con[illegible] acterized by step faults, but the ore shoots [illegible] and they can be easily traced on the surface.

[illegible]

[illegible] Tabotacachi district has shown considerable activity in the past 18 months, but the fall in the price of copper gave this section a setback from which it has not entirely recovered. The Tabotacachi [illegible] about one car per month of silver-copper [illegible] curs in a fissure in the newer andesites and has been opened to a depth of about 350 ft., from which point the shaft is being driven to the 500-ft. level. The Aliso, Credo Liberal and San Ignacio mines [illegible] the upper or oxidized zone in which they resemble the Tabotacachi mine. In the Antigua and Texas mines a considerable tonnage of copper-iron sulphides, carrying [illegible] has not been worked since the drop in the price of copper.

With the exception of the Belen mine operations in the Cumpas district are at the present confined to development work. The companies affected by this condition are the Transvaal Copper Mining Company and the Minneapolis Copper Company. The Transvaal company has the largest territory and its plant includes a 100-ton smelter at Cumpas. The Belen Mining Company has continued shipments of silver-copper ore to El Paso, and another class of ore, running high in silver and bismuth, has been forwarded to Swansea, Wales, via Liverpool. A Medbery furnace to treat the low-grade ores has been installed, but the power plant is being rebuilt and until that has been completed the adaptibility of the furnace will be uncertain.

The district surrounding the camp of Nacozari is the transition period when modern methods have but recently replaced the "gambucino" work of the early prospector. That there have been "mistakes" here as in all other mining camps is painfully evident, but where work has been done in an intelligent manner the results have been uniformly good. Labor and physical conditions are good, and the two great bugaboos of Mexican mining in the eyes of the average investor, the Yaqui and the law, are absent in the first instance and fair to foreign capital in the second. In addition to the broad campaign of development instituted at the Pilares mine by the Phelps-Dodge interests, that company is prosecuting work on other of its holdings in the district and acquiring new ground; while the field representatives of many other American and foreign companies have given the camp favorable consideration. Taken all in all, while it is yet too soon to predict the future of the district, the possibilities of the section surrounding Nacozari compare favorably with those of the more developed portions of the Southwest.



EL GLOBO MILL AND INCLINED TRAMWAY

Transvaal Mining Notes

Special Correspondence

The most noteworthy individual declaration of gold production for the month of July is that of the newly amalgamated East Rand Proprietary, which records the unexampled yield of £213,852—an increase of £13,083 over June returns, when the members of this group registered their outputs separately. A new producer will appear upon the list in August in the Aurora West, whose full mill has been started up after a long term of inactivity.

The Luipaardsvlei Estate, the leading exponent of heavy stamp practice, established a new crushing record in July. With 60 stamps and three tube mills in operation, it treated 17,120 tons—equivalent to 9.52 tons per stamp per day.

At a meeting of the Swaziland Mining and Commercial Chamber, held at Mbabane recently, the president referred optimistically to the marked development in mining which had taken place during the last fiscal year. Operations are still conducted on a small scale, but like many other outside districts, the country has witnessed a considerable increase of activity by syndicates working for mine rather than stock-exchange profits. The president observed that whereas in the preceding year only one gold and one tin mine were producing, during the last 12 months there were three batteries at work on gold quartz, one more was being constructed and three ventures were exporting tin. These concerns were responsible for gold to the value of $65,000 and 535 tons of tin ore, realizing $245,000 in all.

During the last year or so, the South African Association of Engineers, suffering from lack of support more strongly forthcoming in good times, has been criticized as almost moribund. The other societies have been able, working on more practical and less highly scientific lines, to maintain a keener interest in their proceedings. The inaugural address of the new president, E. T. Laschinger, and the discussion on papers read at the meeting last week, however, foreshadow an immediate future of more active utility and incline one to anticipate with some regret the possible amalgamation of an independent organization of such fine traditions with a society even as worthy as the Institute of Mechanical Engineers. Under the presidency of such men as Hennen Jennings, T. Reunert, the late Major Seymour and H. H. Webb, the South African Association of Engineers has seen prosperous days; but because it has largely devoted its attention to matters of primary concern to consulting engineers—civil and mining—its field has appealed but little to the general technical public, constituting the backbone of less exclusive societies.

Mr. Laschinger suggested that mining topics might most beneficially be given more thorough attention in the debates. He remarked upon the noteworthy fact that whereas metallurgical problems were so adequately thrashed out locally, mining papers of importance more frequently made their first appearance in the technical press of England and the United States, or were read before societies outside the country. This fact was the more regrettable in view of the wide scope for valuable discussions, for mining, even on the Rand's regular formation, cannot be conducted successfully on unvariable rules, but by trusting to the "alert judgment of the man on the spot" and not under any general system elaborated for him. The new president furthermore laid stress upon the educational value of writing reports, which so speedily result in revealing to the compiler the directions in which deficiencies of knowledge most urgently call for further investigation and study

Estimation of High Furnace Temperatures

The various methods of estimating the temperature in furnaces have been studied by Dr. H. T. Barnes, of the McGill University, Montreal, (*Journ.* Soc. Chem Ind., July 15, 1908, p. 661). As the result of these studies he states that the only satisfactory instruments for measuring high temperatures are optical pyrometers. These are of two kinds: Those which depend on color estimation, such as the Wanner, and those which depend on the measurement of the total radiation, such as the Féry pyrometer. These instruments extend in range from a low red heat up to the temperature of the sun, or 6000 deg. C. For the latter instrument, recording devices are available, similar to those used with the thermo-electric pyrometer.

It may be said in general, that for very high temperatures, from 2000 deg F. upward, the only really reliable instrument is the optical pyrometer. For a commercial instrument reading from 2600 deg. downward to about 300 deg. or 400 deg. F., the thermo-electric pyrometer, such as the Bristol, is the most serviceable. For work below 500 deg. F. down to the temperature of liquid air, no instrument can compare with the electrical resistance pyrometer. As a standard over the whole range of temperature up to 2200 deg. F., the resistance pyrometer is recommended as the best.

Hacienda Buburon, an Old Mexican Silver Mill

Primitive Crushing and Grinding Appliances in the Guanajuato District, Predecessors of the Stamp and Tube Mills of the Modern Cyanide Plant

BY MARK R. LAMB

One hundred years ago the Hacienda Buburon was among the most prosperous of the scores of similar plants in the neighborhood of Guanajuato. It was the nearest to La Luz by several miles, and the owner had that advantage in purchasing ores. The La Luz ores were much desired, for they contained much gold, and this was not paid for at a very high rate, since the patio process could recover only a small part of it.

HACIENDA BUBURON, AN OLD MEXICAN SILVER [illegible] PLANT

The accompanying illustration of the plant shows it located near what is now a dry river, but in the old days the river ran the year around. Note that the lower water-wheel is half buried in gravel. Whatever water is now in the river flows under this gravel, fathoms deep. The flume which conveyed the power water to the plant is visible crossing a gulch back of the *hacienda.* The water ran first over a wheel in the upper end of the inclosure. The wheel is 30 ft. in diameter and furnished power for 12 heavy (for those days) stamps and also for 10 arrastras. Next the water was conducted to the second wheel of the same size which drove 12 stamps and five arrástras. A third wheel [illegible] the present level of the river. Below the level of these are buried 12 large settlers, which were rope-driven, where the last [illegible] amalgam was recovered.

The third wheel was direct connected to [illegible].

Method of Treatment

To follow the course of the ore through the plant we must begin at the upper left-hand [illegible] of the inclosure in front of the watch-tower. The ore came in under a strong guard, for Guanajuato was noted in those days for its bold bandits. Conditions were as they were in Goldfield not long ago. Ore and bullion would be stolen [illegible] neighbor with no questions asked. In this upper inclosure the ore was broken roughly by hand. From the small heaps of ore still on the ground it is estimated that before being fed to the stamps the ore would pass 1-in. mesh. It was then put in a bin back of the first battery preparatory to fine crushing.

Part of the coarse ore was crushed in a curious cast-iron breaker before being fed to the battery. This breaker was none too strong, so instead of being rigid it [illegible] weight [illegible]. If the ore was particularly hard, or a hammer was dropped into the breaker the weight would lift and thus relieve the strain on the jaw.

"Of course, the breaker would work thus," the old man about the place told me, "even if it were not an accident; so when no one was near, the boys feeding the breaker would compete in throwing the weight."

The stamps of battery No. 1 are oak timbers about 4 in. square. There was a foot-board near the top of the stems and handles by which they were lifted by hand for repairs. These stems were fitted with cast-iron shoes, none of which remain. The wearing part of the shoes was 1 in. thick and was cast with a rough socket into which each stem had to be fitted. The stamps drop on a cast-iron block 8 in. wide, 6 in. thick, and long enough to [illegible] have been placed once for all and never to have been renewed. Battery No. 1 was driven by a rope from the first water-wheel. The [illegible] diameter; it has a key way its full length and [illegible] ranged to give a 1-2-3-4-5-6 sequence of drop. A rounded block of oak set in the end of each arm engaged an oak pin set into the stem. No arrangement was made to shift the tappets for wear. Perhaps there was no wear. Battery No. 2 has a cast-iron drum for a cam-shaft provided with similar sockets for retaining the oak cams. This seems to be an intermediate type between the log cam-shaft used in the *really old* mills, and the shaft on battery No. 1; so I have concluded that the shaft and cams of the latter were of the very latest type.

---

*Mining engineer, Mexico, D. F., Mexico.

TWELVE-STAMP BATTERY, ROPE DRIVEN

POWER DRIVEN ARRASTRAS

POWER WHEEL AND PUMP PINION

WATER WHEEL, STAMPS AND ARRASTRAS

A LEISURELY PROCESS

The batteries were operated with no inclosing mortar, and crushed dry. Horizontal screens of punched rawhide were arranged on both sides of the die. The holes in this were less than 0.25 in. The battery-man would feed from one side for a time, meanwhile scratching the screen with a little wooden rake and tossing the over-size back on the die. While he was on one side the other screen would be accumulating a pile of crushed rock, so he alternated between the screens. Since the capacity of the mill of 12 stamps was 2400 lb. per day the job was not very strenuous.

The crushed ore was then fed in charges into the arrástras, and enough water was added to make a thick pulp. After considerable grinding this pulp was sprinkled slowly, thoroughly and minutely with *pella de cobre*, a sort of silver and copper amalgam. The man having this work in charge would work down the row of arrástras riding on one of the slow-moving grinding stones while sprinkling the amalgam into the pulp with great care. Notched drag-arms were arranged to prevent the drag-stones from working to the center. This method of grinding was particularly suitable for this method of amalgamation, for no iron was added to the charge, and at the same time any desired degree of fineness could be attained. A large portion of the metal was caught in the quiet parts of the bed of this grinder, and with silver ores the amalgam, as it came from the corners and crevices, was worth $5 per lb. With ores containing gold this value was increased, as the gold saved was all caught here. Guard-houses were placed at each end of the rows of arrástras, as the amalgam was easily stolen. In those days little note was taken of an occasional shooting in the *haciendas*.

Careful and continuous tests were made separately of the pulp in each mill, and as soon as the reaction between the copper amalgam and the silver mineral was practically complete, the pulp was discharged into settling pits to drain and dry. Several of these pits are seen at the left of the general view. After drying to a thick mud, the pulp was drawn to the patio and there *castigado*. The proper reagents were added and the mass worked over by droves of mules walking around through it for perhaps a month. Sampling was continuous and washing and testing samples to ascertain the condition of the torta was a vital necessity. It might get "hot" when lime would be added; or it might get "cold" when more iron and copper salts would be needed. In Guanajuato the drivers of the mules were obliged to walk, but in Pachuca, where the weather is much colder in winter, they were permitted to ride.

From the patio, after the amalgamation and treatment of the ore was complete, the pulp was fed into a series of agitators and thinned with water. The amalgam settled out and the tailings overflowed to the river. Even these tailings have a slight value, and were sold to men skilled in concentration; they built *planillas* near the tailings outlet and washed out the last possible grain of *polvillo*. This concentrate was worked over on a very small scale exactly as a *patio torta*, except that roasting preceded amalgamation.

The patio of this plant is under gravel, and only a few inches of the top of the high boundary wall now show above the surface of the sand in the center of the present river bed. Although there was a roof over the entire plant, nothing is now left of it but the supporting walls and pillars.

Mining in Mexico, Past and Present

Spanish Search for the Precious Metals. Early Methods of Mining and Reducing Ores, and Their Results. The Mexican Miner, His Work

BY E. A. H. TAYS*

Within a very few years after Cortez had conquered the country surrounding the present City of Mexico the Spanish had overrun the greater part of the American continent south of the northern boundary of the United States. The prime motive for this extensive exploration, accompanied always with the greatest hardship, danger and privation, was not to add new lands to the Spanish domain, nor to spread the knowledge of the Christian religion among the natives. It was greed for wealth, and the reason the explorations were so extensive and carried out practically within 30 years—much of it within 15 years—after the first landing of the Spaniard, was due to the fact that the wily natives early recognized that the Spaniard's whole desire was wealth, and having had a taste of his methods in the conquest of the valley of Mexico, they told the conqueror fairy tales of "El Dorados," which the Spaniard always found to be farther ahead, and thus he was led by a mythical ignis fatuus far up into the desert north seeking wealth—gold and silver.

MACONI, LOOKING TOWARD EL DOCTOR MINE

OLD SPANISH [illegible]

Search for the Precious Metals

So great was the Spaniard's greed for silver, and so relentless his methods of enslaving the natives, forcing them to work the mines when found, that to this day no true Indian will show anyone a mine; the superstitious belief is that the Indian who makes known the location of a mine will die. It is very easy to follow back the reasoning to its source.

Though Mexico has vast natural agricultural and allied resources, still it is and will be, for years to come, essentially a mining country; and although millions in bullion have been produced, the beginning is only just at hand.

The early Spaniard, and his descendants, were very thorough in their search for the precious metals, and though, undoubtedly, many new mines will be discovered, nevertheless it is remarkable that few of the latest bonanzas today show no signs of a former visit.

There is a standard tradition in Mexico today which the local sage always applies to the discovery of any celebrated ore producer in his section. As this tradition goes, either some *arrieros* stopped for the night, or some lone traveler was forced by the darkness to make his camp fire on the spot, and in the morning found the rocks under or near the fire covered with pellets of silver. I know of one authentic case of a valuable mine being discovered in a somewhat similar way in recent years; but in this case, the Grageda mine in western Chihuahua, a dead oak tree was set afire and several days afterward the parties, by chance, overturned some projecting rocks on the spot, and breaking one, found it to be silver ore.

[illegible] was discovered in a simple way. On top of the hill, now known as "El [illegible] croppings to build a goat corral. In the thirties a party of packers on the way to Guadalupe y Calvo, in Chihuahua, passing by, noticed the corral was made of quartz rock, and one of them, picking up a piece, was surprised to find it well spotted with gold. Here was discovered the [illegible] which gave birth to the camp, although Mina Grande is an unworked prospect today.

One of the favorite superstitions in regard to mines and buried treasure, and one religiously believed in by the native Mexican to this day, is, that where either exists, flames will arise from the spot at certain times of the year.

Early Mining

In the early days mining operations were carried on in the most primitive way. As there was no hoisting machinery but the primitive *malacate*, a horse windlass, few shafts were [illegible], and where horizontal adits were impracticable, the [illegible] from 5 to 30 ft. [illegible] distance, usually on an incline. This method was sometimes carried to respectable depths.

Although [illegible]

---

*Mining engineer, San Blas, Sinaloa, Mex.

usual, nevertheless there are several in the Guanajuato district that are marvels, when we take into consideration the methods by which they were sunk. Take, for instance, the Valenciana, 1800 ft. deep, with an octagonal section 28 ft. in diameter, sunk with black powder and all material hoisted by horse windlass equipped with rawhide ropes and leather buckets. The idea of making it octagonal was with the view of placing a hoist at each of the eight sides.

MINERS AND TANATEROS AT A MEXICAN MINE, 10 YEARS AGO

Later, in the last half of the nineteenth century, four steam hoists were placed at this shaft and these were operated up to 15 or 20 years ago.

On the west coast, up to 20 years ago a vertical shaft was almost unknown, but this, in part, was due to the nature of the country, which lends itself to exploration by adits. In fact, so few are the shafts, that I have had trouble in getting men to work in a shaft sunk but 250 ft. The same fellows, who would crouch down in the bucket, at first, when lowered, a little later on would be found coming up four at a time on a loaded bucket, and would fail to comprehend orders to the contrary.

In early days, and not very far back either, such a thing as a windlass on a winze or a wheelbarrow in a stope or level, were unknown. All waste and ore were taken to the surface on men's backs, in leather bags called *tanates* or *zurrones*, and the laborer performing this work is called a *tanatero*.

They start in as very small boys, when they can hardly carry 25 lb. and are called *buques*, and work by degrees up to a load of 150 lb. The ordinary grown *tanatero* will climb up vertical ladders, on the *pozo y patilla* order—steps of 20 to 30 ft.—several hundred feet. I call to mind one mine where ore was, up to a few years ago, carried up a 1000-ft. shaft on a 36-deg. angle. An electric hoist now does that work.

ARRASTRES RUN BY WATER POWER

Close Working in Former Mines

On account of the crude methods of mining the modern foreigner usually thinks that only the richest of ores could have been worked; but he does not take into account that the dominant class in Mexico, from the conquest up to 20 years ago, had the Indian, the native, practically enslaved, and all such work cost but little. This is the reason for the present belief that all old mines, the *antiguas* as they are called, found abandoned have only to be cleaned out to continue profitable production. Such may often prove to be the case, but the mines have seldom been abandoned because the native could not work the ore on account of its low grade. Usually the reason has been lack of ore, or of values in the ore. Faulting is often the cause, as this natural phenomenon was little understood in early days.

As an illustration of what grade of ore the native of today sometimes works, I will give a personal reminiscence. A few years ago while traveling in the mountains of eastern Sinaloa, in an out-of-the-way gulch I stopped at a little camp composed of two or three huts. As I saw five arrastres being operated on the arroyo's edge, run by burro power, I made inquiries and from the result of these took a look at the ledge from which the ore was taken. This was a fine quartz ledge fully 5 ft. wide and had been worked by open trench, along its outcrop, for 500 or 600 ft., and to a depth of 50 ft. in places. I liked the looks of the ledge so much that I took several samples from the working faces.

I found that the miner with four sons was working the ledge, the output of the five burro-driven arrastres being about two tons per week. He told me that in the rainy season he planted a little corn and in the dry season worked the mine, from which he took 250 to 300 pesos each season, which supplied the family with clothes, etc. My assays, made later, showed that the ore carried but a little over $5 gold per ton. Not much picking in this for the scientific foreigner.

Ore Stealing

One of the great troubles in working high-grade ores in Mexico is the prevalence of high-grading. The native miner does not look on this as stealing. Any rich ore encountered he figures on as his. I have often had them say, in telling of some special find in a stope where they might be working, in a mine not their own, "y Dios me dio"—and God gave me. The nugget they, of course, purloined. They show great ingenuity in getting away with the ore, even when working naked in the mine and being searched on coming out. In a large mine where there is more or less rich ore the loss is considerable. Imprisonment has no horrors for the native miner. The only thing I have ever found that seemed to affect them, and which cut the evil down greatly, was black-listing them. Anyone found with ore on his person or otherwise was black-listed, and, as far as that mine was concerned, was never given work again. I have had fellows beg, with tears in their eyes, to be allowed to return to work. When others found out that the black-list really meant that they would never be employed again, the stealing notably diminished.

"Follow your ore," seemed to be the motto of the *antiguos,* and it is a good one to follow to-day; but the old methods are not to be recommended. I know of a mine, several in fact, that for a number of years produced large sums—a million a year—that never had $100,000 worth of ore actually available at one time.

The Patio Process

Mexico has the honor of having to the credit of one of its sons, Bartolomé de Medina, the invention of the first practical treatment for silver ores. This was the patio process, invented in Pachuca in 1557. This was the standard method of treating silver ores, not smelted, for 300 years.

Then the Comstock came into being, and to an American was due the invention of the pan-amalgamation process, which so modified the old patio process that where the old way took days, the new cut it down to hours.

Smelting Silver Ores

In early days Mexico had made advances in smelting silver-lead ores in a small way; and one often runs across adobe stacks—by courtesy—in which quite creditable work was done. Refining is done almost universally, even today, in the well known *vaso.* I have seen a furnace, running day and night, where man power was used for the blast. The power was applied with the foot supplemented with the weight of the body. Relays were every two hours.

The Spaniard early learned to use a unique water compressor which furnished pressure enough to give sufficient blast. I have seen a number of these old compressor towers in different parts of Mexico, but none on the west coast.

Change in Methods

Up to a few years ago the *tahona de arrastre*—arrastra, as contracted into English—was the universal grinder in Mexico for treating gold ores. Some of these were run by water power. But from a modern viewpoint they were of small capacity at best, though efficient amalgamators.

Great changes have taken place within the last 10 years, and, although the native mine operator was at first slow to make changes, the object lessons given him by the foreign operator were speedily learned. I call to mind an illustration of the conservative ideas of the native mine-owner. Some years ago an American engineer was putting in a small stamp mill for a Mexican miner in western Chihuahua. When about finished the engineer asked old Don Martin if he should not arrange for an assay office. "An assay office!" the old man exclaimed, "What do I want of that?" "So as to know how your ores are running," replied the engineer. "No," said the old man, "that would show me what I was losing, and that would make me mad. No, I do not want an assay office."

Sentiment of this nature is dying out, and in the past few years Mexico has made great changes for the better, and some of the largest and most scientific plants are to be found in Mexico. The pan mill replaced the patio process, and now cyanide practice promises to make them both obsolete. Smelting is carried on along the most advanced lines, and the day of the arrastra and the man-blast furnace is about done.

[illegible] AT TRES SANTOS

Native Miners

The native miner is a curious study. He is hospitable and improvident, superstitious and reckless; is in fact a fatalist. He will work hard, and when treated properly, responds by a frank adherence to his *patron,* though in the mine he will rob him blind; but then, finds of that kind are God given, according to his reasoning, and that is not stealing.

[illegible] "Today" is their motto, and all kinds of games are rife at a live Mexican camp, and from two to three bands of music can always be counted on, for our man revels in a Roman holiday, and he weaves many in with those of [illegible].

Railroads and Changes

Modern railway lines are now being run in unaccustomed parts, and within a very short time it will be possible to build mining and reduction plants as well and cheaply as elsewhere, and the day when the freight on the plant was more than its cost is fast disappearing.

Silver Cyaniding in Mexico

By [illegible]*

The price of silver has reached a point where the successful and economical operation of small properties, or those that contain large bodies of low-grade ore, cannot be operated at a profit. In the opinion of some the solution of the difficulty lies in seeking greater efficiency in extracting the metal from the ore and in reducing costs of production, rather than in awaiting the time when silver will rise in value, and remain more or less constantly at higher figures.

Now that the cyanide process has been applied to the extraction of silver as well as gold, a far larger supply of silver produced at a lower cost than has formerly been practicable will reach the market. Hence, since the price of silver, unlike that of gold, is regulated slowly by the supply and demand, the properties which will be successful in the future will be those which can produce silver at the lowest cost. The problem is, therefore, one for the metallurgists to solve. By more efficient methods, more automatic appliances, better applied chemistry, they will make the production of silver at a lower cost possible. While silver at 52c. per oz. is today looked upon by some companies as too low for successful operation, it may be that in the course of the next year or so, this price will mean good profits for companies employing modern methods.

The production of cheaper silver may be accomplished either by reducing costs or by increasing extraction.

Mining Costs.

In Mexico the cost of mining is largely governed by local conditions, such as distance from railroad, class of labor obtainable in the district, and, last but by no means least, the executive ability and experience of the man in charge of operations. The manager's ability to get the best results from the native labor employed, his experience along the lines of labor-saving devices, his capacity for meeting and overcoming difficulties as they arise, and his ability to distinguish the difference between true and false economy, will often make the difference between the high or low cost per ton of ore mined. A mine superintendent in Mexico has very often to rely entirely on his own resources, especially in small mines where he may be the only white man employed.

It is a very common mistake in mining operations in Mexico to ignore the fact that because labor is cheap it does not necessarily follow that it can be used indiscriminately. Frequently manual labor is used for all kinds of odd jobs simply because labor is cheap. The labor bill thus incurred, although spread over a large number of names, becomes of considerable importance when added to the weekly total. Besides, the larger the number of men employed, the greater the trouble of keeping the work going, especially on Sundays and on fiesta days. Another practice followed in some mines in Mexico, which from a theoretical point of view is good, is the system of piece-work, in particular of paying for drill holes at so much a meter or part of a meter drilled. This method, although economical in mines where white shift-bosses are employed, becomes dangerous where Mexican *cabos* measure the holes. The *cabos* or native shift-bosses are apt to "stand in" with the miners. In these cases it is better to contract by the meter driven or sunk rather than by the hole measured.

---

*[illegible] Mexico.

RAPID CYANIDING BY AGITATION AND AERATION

It has been proved by a number of practical tests carried out during the past six months, that on clean silver-sulphide ores obtained from various silver camps in Mexico it is possible to obtain 93 to 97 per cent. extraction, in a period ranging from 36 to 48 hours in place of the 14 to 21 days' treatment as now practiced. Not only was the extraction obtained in a much shorter time, but in the majority of cases the results were obtained without preliminary concentration. This apparently opens up a new field for silver cyaniding, which will play a considerable part in lowering costs of production of the metal. The tests were all made upon lots of 100 kg. of ore. Each test was made separately and the results were checked. In every case the ore was treated without preliminary concentration, and in each case the tailings after cyaniding were concentrated. With the exception of two cases, the results obtained by concentrating were negative. Two lots of ore showed an extraction by concentration of 1.8 and 2 per cent. of the total silver in the ore. The consumption of cyanide was normal in all cases with the exception of two lots of old dump ore, which contained a considerable amount of ferrous salts. Considerable difficulty was experienced in completely washing out the soluble metal contained in the pulp in the large sample used for the purposes of the concentration test. In some cases the tailings obtained after concentration were of greater value than the tailings resulting from the cyanide treatment.

Hours of Agitation	Assay in Grams		Total per Cent Extraction	
	Silver.	Gold.	Silver.	Gold.
0	1215	4.5		
6	136	0.5	88.8	88.8
12	102	0.5	91.5	88.8
18	64	0.25	94.7	94.4
24	81	0.5	93.3	88.8
30	49	0.5	95.9	88.8
36	46	trace	96.6	
42	46	trace	96.6	
48	37	trace	96.9	

A lot consisting of 100 kg. of ore from the San Rafael mine, Pachuca, and containing 1215 grams silver and 4.5 grams gold was ground to 150 mesh and treated by agitation for 48 hours. At intervals of six hours the pulp was assayed with the result shown in the accompanying table.

The cyanide solution extracted in all 1178 grams silver and 4.49 grams gold, representing a total extraction of 97.3 per cent. of the value of the metals. The strength of the solution before treatment was 0.38 per cent. and after treatment 0.33 per cent, representing a consumption of one kilogram cyanide per ton of ore. The amount of lead accetate added amounted to 30 grams.

The essential factors in this method of rapid cyaniding are: (1) Fine grinding of the ore so that at least 85 per cent. of the sand will pass a 200-mesh screen, and that all will pass a 150-mesh screen; (2) complete agitation and aëration of the pulp in cyanide solution. By complete agitation and aëration is meant the most complete aëration and agitation known at the present day. To accomplish this, it will be necessary to use the air-lift principle in deep tanks of small diameter, such as are at present in use in the Pachuca camp.

This agitation can be accomplished with a consumption of 1¾ h.p. per tank containing 100 tons of solids, mixed with cyanide solution in the proportion of two of solution to one of solids. From 10 to 15 h.p. are required for mechanical agitation. Hence there is a great saving in the power used, as well as a considerable gain in the extraction. These tanks, I understand, are in use in New Zealand where F. C. Brown, their inventor, has them installed at the Grand Junction mine at Waihi. Extremely good results are obtained there from their operation. There are two installations of these tanks at Pachuca, Mexico, five being installed at the Hacienda de San Francisco, and ten at the new mill of the San Raphael y Anexas at the same place.

The third requirement in this method of treatment is the most efficient slime filters at present available. The successful slime filter to cope with conditions, such as a plant of this nature calls for, will be one that will thoroughly displace the dissolved silver contained with moisture in the cake. This can only be done when the washes are entirely barren.

ELECTRIC PRECIPITATION

Another point, which though not essential to the working of the process may yet require serious consideration, especially as applied to silver cyaniding is the use of electric precipitation instead of the zinc-shaving precipitation now generally used. As far as I know the electric precipitation has been mostly used in the past on ores that carry chiefly gold, and but comparatively little work has been done on these lines in the cyaniding of silver ores. The mines of C. Butters at Minas Prietas and Creston Colorado have been using this process for some time, with good success. When it is borne in mind that for every kilogram of silver recovered in the usual method, there is a consumption of zinc ranging according to conditions from 1½ to 3 kg. and estimating zinc shavings to be worth 55c. per kg. we have a cost per kilogram of bullion won, of from 77c. to 1. Taking a 65-peso silver ore containing 500 grams of silver, the charge for zinc per ton of ore treated (eliminating the loss due to non-extraction) would be 38.5 to 82.5 cents. This is a strong argument in favor of electric precipitation, the cost of which is about 24c. per ton of ore. The costs of electric precipitation will vary according to the price of power.

Another point in favor of electric precipitation is that the solutions cannot become charged with the double cyanide of zinc, an important point when cyaniding fairly high grade silver ores.

Spanish Mineral Exports

Exports of ores and minerals from Spain for the seven months ended July 31 are reported by the *Revista Minera* as below, in metric tons:

	1907.	1908.	Changes.
Iron ore	5,438,205	4,624,424	D. 813,781
Copper ore	780,256	711,722	D. 68,534
Zinc ore	95,822	65,087	D. 30,735
Lead ore	3,918	1,941	D. 1,977
Manganese ore	50,943	13,191	D. 37,752
Pyrites	772,010	873,883	I. 101,873
Salt	309,607	393,781	I. 84,174

The large decreases in iron ore and the other metallic ores are further indications of the general depression in business throughout Europe. The British ironmasters, as a rule, draw largely on Spain for their ores, but this year have much reduced their purchases.

Exports of metals for the seven months were as follows, in metric tons:

	1907.	1908.	Changes.
Pig and manu. iron	32,946	18,283	D. 14,663
Copper	4,477	6,508	I. 2,031
Copper precipitate	9,650	12,928	I. 3.278
Zinc	765	812	I. 47
Lead	107,113	110,055	I. 2,942
Quicksilver	1,482	1,491	I. 9

Unlike ores, the metal exports generally show an increase in quantity.

Gold in New Zealand

The Mines Department reports the exports of gold in May at 45,017 oz. bullion, a decrease of 10,668 oz. from May, 1907. For the five months ended May 31, the total was 199,772 oz. bullion in 1907, and 207,399 oz. in 1908; an increase of 7627 oz. The bullion reported this year was equal to $3,977,596, or 192,433 oz. fine gold.

Silver exports in May were 265,450 oz. in 1907, and 164,635 oz. in 1908; a decrease of 100,815 oz. this year.

Guanajuato, the Great Silver Camp of Mexico

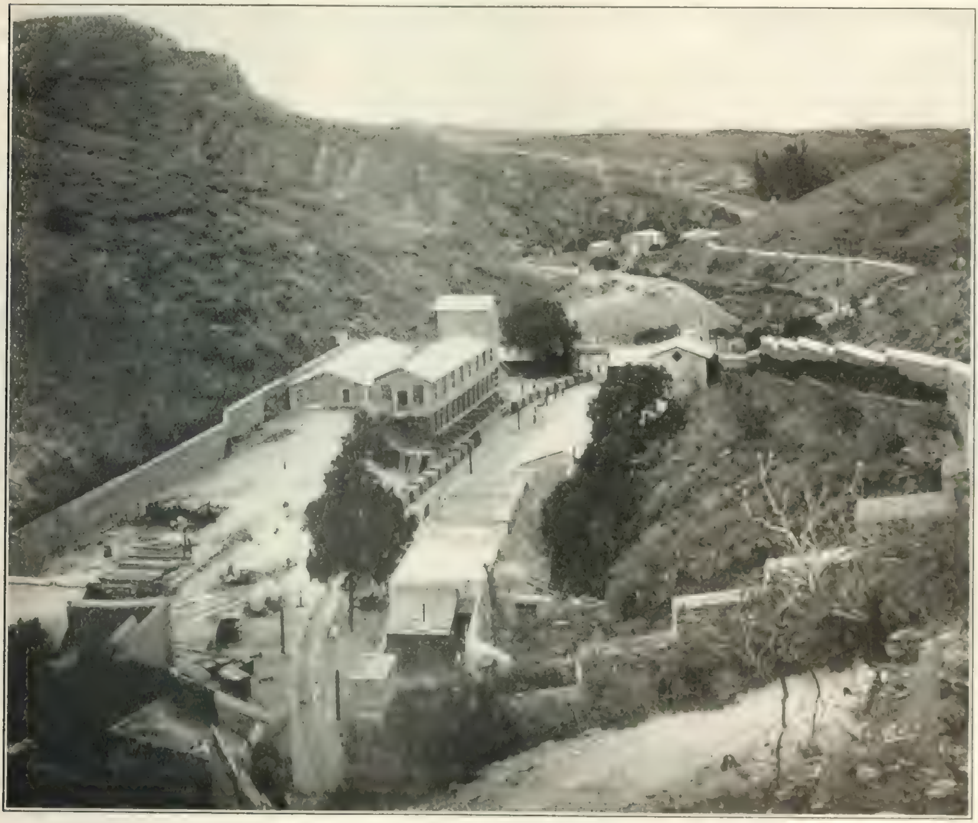
Ore Now Milled Comes Mainly from Dumps, but the Mine Tonnage Is Increasing and the Veta Madre Mines Are Being Reopened

BY CLAUDE T. RICE

The city of Guanajuato, which has a population of about 45,000, is situated on the short branch of the Mexican Central that leaves the main line at Silao.

The magnificent churches, offerings of pious miners, the beautiful public buildings and residences, and the quaint old surroundings make Guanajuato probably the most picturesque mining city in Mexico. It was the first city that Hidalgo's forces took in the war of independence. This war killed mining at Guanajuato and other mining camps during the years that it lasted. When mining resumed, it was English capital at Guanajuato, Pachuca, El Oro and Zacatecas that reopened many of the best mines.

Guanajuato is situated in a gulch below the meeting of several other gulches. The whole country is steep and rugged. After a heavy rain the streams in these gulches suddenly become torrents; consequently the city has been visited by several disastrous floods, the last of which occurred July 1, 1905. Since that time the Porfirio Diaz tunnel, 2000 ft. long and more than [illegible] in diameter, has been driven to carry sudden rushes of water through it and away from the town.



THE [illegible] AT THE SIRENA MINE, GUANAJUATO

THE MINES OF THE DISTRICT

The ore in the mines of Guanajuato has been very rich; the mines have produced immensely; many men have become rich and have been ennobled on account of the bonanzas found along the Veta Madre. [illegible] The production of the mines has been enormous, [illegible] present. As a result Guanajuato is the most advertised mining district in Mexico. The drop in the price of silver has done a good and thorough [illegible] the grain from the chaff and several companies have shut down, leaving the Guanajuato Consolidated Mining and Milling Company, the Guanajuato Development Company, the Guanajuato Mines and Reduction Company and the Guanajuato Amalgamated Gold Mines Company, composing the solid companies of the camp.

[illegible]

a development of the past: only one new lode—the Carmen-Pinguico vein—has been found and developed in recent years. The other companies are working the old properties mined years ago, for the cyanide process and electric power have rendered valuable ore that formerly would not pay for working.

Nothing is more tedious than unwatering and putting in shape a large mine that has been shut down for years, and the mines of Guanajuato have been slow in resuming production. The Sirena mine of the Guanajuato Consolidated, as it was the first to be re-opened and as it was not as extensively worked in the past as some of the others, is now in good working order. The Guanajuato Consolidated and the Pinguico Mines Company, a subsidiary company of the Guanajuato Development Company, are treating mine ore, but much, if not most of the ore treated at the other properties comes from the dumps. Many of the companies have been equipped with more stamps than the development warranted and so there has been continual scratching in the mines to keep ahead of the mills.

CITY OF GUANAJUATO AND SURROUNDING COUNTRY FROM THE SOUTHWEST

History

Ore was first discovered at Guanajuato in 1548 by some muleteers on their way to Zacatecas. The ore was found in La Luz, the western part of the district, and the San Bernabé mine was opened up. Two years later Juan de Rayas, a mule-driver, discovered the Veta Madre and gave his name to the Rayas mine. Work was started on the Rayas and the Mellada mines at the same time, April, 1550, so that these are the oldest mines on the Veta Madre. But it was not until 1768 that the ore was traced far enough to the northward to find the rich ore in the Valenciana.

During the eighteenth century the Veta Madre mines were the scene of most of the mining, and many men were ennobled on account of the richness of the ore-bodies found in the Valenciana, Cata and Rayas mines. The Sirena mine also produced a large amount of ore, but the Sirena, although having a far more glorious present than the others, was not so conspicuous in the past. From 1810 to 1829 the mines of Guanajuato did not produce much ore. About 1843 the veins at La Luz began to produce heavily.

About 1825 the Anglo-Mexican Company and the United Mexican Mining Company, both English, entered the district, but they seem to have left little impression on the camp. The Anglo-Mexican company worked the Valenciana, Concepcion, and other mines; the United Mexican worked the Rayas, the Secho, the Cata, and other mines, and even as late as 1881 paid a dividend from ore mined in the San Cayetano adit. These two were the only foreign companies that had operated in the district prior to 1898 when the Guanajuato Consolidated Mining and Milling Company entered the district, which was then practically dead.

Production

The production of Guanajuato is estimated by a government publication to have been 279,000,000 pesos from 1701 to 1800, and from 1800 to 1900, 231,137,013 pesos. The most productive years in the history of Guanajuato have been 1791, 1804, 1849, 1850 and 1852. The first period is the time when the Valenciana was making its largest production, and the last three years, those during which La Luz and the San José de los Muchachos mines were producing bonanza ore.

From 1852 until 1898 the output slowly declined as the extraction from the ore by the patio process decreased. In 1898 it consisted mainly of *gambucino* work in a few of the larger mines. The *patios*, which were situated along the river between Guanajuato and Marfil, ran fairly continuously during the summer months, for then the extraction was greater than during colder weather, but in winter they ran only occasionally. Most of the mines were owned by Mexicans, who were also interested in the *haciendas*. In fact 12 years ago, when M. E. MacDonald began to work the Sirena mine, there were only 30 to 35 *patios* making any pretence at working. The ore, that the Mexicans were treating in the *patio*, assayed about 30 oz. silver and 0.4 to 0.5 oz. gold per ton, for, while some of the larger *haciendas* could treat ore at 13.50 pesos, at many of them the cost was 17.50 pesos. Ore that assayed much higher than this was shipped; at that time the shipped ore amounted to about 1000 metric tons per month.

Modern Operations

In 1896 or 1897 the MacDonalds entered the district; in 1898 the Guanajuato Consolidated Mining and Milling Company, organized by them, purchased the old Sirena mine. They erected a pan-amalgamation mill to treat the ore. This and the small Nayal mill were the only pan-amalgamation mills in the district.

The awakening in the district came in 1905 when the success of cyanidation of the ore was proved. Experiments by E. M. Hamilton of Chas. Butters & Co., had demonstrated in 1902 the feasibility of cyaniding the ore; but even with the experience gained at El Oro, where considerable silver occurs in the ore, and the experience of cyaniding Comstock ore, which also carries considerable silver, the Consolidated company continued to treat the ore by pan-amalgamation and retained its mill in readiness for running until the success of the cyanide process was clearly proved. In 1906 and 1907 several mills were built in the district; all retain the old sand and slime treatment, although gradually an all-sliming process is being approached.

Geology

The geology of the district has been the subject of much study, and each investigator appears to come to some new conclusion either regarding the age or the origin of the rocks.

The rocks forming most of the mineralized area which extends 13 miles northwest-southwest and to [illegible] southwest are argillaceous schists, slates, and calcareous conglomerates. The schists vary in color greatly, being yellowish green, gray or red. The deepest member of the series is generally a black slate. These sediments have all been greatly folded.

According to the older theory, after this folding there was the formation of a large thickness of red agglomerate generally called locally a conglomerate, which in many places has a strike between north 30 and north 40 deg. west, with a dip varying from 10 to 40 deg. toward the northeast. In the upper part of the red agglomerate in La Luz part of the district was intruded a granite laccolith. Younger than the red agglomerate are the rhyolite and rhyolite breccias, while later than the rhyolite is a capping of andesite and andesitic breccia.

According to the newer theory worked out by C. W. Botsford, who has studied the geology of the district more closely than anyone else, and indorsed by John A. Church, the agglomerates and schists are of the same age, the schists being merely a propylitic alteration of the agglomerates. This alteration has been more thorough in the lower part of the agglomerates than in the upper part. Taken together, the thickness of these agglomerates and schists is over 3000 ft.[1]

The main direction of fracturing at Guanajuato has a strike varying between north 30 and north 60 deg. west with a dip varying between 45 and 75 deg. to the southwest, rarely to the northeast. The main veins were formed along this system. A less important system was developed at right angles to these; only rarely has much ore formed along these fractures.

Ore Zones

There are three main ore zones at Guanajuato, the Veta Madre in the center, the Sierra system on the east, and La Luz system on the west. The Veta Madre is the most important, while La Luz is next in importance.

The Veta Madre is an immense vein about three miles long and from 20 to 300 ft. wide; it has a general northwest strike and dips from 45 to 55 deg. to the southwest. The hanging wall of the fissure has been dropped more than 1000 ft. Along most of its length both walls are the red agglomerate; at depth this changes to the schists, and at still greater depth black slate forms the footwall. The ore occurs in three zones: one near the hanging wall, one near the footwall, and one in the center; sometimes one occurs, sometimes two; rarely the ore extends from wall to wall. The richest ore is found just below the intersection of cross-veins and fractures on the hanging-wall side. The most productive area of the Veta Madre has been from the Rayas to the Valenciana mine.

The veins of the Sierra system occur in schists, rhyolites, and rhyolite breccias. Those of La Luz district occur in schists with a capping of granite, the fissures being comparatively barren in the granite.

The veins in the district are characterized by a peculiar form of ore deposit called *ramaléos*, consisting of brecciated wall rock laced together with stringers of quartz. The *ramaléo* often extends to a considerable distance from the ore. Between the Veta Madre and La Luz vein systems there are several smaller veins, especially near the hanging wall of the Veta Madre.

The Pinguico vein is one of the peculiar features of the district. This vein is capped by the andesite; the fissure extends into the capping andesite, but the ore did not appear in it until a depth of 250 ft. was reached below the contact of the andesite with the rhyolite inclosing the vein. The capping andesite is 680 ft. deep. This vein was discovered in 1903, being traced from the neighboring Carmen mine where the andesite capping has been eroded. The upper [illegible] of the [illegible] matter cemented with moist clay forming a pasty ore hard to mill. In depth this ore has become harder and more closely resembles the ore in the other mines. John A. Church suggests that this vein in the hanging wall of the Veta Madre has bled the southern portion of the Veta Madre as the Comstock vein did the Virginia vein at Virginia City, Nevada. The strike of the Pinguico vein is north [illegible]

GUANAJUATO, [illegible]

The Ore

The vein minerals are argentite, stephanite, pyrite, and polybasite in a quartz gangue; galena, sphalerite and chalcopyrite also occur, but that rarely. Proustite is frequently found in La Luz mines. Native gold is sometimes found in some La Luz mines and in those of the Sierra system. The mine richest in gold in the Guanajuato district is the San Nicholas del Monte of the Sierra system. The quartz occurs amorphous and crystalline; frequently it is amethystine; calcite sometimes occurs in the ore in considerable quantity, especially at the Jesus Maria mine at La Luz, where in some parts of the mine there is more calcite than silica in the ore.

The ratio of gold to silver varies considerably in the different veins. In the Jesus Maria mine the ore at present mined is worth $6 per ton, 58 per cent. being in gold. In the Peregrina mine the ratio is 13 silver to 1 gold. At the Sirena mine the ore at present mined after 15 per cent waste has been sorted out averages 13 oz silver and 0.057 oz. gold per ton, or 228 parts silver to 1 part gold. In the Pin[illegible] to 1.

[illegible]

[illegible] Helpers on piston drills per 10-hour shift, 2 pesos; hand drillers, 1.50, shovelers, 0.75; skipmen, 1.25; timbermen, 1.25; helpers, 0.75; trackmen, [illegible] sharpeners on hand steel, 2.50; on machine steel, 3; helpers, 1.50; carmen, 1; motormen on electric locomotives, 1.75; conductors, 1.75; hoistmen, per 8-hour shift, 1.50 to 2 pesos. Peons on surface get 50 to 75 centavos. The machinemen on large machines work on contract and average about 3 pesos per day.

---

[1] For full discussion of the geology of Guanajuato, see the JOURNAL, April 14 and 21, 1904, Nov 24, 1906; July 20 and 27, 1907.

GENERAL CONCLUSIONS

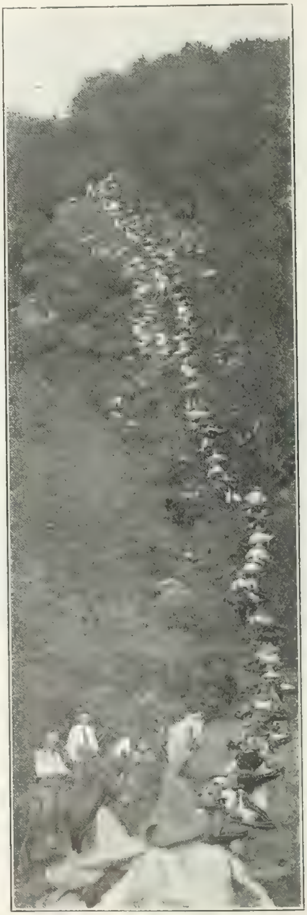
Guanajuato has had a great past; it has proved the success of cyaniding silver ores, and from being a decadent camp only five years ago it has become one of the foremost active silver camps in Mexico. Most of the ore treated since the revival has come from the dumps, but the mines are being unwatered and developed rapidly, and the tonnage coming from them is daily increasing. The great problem of the wet metallurgy of silver ores has been successfully solved and now it remains to improve the mining methods. Joseph MacDonald, formerly in charge of the Alaska-Treadwell mine in Alaska, is manager for the Guanajuato Consolidated Company, and Cortlandt E. Palmer has been directing the operations of the Guanajuato Development Company since April, 1908. Mr. Palmer has already reduced the cost of mining and has increased the tonnage mined at that company's properties by modernizing the mining methods. With the example of such men the mining methods of the other companies will be given the study that heretofore has been given to the metallurgy of the ores. The room for improvement lies more at the mines than at the mills.

Guanajuato has a good source of electric power at reasonable cost; the walls of the veins are strong so that little timber is required in mining the ore; water is plentiful for milling, if not over-abundant, and fortunately, the mines along the Veta Madre and other veins do not drain each other; labor is plentiful and of a good quality, except in regard to its ability with the hammer. But the more extended use of air-hammer drills will solve this weakness in the labor, and render it possible to use ore-filled stopes in mining, for that method seems to be the one best adapted to mining the large orebodies of the district.

The forming-up of 1⅛-in. octagonal steel into a 2½-in. star bit is condemned by W. E. Kimber (*Journ.* Transvaal Inst. Mech. Eng., May, 1908). He states that this staving-up does not improve the steel and, further, that it is expensive. Instead, he recommends the use of cheap steel for the shank and a piece of good cruciform steel, 9 in. long, welded on for the bit. The saving in the cost of the cheap steel almost pays for the welding. As the steel when it becomes too short for starters (2 ft. long) must be welded, he thinks that it is as well to do the welding first as last.

Packing 13,000 Feet of Steel Cable Over a Mountain Trail

The long file of peons shown in the accompanying illustration is a section of the procession of 350 men who packed 13,000 ft. of steel cable from a point on the Inter-oceanic railroad, a distance of 5½ kilometers over a mountain trail to the Chignautla limestone quarry of the Teziutlan Copper Company in Mexico at a cost of $90. Although in the photograph the men, each bearing a coil of the cable, appear to be deployed along a fairly steep ascent, the trail selected by Cyrus Robinson, the engineer in charge, was practically level. The quarry, the upper terminal of the tramway for which the cable is to be used, lies immediately beyond the ridge which the men seem to be climbing.



PEONS CARRYING STEEL CABLE

The country in that part of Mexico is far from level and the trail necessarily had several curves and difficult twists where a dozen or more men might easily have been swept into the arroyo had the speed of the different parts of the long file not been carefully regulated. To prevent mishaps of this kind and also to avoid injury to the cable, the men were carefully organized before the march began. The peons were taught to preserve their proper distance and each ten men were under command of a *cabo*. A single pistol shot was the signal for starting and two shots ordered a stop. The entire operation was completed without the slightest mishap.

The tramway, of which this cable forms a part will deliver limestone from the quarry into the bins of the new smelting works now in process of construction at Teziutlan. The upper terminal is at an altitude of 7800 ft. and the smelter bins have an elevation of 5200 ft.; 1800 ft. of this drop occurs in the upper 4000 ft. of the line. Owing to the steep inclination (30 deg. at the upper end) no friction grips can be used; only solid grips are to be employed.

The tramway is a Leschen automatic and has a capacity of 20 tons per hour. There are 34 all-steel towers and the longest span is 1500 ft. The towers are mounted upon concrete foundations, and the steel will be protected from the weather by a coat of asphalt paint. One man will be detailed to devote his entire time to inspecting and painting these towers. When he has finished painting at one end of the line he will begin at the other and continue indefinitely.

Rhodesian Production

Gold production in July was 54,237 oz. fine; the largest monthly output ever reported. For the seven months ended July 31, the total was 351,545 oz. fine gold, or $7,266,435. The total reported for the seven months in 1907, was 346,046 oz.; but no comparison can be made, as the returns last year were made in bullion, and this year in fine gold.

Other production reported in July was: 28,151 oz. silver; 115 tons lead; 8 tons copper; 617 tons chrome ore; 5 tons asbestos. This is the first time asbestos has appeared in the returns. Coal mined was 9158 tons.

According to Consul-General Michael, of Calcutta, the output of amber in 1907 by the mines of Burma was 2½ tons, valued at $1920. These mines are situated in the administered territory of the Myitkyina. The output of the year previous was 216½ cwt., valued at $3543. Amber mining in Burma is reported not to be a paying business. The average value of amber in Burma is $43 per cwt., which is higher by $8 or $9 than the price of last year.

South Staffordshire Method of Mining Coal

Circular Brick-lined Shafts with Rope Guides Are in Common Use, and One Hoisting Engine Drum Sometimes Serves Two Shafts

BY LUCIUS W. MAYER*

Typical operation of the South Staffordshire method of working a thick coal seam was first observed at the Sandwell Park colliery. This mine is located in the heart of the South Staffordshire district, the county of Staffordshire, known as "Staffs." The nearest town to the colliery is Smethwick, which is on the northeastern road from Birmingham, some 10 miles distant.

Birmingham is the fourth largest city in England and is located in the northwest corner of Warwickshire. It is known for its eminence as a manufacturing town for the production of all kinds of iron, brass, and metallic wares; coming after Manchester in importance as an industrial center. Passing from Birmingham to the northwest, there is a succession of iron manufacturing towns, and coal mines are seen continuously along the route, which shortly passes into Staffordshire county. The district is locally called the "black country," but the atmosphere and surroundings hardly bear out the fairness of this name.

Some of the largest coal plants in the country are located in this vicinity, and recent new discoveries of extensive coal beds have brought in capital for the erection of high-class plants, typical of the English policy in regard to permanency. The coal bed in this district is generally known as the 10-yd. seam, though this thickness is not general. At the Sandwell colliery, for example, the average thickness approaches 14 feet.

To summarize the method of mining in a general way, it may be stated that roads are usually driven out to the boundary, and the operation of mining is accomplished on the retreat on a series of blocks of coal, which are separated one from the other by ribs or narrow pillars of coal. Within these ribs, small, square pillars are left for the support of the roof. The first work is done in the bottom 6 ft. of coal, and the top coal is won by cutting what are known as spurs into the roof between the pillars; in this way the coal is brought down slice by slice with the assistance of light powder shots. This method is also used in certain parts of India, whence a number of South Staffordshire workmen have gone. There the roof and floor are of a hard sandstone.

THE SANDWELL PARK COLLIERY

At Sandwell Park, they have 10 ft. of material called "bind," which lies over the coal. Above this band are successive layers of red and gray sandstones with intervening coal seams and shales. Eighty yards from the surface is an unworked seam 3½ ft. thick, called "brooch," which has exceptional qualities for household purposes, and seems to bear similar characteristics to the comb coal at Watnall colliery.

The main coal is worked to a depth of approximately 1260 ft. at Sandwell. This is not a maximum for the district, where some very speedy hoists have been erected by the Allis-Frazers Company for lifts up to 2000 feet.

A general view of the Sandwell Park colliery is shown in Fig. 1. In this illustration, notice that cultivation does not seem to have suffered much as a result of the subsidence. The three pits, headframes of which are seen in the figure, are about 200 ft. from one another. Two of the shafts are downcasts. All three pits are circular and are brick lined throughout. The center head-frame is of steel design, being of latticed girders. It is 60 ft. high from base to sheave wheel shaft, 28 ft. center to center of legs, and 52 ft. from center of back-stay to near upright leg.

Rope guides are suspended in each of the shafts. Only three of the ropes are used for guides in each compartment, two on one side, and one in the center of the other side. These ropes are 1½-in. in diameter, and of single-wire strands. The ropes, which are weighted at the bottom of the shaft, are free to meet the changes of length induced by variance in temperatures. Within 15 ft. of the collar of the shaft, timber guides are placed which insure steady landing of the cage. Aside from the guide ropes on which the two cages run, the shaft is clear below the shoes above mentioned.

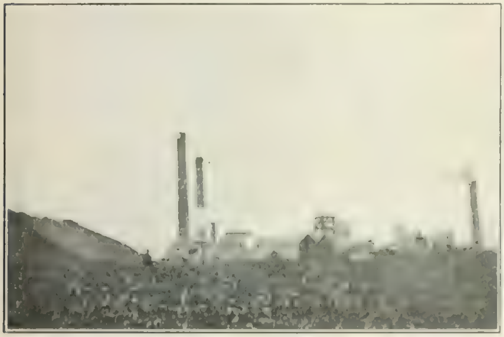


FIG. 1. GENERAL VIEW OF SANDWELL PARK COLLIERY

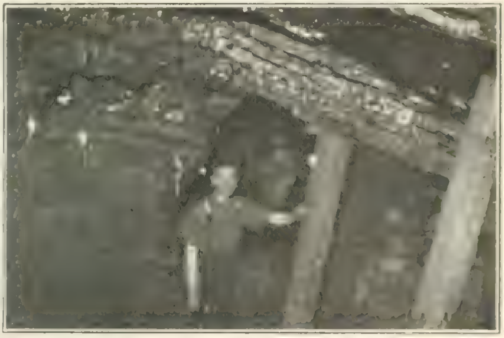


FIG. 2. EXTRACTION OF COAL IN BETWEEN THE PILLARS

Weights are not always used for keeping the ropes taut. In a deep shaft as much as 7 or 8 tons may be required to properly stretch and hold the rope. This involves more or less space, which may be objectionable where space is limited. A number of mechanical devices have been employed for holding the rope in place. It is, of course, extremely desirable that the ropes be held perfectly taut, and they should not twist. Accidents due to cages coming in contact with each other in the shaft during the flight are not unknown. The cage is a double-decker, each deck holding two cars end to end.

Catching Water in Shafts

The matter of dripping of water in the

---

*Mining engineer, 71 Broadway, New York City shafts has received careful attention in the South Staffordshire district. Water rings, or what are called "garlands," are set at intervals in the shaft. These act as receptacles for the water, which is conducted down the shaft from these reservoirs in small pipes, to join the body of mine water to be pumped.

There are a number of forms of water rings which are set to encircle the inner part of the shaft lining. The common form is simply a groove-like depression in an iron casting, which is set in the brick lining of the shaft. Above this the bricks are trimmed inward, so that the water in running down the lining is conducted to the groove, from whence it drains to a common point where a tube connects, and the water which has found its way into the groove is conducted down the shaft. This form, however, has not proved so desirable because of the accumulation of small particles of refuse necessitating a frequent cleaning out.

Another form of water ring often seen in the Staffordshire district appears to serve the purpose well. In sinking a circular shaft in moderately hard formation, what is known as a "curb" is placed at certain intervals in the course of the sinking work. This curb is simply an annulus which may be of timber or metal, and is divided into a number of segments which are fastened together to complete the circle. Timber laggings are fixed behind these curbs, which perform practically the same duties in circular shafts as regards holding the lagging in place as our square shaft sets do in America. It may be stated here that the square shafts are as rare in Europe as circular shafts are in America.

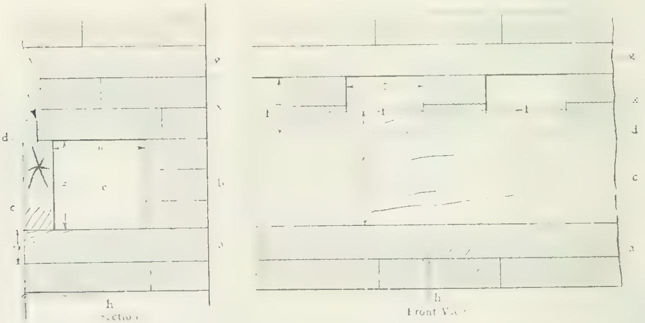


FIG. 3. GENERAL DETAILED METHOD OF CONSTRUCTING A CURB

The Construction of a Curb

Vertical stringers are placed between the curbs to act the same as our hangers. In setting these water accumulators, an ordinary curb is set in the usual manner, see Fig. 3. Two or three courses of brick are now set on the curb back as shown at *b*. A wooden piece *c*, made of flexible plank about 2x8 in. and having a ledge *d* cut on the top, is now set on end and nailed to the curb *a*. This is so arranged that the outer edge of lip *d* is flushed with the inner line of shaft.

Resting on this ledge *d*, and on the bricks *b* is set a series of bricks *x*. Thus an archway *e* is formed, in which space the water accumulates. These latter rows *x* are placed at intervals, leaving a space of 4 or 5 in., as shown by *f*, in Fig. 3. In this way the water coming down the shafts finds its way into the reservoir *e*. Above the rows *x* a second curb is placed; *d*, the top edge of which makes the original width to the lining, and the shaft from that point on, is again of the original inner diameter.

At *h* is shown the pipe, which is simply a small pipe for conducting the water from the reservoir down the shaft, either to the next garland, or else, if it is the last reservoir, to the sump. Behind the brickwork, ashes or puddled clay is packed, and all joints between the curb and the brickwork are made tight.

Steel Timbering at Sandwell

The prevalent use of steel underground was noticed, but as elsewhere, the use of this same material is more for girders than for any other purpose. It is generally used in England, usually to replace the timber caps only, wooden posts being retained.

Where heavy pressures have to be counteracted, the use of steel girders has proved economical; instances have been noted where timbers have had to be changed two or three times, within short intervals. The first cost of steel is, of course, much greater, but under certain conditions the final cost has been found to be less.

At Sandwell, steel is used considerably in the stations, and also on main haulageways. Where a side pressure is met, a shoe is shrunk on the beam at the point where the beam rests on the edge of the post. This shoe fits around the lower flange of the girder and butts up against the post. The girder often used weighs about 66 lb. per yard, and has a 4 to 5 in. web and flange. A one-half inch thickness of metal is used for an 8-in. span.

Controller Device

A device has been installed whereby the engineer on a haulage motor is restrained from throwing the controller at full speed in a sudden manner. On a motor controlling the haulage on an incline, the controller wheel was engaged with a thread gear so pitched that the movement of this screw effected only a gradual throwing out, or in, of the resistance. It was impossible for the engineer to move his controller with sufficient speed to cause a burning out of the motor. It was so arranged, however, that while the engineer could only throw out the resistance in a gradual manner, he could throw it on in its entirety at any moment, should a sudden stop be necessitated. In this way common labor could be employed at these stations, where formerly a more or less intelligent class was required.

It may be remembered that one of the chief features of the South Staffordshire mines to be reckoned with, is the gas, which rapidly accumulates in this formation. On this account, more than any other, perhaps, is due the system of mining whereby these rectangular sides of work are shut off one from the other in the progress of the work.

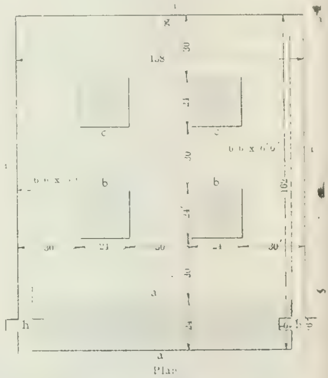


FIG. 4. SHOWING COAL SEAM AFTER FIRST STAGE HAS BEEN COMPLETED

In working the South Staffordshire beds there are three distinct stages of operation. The first is the getting of the coal in the manner previously described. The second is the winning of the coal in pillars and ribs, and the third is the recovery of coal left in the second stage. In the third stage, the work is carried on entirely through broken ground.

Many years may elapse between the operation of these various stages. The third stage, for example, may be an attack on a mine which has not been operated for 50 years, and where coal hitherto not of sufficient value, may now be extracted with profit.

That the South Staffordshire system of mining involves danger is beyond question. The number of accidents due to falls of roof is very large. The system requires a great amount of skill, and could not be successfully operated by miners acquainted only with the ordinary methods of mining coal. In this section the men have grown up with the system, and in spite of this, only the ablest men are employed in getting down the [illegible] coal.

Handling 30-foot Timbers

In a 30-ft. seam, about 24 ft. of coal will be brought down by dropping. Timbers sufficiently high to hold up this roof in working places, must naturally be employed, and the handling of timbers of 30 ft. hight in an expeditious manner is an art in itself.

There is no better evidence of the fulfilment of the duties of these timbers than seeing the roof fall as soon as they are removed. Fig. 4 shows a side of work, the first stage having been completed. The original roads are outlined by the dotted lines *i i i*, and are the ribs which encircle this work. Fig. 5 shows the pillars being formed and work of extraction in the intervals. The section on Fig. 5 shows the completed side of work before withdrawal of all timbers. Fig. 2 shows a similar condition as exists in the plan illustrated by Fig. 5.

The white cross to the left of the man's head in Fig. 2 shows the corner of a pillar, similarly as at *X*, in Fig. 6. Note the timbers supporting the upper coal. The photo was taken at a point shown at *f*, Fig. 6, where there was 20 ft. of space overhead, the roof having begun to destroy itself, following removal of timbers. In Fig. 2, above the white cross *X*, a spurn would be holed, and on removal of the timber seen in the illustration, a considerable amount of coal would be brought down with the aid of light shots.

Measures Anticipating Fire

To meet the constant exigencies of impending fire, sides of work are so arranged that they may be cut off at any time. As soon as fire breaks out, this particular side of work is abandoned, and cribs of timber are set in the places *h*, of Figs. 4 and 5. This cribbing is filled with bags of sand, and the district is shut off and placed out of communication with the circulating mine air currents. These pits are quite hot and dry. The men drink a peculiar kind of beer, which is brought to them at intervals. As shown in Fig. 2, the men often work stripped from the waist, but do not seem to suffer from the unusually warm conditions.

In gathering the coal to be loaded into the cars, shallow baskets are commonly used in this district. They are made of wicker work, or some light metal. Coal is raked into the basket by means of a short-handled wide-toothed rake, or with a scoop. It is claimed that with these baskets a man loads considerably more than he could with a shovel, especially where the floor is even. Certain it is that he makes fewer movements from the floor to the top of the car by this method, inasmuch as the baskets hold several shovelfuls.

[illegible]

With a view of investigating the second working of the South Staffordshire coal, the Delph colliery was visited. This is in the same district as Sandwell Park, near a place called Breattle Lane, on the Northwestern line.

In reviewing the first stage of work of the South Staffordshire method, the pillars are supposedly standing, but the roof between the pillars has now a tendency to fall, as practically all the timbers have been removed. The pillars are not necessarily the original size as cut in the first work, because very often an attempt is made to remove the pillars during this first work, though a complete removal is rarely effected. The ribs of coal would not be touched in the first working. Finally a condition of thoroughly packed areas exists around the pillars, as shown in Fig. 5. In the course of time this material solidifies to such an extent that the work of passing through it presents quite the same conditions as the original coal did, though this extreme condition does not obtain until the ground has been al[illegible] 20 or more years between the time of [illegible] all the timber is removed in the first working.

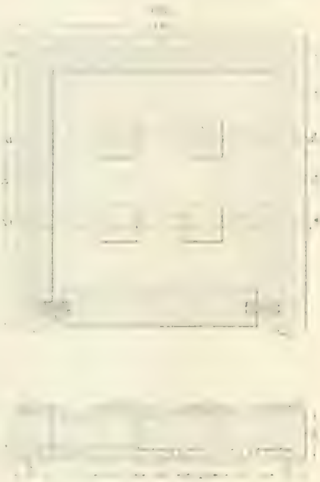


FIG. 5. [illegible] WITHDRAWAL OF ALL TIMBERS

To regain the ribs and pillars, roads $6\frac{1}{2}\times6\frac{1}{2}$ ft. are driven through the ribs, which latter are 24 to 30 ft. wide. When the back rib is met, roads are started and [illegible] Then working on the retreat, the operation of taking the rib is carried on. In the meantime, from the side ribs, roads are driven through the fallen ground to cut the point where it is known that the pillars or stumps are standing, though perhaps in more or less shattered condition.

The work of taking the rib of a pillar is then carried back. Pillars are removed in the ordinary way by undercutting, setting up posts, and finally, intelligent removal of the posts with ensuing fall of the coal from the upper part of the pillars.

[illegible]

In the Delph mine, coal was being mined 100 years ago, but then only the best of it was taken, so that now the work is largely the recovery of coal not marketable in those days, which at the present brings in a profit. At a lower level in the same property, clay is being mined, and is used for burning into bricks.

The coal seam is far from clean; there are innumerable bands of shale, etc., each of which is recognized by the natives and given a name. Where a band of stone becomes thick, the method of getting the coal is to first mine out under the stone band, support this roof with timber, and withdraw this timber after the coal in an area has been removed from under; now dropping this stone and standing on the fallen ground to attack the coal above.

The Top Fence

A very neat form of top fence is used. This is formed of two upright stepped posts, on which rest four boards. First, the longest board rests on the top of the posts; second, the next shorter rests on its step, etc. The vertical movement of these boards is governed by the light rope guide, which passes through holes at each end of the boards.

[illegible]

In the third stage of the South Staffordshire method of mining, the major part of the coal seam is practically drawn. The pillars have been removed as far as possible in the first and second stages, but there is considerable pay material left to [illegible] erate profit with reasonable outlay. The Parkhead colliery is located at Brierly Hill, a few miles from the seat of the Delph operations.

At this mine, the shafts are uncommonly close together. One hoisting engine drum serves both shafts, the balance being effective between the two cages. The purpose for having the drum outside in the hoist house appears to be to simplify construction, and economize on building material [illegible] house is required. It is not infrequent in South Staffordshire to see two shafts sev-[illegible] engine, which may be placed midway between the two shafts, the hoisting ropes being held in position at intervals by light timber frames and idler pulleys.

Underground Conditions

Conditions existing underground are a completely fallen roof, with roof coal in the goaf, also stumps of pillars and ribs. The drivages are entirely in loose ground.

A heading 6½x6½ ft. has been driven out to the limits of the property, and a small air course 4x4 ft. runs parallel to it. From these courses branch courses radiate, and the work is brought back each time to the main heading. Every 12 to 15 yd. a ventilating cross-heading is run. The branches are made only about 20 yd. long, and when all the ground is exploited, which has been blocked out in this manner by branch headings, another set of main headings are driven to the boundary, similar to the first, and the operation of driving branch headings from this main heading repeated, as well as the winning of the coal in this new area, until finally all the ground is worked out. Control of air circulation is quite difficult with means at hand, and in this case was extremely poor. The returns from this kind of work are not prodigious. The work is usually carried on by leasers, who, as a class, are not prone to elaborate outlay.

The air current in this particular mine is stimulated by the dropping of water down one shaft, a jet of steam being passed up the other. Ventilation is at its best very poor, and the presence of black damp was so noticeable during my visit that it was only with great difficulty that illumination could be maintained; certain working places could not be entered on this day. In driving through the loose ground, forespiling is resorted to.

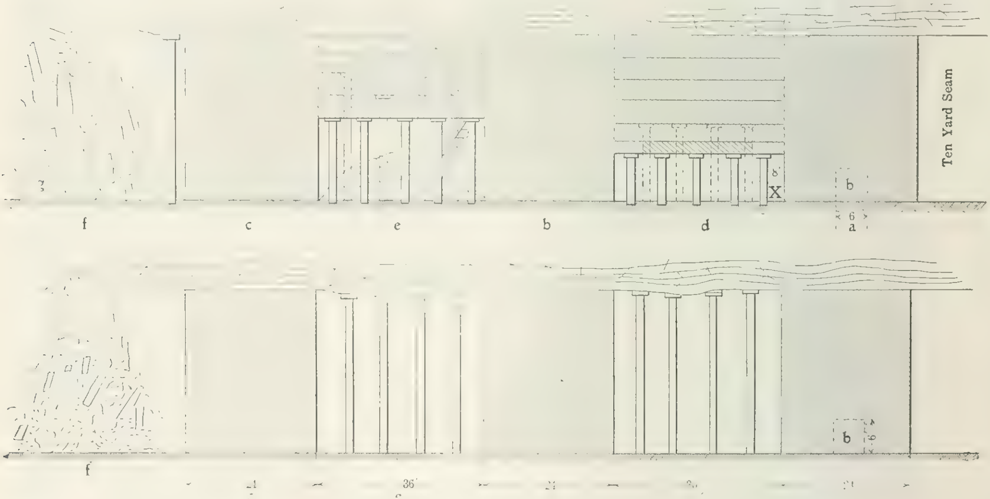


FIG. 6. TWO STAGES IN THE METHOD OF DROPPING COAL BY THE SOUTH STAFFORDSHIRE SYSTEM

Colliery Notes

A squeeze may sometimes be stopped by flushing the affected area with culm.

Leaving exposed places on an electric mine cable in order to make connections is a dangerous and objectionable practice.

When suspicious of the condition of a section of roof, examine the timber caps, as their condition is one of the best indications of roof disturbance.

Steel wire used in the manufacture of the best qualities of winding ropes has a breaking strength of from 100 to 120 tons per square inch of sectional area.

Twisted drills are recommended for putting down blasting holes, as the uneven surface left by these drills is an efficient aid in holding the stemming in place.

It is stated that silica bricks for use in the flue walls of coke ovens give better results than do the quartzite bricks generally used. Silica has the advantage of not being injured by the high heat required, and is also a better heat conductor than is quartzite.

Cage keeps tend to shorten the life of a rope, and occasion jerky strains. Tests carried on under working conditions have shown that with less than one foot of slack chain, the strain on the rope in picking up may sometimes be as much as three times the actual load.

When recapping a rope, which should be done three or four times a year, a length of rope not less than one-half of the circumference of the head-gear pulleys should be cut off with the old capping so that the excessive wear to which the rope is subjected may not become local.

Where low-pressure motors are used, shocks from live wires intentionally left exposed are comparatively frequent in consequence of the exaggerated idea of the harmless nature of the shocks produced by them. The practice of leaving these wires exposed is nevertheless a grave source of danger. They should be as carefully protected as the wires of high-pressure motors.

One of the safety cage devices favorably reported upon by the Transvaal commission is a device consisting of a steel cylinder containing liquefied carbonic-acid gas, which, in the event of the rope breaking, operates two rams or pistons working in other cylinders. These rams are designed to actuate brake-blocks which bear upon the rigid guides in the shaft and bring the cage to rest gradually.

In England, from 75 to 80 per cent. of the deaths resulting from colliery explosions have been found to be directly due to carbonic-oxide poisoning. The use of excessive quantities of explosives in poorly ventilated rooms often results in headache, listlessness, etc., in the miner, which is the result of a partial poisoning. Many explosives, particularly common blasting powder, produce a large amount of gas when fired; 40 per cent. of this gas is carbon monoxide.

Jerky winding with its sudden variations of strain on a rope, is due either to unskilful manipulation, to a wrongly proportioned engine, or to unsuitable controlling appliances on the engine. Even a skilful engineer cannot avoid jerking if the engine is wrongly proportioned. If it is not so proportioned that either cylinder can start the load with a reasonable rate of acceleration, there is a temptation to start with a run or jerk so as to overcome the dead center.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks, or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, was 40,800 copies.

October 3.............. 13,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials
  The Proposed Mexican Mining Law 677
  Mining in Mexico 677
  The Ely Companies.................... 677
  Freight Rates on Anthracite and Bituminous Coal .. 678
  The Use of Privately Owned Coal Cars 678
*Cyanidation of Silver Ores, Pachuca, Mexico *Claude T. Rice* [illegible]
Gold Dredging in French Guiana *Special Correspondence* [illegible]
Homestake Mining Company [illegible]
Cyanide Practice in Mexico *Special Correspondence* 654
Present Conditions of Mining in Mexico *Franklin Wheaton Smith* 655
The Scotch Shale Oil Industry 656
Effect of Borax in Assaying .. 656
Progress of the Dry-air Blast 656
Nacozari Mining District, Sonora, Mexico *B. E. Russell* 657
Transvaal Mining Notes *Special Correspondence* 662
Estimation of High Furnace Temperatures 662
*Hacienda Bustos, an Old Mexican Silver Mine *Mark R. Lamb* 663
*Mining in Mexico, Past and Present. *E. A. H. Tays* 665
Silver Cyaniding in Mexico *J. B. Empson* 667
Spanish Mineral Exports 668
Gold in New Zealand 668
*Guanajuato, the Great Silver Camp of Mexico .. *Claude T. Rice* 669
Packing 13,000 Feet of Steel Cable Over a Mountain Trail 672
Rhodesian Production 672
*South Staffordshire Method of Mining Coal *Lucius W. Mayer* 673
Colliery Notes .. 676
Correspondence
  Mexico's Proposed Mining Law. *S. J. Pease* 679
  The Proposed Mexican Mining Law *Faustino Roel* 680
  The Copper River District, Alaska. *R. Webster* 680
  Coal Mining in Southern Anthracite Field *General Superintendent* 680
  The Goldfield Consolidated Mill *Percy E. Barbour* 680
Iron Production in France 680
The Cyanide Correspondence Club of Mexico 681
Ancient Plants at Guanajuato, Mexico *Mark R. Lamb* 681
Chronology of Mining for September 681
Personals, Obituaries, Societies and Technical Schools 682
Special Correspondence 683
Mining News [illegible]
Markets, etc 690
Chemicals, Minerals, Rare Earths, etc [illegible]
Mining Index 696
*Illustrated.

The Proposed Mexican Mining Law

No question has been more earnestly debated in Mexico this year than the new mining law proposed by Señor Molina, the Secretary of Fomento, and there never was a more enlightening debate, serving to bring the pros and cons upon common ground. It has developed that the intention and effect of the proposed law are by no means so unjust to foreign corporations as was originally interpreted, being indeed only of the character that other self-respecting countries have enacted without protest. This is ably pointed out by several correspondents in this issue. Even the opposition of the influential *Mexican Herald* has ceased. On the other hand, the Government of Mexico has all along accepted the criticisms in an admirable spirit. It has sought by argument and logic to convince its opponents of the merits of its position and to a large extent has succeeded in so doing. At the same time it has given serious consideration to the sound objections that have been raised against the proposal and has signified its intention of so modifying the law that it will contain nothing inimical to foreign capital already invested in Mexico, or seeking investment there. This is a happy ending of what began as a bitter controversy and confirms the belief, that we have often expressed, in the fairness and consideration of the administration of President Diaz.

Mining in Mexico

The range of mining in Mexico is well illustrated by the articles in the present issue of the JOURNAL. The historical and general industrial features are engagingly and illuminatingly treated by Mr. Smith and Mr. Tays. Modern mining is described by Mr. Russell and Mr. Rice, who write of two of the great camps—Nacozari and Guanajuato—one noted for its production of copper, the other for its silver-gold ore. It is a vast range in the scale of progress from the old workings described by Mr. Tays, from which the ore was laboriously raised by *tanateros* and *malacates* to the electric trains running into the great electrically lighted adit of the Pilares mine, described by Mr. Russell. Even in the short recollection of engineers of middle age, who first knew Mexico 20 years ago, it is still a source of amazement that so many features of modern engineering have been introduced in Mexico in so brief a time. Those who painfully made their way by *diligencia* and muleback to some remote camp in the Sierra Madre to labor at mining and metallurgy with a combination of primitive methods and modern makeshifts find it difficult to realize how such places as Monterey and Cananea have come into existence.

So it is with metallurgical progress, particularly in the extraction of gold and silver. Bartolome de Medina invented the patio process at Pachuca in 1557 and for more than three centuries it remained the chief means for working silver ores. It was not until 1793 that mules and horses were first used for mixing the pulp, mercury and chemicals, which previously was done by human labor alone. This improvement saved 75 per cent. in the cost of the process. In the latter half of the nineteenth century pan-amalgamation was introduced; then hyposulphite lixiviation; finally the cyanide process. In the application of the last to the treatment of silver ore Mexico has led the way. Such methods as are in use at Pachuca, which Mr. Rice describes, are a revelation of the wonderful metallurgical progress in Mexico. Mr. Lamb's interesting description of an old *hacienda* at Guanajuato is a striking antithesis. It is one of the great charms of Mexico that it has such a romantic, historical background.

The Ely Companies

According to an evidently inspired report in one of the newspapers, an effort is again to be made to consolidate the Cumberland-Ely and the Nevada Consolidated companies. It is said that stockholders of these companies have been led to expect a consolidation of them for over two years, as if this were something greatly desired by the stockholders, especially the minority stockholders, who will not be satisfied until they secure it. This is humorous, inasmuch as the proposed consolidation has all along been blocked by large minority interests in the Nevada Consolidated, which have been unwilling to agree to an amalgamation of the two companies upon any basis other than an unbiased intrinsic valuation of each, which in their opinion is something widely different from the valuation current in the stock markets.

The [illegible] the

Nevada Consolidated gave up to the Cumberland-Ely a half interest in the Nevada Northern Railway, and allowed the Cumberland-Ely to join it as an equal partner in the construction of the Steptoe reduction works for various considerations, among which was 200,000 shares of Cumberland-Ely, valued at $10 per share, was an operation that did not reflect credit upon the Guggenheims in their relation toward the public. As things turned out, the arrangement did not prove so bad, perhaps, as it really was when consummated, and anyway the stockholders of the Nevada Consolidated have been resigned with the idea that the worst had happened.

Now it is said that the properties could be more economically managed under one head, and that the joint ownership of the railroad and smelter has already resulted in more or less friction. It is complained also that developments by the Nevada Consolidated have been conducted aggressively, whereas the reverse has been the case with the Cumberland-Ely company. The Nevada Consolidated is said to be now planning an increase in the Steptoe plant and the purchase of additional stock in the Steptoe company, so that it will have a majority interest in that company. This cannot fail to be amusing to large interests which have grumbled under the Guggenheim management. The stock of the Nevada Consolidated company has been widely distributed, and the interests of its owners must be carefully guarded if the Guggenheims are to preserve some of the esteem among investors that they once had so richly. It is only fair to say that the rumor as to plans for the consolidation of these companies was promptly denied by the Guggenheims.

Freight Rates on Anthracite and Bituminous Coal

From time to time there has been much discussion over the railroad rates charged on anthracite coal from the mines, and comparisons have been made with those on bituminous coal. The question is brought up again by the simultaneous publication of the annual reports of two great coal-carrying roads, the Philadelphia & Reading and the Chesapeake & Ohio. With both these roads coal constitutes about two-thirds of the business; but the coal carried by the Chesapeake & Ohio is wholly bituminous, while the Reading's tonnage is chiefly anthracite. A comparison of data from these reports will, therefore, be of interest. Both cover the same periods, their fiscal years ending June 30 last.

The data given in the Reading report are not as explicit as they might be. The coal rate is not separated from that on general freight. The average rate on all freight carried was 0.954c. per ton-mile. This was probably a little above the coal rate, though there is no way of determining exactly. A closer approximation can, however, be obtained from the statement of the Philadelphia & Reading Coal and Iron Company, which furnishes the bulk of the anthracite carried by the railroad. That company paid out for railroad transportation on its coal an average of 83.6c. per ton. Taking the average haul from Reading mine points to tidewater and leading consuming points, this gives an average rate of over 0.8c. per ton-mile. The true average on all anthracite hauled would be somewhere between the 0.8 and 0.954c., or perhaps about 0.85c. per ton-mile.

The Chesapeake & Ohio report goes more into details, and gives the average rate on all coal hauled at 0.326c. per ton-mile. The very low rate is imposed by the conditions of competition. New River and Kanawha coal has to be hauled from 350 to 400 miles to tidewater. It must compete there, not only with Pocahontas—which has about the same haul—but also with Cumberland, Clearfield and other coals, which are carried only about one-third the distance to tidewater and Eastern markets. Moreover, there is nearly as long a haul on the Chesapeake & Ohio coal to Western markets, where it must compete with that of Ohio, Indiana and Illinois mines. Low as the present rate is, it is 30 per cent. higher than that charged a few years ago, when Pocahontas and New River coals were hauled to tidewater on a rate of 0.25c. per ton-mile.

It is true that the proportion of terminal expenses is higher on a short than on a long haul. On the other hand, anthracite stands handling far better than bituminous coal, and can be unloaded and transferred more cheaply. The fact remains that the rate per ton-mile on anthracite to the seaboard is more than two and one-half times that on bituminous. The reason, of course, is that bituminous coal is sold under competitive conditions, while in the present position of the anthracite trade there is practically no competition. Long ago a high authority said that the profit on anthracite had never been in mining, but in carrying and selling it. The reports of the railroads and coal companies show that this is as true today as it was then.

The Use of Privately Owned Coal Cars

The decision of the United States Circuit Court of Appeals in the Pitcairn Coal Company discrimination case—given in our last issue—does not, as some newspaper comments seem to indicate, interfere with the use of coal cars owned by companies and individual shippers. In effect it only provides that discrimination in favor of operators owning such cars is unlawful; and that, in distributing cars to coal mines, the total number of available cars must be taken—no matter whether they are owned by railroad companies or coal operators—and the allotment must be made to each mine of its proportion of the total number, calculated on an equitable basis.

This rule does not interfere with the use of cars owned by coal companies. It does, however, deprive the owners of such cars of the advantages which they have heretofore had on various roads through the return of their own cars. At a time when cars are scarce, this might increase their shipping facilities largely, to the disadvantage of operators less favorably situated. Such a result the court holds to be in the nature of a discrimination contrary to the law.

THE MEETING OF the American Institute of Mining Engineers, which begins this week at Chattanooga promises to be well attended. The members who have gone to it will find much of interest in the important industrial region that is to be visited. At the same time a noteworthy list of technical papers is to be read. It is to be hoped that these will draw out a profitable discussion and that everything will contribute toward making this a red-letter meeting of the Institute, like some of those of old times.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Mexico's Proposed Mining Law

The term "anti foreign mining law" has been widely applied in the press of the United States and Europe to the draft of a proposed revision of the Mexican mining law submitted by the Minister of the Interior, to the public, and to various commercial, industrial and progressive organizations through the Chief Executive for comment, revision, amendment, or veto, before placing it in the hands of the legislators or law makers of the republic, necessary to make it effective.

Why should the law as submitted be passed? If passed, what would be its effect on existing and future mine investments? These are questions of greatest interest to both local and foreign capitalists and investors.

The present investor is in no way affected. The constitution of Mexico specifically prohibits retroactive law.

Border States

The first section of the proposed law prohibiting foreigners from locating property in the "border States," Chihuahua and Sonora on the north, and Chiapas, Yucatan and others on the south, is only a mild modification of the mining law of the United States (which absolutely prohibits any foreigner making a mineral location until he becomes a *bona-fide* naturalized citizen) and provides a simple means by which any foreigner may acquire mining properties, that is, by presenting the Chief Executive with a petition properly indorsed as to good character, and asking a permit to acquire the desired property, which is in every event granted.

The reason for the enactment of such a law is self-evident. Along the border States the outlaw and criminal element—of which there are large numbers infesting these States, and who have emigrated from the United States and other countries—find mining a respectable excuse for their presence in the country, and while they are ostensibly mining as a vocation, they are in reality leading a "coyote" existence, carrying on a nefarious traffic, and are a disturbing element to both republics.

The instigation of raids across the border, the formation of revolutionary parties, a general disturbing of the peace of the country, is an all too common occurrence, and in every known case this border element, if not being the head of such disturbances, has been prominently connected therewith, and [illegible] [illegible] sentatives of other governments as much abused subjects.

The passage of the proposed law would [illegible] this disturbing and worthless element, but would enhance the standing of foreign mine-owners among strangers, the possession of the required certificate of good character, approved by the Executive of the Republic, going far toward establishing the respectability of its holder.

This section of the proposed law is fair and just in all of its purposes and proposed regulation of existing abuses.

Foreign Corporations

The second section of the proposed law, prohibiting unregistered foreign corporations from acquiring properties has so many sustaining arguments that space forbids enumerating more than a small portion, and the opposing arguments are positively nil.

Comparing with the corporation laws of the United States, we find that no foreign corporation can transact corporate business in any State in the Union until it has been duly registered or "naturalized." A "foreign corporation" is legally defined as a corporation organized in any other State, or in a foreign country.

In Mexico a corporation is organized under the Federal law with equal authority in all of the States of the Republic, while the corporations organized in foreign countries are legalized ("naturalized") by "protocolization" of the articles of incorporation and by-laws, subjecting themselves to the laws of the Republic, and paying the usual corporation fee.

Over-capitalization is the parent of fraud in all corporations, and in mining a tangible excuse is presented by unscrupulous promoters to the uninformed in- [illegible] virtue.

One example will suffice: A company organized in the United States, sensationally operating in the state of Chihuahua, controlling by its various machinations the press, and capitalized for many millions of dollars, has sold millions of dollars worth of beautifully engraved paper [illegible] New York, and other stock markets of the United States and Europe, and through accredited agents in every small hamlet of the country where there was a chance to inveigle the unwary. The proceeds of these sales have been thrown to the sun- [illegible] blind the eyes of the more conservative investors as to induce them to part from their money and load themselves up with finely engraved stock certificates.

This company has paid dividends from the funds of its promoters derived from the sale of "private stock," and at the present time there are thousands of its former and present employees holding its worthless "paper scrip" while suffering for the bare necessities of life.

The poor stockholders who have, in many instances, invested all of their savings to buy the stock of this company at a fancy price, now find it quoted at but 1c. per share, and with no buyers at any price, while the great king promoter of this self-same company is traveling in state in the Orient. His great ranches and stock farms, wonderfully productive, are exempt from corporate debts.

More than 100 parallel cases of less magnitude might be cited of companies following the same course, and only deterred from like results by their lack of persuasive ability with the public.

Today the aggregate paper value of the mining stocks of over-capitalized and fraudulently organized companies who offer their shares for sale in the New York markets will far exceed $1,000,000,000, while the dividend, or that which will ever be dividend stock, will never be 0.1 per cent. of the enormous total.

The proposed new law practically prohibits such fraudulent capitalization, in that the organization or naturalization in Mexico of all companies operating or dealing in mines in the country a fee is charged, which, for a company with $10,000,000 capital would cost the organizers more than the entire assets of many of the numerous "wildcat" companies now in existence, while the costs for organizing a capitalization on the reasonable assets of the same mines' sales value [illegible]

[illegible]

Another important reason in favor of the proposed new law, which, though technical, is all important, is, that it has been the custom for foreign companies to organize in the United States with "fraudulently" large capital, and then organize [illegible]

This subsidiary company acquires titles and transfers its stock to the parent company, which results in possession *de facto*. [illegible] title the parent company does not, nor can it, have judicial recognition to protect their holdings in the Mexican courts.

At least nine-tenths of all the Mexican mine litigation arises from this double organization, the controversy between the foreign holders of the foreign company's stock, as to the possessory rights of Mexican titles, the suits being brought in the United States courts, thus reflecting upon the judiciary of Mexico, while tying up valuable industries that would under the Mexican laws be quickly and justly adjudicated without loss of time and at small expense.

As a further reason for the passage of the proposed law, the holding companies organized are capitalized at a very small per cent. of the parent company, solely to avoid the publication tax imposed by the Mexican law, which is the only tax placed upon corporate existence, so by this evasion the Mexican Republic is openly defrauded of just revenues, while the foreign corporation sports a capitalization from which it proposes to acquire millions.

The passage of the law as proposed would be a protective enactment for all legitimate mine operators, and a fatal blow to the corporation "high-grader."

S. L. Pearce.

Alamos, Sonora, Mex., Sept. 9, 1908.

The Proposed Mexican Mining Law

In recent issues of the Journal I find a number of articles sent in by correspondents in Mexico, giving a distorted interpretation to the proposed new mining law presented to the legislative bodies by the Ministerio de Fomento and criticizing it severely. It would be greatly appreciated by myself as well as many other Mexicans if you would publish extracts, or all, of the articles which I inclose, so as to show the injustice of these attacks and also to prove once more the impartiality with which your valued Journal treats matters of interest to the mining industry.

Faustino Roel.

Monterrey, Mex., Sept. 12, 1908.

[The article which Señor Roel inclosed was a statement by Señor O. Molina, secretario de Fomento, in which arguments in defense of the proposed measure are presented. Substantially the same statements were published in the Journal of June 20, 1908. If our correspondent will examine our columns carefully he will find both sides of this important question treated with the entire partiality for which he gives us credit. Our columns have been open to everyone who has had anything of importance to say for or against this famous measure, and our attitude is fairly summed up in the following sentences from a recent editorial in these columns: "As we have previously expressed ourselves, and as our correspondent reiterates in this issue, President Diaz 'has always treated capital with great consideration and fairness, and will in all probability continue to do so.' We feel that the present case may safely be left in his hands." Editor.]

The Copper River District, Alaska

In his article entitled, "The Copper River District, Alaska," by H. A. Keller, published in the Journal of June 27, there is a statement to which I think I may take exception. The article states that, "the ore on Elliott creek occurs in the amygdaloid *directly* below the Chitistone limestone." As a matter of fact, in only one instance has ore been found directly below the limestone, i.e., at the contact, while the great bulk of ore is found (1) in a series of fissure veins varying in their strike but a few degrees from a north-south direction, while the contact runs approximately east-west; and (2) as replacements in the amygdaloid at distances varying from 100 to 400 ft. stratagraphically below the limestone.

B. Webster.

Superintendent, Hubbard-Elliott Copper Mines Development Company,
Elliott Creek, Alaska, Aug. 25, 1908.

Coal Mining in Southern Anthracite Field

Your article "Coal Mining in the Southern Anthracite Field" was read with a great deal of interest by me as it describes almost exactly, the conditions that exist at one of our collieries, the Melmont mine, located in the northern end of the Wilkison coalfield, Pierce county, Washington.

The only difference is that the seam or strata does not contain any gas, which makes the weight and pressure hard to explain. Quite often, fireclay in or near a seam of coal will swell and cause a condition similar to the one you have to contend with, but there is no fireclay in the seam in our case, or none in the surrounding measures. However, I have seen a new slope down 400 ft. in the solid coal, drive the sinkers from the face, and close tight for a distance of 75 ft., in a few hours breaking timber 18 to 20 in. in diameter.

On the gangway, as soon as the set is up a few hours, you can see it has taken the weight, and often in a few days, you can hear the timber cracking, due to the enormous pressure, and in a short time a collar or a leg 18 in. in diameter is broken and has to be replaced. Often the gangway will close when it is 500 ft. ahead of any working places, and a crosscut will close so tight that it is impossible to tell where it was originally driven.

The seam pitches 45 deg., has a sandrock floor, 11 ft. of coal, 3 ft. of slate cap-rock, and 200 ft. of sandrock to the next seam which works exactly in the same way. We are developing the seam on the chute, or stand-and-pillar system.

After watching the condition at this mine for several years, the only explanation I can offer is that the weight on the seams is due to the unstable condition of the superimposed strata, due to the pressure that caused the tilting of the seams and fractured the original bedding of the sandrock strata. This tilting was undoubtedly of a comparatively recent age, and is probably still under some tension. The coal seams in this district were laid down in the Tertiary Era.

The coal mines working this seam, within three miles on either side, do not have these conditions to contend with, their gangways will stand for years without retimbering, so the cause of this condition is local to the immediate territory of this mine.

General Superintendent.

Northwestern Improvement Company.
Roslyn, Wash., Sept. 10, 1908.

The Goldfield Consolidated Mill

In my article on the Goldfield Consolidated mill, which appeared in the Journal Sept. 5, an unintentional injustice was done J. B. Fleming in that, through an inadvertent and regrettable omission, he was not given credit due him in connection with the plant described. Mr. Fleming was connected with the Consolidated as mechanical engineer for the new mill for six months, and it was under him that the original design of the mill was worked out, the specifications drawn up, and the contracts for machinery and structural steel were let. Moreover, many of the innovations in the mill are not only due to Mr. Fleming, but are his own designs.

Percy E. Barbour.

Goldfield, Nev., Sept. 24, 1908.

Iron Production in France

Pig-iron production in France for the half-year ended June 30 is officially reported at 1,797,843 metric tons in 1907, and 1,746,634 in 1908; a decrease of 51,209 tons, or 2.8 per cent. More than half the iron reported this year was basic pig. The raw material used this year was 3,862,252 tons ore mined in France; 854,837 tons ore imported, chiefly from Luxemburg and Lorraine; 329,055 tons scrap, cinder and pyrites residues; a total of 5,046,144 tons, being an average of 2.89 tons per ton of iron made. This indicates an average iron content of about 35 per cent.

The Cyanide Correspondence Club of Mexico

Several metallurgists who are actively engaged in Mexico have suggested the formation of a club or association which will enable those engaged in cyaniding in that country to exchange experience and ideas, for their mutual benefit. Owing to conditions in Mexico this would have to be done through correspondence rather than by meetings. The plan, which was originated by Bernard Macdonald and others, is embodied in the following circular letter which has been sent to a number of metallurgists and mill managers.

The Circular Letter

The possible advantages of a "Cyanide Correspondence Club of Mexico," or a club of any suitable name, having for its objects those outlined or suggested below, will be obvious to all engaged directly, or indirectly, in cyanidation.

The cyanidation of gold and silver ores is now carried on in a large scale in Mexico and the application of this process in the recovery of these metals will increase rapidly. This is especially true of the mines producing dry silver ores, which at the present low price of the metal cannot be operated profitably by the old methods —pan-amalgamation or the patio process. This class of mines predominates in Mexico, and if they continue to operate they would be obliged to substitute cyanidation for present methods; and where mines of this character exist containing large bodies of ore too low grade to be worked by other methods, modern cyanide plants properly constructed and managed by practical and competent men would probably make such mines exceedingly profitable.

The field for substitution or employment of cyanidation in the metallurgy of silver ores, is, therefore, very broad and wide in Mexico and those engaged in the technical or managerial capacities in existing cyanide plants, or interested in such in a proprietary way, or having prospects of becoming interested in such capacities, would be greatly benefited by being members of such a club.

In other countries where the cyanidation of ores is carried on to a large extent, as in some of the districts in Australia and Africa, there have been organized technical clubs having regular meetings where the reading and discussion of papers on the problems involved in the chemistry and practice of the process, or in the mechanics of plant construction, are the main features. Such associations have greatly advanced the chemistry and mechanical science of cyanidation.

In Mexico regular meetings of members would be impracticable, owing to the great distances separating the districts and the disadvantage of the members being absent from the plants with which they are connected. There is no reason, however, why the same objects might not be attained as well, or even better, by the organization of a correspondence club having provided for its purposes the use of a monthly journal, one already existing and devoted to mining and metallurgy, wherein the correspondence of the members would regularly appear and reach all. Such a journal would become the official organ of the club.

It is probable that there are at least 500 people in Mexico who would be eligible and glad to join such a club, under the following qualifications, which would entitle applicants to membership.

1. Proprietors, managers, or superintendents of cyanide plants.
2. Chemists engaged in cyanide plants as such.
3. Inventors of mechanical or chemical methods used in the process.

It should be an obligation of membership that each member should contribute a paper, on plant construction or the technique of practice or statistics at some plant within a year from the time of becoming a member.

Papers need not be lengthy and could be compiled leisurely at odd times that would not interfere with the ordinary duties of the writer.

The papers or transactions should be revised and compiled into semi-annual volumes, which would constitute an important part of the world's literature on cyanidation and be of great value to the industry.

Ancient Plants at Guanajuato, Mexico

By Mark R. Lamb

Guanajuato had many old treatment plants which lined the river banks from La Presa to far below Marfil. During the 5-km. ride from the railway terminus to Guanajuato on the street cars the ruins of these old plants form an almost continuous line; and guard-houses, high walls, horsepower wells and extensive paved patios are now in ruins, while past them runs the stream carrying at least 1000 tons of barren sand and slime from modern cyanide plants.

It is said that a few centuries ago, when Guanajuato was in its glory, the King of Spain sent an examining engineer to ascertain the advisability of getting control of some of the richer mines. This engineer reported that the difficulties of mining, losses by theft and bandits, church and treatment expenses were so great that he advised the King to be satisfied with the taxes then being paid. He described in detail the amounts exacted by the church, the cost of guards, the constant driving of labor necessary to make expenses at the *haciendas* and stated most decidedly that the King could get no [illegible] owners did for themselves. His final summary was to the effect that the King was better off with his taxes than if he could acquire the mines at no cost!

Chronology of Mining for September

Sept. 1—Engineers gain control of the burning oil gusher of S. Pearson & Sons at Dos Bocas, Mexico.

Sept. 4—Fire destroys the town of Rawhide, Nevada.

Sept. 10—The United States Circuit Court for the Eastern District of Pennsylvania decides that the "commodity clause" affecting the transportation by railroads of coal owned by them is unconstitutional.

Sept. 14—It is announced that all properties of the Tennessee Coal, Iron and Railroad Company will be in operation on Oct. 1.

Sept. 16—The board of directors of the Davis-Daly Copper Company elects F. Augustus Heinze president and Newman Erb chairman of the board. The Montana State Railway Commission orders cuts in freight rates on ore shipments from all parts of the State.

Sept. 18—Vice-President Ramon Corral of Mexico declares semi-officially that the section of the new mining law obnoxious to foreigners will not be passed.

Sept. 23—The Oliver Iron Mining Company calls for bids on a $1,500,000 concentrating plant on the west end of the Mesabi range. Export business in iron and steel is reported to be normal.

Sept. 24—Trustees in bankrupcy offer for sale the property of the Consolidated Arizona Smelting Company, including the smelter at Humboldt, the Blue Bell mine and stock in the De Soto Mining Company.

Sept. 25—A deal is reported consummated between the Hubbard-Elliot Mining Company owning extensive copper properties in Alaska and L. Hirsch & Co., of London involving the organization of a new $30,500,000 corporation.

According to Consul A. G. Seyfert, of Owen Sound, Ontario, one-half of all the cement produced in Canada is manufactured in the locality of Owen Sound, the daily output here being 3000 bbl. The demand for concrete material for building the transcontinental railroad has increased the output to the full capacity of the plants during the past year. During 1907 Canada produced 2,500,000 bbl. of portland cement, and imported 1,000,000 bbl. more, nearly all from the United States.

At the Alaska Treadwell mine, one pound of chrome steel in the shoes crushed 2.94 tons of ore in the 240-stamp mill and in the 300-stamp mill, 2.34 tons [illegible]

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of of their movements and appointments.

W. E. Pomeroy is in charge of El Salto mill, at Ocampo, Mexico.

John E. Rothwell, mining engineer and metallurgist, of Denver, has been visiting New York and Philadelphia.

Charles Briggs, president of the Calumet & Arizona Mining Company, is at present at Cleveland, Ohio.

N. E. Isbell, of Goldfield, Nev., has been making an examination of the Paymaster gold mine, Manitoba Lake, Ontario.

W. J. Mitts has taken charge of the property of the Brazilian-Monitor Mining Company at Silverton, Colorado.

Henry F. Lefevre has been for two weeks past engaged in examining mines in the Georgetown district in Nevada.

M. D. Murray has been appointed superintendent of the Rio Tinto copper mine at Terrazas, Chihuahua, Mexico.

Thomas Cole, president of the Oliver Iron Mining Company, has been inspecting some mines in the Lake Superior copper district.

W. D. Pierce, manager of the Almoloya mines, has returned to Parral, Mexico, from Las Vegas, Nev., where he has been for some time.

Edward K. Judd, mining engineer, has returned to New York after several weeks' spent in examining mining property in Newfoundland.

Thomas Hoatson, managing director of the Keweenaw Copper Company, has returned after attending a meeting of the company at New York.

Frank C. Morehouse, manager of the Alvarado Consolidated Mines Company, has returned to Parral, Mexico, from a trip to the United States.

Gordon R. Campbell, secretary of the Calumet & Arizona and the Superior and Pittsbury companies, is in the Butte district in Montana on business.

G. R. Young, of Yonkers, N. Y., has just returned from Brazil, where he has been erecting a Link-Belt-Company dredge for the Diamond King Mining Company.

Donald M. Levy, of the University of Birmingham, England, has reached New York after a tour of inspection of the copper mines and smelters of Montana and Tennessee.

Daniel Guggenheim, president, and other officials of the American Smelting and Refining Company, have been making an inspection of the Utah and Nevada enterprises operated or controlled by the company.

Willard S. Morse, who has represented the executive committee of the American Smelting and Refining Company, at Salt Lake City for some time past, has been relieved and will return to the New York headquarters of the company.

J. M. Boutwell, who has been engaged in mining work for the Government in western districts during the last 10 years, has resigned his position as geologist on the United States Geological Survey. He will engage in mining geology for private interests, and is now on his way from Washington to Bisbee, Arizona.

Jesse Knight, the prominent Utah mine operator, who was recently nominated by the Democratic State convention for governor of Utah, declined the honor, preferring to devote his energy to his mining affairs. Being exceedingly popular, Mr. Knight would undoubtedly have been elected had he consented to make the race, as he would have polled a large vote from the opposing party.

Obituary

O. A. Caldwell, formerly of Pocatello, Idaho, but recently connected with the Minas Tecolotes y Anexas at Santa Barbara, Mexico, died at that place Sept. 15, of heart failure.

Cabell Whitehead, formerly for several years assayer of the United States Mint, and a writer on technical questions, died of pneumonia at Nome, Alaska, Sept. 7. He was born in Lynchburg, Va., and graduated from Lehigh University. He was 45 years old.

Andrew Stephens Patterson died at Pittsburg, Penn, Sept. 25, aged 59 years. He was born in Wheeling, W. Va., but had lived in Pittsburg 35 years. He was for the greater part of that time an active coal operator in the Pittsburg district, and had been president of the Patterson Coal Company for five years.

Dr. Theodore Peters, director of the Verein deutscher Ingenieure, died Sept. 2. Born in 1841, at Menden, near Siegburg, Germany, where his father owned a forge, he became an engineer, and for a while was a partner of the firm of A. H. Oechelhaeuser, at Siegen. In 1882 he became manager of the society above named, and in 1891 succeeded Dr. Grashof as director. As editor he developed the *Zeitschrift des Vereines deutscher Ingenieure*, until it is now one of the more important technical journals in Germany.

Societies and Technical Schools

Northwestern University—At this institution at Evanston, Ill., Dr. George R. Mansfield, of Harvard University, has been appointed assistant professor of Geology to succeed Prof. J. W. Goldthwait, who goes to Dartmouth College. Prof. Mansfield will begin work in February, 1909. C. E. Decker has been appointed instructor in Geology at Northwestern University for the first half of the present year, and D. F. Higgins, Jr., assistant. Prof. J. H. Cline, of Bridgewater College, Virginia, has been appointed a fellow in the same department.

West Virginia Mining Association—This association will hold a general meeting in Charleston, W. Va., Oct. 7. The association expects to have as its guests at that time George Otis Smith, director of the United States Geological Survey; Edward W. Parker, chief of the Bureau of Mines and Minerals; Dr. J. A. Holmes, chief of the Bureau of Technology; Captain Desborough, inspector of explosives for Great Britain; Victor Watteyne, engineering chief for the Administration of Mines, Belgium; and a number of representatives from the mining departments and universities of this and other States.

The meeting will open at 2 p.m., Oct. 7, when the association will extend a welcome to the distinguished scientists from abroad, to the members of the United States and West Virginia Geological Surveys, to the representatives from States and to other guests. Following the introductions the afternoon and evening will be given to the discussion of matters relating to the advancement of the mining industry in West Virginia and special papers will be presented as follows:

1. The Effect of Legislation on the Mining Industry in West Virginia.

2. The Proper Relationship Between Capital and Labor in West Virginia Coal Mining.

3. Recent Mine Disasters—Causes and Remedies as far as Ascertained.

4. Is Dust, as such, Explosive, and if so, What are the Chemical Reactions and the Most Efficient Preventives?

5. The Standardization of Powders and Explosives for Underground Workings.

6. The Advisability of Standardizing Electrical Appliances in Mines.

7. The Education of Mine Managers in Rescue Work and the Danger Involved by Untrained Men Attempting such Work.

8. Mine Fatalities in West Virginia as Compared with other Countries and the Present Methods Pursued by the Mine Department of West Virginia in Tabulating the Same.

A special train has been placed at the disposal of the association and will leave Charleston at 8:45 a.m., Oct. 8 for a trip to Princeton, Mercer county and return. The opportunity will be given to study all of the formations belonging to southern West Virginia. Starting from Charleston, which is within two miles of mines in the Pittsburg seam, the excursion will cross in succession the coals belonging to the Kanawha-Allegheny, the New River and the Pocahontas measures. Short stops will be made at the mines of the Loup Creek Collieries Company, at Page; the New River Collieries Company, at Eccles; the mines of the Slab Fork Coal Company and possibly one or two additional points.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Butte and Indianapolis

---

REVIEWS OF IMPORTANT EVENTS

San Francisco.

Sept. 23—The El Dorado Gold Dredging Company, which has been operating intermittently in the Folsom dredging field, Sacramento county, for several years past, finally closed down operations this week, having been unable to make any profit from its work. The company has paid off its labor account, but still has about $20,000 of debts to liquidate. The stock is unassessable, and the wealthier stockholders refuse any longer to carry those who are unable to pay their proportion of expenses. Repairs to the machinery have been excessive and constant breakdowns involving heavy expenses have dissatisfied the stockholders. By some the failure is attributed to poverty of the ground, and by others to lack of strength in the machinery.

According to advance figures published by the U. S. Geological Survey, the gold production of California in 1907 was $16,727,928 and the silver $751,646. This is a decrease in gold of $2,004,525, and of $66,182 silver. The reasons for this reduction are not far to seek and do not have much of anything to do with the actual conditions of the gold mines. The greatest falling off in gold yield, more than half a million dollars, was in Calaveras county, where, during 1907 the most productive mines in the county, at Angels, were closed several months by a miners' strike. In Grass Valley district the mines were also disturbed by strikes for two months and some others made less output than usual, so Nevada county shows a reduced yield. In Butte county, which is a quarter of a million below the record of the year before, the floods in the spring of 1907 wrecked a number of dredges altogether, and badly damaged several others. Both in the Oroville and Folsom dredging fields, that industry suffered from lack of steady electric power, much time being lost. In some other counties large operators quit during the financial stringency.

There is a stampede of gold seekers to Silver Lake, about 15 miles south of Mono Lake, in Mono county, especially from the southern Nevada camps. Numbers of men are also going in from Bodie, Bridgeport, Benton, and Bishop, in Inyo and Mono counties. The rich ore strike which has occasioned this excitement was made by a man named Miller, from Rawhide, Nev. This ore was found toward the upper end of Rush creek, on a direct air line between the May Lundy and Mammoth mines, two of the rich properties at [illegible] encamped near the new prospect.

The old Coolgardie dry-washing placers, 25 miles north of Barstow, San Bernardino county, are again being worked, this time by the Coolgardie Mining Company, which has a couple of thousand acres of the channel ground. The gravel is shallow, it being only about 3½ ft. to bedrock. Considerable gold was taken out in this district years ago, but none of the dry washers had sufficient capacity to make the workings profitable. After considerable rather extensive experiments, the company devised and patented a dry washer, which would handle 100 tons of gravel daily, and this has been working recently in such a satisfactory manner that seven more of the same type have been ordered in Los Angeles. The hundred tons of gravel is concentrated into one ton, and these concentrates are worked in a smaller machine of the same pattern. A. R. Gibson, W. M. Hine, and J. B. Renshaw, of Los Angeles, are members of the company operating this ground at Coolgardie.

The directors of the Associated Oil Company have authorized an increase of the capital stock of that corporation to the extent of 102,630 shares of treasury stock of the par value of $100 a share. The new stock will be offered the present holders of stock certificates pro rata at $25 a share, the total proceeds to the company, therefore, amounting to $2,565,750. This is the last of the company's treasury stock. It is announced in a circular issued by the directors that the proceeds of the sale will be used in liquidating the indebtedness of the corporation, in acquiring additional properties and making betterments.

The sum of $26,000 has been paid for the Larimer quartz claim by the North Star Mine Company, at Grass Valley. The sale was made by decree of court, a partition suit having been brought between owners of the Larimer estate, the suit being of a friendly nature to enable the sale to be made. The property adjoins the North Star holdings and comprises about 20 acres. It carries with it seven water rights, which are valuable.

The Natoma Development Company, which entered the dredging field at Folsom this year, has had three dredges operating there for the past two or three months and a week since started up a fourth one. The new machines which are equipped with 13-cu.ft. capacity buckets, are handling now over 250,000 cu.yd. of auriferous gravel per month, and are [illegible]

Salt Lake City

[illegible] elected directors for the ensuing year consisting of Willard F. Fitzgerald and James D. Casey, Brookline, Mass.; Charles A. Moore, New York; Henry Bradley, Bangor, Me.; R. F. Hoffer, Jr., Fall River, Mass.; John W. Horne, Edward R. Hastings and John P. Gorman, of Boston; Cowley Lambert, London, Eng. The Utah-Apex mine is shipping 40 tons of high-grade silver-lead ore to the smeltery from which a profit of $750 a day is being realized.

The South Columbus Consolidated Mining Company, operating at Alta, has absorbed the Columbus-Wedge Mining Company, owning adjacent property, by increasing the capital stock from 300,000 to 500,000 shares, holders of shares in the latter corporation getting 115,000 shares of the new stock.

The Cedar and Talisman mines in Beaver county have been consolidated and will be operated hereafter by the Cedar-Talisman Consolidated Mines Company. Both properties consist of 15 lode claims, are producers of silver-lead ore and are well equipped.

A local branch of the American Mining Congress is about to be organized with a membership of about 100 persons. A vigorous effort is being made to secure the location of the headquarters of the congress for Salt Lake and the building of a large mining temple here, for which [illegible] been pledged.

Butte

[illegible] Company has begun suit against James Breen, John MacGinniss and B. T. Spaulding, a copartnership, doing business under the name of MacGinniss & Spaulding, [illegible] alleged to have been furnished. MacGinniss & Spaulding entered into an agreement last fall under which they were to build a mill and develop the property of the Montana Gold Mountain Mining Company, situated [illegible] held an option on the stock of the company. It is for machinery alleged to have been furnished for this mill that the action is brought.

Recent negotiations at Helena between the coal miners and operators of Montana, held with a view to settling the dif- [illegible]

No strike is anticipated at present, however, since the miners intend to take the matter up with their national officers before taking further action.

The outlook for Butte's coal supply was bettered materially the early part of this week when four mines at Glencoe and Diamondville, Wyoming, employing 500 men, resumed operations after a shutdown due to difficulties arising over the wage scale.

The reorganization of the Davis-Daly Estates Copper Company by means of the formation of the new Davis-Daly Company, is gradually assuming tangible form. For a time it was feared that differences of opinion over the personnel of the board of directors of the new company would result in a deadlock. The underwriters insisted that an entirely neutral board be put in charge, while those in control of the old company thought that they should be well represented. The matter was finally settled by the resignation of G. Wesley Davis, who was one of those elected director at the first meeting of the new company. The board, as finally decided upon, consists of F. Augustus Heinze, Newman Erb, Samuel F. Jarvis, John C. Montgomery and H. Mason Raborg. A circular letter has been sent to the stockholders explaining the plan for reorganization and the exchange of the old shares for those of the new company and urging stockholders in the old company to take advantage of the offer.

Denver

Sept. 24—The Sugar Loaf district, which is as old as the Leadville district itself, has had rather a fitful career. When silver was high, some important strikes were made, and some of the mines have produced extensively. The mines are entirely in the granite, and the veins, on reaching a moderate depth, are very wet. One of the largest producers has been the Dinero, and it is pleasing to read that the deep tunnel which has been for some time in progress, with the object of draining the mine at considerable depth, has just intersected a vein at 3400 ft. from the portal. The vein is reported to exceed 12 ft. in width, and to run well in silver. This strike has attracted renewed attention to the Sugar Loaf district, and revived many of the old theories of the granite area under the Leadville limestone district being itself productive, and that fissure veins will be found in the granite below the sedimentaries of Leadville, similar to those of Sugar Loaf, but I do not believe that any experienced geologists or mining men take much stock in this theory. The mines of Sugar Loaf are seven or eight miles distant from Leadville.

In driving a lateral to the northward from the Yak tunnel, in the eastern portion of Iron Hill, Mr. Dyatt has disclosed a large body of ore. By some persons it is contended that this is the northeastern extension of the North Iron mine oreshoot, which was lost or exhausted years ago, while others believe it to be an entirely new shoot. The find is an important one, whichever view is accepted.

In California gulch, just west of the Iron Hill fault, at a depth of 500 ft. under the gulch, a body of lead-carbonate ore has been uncovered, which reminds one of the olden days. The ore is composed largely of gray-lead sand, and heavy, hard carbonate of lead. The ore is the western extension of one of the ore-shoots that yielded so largely in the Silver Cord territory in the past. Additional development is required to show the full magnitude of the find.

A number of laterals are about to be started from near the breast of the Yak tunnel, and new discoveries in Little Ella hill may be expected in the near future.

Though it has come about somewhat late in the season, the Red Mountain mines, between Ouray and Silverton, have taken on a new life, and activity is everywhere evident. A good deal of this is due to the fact that the head of the Red Mountain Mining and Railway Company has come in and paid off all the indebtedness; the delay in payment was largely due to the financial slump which overtook him last autumn. He now has a large force of men at work, and is driving the Joker tunnel and the Gennessee-Vanderbilt tunnel. The Yankee Girl mine is also being unwatered, and is shipping one car of ore per day. At Ironton, the Mono-Baltic Company, a Boston corporation, owning the Saratoga group of about 200 acres, is clearing the site for a pyritic smelter to be built in the spring. At Red Mountain, the San Antonio mine is working 40 men, and shipping 50 tons per day, averaging 12 per cent. copper, 10 per cent. lead, 10 oz. silver and $3 gold. The company is also running a tunnel from Sheridan Junction, a distance of 2300 ft. to the orebody, to cut it 500 ft. deep, or 300 ft. below the present workings. This will allow ore to be loaded directly on the cars of the Silverton railroad. A great deal of development work is going on, and the evidence is very strong that this district is getting on its feet permanently.

It is reported that during August, the mills of San Juan county shipped 2000 tons of ore to the smelters.

The Roosevelt deep drainage tunnel to which reference was made in this column last week, records the extent of progress as follows: The intermediate shaft is completed, and the headings were started in both directions on Sept. 11. At the present rate of progress, the portal heading should connect with the heading from the intermediate shaft about June next, while connection of the other heading from the intermediate shaft with the El Paso water-course should, at the present rate of progress, be completed about May, 1910. This drainage tunnel will then lower the water in the district 730 ft. below its present level.

A company which is said to control by lease and by options about 6000 acres of land within about two miles of Colorado Springs, is putting down a bore for oil, and mainly on the strength of a very strong report by J. W. Frank, an engineer of repute in the oil industry. Prof. Arthur Lakes also made a favorable report on this same locality. The indications as the well goes down are good, and the result will be watched with much interest.

Houghton, Michigan

Sept. 26—Rumors are current that large interests in the Franklin and Rhode Island mines are considering a consolidation of the two properties and also the acquisition of land from the St. Mary's Mineral Land Company. Should this amalgamation be consummated it is proposed to increase the authorized capital of the Franklin from 100,000 to 200,000 shares and to issue 45,000 shares of the new stock for the 100,000 shares of Rhode Island. The latter company owns 640 acres of land and has $40,000 in the treasury. If all the proposed plans are consummated the new company will have a working capital of $400,000 and 55,000 shares of stock in the treasury. The newly acquired land will permit farther sinking of the Franklin Jr. shaft and will give the Franklin mine an extension of the Pewabic lode on Rhode Island property. The combination would give the new company more than two miles carrying the outcrop of the Pewabic lode and nearly two miles carrying the outcrop of the Kearsarge lode.

The company would own all the available mineral land between the Quincy on the southwest and the La Salle on the northeast with practically unlimited depth for sinking on both formations.

Indianapolis

Sept. 28—Permission to transact business in Indiana has been granted to the United Coke and Gas Company, of West Virginia, and the American Coke and Gas Construction Company, of New Jersey, by the Secretary of State. Both of these companies are aiding in the construction and equipment of the Citizens Gas Company's plant, the company having a franchise to furnish gas at 60c. per 1000 ft. The United Coke and Gas Company has a capital stock of $2,500,000, and of this amount $60,000 is represented in Indiana. The American Coke and Gas Company is a subsidiary company of the other, and is capitalized at $400,000, with $50,000 represented in Indiana. The United Coke and Gas Company has the contract for putting in the by-product ovens, the main condenser house and the power plant in the Citizens company's plant. Both companies will maintain offices in Indianapolis.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Bisbee-Sonora—This property in the Chiricahua mountains is sacking its silver-lead ore for shipment to El Paso. The character of the ore has improved with development and the width of the orebody has increased.

GILA COUNTY

Arizona-Colorado—This company has encountered 30 ft. of mineralized vein matter on the 800-ft. level. Some of the body is commercial ore carrying copper and gold.

McMillen-Stonewall—The shaft on these claims is down below 200 ft. When the 300-ft. mark has been reached a crosscut will be driven to the old shaft. A cyanide plan is under consideration.

YUMA COUNTY

Clara Consolidated—In one of the large orebodies at the 160-ft. level a considerable amount of metallic copper has been encountered. The orebody continues to the 200-ft. level, and is apparently gaining in strength. The company is sinking to the 600-ft. level as fast as possible.

California

AMADOR COUNTY

Bunker Hill—On this property preparations are being made for sinking the shaft 400 ft. deeper and to open up two new levels.

BUTTE COUNTY

U. S. Diamond Mining Company—The work on the property of this company, at Cherokee, M. J. Cooney, manager, was ineffective in the spring months when there was too much water, but prospect shafts are now being sunk to find "blue ground."

Mammoth Channel Mining Company—This company, which is sinking a shaft at the inner end of the 1255-ft. tunnel, has cut a chamber for a gasolene hoisting engine, blower and pump.

EL DORADO COUNTY

Sunshine Mining and Development Company—This company has bonded considerable mining ground in Grizzly Flat district, and has undertaken its development.

INYO COUNTY

Kilian Mining Company—This property is to be opened up with power drills, the Casa Diablo Company furnishing the electric power. The mill is to be placed on a flat 400 ft. lower than the mine, and the ore will be transported by an overhead cable line.

Bishop Creek Gold Company—Arrangements are being made to continue work during the winter and to erect a stamp mill on this property.

Casa Diablo Mining Company—This company is about to install a plant to treat its concentrates at the mine.

MODOC COUNTY

Hoag District—The Sunshine Mining Company, which recently began shipping bullion in a small way, will continue work through the winter. The Fort Bidwell Consolidated Mines Company is about to start its tunnel. A new company is about to start work on the Josephine, having bonded it.

NEVADA COUNTY

Oustomch—This mine, at Nevada City, has formally been bonded by A. M. Gilbert, of Santa Barbara, and 20 men are at work. The mine is well equipped and has a 10-stamp mill.

Chicago Park—In this section, George Shebley is developing a quartz mine at the junction of Bear river and Greenhorn creek, on which there are three tunnels. A mill will shortly be erected.

Hill—At this mine, in the center of Grass Valley, a pit is being excavated for a pump, and a gasolene hoist is being put up.

Searchlight Mining Company—At this property, Washington, superintendent Hemmingsen is drifting on the Star ground for an extension of the Crown Point pay shoot.

Norambagua—A contract has been let to install a big compressor on this property at Grass Valley.

PLACER COUNTY

Bellevue Mining Company—This company is drifting in the 400-ft. level on a 2-ft. vein of pay ore.

White Oak—Through the tunnel in this mine the channel has been prospected and good pay gravel has been found.

PLUMAS COUNTY

[illegible] Jacks—This group of claims on the Middle fork of Feather river in Nelson Point district, has been sold to C. H. Culp & Co., of San Diego. Tunnel work to develop the property is to be commenced at once, and work will be continued during the winter.

RIVERSIDE COUNTY

Hemet District—In this district M. Ruth, of Los Angeles, has purchased the Highland Tourmaline Gem No. 4, and interest in the O. J. W., Ruby, Tourmaline Gem No. 5, Kunzite, Point View and Black Lizard claims.

SHASTA COUNTY

Niagara—At this mine, French gulch, 20 men are at work on the shaft of the Surpion claims. A mill is to be built on the property this fall.

Drilling—A Keystone drill has been put in operation on the Dakin ranch, east of Redding, for testing the gold-gravel deposits in that section.

SIERRA COUNTY

Golden Rose—This mine, Alleghany district, recently bonded to Flynn Brothers and E. H. Wilson, is in bonanza, with a streak of ore running up into the thousands per ton. The mine is on the north side of the Middle Yuba mine, on the trail from Moore's Flat to Chipp's Flat.

SISKIYOU COUNTY

Yocum Group—At this claim in the Blue Ridge section of Salmon mine, a body of ore has been found, which is keeping the mill running steadily.

Dredge—J. A. Brent and associates are building a dredge at Hamburg bar. Various gravel bars along the Klamath river are to be dredged when the machine is completed.

Indian Girl—A new mill has been purchased for this mine at Hornbrook, and is being hauled to the mine.

TRINITY COUNTY

Chloride Bailey and Globe—For these mines at Dedrick an electrical equipment is being provided to furnish power to operate a 20-stamp mill.

TUOLUMNE COUNTY

Anaconda—This mine, owned by McKenzie & O'Hara, is producing good ore, and has [illegible] working.

YUBA COUNTY

[illegible] Mining Company—Local men at Nevada City have organized this company to take over and work the R. & C. and the First and Last Chance mines at Brownville. Development will begin at once.

Brandy City—At this mine, Camptonville, 65 men are at work. A larger part of the flume has been completed. It will be nine miles in length when finished.

Colorado

Lake County—Leadville

Dinero Tunnel—About 100 ft. have been driven on the vein since the strike was made last week and the hanging wall has not been caught as yet. It is now understood that crosscutting will be started to locate the wall and to determine the width of the vein. Samples have been taken from different parts of the vein, and with all of the native silver in sight eliminated, gave returns of $150 per ton. There is a small proportion of gold and copper in the ore.

Big Six—With development work the body of ore recently opened in this property, Breece hill, continues to widen and shipments are now going out daily. The rich gold streak found in the center of the orebody still holds out and carries the same high proportion of gold; this ore is being sacked.

International Shaft—The large body of ore recently opened in this property, Robinson, contains a heavy percentage of milling ore, and the company will decide before the end of the month whether a mill will be erected at the mine or in Leadville. The probabilities are that it will be installed at the mine and act as a custom mill for the surrounding neighborhood. At present the property is closed pending the decision of the officials of the company.

Breece Hill—The Ibex Mining Company is producing in the neighborhood of 7000 tons per month of silicious and sulphide ores. Lessees on the Fanny Rawlins are shipping 50 tons daily of a high-grade ore taken from the lower levels. The Black Prince and Highland Chief are both producing a good grade of iron ore, and from the two shafts 50 tons daily are going out. The Gold Basin, M. N. Fraction, Little Vinnie, Penn and others are shipping regularly.

Coon Valley—The owner of this property, Rock hill, is installing electric power throughout the mine, and when completed work will be resumed on the orebody opened in one of the lower levels; the character of the ore is a lead sulphide.

Raymond Shaft—From the 300-ft. level shipments of lead and iron are going out steadily. The ore shoot is being developed toward the Reindeer.

Upper Arkansas—Considerable work has been done in this section during the summer with excellent results. A tunnel is being driven on the D. C. Bryan claim and at the breast a streak of ore was opened a few days ago that runs high in gold and silver. The gold is found in a soft gouge matter, while the silver is taken from a quartz vein.

Ouray County

Camp Bird—The London office reports that during August the mill ran 30 days and crushed 6748 tons, dry weight, of ore. The yield was 7368 oz. bullion and 411 tons concentrates. There was received during the month for bullion, $121,669; concentrates, $25,892; total, $147,561. Mine and other expenses were $46,360; London office, $1500; total, $47,860, leaving a net balance of $97,701. There was 314 ft. of development work done during the month; and the sum of $2788 was expended for construction.

Indiana

Greene County

Crescent Coal Company—Two of this company's mines two miles east of Jasonville, on the Monon railroad, that have been idle since April 1, started operation during the week, giving employment to about 300 men.

Sullivan County

A surprise came this week when it was announced that the Antioch mine, the property of the United Fourth Vein Coal Company, would be closed. The mine has been in operation all the year. The managers state that it was impossible to obtain enough help at the mine during the busy season, and that another mine in this territory will be reopened.

Warrick County

Within the last month over 500 oil and gas leases have been made in this county. These leases were made by the Standard Oil Company, the Pure Oil Company and a local company. Each company is working different sections of the county. Wells are being put down, and indications point to a prosperous season in this field.

Michigan

Copper

Forest fires continue unabated throughout the upper peninsula and several of the outlying localities are in immediate danger. The Atlantic mine location is about surrounded and several of the scattered buildings have been destroyed. Everything possible is being done to fight the fires. To the north the Calumet & Hecla and Tamarack companies have had forces of men out all week to protect their pumping stations on the shore of Lake Superior. There has been practically no rain for the last two months and a strong breeze continues.

Lake—Drifting is under way from the 2nd level of the shaft at a depth of 300 ft. and the same high-grade mineralization is being encountered. The south drift from the 1st level is in 280 ft. and is breasted in the high-grade copper-bearing ground that has characterized it from the start. A new 20-drill air compressor has arrived at the property and will be installed at once; more drills will be added and a more progressive policy will be persued. The company has also purchased a high-duty hoisting engine, capable of operating from a depth of 2500 ft. With this additional apparatus the surface plant will be able to take care of all requirements for some time.

Keweenaw—An assessment of $2 per share has been levied on the outstanding shares of this company, to provide additional funds for the opening up of the property on a more extensive scale. The company has one producing shaft down 1160 ft. on its Medora tract and is shipping about 225 tons of rock daily to the mill; the rock averages about 16 lb. copper to the ton. It is planned to sink this shaft deeper and to extend the openings. The company expects to explore fully the adjoining lands, which are known to carry several of the productive lodes of the district.

Mass—This company has cut a 12-ft. vein with a diamond drill that is being operated from the 5th level of "A" shaft; the core taken out shows a well mineralized vein. Diamond drill operations are to be continued and the various lodes existing in that locality will be penetrated.

Missouri

Joplin District

Kitty Mack—This company has incorporated with a capital stock of $25,000. The stockholders are Cincinnati and Joplin men.

Little Boss—This company will erect a second 100-ton mill on its tract at Granby.

Blackberry—Chas. Theurer has completed a tailing mill at this mine west of Joplin.

J. Wolley Mining Company—This company has incorporated with a capital stock of $75,000. The shareholders are from Evansville, Ind., and Joplin.

Hershel Mining Company—This company has incorporated with a capital stock of $25,000. The incorporators are Kansas City and Joplin men.

Oronogo Circle—This company is building a sludge mill to handle the sludge from five of its plants, and is installing 11 concentrating tables.

Continental Zinc Company—This company is installing a concrete-lined water column in its Prosperity mine for pumping the acid water. A 20-in. drill hole is put down and a 10-in. iron pipe placed inside. Around this 10-in. pipe concrete is run. When the acid water has eaten away the iron pipe the concrete column will remain.

Drillers—This company has put down four drill holes on its lease on the Rex land at Joplin and found ore in all of them.

United Zinc Company—This company has leased all its lands at Aurora to the Magnolia Lead and Zinc Company, a corporation capitalized at $200,000, and with the following stockholders: L. W. Place and C. E. Hemp, of Hamilton, O.; W. F. Hilles, Dallas, Tex.; P. H. Fitspatrick, Syracuse, N. Y., and Fred Holt and F. B. Wilcox, of Joplin. The land comprises 131 acres in fee.

Montana

Butte District

East Butte—The work of unwatering the main shaft has been begun. About 250 ft. of water are in the shaft, which is more than 900 ft. in depth. Several weeks will be required to pump the shaft, and then sinking will be begun. At the same time a crosscut will be driven from the 900-ft. station, and drifting will be done on the lead.

Anaconda Company—The Anaconda mine has been closed down for the past few days because of gases generated from fires in the old stopes. It is not expected that the mine will remain closed for more than a few days. At the J. I. C. mine of the same company a new electric hoist is being installed.

Copper Eagle Mining Company—The shaft has reached a depth of 350 ft. Sinking will be discontinued, and development work on the orebodies begun.

Deer Lodge County

Cable Consolidated—About 10 men are working on the property. Most of the work is being done on the surface and consists of exploration shafts sunk for the purpose of locating the outcroppings of certain ore-shoots.

Southern Cross—It is reported that a new body of gold ore of considerable extent has been discovered in an excavation recently made for the foundation of a new building on the property.

Savage Property—Burt Adams Tower, a mining engineer, of Butte, is in charge of the mill.

Jefferson County

Boston & Corbin—Sinking is progressing rapidly and will be continued until the 1000-ft. mark is reached. At a distance of 700 ft. from the shaft on the 500-ft. level the Bertha lode has been cut. It is reported that the vein at the point of intersection is 2 ft. wide.

Nevada

Esmeralda County—Goldfield

Output—The production last week was much greater than usual owing largely to treating a bunch of "jewelry ore" in the Combination mill, but this is not included in these figures. The ore-handling companies handled 2461 tons of ore worth $168,450. Besides this, 5 tons of rich ore came from Montezuma and 40 tons of $400 concentrates were treated at the Kinkead mill by the new Consolidated process. The Combination mill treated 400 tons of Consolidated ores. The Western Ore Purchasing Company handled from the Engineers Lease, 243 tons; Florence Consolidated, 166; Consolidated Red Top, 125; Mohawk Jumbo, 344; Engineers dump, 25; Kinkead Concentrates, 98; Durgan & Flynn lease, 5 tons. The Nevada Goldfield Reduction Works treated from the Combination Fraction, 320 tons; Baby Florence, 70; Mohawk Jumbo dump, 75; Red Top Lease, 30; Begole dump, 325; Little Florence dump, 102; Black Butte Consolidated, 23; January dump, 20 tons.

[illegible] was started again this week after a shutdown due to litigation.

Lone Star—Work has been started on the lease belonging to the Goldfield Star Leasing and Mining Company. A two-compartment shaft is being sunk to the 200-ft. level where a crosscut will be run to catch the vein formerly worked through an old incline shaft and from which $20,000 was extracted in the early days of the camp.

Sandstorm—The Prior & Quinn lease on the Sandstorm has been granted 18 months' time and the use of the Kendal shaft. The lease is unusually large, embracing 500 ft. on the Kruger and 600 ft. on the Magnolia claim.

Atlanta—The Maloney lease on block five has been extended for a period of nine months. The consideration is that the shaft, which is now 30 ft. deep, shall be sunk 200 ft. deeper.

C. O. D. Consolidated—The C. O. D. Fargo Mining Company has been formed with a capitalization of $1,500,000 to take over the old Fargo and C. O. D. Mining and Leasing Company's leases on the C. O. D. property. The Fargo lease has a life of 18 months. The shaft is 420 ft. deep.

Florence Consolidated—This lease on the Cornishman claim of the Florence property has found the oreshoot on the 173-ft. level and is shipping ore. The vein is trending toward the Jim Florence lease.

Jumbo Consolidated—The shaft is now 285 ft. deep; crosscutting has been started on the 250-ft. level.

Rustler Fraction—The Mountain Crown lease has reached a depth of 460 ft.; the shaft will be sunk to a depth of 500 ft. The water made in the shaft has decreased [illegible] buckets.

Blue Bull—The Terrell & Cosser lease on the Hat claim of the Blue Bull has resumed operations after a shut-down lasting several weeks. This property has been working for the past three years. The shaft is 400 ft. deep.

Yellow Tiger—The Elk Consolidated lease, which was reported to have struck ore on the 580-ft. level, and which then immediately closed down, is said to have made arrangements for sinking the shaft.

[illegible] been granted to the Nevada Gold Ore Mines Company for three years on the Gold Bar claim on condition that the shaft which is now 520 ft. deep shall be sent to a depth of 1000 ft. within 12 months.

Laguna—The Five Friends lease in the Last Chance claim of the Laguna has struck a low-grade vein in the shaft at a depth of 585 ft. Machine drills are used in sinking this shaft, and rapid progress is being made.

Combination Fraction—The Little Florence lease on this property is doing more development work than any other non-producing property in camp. In addition to three electric plants, a 40-h.p. gasolene hoist and an air compressor are being installed. Two compressors are now running, [illegible] and the other of 8 drills. The three-compartment shaft, which is to be sunk to a depth of 1000 ft. has reached the 357-ft. level and a station is being cut. A new shaft has been started and equipped with machinery in the southeast corner of the leasehold. It is already 100 ft. deep.

Zinn Florence—This lease on the Florence has, owing to discovery of an error in surveying, secured a block of ground 20 ft. wide and 200 ft. long, on the side toward the Baby shaft. Work is being done in the 76-, 120- and 185-ft. levels.

Baby Florence—This lease, also on the Florence, has 30 in. of ore on the 150-ft level, which gives sampler returns of $94 per ton. This stope is now 40 ft. long.

Consolidated—The new mill is growing rapidly. The 100 stamps are in place and will be given a trial run in a few days. The tube mills, as well as the driving gear and motors are all installed. Eight of the 16 settlers are built, also three of the large tanks for the Butters filter system. Four of the 45-ft. Pachuca tanks have been erected. The crusher plant is completed and ready to run except for the belts. The steel work for the sampling mill is all in place, and the steel work on the first two terraces of the main mill is practically completed.

[illegible]

[illegible] company has been organized in New York to develop mines in the Railroad Pass district, 23 miles southeast of Las Vegas. A contract has been let to sink a two-compartment shaft, and other operations are planned. R. T. Hill, of New York, is the directing geologist of the company. C. L. Graves is president and W. D. Pearce general manager.

[illegible]

Production—The week's production amounted to 5030 tons, valued at $135,000. The Tonopah Mining Company mined 2750 tons; Belmont, 480; Montana-Tonopah, 1070; Midway, 150; MacNamara, 250; Jim Butler, 90; Tonopah Extension, 90 tons.

Belmont—The company's 60-stamp mill at Millers is running every stamp and treating about 200 tons of ore per day that comes partly from the company's mines and partly from the MacNamara, West End, Jim Butler, Midway and North Star mines. The company intends to make some important changes in the mill. A Blaisdell distributor and excavator will be installed and possibly a tube mill.

New York

Knickerbocker Portland Cement Company—This company has concluded contracts with the American Cement Engineering Company, of New York, under which the latter will construct two cement plants on the Hudson river with a combined daily capacity of 12,000 bbl., and an annual output of not less than 4,000,000 bbl. of portland cement. Work will start almost immediately on the rebuilding of the present 2000-bbl. plant at Hudson, on the east bank of the river. Its daily capacity will be raised to 6000 bbl. The Engineering company promises to have the plant ready to reach a production at the rate of 2,000,000 bbl. annually, late next spring. The plant on the west bank, near Catskill, will have construction started early next year, and will be completed and in operation about a year from the date the foundations are started. Both contracts provide for machinery of the highest efficiency, and factory construction generally of the most solid type. These plants will mark the advances made in recent years in the use of electricity. The Knickerbocker Portland Cement Company has acquired about 1400 acres of limestone, shale and clay lands on the east bank of the river, and more than 500 acres on the west bank, with good railroad and water shipping facilities on both properties.

Oklahoma

OTTAWA COUNTY

King Jack—This mine made its first turn-in last week and is installing Kirk concentrating tables.

Miami-Yankee—This company has begun the erection of a mill on its lease.

Drills—Twelve drills are at work within one mile of the Emma Gordon mine at Miami.

Good Luck—This company is erecting a new mill in the Quepaw camps.

Pennsylvania

ANTHRACITE

Reading Coal Company—This company has drained old mine workings under the Schuylkill and Mahanoy valleys and is preparing to further develop the territory. It owns, in this locality, a valuable seam of coal of nearly uniform thickness and considerable length which will soon be mined.

BITUMINOUS COAL

It is stated that H. A. Kuhn, president of the Pittsburg & Westmoreland Coal Company, near Monongahela, Penn., has invented a coal-cutting machine, which is said to be an improvement on all cutters now in use. The machine in operation is said to have cut coal at the rate of 1200 lb. a minute, while its advance into the vein was 3 in. a minute. This feat was accomplished while the machine was running at about 50 per cent. of its capacity. The passage was cut 10 ft. wide. Electric power was used.

The H. C. Frick Coke Company is to erect three new coke plants in the Connellsville region. The cost will be about $4,000,000.

Westmoreland Coal Company—This company has completed plans for the development of a large tract, of 20,000,000 acres which it has held in Westmoreland county for some time as a reserve. An appropriation of $1,000,000 has been made by the company for this work. Two mines are to be opened on the tract, and a new mining town is to be built, which will be named Yukon.

South Dakota

LAWRENCE COUNTY

Branch Mint Operating Company—This company, composed of Otto P. Heyn, Michael Hecht and other New York men, has taken over on five years' lease the property of the Branch Mint Mining Company at Galena and will operate at once. All Branch Mint labor claims, amounting to $20,000 were paid on taking the lease.

Queen Esther—At the annual meeting A. L. Kingdom, Warren, O., was chosen president; S. V. Pierce, Niles, O., vice-president; W. W. Conner, Columbus, O., secretary and treasurer; Stewart Conner, Tinton, general manager. Other directors include Ernest Mueller, Deadwood; John McVean, Terry; David Pugh, Mineral Point, O.; C. L. Hammond, Columbus, O. The operations will continue in shaft and tunnel.

Safe Investment—Patent to 1800 acres on Box Elder creek has been received and operations will be resumed next month. There are numerous large veins showing gold, silver and copper. The 40-stamp mill will be put in commission again and extensive development will be done.

Gold Ridge—H. B. Trathen and other local owners are negotiating for the sale of the property on Bear creek, where a good body of gold ore has been opened up. The mine is worked by tunnel.

PENNINGTON COUNTY

Keystone-Holy Terror—Warner Gray, of New York, superintendent for the United Mines Company, is in Keystone making arrangements for reopening the property. All indebtedness has been paid and unwatering will commence in a few days.

Reynolds Ground—M. J. Scanlon and other owners have encountered a rich oreshoot near Keystone. The rock carries free gold in a vein 3 ft. wide.

Texas

Production of petroleum in the southeast Texas district in August is reported by the *Oil Investors' Journal* at 922,800 bbl., an increase of 105,600 bbl. over July. Shipments of crude oil in August were 786,812 bbl.; of refinery products, 511,078 bbl. The well report shows 31 wells completed during the month, 21 being producers. There were 78 wells drilling at the end of the month.

Utah

CARBON COUNTY

Union Pacific Coal Company—The power house of the new mine at Winter Quarters was burned Sept. 28, the loss being $50,000. There were 50 men in the mine when the fire started, but all escaped.

IRON COUNTY

Jennie Gold Mining Company—The new management is in charge; shareholders have been called on for an assessment of 5c. per share, or $30,000, to meet immediate demands. It is proposed to make certain changes in the mill and to sink the shaft deeper as the mine is opened to a depth of only 130 feet.

JUAB COUNTY

Tintic Standard—This property has been equipped with a new steam-hoisting plant.

Ajax—This property is shipping again after nine months of inaction.

Tintic Smeltery—The men in charge declare results achieved at this smeltery have been exceptionally gratifying.

SALT LAKE COUNTY

Columbus Extension—This company has been developing its property in the Alta district for nearly three years; during this time $35,000 has been expended. The first orebody of any consequence was encountered last week when the adit through which the property is being developed cut the Flagstaff vein at a vertical depth of 1300 ft. The vein is about 8 ft. wide and the ore assays from 2 to 10 per cent. copper. The adit is 3500 ft. long.

Utah Apex—This mine, at Bingham, is shipping 50 tons per day of lead-silver ore. The mine is worked through the Parvenue adit, the lowest level in the mine.

TOOELE COUNTY

Boston-Sunshine—Plans for the alterations in the mill owned by this corporation have been completed, and the changes will soon be made. The equipment will be similar to that in use at the Consolidated Mercur mill, four miles away.

Clift Mining Company—The mine at Ophir is shipping about a carload per day to the Salt Lake valley smelters.

Wisconsin

ZINC-LEAD DISTRICT

Empire—The litigation pending between the Empire and Enterprise companies, of Platteville, over alleged encroachment on the Empire land by the Enterprise company was settled this week, the Enterprise company paying $1000 damages.

Lyght—This company has purchased the 75-ton mill and entire surface equipment of the Rico and will remove it to the Lyght mine.

United States Zinc—This company has let a contract to the Galena Iron Works for the erection of a new roaster of the Galena type.

Union Zinc Company—This company has purchased the property and equipment of the Sunset and will reopen the mine.

New Jersey Reduction Company—This company proposes to build another custom roasting plant at Galena, with capacity to handle 150 tons of concentrates per day.

Platteville—The plant of the Electrostatic Separator Company is closed down to make alterations and enlargements. The company has become an active buyer of the low-grade pyritic zinc ores from which it extracts a salable pyrite or sulphur ore assaying 42 to 46 per cent. sulphur, that is being successfully marketed.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Sept. 22 were as follows: Coniagas, 63,000 lb.; Crown Reserve, 60,000; Chambers-Ferland, 61,000; Foster, 58,900; La Rose, 189,250; Nipissing, 377,280; Nova Scotia, 40,500; O'Brien, 137,900; Right of Way, 122,850; Temiskaming & Hudson Bay, 60,000; Watts, 80,590; Total, 1,199,779 pounds.

Gould Consolidated—This company, which is working two properties leased from the Peterson Lake company has installed compressor drills and a hoist; power is furnished by the Nipissing company

Temiskaming & Hudson Bay—Recently a vein was struck within 10 ft. of the Trethewey mine in the drift at the 100-ft. level. It is 5 in. wide and is rich in silver.

La Rose Consolidated—An initial dividend of 3 per cent. for the quarter ending Aug. 31 has been declared.

O'Brien—A rich vein 4 to 5 in. wide has been struck in crosscutting at the 175-ft. level, 60 ft. from No. 2 shaft. It is said to assay 2800 oz. silver to the ton.

Rochester—The directors have decided to sink the main shaft, now down 90 ft., to the 200-ft. level. Stoping will be commenced at the 80-ft. level.

Silver Leaf—The shaft is down 204 ft. with driftings at the 75-ft. and 135-ft. levels. A station has been cut at the 200-ft. level. The main vein shows the entire depth of the shaft and at the bottom has a width of 5 in. of calcite and silver nearly free from cobalt. A 6-in. calcite vein, encountered in a crosscut at the 135-ft. level, at a distance of 109 ft., has been drifted on for 137 ft., disclosing good silver.

Silver Spade Mining Company—This company holds four claims in South Lorraine township, from which satisfactory assay returns have been received. A force of men under Superintendent Thomas R. Allison has begun development work.

Temiskaming—The new shaft is down 90 ft. A new 20-drill Corliss tandem air compressor and a large hoist have been ordered. The rich vein at the 200-ft level has widened to nearly 3 feet.

ONTARIO-TEMAGAMI FOREST RESERVE

Otisse—This property, comprising 40 acres situated 6 miles west of Elk City, has been sold to E. D. Warren & Co. Native silver has been discovered and work will be commenced at once by a force of 25 men in charge of Robert Longley.

Beaver—The main vein is now down 225 ft., at which level a drift has been started to tap the big vein of the Temiskaming mine.

Buffalo—Many improvements and additions to the plant have been made. A 125-h.p. boiler is in place in the new boiler house and a cyanide plant is being installed in the new addition to the mill building. New crushers, rolls and tables are being added to the concentrating plant, increasing the capacity to 100 tons daily. Two nuggets weighing 1500 and 500 pounds respectively, carrying 5000 oz. to the ton, were recently taken from the 80-ft. level in No. 12 vein.

Nova Scotia—A sample of rich ore, taken from the 150-ft. level, weighing 160 pounds and valued at $850, is on exhibition in Toronto.

NOVA SCOTIA

Dominion Iron and Steel Company—In the suit against the Dominion Coal Company, the Steel company has obtained a peremptory order from the British Privy Council compelling the Coal company to file its case within 14 days from Sept. 14. On Aug. 14 an order was issued calling on the Coal company to enter its case. The Coal company having taken no action, the peremptory order was issued. Should the Coal company be in default when the time expires, the Steel company can either force a hearing or obtain the dismissal of the appeal.

[illegible] have been slackened in view of the decreased demand. The company has closed down the East slope at colliery No. 5 and is making other curtailments, affecting in all about 400 men.

ONTARIO—MICHIPICOTEN DISTRICT

Helen—The Lake Superior Power Company, which is operating this iron mine, is making extensive improvements in the equipment, including the introduction of electric power. An electric-generating plant is to be installed on the Michipicoten river, where there is a fall of 128 ft. This includes a 1000-h.p. single, horizontal turbine connected with a 600-k.w. alternating-current generator. Transformers will reduce the pressure from 10,000 to 600 volts. An air compressor, operated by a 200-h.p. motor, and other mechanism for the hoists, etc., will be installed at the mine. The contract for electrical equipment has been given to Allis-Chalmers-Bullock, Ltd., of Montreal.

Mexico

DURANGO

Indé—The mill is treating about 100 tons of ore daily from the Mina Terrible. The cyanide process is employed.

Guadalupe—This company is extracting gold bullion from about 100 tons of ore daily. Power is generated in a plant on the river about five miles from the mine.

GUANAJUATO

Production—The output for the third week in September showed a marked falling off. The shipments of ore and concentrates were less than in the preceding week and also the shipments of bullion.

Guanajuato Reduction and Mines Company—The ore handled during the month ending Sept. 21 amounted to 16,120 metric tons. The new aërial tramway is transporting daily 150 tons of ore from the mine to the Bustos mill at a cost of 6c. per ton

SONORA

Chispas—This mine at Arizpe is making regular shipments of ore by burro train to the Sonora railroad. The guards are doubled because of the activity of the Yaquis. The Carmen mine, which adjoins the Chispas, is reported to be preparing to resume.

VERA CRUZ

Dos Bocas Gusher—Although the fire of the great oil well of the Pearsons was extinguished some time ago, the flow of oil and salt water continues, and it has thus far been impossible to get it under control. The pipe was blown out at the first outburst and the crater, now 100 to 200 yd. across, is widening. Troops have been at work building dams to inclose the oil, and a railroad contractor is preparing to undertake operations with a large force [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 30—The coal trade in the West is still improving, but very slowly. The weather is still warm enough to hold back domestic trade, while steam-coal demand increases irregularly. The Lake trade is slow for the season.

In the East bituminous trade rather drags. Anthracite business is dull also, owing chiefly to the continued warm weather which has prevailed.

Throughout Pennsylvania, both in the bituminous and the anthracite regions, mining has been hindered by the short supply of water resulting from the long drought. Some mines have been obliged to stop altogether, and others to cut down production for this reason.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Sept. 19, in short tons:

	1907.	1908.	Changes.
Anthracite......	4,063,733	3,620,482	D. 443,251
Bituminous.....	27,957,480	23,424,136	D. 4,533,344
Coke............	10,138,787	4,895,229	D. 5,243,558
Total.........	42,160,000	31,939,847	D. 10,220,153

Total decrease this year to date was 24.2 per cent.

Shipments of coal by water from Seattle and Tacoma, Wash., seven months ended July 31 were 416,650 tons in 1907, and 347,759 in 1908; a decrease of 68,891 tons.

Receipts of coal at St. Louis, seven months ended July 31 were 4,240,797 short tons in 1907, and 3,573,073 in 1908; a decrease of 667,704 tons.

Coastwise shipments of coal from principal Atlantic ports, seven months ended July 31, long tons:

	Anthracite	Bitum.	Total.	PerCt.
New York....	8,931,669	5,723,054	14,654,723	63.3
Philadelphia	1,265,849	2,656,703	3,922,552	16 9
Baltimore....	145,971	2,087,675	2,233,646	9.6
Newport News	....	1,462,626	1,463,626	6.3
Norfolk..	....	896,191	896,191	3.9
Total.......	10,343,489	12,827,249	23,170,738	100.0
Total, 1907.	11,310,253	13,564,270	24,874,523	.....

Total decrease this year, 1,703,785 tons, or 6.8 per cent. New York includes all the New York harbor shipping ports.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, seven months ended July 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio........	12,070,189	1,535,269	13,605,458
Buff., Roch. & Pitts.	3,040,035	201,033	3,241,068
Penn. lines, N. Y. C.	3,553,012	37,607	3,590,619
Pitts. & L. Erie.....	4,069,633	1,500,345	5,569,978
Norfolk & Western.	5,884,885	1,052,571	6,937,456
Total.............	28,617,754	4,326,825	32,944,579
Total 1907........	36,832,729	8,385,073	45,217,802

Decrease this year in coal 8,214,075 tons; in coke, 4,058,248; total, 12,273,223 tons, or 27.1 per cent. In addition to the above, the Baltimore & Ohio carried 584,301 tons anthracite in 1907, and 440,584 in 1908; decrease, 143,717 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, seven months ended July 31, short tons:

	1907.	1908.	Changes.
Hocking Valley......	2,165,336	1,444,791	D. 720,545
Toledo & Ohio Cent..	994,618	695,578	D. 299,040
Baltimore & Ohio....	1,260,230	771,191	D. 489,039
Wheeling & L. Erie..	2,001,865	1,489,099	D. 512,766
Cleve., Lorain & Wh.	1,649,158	1,352,969	D. 296,189
Zanesville & Western	932,736	613,514	D. 319,222
Toledo Div., Pen. Co.	1,369,635	863,911	D. 505,724
L.Erie,Alliance&Wh.	706,303	517,868	D. 188,435
Marietta, Col. & Clev.	14,787	26,332	I. 11,545
Total..............	11,094,668	7,775,253	D.3,319,415

Total decrease this year was 29.9 per cent.

New York

ANTHRACITE

Sept. 30—The hard-coal market seems to have settled back into the same lifeless condition which has prevailed for the last few weeks. Among the small steam sizes buckwheat coal is in fair demand for both No. 1 and No. 2; other sizes are inactive.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Steam size prices are unchanged: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

There seems to be a slight improvement in the soft-coal trade and business has been coming in a little more freely. There have been a number of inquiries from shoalwater ports and it is expected that consumers from these points will soon contract for their winter's supply.

New York harbor trade is inactive and little business is being done. Good grades of steam coal fetch $2.50@2.65 with the poorer qualities selling around $2.40. In all-rail trade slack coal is quoted at 50c., run-of-mine at 85c. and ¾-in. gas coal at 90c., all f.o.b. mine. Transportation seems to have improved and cars are in good supply, although a few shortages have been reported.

In the Coastwise vessel trade there seems to be a shortage of vessels and freight rates are very firm, although unchanged from last week. Rates for large vessels from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Porthmouth and Bath, 60@65c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@$1; Providence, New Bedford and the Sound, 45@50c. per ton.

Birmingham

Sept. 28—By degrees the coal production in Alabama is improving. The normal output is being approached and there appears to be a fairly good demand for the coal. The railroads have prepared themselves to meet all demands for empty cars. Coal prices are not improving.

The coke production shows signs of improvement. There is need for all the coke that can be manufactured.

Chicago

Sept. 28—The coal market for the last week has been listless. A sharp drop in the temperature over the Middle West has had the result, at the beginning of the week, of stimulating sales of domestic coals. Steam coals are not yet in so good demand.

Illinois and Indiana coals bring, in car lots, $1.75@2.50 for lump and egg; $1.50@1.75 for run-of-mine, and $1.20@1.50 for screenings. Lump has strengthened and fine coals have weakened.

Of Eastern coal smokeless is ragged, with run-of-mine at $3.05@3.45 and lump at $4.05@4.30. Youghiogheny is steady at $3@3.15 for ¾-in. coal on contracts. Hocking is steady at $3.15 with sales fair and supply well regulated.

Indianapolis

Sept. 28—The bill to amend the law providing for safety regulations for blasting coal relating to the size of the drill bit used by the miners in preparing blasts has been passed by the Legislature, now in extraordinary session.

The Legislature two years ago made it unlawful to use a bit larger than 2½ in. As amended and passed the measure gives the miners the right to use a 3¼-in. bit. The passage of the amendment was opposed by the Indiana Coal Operators' Association because heavy charges are conducive to mine explosions. It was claimed the law had amply justified its existence. About 90 per cent. of the miners favored the amendment, and it was unanimously passed.

Pittsburg

Sept. 29—Production in the Pittsburg district, which has been at the rate of about 85 per cent. has dropped to around 30 per cent. This is due to a falling off in Lake shipments and there is no increased demand in the local [illegible] Prices, however, remain firm on the basis of $1.15 per ton for mine-run coal at the mine; slack ranges from 50c. to 60c. The river mines continue idle as there are no empty coal boats or barges to load and navigation is suspended owing to the long drought.

Connellsville Coke—The coke [illegible] continues strong, although sales are not heavy. Prices are firm. Furnace coke is $1.65@1.85 on contract, and foundry $2.10@2.25 per ton at the ovens. These prices have been shaded considerably for prompt shipment. The *Courier* in its weekly report gives the production in both regions at 201,485 tons. The shipments amounted to 7878 cars as follows: To Pittsburg, 4167; to points west of Pittsburg, 3268; to points east of Connellsville, 443 cars.

Foreign Coal Trade

United States Coal Exports—Total coal sold for consumption beyond the limits of the United States, seven months ended July 31:

	1907	1908	Changes.	
Exported	7,133,730	6,484,976	D	648,754
Steamship coal	3,271,779	3,413,528	I	141,749
Total	10,405,509	9,898,504	D	507,005

The steamship coal is that furnished to vessels in foreign trade.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, eight months ended Aug. 31, long tons:

	1907.	1908.	Changes.	
Coal	41,405,273	41,123,374	D	281,899
Coke	586,231	705,807	I	119,576
Briquets	981,468	1,039,985	I	58,517
Total exports	42,972,972	42,869,166	D	103,806
Steamer coal	12,364,530	12,803,762	I	439,232
Total	55,337, 02	55,672,928	I	335,426

The larger exports were to France, Germany, Italy and Sweden.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Sept. 19: Best Welsh steam, $3.78; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.30; seconds, $3.12; best small steam, $1.92; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 30—The iron and steel markets do not show any special advance. In fact, business has been rather quiet in most departments, so far as new orders are concerned. Structural plans of some importance are under negotiation, but the progress to the contract stage is slow. Railroad business is still held back, the only trade of this kind reported being a few orders for cars and two or three small ones for rails.

The pig-iron market has been dull, and [illegible] the rule. Buyers do not seem yet to be sure enough of the future to place business far ahead.

Some export business is soid to have been placed, chiefly for Mexico and South America. Canadian business is also improving. The railroads are preparing a new adjustment of rates between Pittsburg and western points. It is understood that no general increase is proposed, the purpose being only to remedy some inequalities which have grown up.

[illegible] despatch reports that the Dominion Steel Company, at Sydney, N. S., has closed a contract for 9000 tons of steel rails for export to India.

Baltimore

Sept. 28—Imports for the week included 450 tons spiegeleisen, 2620 tons ferromanganese and 500 tons ferrosilicon; 1560 tons manganese ore from Liverpool and 5500 tons iron ore from Cuba. Exports included 5874 tons steel rails, chiefly to Mexico; 280,118 lb. spelter to Glasgow.

Birmingham

Sept. 28—While the [illegible] in this section of the country is not as active as it has been, it is steady, and the quotations are firm and inclined toward a higher plane. All sales made recently in this section have been in small lots for immediate delivery. The quotations are around $13 per ton No. 2 foundry. The shipments from this territory have been steady all along and there has been no accumulation of iron. The Sloss-Sheffield company is making iron again at Lady Ensley furnace at Sheffield, while the work on Philadelphia furnace at Florence is nearing completion. This will make six out of seven furnaces in operation with this concern. The Tennessee company will have two furnaces in Bessemer about ready a fortnight or so hence. Some few sales of iron have been booked in southern territory for delivery during the first quarter of 1909. The quotations for these are around $13 per ton No. 2 foundry.

The Bessemer rolling mills are still idle because of the scarcity of steel. The cast-iron pipe trade lags a little. Foundries and machine shops are doing a little better in this territory.

Chicago

[illegible] iron and steel products continues quiet. Small lots are the rule in the pig-iron purchases with few sales for 1909 delivery. [illegible] last quarter deliveries; for 1909 first-quarter deliveries $13.50 is generally asked. Northern No. 2 is somewhat wobbly about [illegible] some 50c. more. On business for next year prices are fairly firm; for this year they very according to individual conditions.

The market for iron and steel products continues fairly active, sales being steady in about every line except steel rails and structural material. Coke is firm but quiet at $4.90 for the best Connellsville.

Cleveland

[illegible] upper ports will run over 4,000,000 tons for September, making a total of about 16,500,000 tons for the season. All the business, practically, is being done by the contract vessels, and there is no call for wild boats.

Philadelphia

Sept. 30—The large transactions in basic iron were not altogether a surprise to the trade here. The negotiations pending for additional blocks are expected to go through shortly. The fair volume of new business in plates and structural material has diverted attention to pig iron for steel purposes. Generally speaking, there is no demand outside of small lots for iron for quick delivery. Local foundry consumers are fairly covered for 30 to 60 days. Forge iron is at the tail of the list and averages $16, while No. 2X is dull at an average of $17.

Steel Billets—This branch of the industry is decidedly improved under the larger demand for finished products.

Plates—The car-building demand has benefited the Eastern mills to some extent. The boiler-shop demand is gaining.

Structural Material—Building work is calling for small lots of fabricated material, generally under 50 tons.

Rails—Apart from a few orders for light sections no business has been reported. The cutting of prices on large export orders is commented on in the [illegible]

Scrap—The scrap dealers report an indifferent demand. Railroad and heavy [illegible]

Pittsburg

[illegible] noted this week in the iron and steel trade but there are still signs of an improvement. [illegible] plications in the political situation are held responsible for the failure in carrying out of former predictions. Business has not gone back any, and small orders continue to come in. Reports from small independent concerns show that there has been an increase in trade compared with the past few weeks. This can only be accounted for from the fact that the smaller interests are anticipating the action of the larger companies by shading prices and booking what little business is going. The large concerns are taking orders and keeping their mills running but not on as large a scale as was anticipated a month ago. The National Tube Company is booking a considerable amount of small business. In addition it has taken one of the largest contracts placed for a year. It calls for 20,000 tons of gas pipe for the Columbia Gas and Electric Company for a line from the gasfields of West Virginia to Cincinnati. The Carnegie Steel Company is going to the extent of over 65 per cent. The American Bridge Company and the American Steel and Wire Company are running their plants to more than 50 per cent. of capacity. The American Sheet and Tin Plate Company shows a falling off in both its sheet and tinplate works but this is only temporary. The Republic Iron and Steel Company is operating about 70 per cent. of its capacity.

Pig Iron—The most important order taken this week calls for 2000 tons of basic iron for the Pittsburg Steel Company, the largest independent wire producer in the country. The price is not made public. The report that it also has purchased 2000 tons of steel billets is neither confirmed nor denied. There is no pig-iron market as to dealers and producers and it is characterized as a "consumers' market." This means that consumers who want iron can get it at almost any price in reason. Sales, however, during the week have been confined to carload lots. Quotations for prompt delivery are given as follows: Standard bessemer, $15; malleable bessemer, $14.50; basic, $14.25; No. 2 foundry, $14.50; gray forge, $13.50.

Steel—Bessemer and open-hearth billets are still quoted firmly at $25, Pittsburg, and no concessions are made, although there are a number of good inquiries. Merchant-steel bars remain at 1.40c. and plates at 1.60 cents.

Sheets—There is no decline in sheets and some good sales at the regular rates. Some independent producers are reported to be selling at less, but so far as known today all cutting has been stopped. Black sheets are quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The price remains $45@46, Pittsburg, but the demand is stronger.

Foreign Iron Trade

German Iron Trade—Imports and exports of iron and steel, including machinery, in Germany, seven months ended July 31, metric tons:

Imports:	1907.	1908.	Changes.
Iron and steel	466,413	324,902	D. 140,511
Machinery	60,464	53,817	D. 6,647
Total	525,877	378,719	D. 147,158
Exports			
Iron and steel......	1,981,909	2,229,040	I. 247,131
Machinery..........	186,484	208,478	I. 21,994
Total	2 168,393	2,437,518	I. 269,125

The increase in exports this year is due to the action of the Steel Syndicate in pressing foreign sales.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 30.

At all U. S. Ports in August and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1908..	$ 6,597,101	$ 4,257,255	Exp. $ 2,339,846
" 1907..	4,596,879	3,223,772	" 1,373,107
Year 1908..	64,960,348	33,614,330	" 31,346,018
" 1907..	48,375,977	28,103,201	" 20,272,776
Silver:			
Aug. 1908..	4,130,853	3,194,426	Exp. 936,427
" 1907..	6,748,085	4,882,622	" 1,865,463
Year 1908..	34,576,144	27,375,355	" 7,200,789
" 1907..	41,922,336	30,665,45	" 11,256,878

Exports of specie from New York week ended Sept. 26: Gold, $506,125, chiefly to Argentina; silver, $810,016, principally to London. Imports: Gold, $760,909, from Australia, London and the West Indies; silver, $61,953, from Central America and Mexico.

Specie holdings of the leading banks of the world, Sept. 26, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$321,194,500
England........	$192,854,200	....	192,854,200
France........	648,805,935	$180,145,475	828,951,410
Germany.......	206,125,000	85,545,000	291,670,000
Spain...........	78,590,000	169,555,000	248,145,000
Netherlands....	38,842,500	19,767,500	58,610,000
Belgium........	20,230,000	10,115,000	30,345,000
Italy............	185,165,000	22,500,000	207,665,000
Russia..........	591,620,000	37,955,000	629,575,000
Aust.-Hungary.	242,510,000	65,605,000	308,115,000
Sweden.........	20,660,000	....	20,660,000
Norway.........	8,655,000	....	8,655,000
Switzerland....	22,945,000	....	22,945,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in Great Britain eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Gold..........	£30 671,542	£29,729,543	Imp. £ 941,999
Gold, 1907...	31,138,757	21,503,887	Imp. 9,634,870
Silver	6,883,805	8,830,493	Exp. 1,946,688
Silver, 1907.	11,181,054	11,943,172	Exp. 762,118

Silver Market

SILVER AND STERLING EXCHANGE.

		Silver.				Silver.	
Sept.	Sterling Exchange.	New York, Cents.	London, Pence.	Sept.	Sterling Exchange.	New York, Cents.	London, Pence.
24	4.8640	51⅞	23 15/16	28	4.8640	51⅝	23 13/16
25	4.8640	51⅝	23 13/16	29	4 8640	51¾	23⅞
26	4.8640	51½	23¾	30	4.8640	51¾	23⅞

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Sept. 17:

	1907.	1908.	Changes.
India.	£8,817,864	£6,557,063	D. £2,260,801
China.......	....	516,400	I. 516,400
Straits......	598,700	112,385	D. 486,315
Total......	£9,416,564	£7,185,848	D. £2,230,716

Receipts for the week were £10,000 from Malta, £105,000 from Shanghai and £142,700 from New York; a total of £257,700. Exports were £1000 to Gibraltar, £22,000 to Singapore and £98,500 to India; £121,500 in all.

Silver continues steady, and with little change. Demand is good, but not sufficient to lift the price. The tendency is uncertain owing to the large speculative business which has been reported from India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

	Copper.			Tin.	Lead.	Spelter.	
Sept.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
24	13⅜ @13⅝	13¼ @13⅜	60	29⅛	4 45 @4 50	4 75 @4 80	4 60 @4.65
25	13⅜ @13⅝	13¼ @13⅜	60¼	29½	4 45 @4 50	4 75 @4 80	4 60 @4 65
26	13⅜ @13⅝	13¼ @13⅜	....	29½	4.45 @4.50	4 75 @4 80	4 60 @4.65
28	13⅜ @13⅝	13¼ @13⅜	59¾	29¼	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
29	13⅜ @13⅝	13¼ @13⅜	59⅝	29⅛	4.42½ @4 47½	4 75 @4 80	4 60 @4 65
30	13⅜ @13⅝	13¼ @13⅜	59⅞	29½	4.42½ @4.47½	4.75 @4 80	4.60 @4 65

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Sept. 23 there has been a little revival of business, particularly for export, but the transactions have not been active or of large volume. Business with domestic consumers has been insignificant. In short the market is almost at a standstill, producers waiting for buyers. There is no apparent anxiety to force copper on the market. One large producer of Lake copper is asking 14c. from which point asking prices scale downward, but the small amount of business actually done has been at lower figures than these nominal asking prices. To inquiries for domestic delivery slightly higher prices are named than are accepted for export, but if there were any important orders in the market they would doubtless be eagerly competed for. The copper recently offered by second hands appears to have been absorbed. The market closes steady at 13⅜@13⅝c. for Lake and 13¼@13⅜ for electrolytic. Casting has averaged 13@13⅛c. during the week.

The standard market in London does not show much change either way in its fluctuations throughout the week. The close is slightly better at £59 17s. 6d. for spot, £60 13s. 9d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@63 10s.; strong sheets, £74 10s.@75 10s.

Exports of copper from New York and Philadelphia for the week were 4960 long tons. Exports from Baltimore, as reported by our special correspondent, were 342 tons.

Manufactured Copper—Sheets, cold-rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 15¼c. base, carload lots at mill.

Tin—The London market showed some signs of manipulation in a downward direction incident to the Banka sale which took place during the week. After the consummation of this sale, prices hardened and the close is very firm at £134 for spot, £135 10s. for three months.

A fairly good-sized business was done among New York dealers, while orders on the part of consumers were placed for their immediate requirements only. As supplies of raw materials are quite large, the premium which existed some time ago has entirely disappeared, and quotations at the close are made at around 29½ cents.

Lead—The offers from St. Louis on the one hand and on the part of local speculators on the other have been of liberal volume and most insistent, so that prices have given way further, the close being weak at 4.42½@4.47½c. New York.

The St. Louis market is reported dull and lower. Sales have been made on a basis of 4.32½c. for Missouri brands.

The London market is somewhat firmer, closing at £13 5s. for Spanish lead, £13 7s. 6d. for English lead.

Spelter—There is no change. A sprinkling of orders is being placed right along, as the rank and file of consumers are entirely bare of supplies. The close is steady at 4.60@4.65 St. Louis, 4.75@4.80 New York.

The market abroad is again somewhat higher and closes firm at £19 15s. for good ordinaries, £20 for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is quiet and little business is being done. There were a number of sales the latter half of last week, but the activity was short lived. Quotations are 8¼@8½c. for Cookson's, 7⅞@8⅛c. for Hallett's, and 7½@7¾c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is $42.50 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $42 for domestic orders, and $40 for export. London price is higher, at £8 5s. per flask, but £8 is done with jobbers.

Platinum—Quotations are $22.50 for hard platinum, $20 for ordinary, and $16 for scrap.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, eight months ended Aug. 31, figures in long tons, except quicksilver, which is in pounds:

	Imports	Exports	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Tin-ore imports, 15,223 tons in 1907, and 17,722 in 1908; increase, 2499 tons. Iron and copper pyrites, 521,219 tons in 1907, and 547,946 in 1908; increase, 26,727 tons. Of the imports this year the United States furnished 4794 tons copper matte, 44,697 tons fine copper and 25,210 tons lead.

Missouri Ore Market

Joplin, Mo., Sept. 26—The highest price paid for zinc ore was $41 per ton, on a base price of $38. Some ore sold as low as $37 per ton of 60 per cent. zinc. The base price of silicate of zinc was $20, some ore selling as high as $26.50. The average price, all grades, was $34.78 per ton. One bin of lead sold at $56, but the general price was $54 until Thursday, when it dropped to $53, closing the week at the lower figure. The average price, all grades, was $53.84 per ton.

The output is surprising, after a trip over the district which discloses a number of big mills around Webb City, Carterville and Duenweg still closed down. Many mines, however, have been developed from prospects of a year ago. In the Webb City field richer sheet-ore mines have been opened, and a number of new "free-ore" mines have been developed around Joplin, while new mines have been opened at Quapaw-Baxter and Miami, in Oklahoma.

Following are shipments for the week ended Sept. 26:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	[illegible]	[illegible]	[illegible]
Galena	[illegible]	138,990	[illegible]
Oronogo	[illegible]	[illegible]	12,473
Spurgeon	[illegible]	[illegible]	[illegible]
Badger	[illegible]		[illegible]
Alba-Neck	[illegible]		[illegible]
Miami	[illegible]	[illegible]	7,346
Quapaw-Baxter	[illegible]	[illegible]	6,925
Granby	[illegible]	22,300	6,850
Aurora	[illegible]	[illegible]	6,262
Duenweg	[illegible]	[illegible]	6,229
Carthage	[illegible]		8,249
Prosperity	155,390	74,480	[illegible]
Sarcoxie	[illegible]		[illegible]
Cave Springs	[illegible]		[illegible]
Carl Junction	[illegible]	4,270	1,274
Zincite	[illegible]		479
Totals	[illegible]	1,415,[illegible]	[illegible]

Nine months [illegible]

Zinc value, the week, $192,1[illegible]; 9 months, [illegible]

Lead value, the week, [illegible]8,111; 9 months, 1,[illegible]

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

	Zinc Ore				Lead Ore	
Month	Base Price		All Ores		All Ores	
	1907	1908	1907	1908	1907	1908
January	$46.90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February....	48.90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	44.50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	41.75	......	[illegible]		[illegible]	
November...	[illegible]		[illegible]		[illegible]	
December	31.50	....	30.87	......	37.71	
Year	[illegible]		[illegible]		[illegible]	

Note—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Sept. 30—The general market is beginning to show a slight improvement; dealers report more business although the volume is still below normal for this time of year.

Arsenic—White arsenic is freely offered at 3¼@3⅜c., which is as low as at any time this year. Consumption is small and mostly for immediate delivery.

Copper Sulphate—The demand has slackened and the volume of business is less than for the last two or three weeks. Standard goods are still quoted at $4.65 per 100 lb. in carloads and up to $4.90 in smaller lots.

Nitrate of Soda—The market is quiet and buyers are exceedingly cautious. Prices are 2.25c. for the rest of 1908 and for 1909, but it is reported that spot quotations are being made at a lower figure than those given out by the principal dealers.

Mining Stocks

New York, Sept. 30—The excitement and recession in the general stock markets, which were reported last week, have given way to a rather dull and uncertain market. The volume of trading dropped abruptly and prices have been irregular. Political and other conditions have not changed, and matters have depended very much on the ideas of individual operators. The public seems to have taken little active interest.

On the Curb, trading followed the lead of the [illegible] and was not [illegible]ly active. There was some selling of copper stocks, but the leaders in the trading were found among the shares which are not usually very active. The only sensation was a sharp break in Standard Oil, on light trading.

Boston

Sept. 29—The mining share market has diminished quite a bit in the volume of business, but prices have stiffened materially, considering the little public interest taken. Some specialties have been active, and sharp advances were recorded in a few cases, although moderate reactions followed. The declaration of the regular quarterly dividend of 50c. by Anaconda mining directors gives a little inspiration and a forecast that there is little or no likelihood of any increase in the Amalgamated Copper Company's rate.

North Butte has been in active demand, and is readily absorbed on reactions for Western account. From $77.50 it rose smartly to $82.75, reacted to $78.62½, and closed tonight at $80. Atlantic spurted $2.50 to $18.50, losing $1.25 of it. The advance was due to report of important developments on the section 16, 13th level toward the Baltic mine. Isle Royale, in sympathy, rose $4.25 to $24.25, reacting to $22 again.

Amalgamated rose $4.75 to $75, but closed at $73.25 tonight. Copper Range spurted $3.75 to $74, closing at $73 tonight. P. W. Denton, of Painesdale, Mich., has been elected a director of this company to succeed Cameron Currie, of Detroit.

The Curb has also shown gradual stiffening in prices. Keweenaw has been soft, falling from $4.25 to $3 on the announcement of a $2 assessment, payable in two instalments of $1 each. Superior & Boston rose sharply from $7.25 to $9.37½, and East Butte $1.12½ to $8.12½.

STOCK QUOTATIONS

NEW YORK Sept. 29

Name of Comp.	Clg.
Alaska Mine	½
Amalgamated	73⅛
Anaconda	43½
Balaklala	‡2 1/16
British Col. Cop.	6½
Butte & London	....
Butte Coalition	24
Colonial Silver	
Cum. Ely Mining	7
Davis Daly	1 3/16
Dominion Cop.	1
Douglas Copper	3½
El Rayo	3¼
Florence	3½
Foster Cobalt	.62
Furnace Creek	.16
Giroux	4⅜
Gold Hill	⅜
Goldfield Con.	5 11/16
Granby	‡97
Greene Gold	¾
Greene G. & S.	½
Greenw'r & D. Val.	‡75
Guanajuato	2⅛
Guggen. Exp.	160
Hanapah	‡20
McKinley Dar.	1.00
Micmac	2¼
Mines Co. of Am.	1 1/16
Mitchell Mining	
Mont. Shos. C.	
Nev. Utah M. & S.	3
Newhouse M. & S.	5½
Nipissing Mines	8½
Old Hundred	½
Silver Queen	1.25
Stewart	11/16
Tennessee Cop'r.	29⅛
Tri-Bullion	1
Union Copper	⅜
Utah Apex	4½
Utah Copper	41
Yukon Gold	4 1/16

BOSTON Sept. 29

Name of Comp.	Clg.
Adventure	8¼
Allouez	34
Am. Zinc	23¾
Arcadian	2½
Arizona Com	28¼
Atlantic	17⅝
Bingham	‡.40
Boston Con.	13¾
Calumet & Ariz.	114½
Calumet & Hecla	640
Centennial	32
Con. Mercur	‡.40
Copper Range	72½
Daly West	9
Franklin	12
Greene Can.	10¼
Isle Royal	22¼
La Salle	13¼
Mass	6½
Michigan	12¾
Mohawk	60½
Nevada	15½
North Butte	79⅛
Old Colony	.60
Old Dominion	40
Osceola	106
Parrot	‡26
Quincy	90
Rhode Island	4½
Santa Fe	‡1⅜
Shannon	14¼
Superior	24
Tamarack	70
Trinity	18½
United Cop., com.	10⅞
U. S. Oil	‡24¾
U. S. Smg. & Ref.	39⅞
U.S.Sm. & Re., pd.	45
Utah Con.	43
Victoria	4¼
Winona	‡5½
Wolverine	‡140
Wyandotte	‡2⅝

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	28
Am. Smelt. & Ref.	83¾
Am. Sm. & Ref., pf.	‡102⅛
Bethlehem Steel	‡22
Colo. Fuel & Iron	34½
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	82½
National Lead, pf.	‡102
Pittsburg Coal	‡10⅛
Republic I. & S.	‡21½
Republic I. & S., pf.	77¼
Sloss-Sheffield	60
Standard Oil	615
U. S. Red. & Ref.	‡9
U. S. Steel	44⅞
U. S. Steel, pf.	108⅛
Va. Car. Chem.	29¼

BOSTON CURB

Ahmeek	100
Black Mt.	3⅛
East Butte	8
Hancock Con.	5¾
Keweenaw	3½
Majestic	.71
Raven	.85
Shawmut	.20
Superior & Pitts.	13½
Troy Man.	‡.30

ST. LOUIS Sept. 26

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.25	1.50
Cent. C. & C.	68 00	67 00
C. C. & C. pd.	74 00	72 00
Cent. Oil	110.00	100.00
Columbia	5.00	3.00
Con. Coal	21 00	19 00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe	14.00	12.50

LONDON Sept. 30

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind	0	1	0
Camp Bird	0	13	3
Esperanza	3	8	9
Tomboy	1	2	6
El Oro	1	6	3
Oroville	0	11	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Sept. 30.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.24
Best & Belcher	.41
Caledonia	.12
Chollar	.18
Comstock	‡.24
Con. Cal. & Va.	.71
Crown Point	.27
Exchequer	.25
Gould & Curry	.08
Hale & Norcross	.30
Mexican	.74
Ophir	1.75
Overman	.15
Potosi	.17
Savage	.28
Sierra Nevada	.20
Union	.29
Utah	.05
Yellow Jacket	50
TONOPAH STOCKS	
Belmont	1.27
Extension	.64
Golden Anchor	.02
Jim Butler	.25
MacNamara	.50
Midway	.29
Montana	95
North Star	.06
Tono'h Mine of N.	7.12½
West End Con.	.50
GOLDFI'D STOCKS	
Adams	.04
Atlanta	.23
Booth	.46
Columbia Mt.	22
Comb. Frac.	1.39
Cracker Jack	.06
Dia'dfield B. B. C.	.15
Goldfield Belmont	.15
Goldfield Daisy	.82
Great Bend	.34
Jumbo Extension	.36
Katherine	...
Kendall	.14
Lone Star	.08
May Queen	.06
Oro	.11
Red Hill	.22
Roanoke	..
Sandstorm	.22

Name of Comp.	Clg.
Silver Pick	.16
St. Ives	.25
Triangle	.04
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B.	.03
Gibraltar	.03
Gold Bar	.03
Homestake King	.26
Montgomery Mt.	.07
Mont. Shoshone C.	.81½
Original Bullfrog	.01
Tramp Cons.	.16
MANHAT'N STOCKS	
Manhattan Cons	.06
Manhat'n Dexter	.05
Jumping Jack	.03
Stray Dog	.03
MISCELLANEOUS	
Golden Boulder	.06
Bonnie Clare	.06
Lee Gold Grotto	...
Nevada Hills	1.00
Nevada Smelting	.87½
Pittsburgh S. Pk	.96
Round Mt. Sphinx	.15

COLO. SPRINGS Sept. 26

Name of Comp.	Clg.
Acacia	‡6⅛
Black Bell	....
C. C. Con.	3¾
Dante	....
Doctor Jack Pot	6½
Elkton	65
El Paso	37
Findlay	21
Gold Dollar	7
Gold Sovereign	3
Isabella	26½
Index	....
Jennie Sample	2¾
Jerry Johnson	‡4
Mary McKinney	31
Pharmacist	‡3⅛
Portland	1.05
Un. Gold Mines	4
Vindicator	83½
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
Belcher, Nev.	Sept. 15	Oct. 6	$0.10
Bullion, Nev.	Oct. 29	Nov. 20	0.05
Caledonia, Nev.	Oct. 21	Nov. 11	0.05
Challenge Con., Nev.	Aug. 31	Sept. 22	0.05
Con. Imperial, Nev.	Sept. 29	Oct. 22	0.01
Gould & Curry, Nev.	Oct. 7	Oct. 29	0.10
Lady Washington, Nev.	Oct. 26	Nov. 16	0.05
Nevada Fairview	Sept. 14	Oct. 26	0.005
Nonpareil, Utah	Sept. 15	Oct. 15	0.01
Overman, Nev.	Sept. 23	Oct. 14	0.05
Potosi, Nev.	Sept. 4	Sept. 29	0.10
Savage, Nev.	Aug. 27	Sept. 18	0.10
Sierra Nevada, Nev.	Oct. 14	Nov. 4	0.10
Signet	Aug. 8	Oct. 6	0.01
Union Con., Nev.	Sept. 15	Oct. 7	0.10
Wabash, Utah	Sept. 15	Oct. 8	0.07
West Quincy, Utah	Sept. 12	Oct. 1	0.03
Wheeler, Utah	Oct. 5	Oct. 23	0.01
Yellow Jacket, Nev.	Aug. 10	Sept. 15	0.25

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	......	28.863	......
November	58.677	......	27.154	......
December	54.565	......	25.362	.....
Year	65.327	......	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	......	13.551	......	60.717	....
November	13.391	......	13.870	......	61.226	....
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	......	5.280	......	21.781	......
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—	
Bort, good drill quality, carat	[illegible]
Carborundum, f.o.b. Niagara Falls, powd............lb.	.08
Grains... "	10@ 17
Corundum "	07@ 10
Crushed Steel, f.o.b. Pittsburg "	05½@ 06
Emery, in kegs; Turkish flour................... "	.01¾@.02¼
Grains.............. "	.03¼@ 04½
Naxos flour........... "	.01¾@ 02½
Grains "	03½@ 04½
Chester flour "	01½
Grains "	03½@ 04½
Peekskill, f.o.b. New York, flour.................. "	.01¼@ 01½
Grains, in kegs........ "	.02¼@ 02½
Garnet, per quality sh. ton	25 00@35 00
Pumice Stone, Am. powd 100 lb	1 60@2 00
Italian, powdered ... "	01¼@ 01½
Lump, per quality "	03@ 20
Rottenstone, ground..... "	02@ 04
Lump, per quality "	05@ 25
Rouge, per quality....... "	.05@.30
Steel Emery, f.o.b. Pittsburg "	07½@ 07¾
ACIDS—	
Acetic 28%..............lb.	.026@ 03
Boric.................... "	.08@ 08½
Hydrofluoric, 30%........ "	.02¾@.03
" 48%........ "	.06
" 60%........ "	.10
Hydrochloric acid, 20°, per lb.	1.25@1.50
Nitric acid, 38° per lb	4 25@4 62½c
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton	16 00@18 00
66°, 100 lb in carboys.	1 00@1 25
66°, bulk, ton.......	18.00
Oxalic "	06½@ 06¾
ALCOHOL—Grain 95%....gal.	2.63
Denatured "	43@ 49
Refined wood, 95@97%... "	.47@.53
ALUM—Lump 100 lb.	$1 75
Ground............. "	1.85
Chrome Alum............lb.	.04½@.05
ALUMINUM—Sulphate, com'l. lb.	1 10@1 75
AMMONIA—24 deg. lb...... "	.04½@.05½
" 26 deg. lb.......	.04¾@.05¾
AMMONIUM—	
Bromide................lb.	.23
Carbonate "	07¾@ 08
Muriate grain "	05¾@ 06½
Lump "	09¼@ 09½
Sulphate, 100 lb	3 05@3 10
Sulphocyanide com "	30
" " chem. pure.. "	.40
ANTIMONY—needle, lump.. "	.03¼@.03½
ARSENIC—White "	.03¼@ 03¾
Red "	07½@ 07¾
ASPHALTUM—	
Barbadoes per ton.	40 00@80 00
West Indies.......... "	20.00@60 00
Egyptian.................lb.	.10@.11
Gilsonite, Utah, ordinary per ton.	32.00
Trinidad "	22 50@30 00
California "	21 00@27 00
BARIUM—	
Carb. Lump, 80@90% lg. ton.	30.00@35.00
Precipitated 96@98%......	36.00@40.00
Powdered, 80@90%.....lb.	.02@.02¼
Chloride com'l...........ton.	39.00@41.00
Nitrate powdered, in casks..lb.	.05½@.06
Blanc Fixe............per lb.	.02¼
BARYTES—	
Am. Ground..........sh. ton.	14.00@21.00
Floated "	22 00
Foreign floated "	19 50@22 50
BISMUTH—Sub-nitrate.....lb.	1.50
BLEACHING POWDER—35%, 100 lb	1 25@1 40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	4.65
BONE ASH...............lb.	.02¾@.04
BORAX "	04½@ 05¼
CALCIUM—Acetate, gray, 100 lb	2 00@2 05
Acetate, brown............lb.	1.25@1.30
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J sh ton	65 00
Chloride, f.o.b. N. Y... "	11.00@14.00
CEMENT—	
Portland, Am. 500 lb.....bbl.	1.55@1.60
Foreign............... "	2.25@2.90
"Rosendale," 300 lb...... "	.85
(in sacks).............. "	.65
Slag cement "	75@1 25
CHROME ORE—	
New Caledonia 50% ex. ship N. Y...........per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, M ton.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.........ton.	8.00@9 00
Foreign.................. "	10 00@17.50
COBALT—Oxide lb	[illegible]
COPPERAS—[illegible] 100 lb.	[illegible]
In bbls............... "	.65@.75
[illegible]	[illegible]
CRYOLITE lb	[illegible]
FELDSPAR—[illegible] ton.	[illegible]
FIRE BRICK—	
[illegible]...............per M.	[illegible]
Imported .... "	30.00@45 00
[illegible]	[illegible]
[illegible]	[illegible]
Extra................ "	20 00@23 00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality per ton.	5 00
[illegible]	[illegible]
FLUORSPAR—	
Domestic f.o.b. shipping port:	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
FULLER'S EARTH—Lump 100 lb	[illegible]
Powdered	[illegible]
GRAPHITE—[illegible]	
Flying dust, finest to best. .lb.	01@ 04
[illegible]	[illegible]
Chip.................... "	02¾@ 07½
Lump................. "	.04@ 10
Large [illegible]	[illegible]
GYPSUM—	
[illegible]	[illegible]
Ground............... "	4 00@7 00
INFUSORIAL EARTH—	
Ground Am. Best......... lb.	.01¾
[illegible] lg. ton	[illegible]
German.................lb.	.02¼@ 02¾
LEAD—Acetate [illegible] brown ....lb.	.07¾
Nitrate [illegible]	[illegible]
MAGNESITE—[illegible]	
Crude [illegible] lg. ton	[illegible]
Calcined, [illegible] sh. ton	26 00@[illegible]
Bricks, domes, per qual. f.o.b. Pittsburg M	[illegible]
MAGNESIUM—	
Chloride, com'l........100 lb.	.90@1.25
Sulphate (Epsom salt). 100 lb.	.85@1 00
MANGANESE—	
Foreign, crude, powdered: 70@75% binoxide.......lb.	.01@ 01½
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Ore, 80%-85%........sh. ton.	16 00@32.50
MARBLE—[illegible] sh. ton	[illegible]
MINERAL WOOL—	
Slag, ordinary sh. ton	[illegible]
Selected	[illegible]
Rock, ordinary........ "	32 00
Selected............ "	40 00
MONAZITE SAND—	
Guar. [illegible] thorium oxide [illegible] lb	08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	[illegible]
Sulphate, single...........lb.	.09@ 11
Sulphate, double.......... "	.06½@ 08
NITRATE OF SODA—100 lb 95% for '08	[illegible]
95% for 1909	[illegible]
95% for 1910.. ..	2 22½
96% is 5c. higher per 100 lb.	
OZOKERITE—best........lb.	.14@ 17
PAINTS AND COLORS—	
Litharge, Am. powdered lb	[illegible]
[illegible]	[illegible]
Lithopone	[illegible]
Metallic, brown...... .sh. ton.	16.50@22 00
Red	[illegible]
Ocher, Am. common... "	8 50@9 00
[illegible]	[illegible]
[illegible] lb	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Turpentine, spirits bbl., per gal.	.42½
White lead, Am., [illegible] lb	[illegible]
Am[illegible], in oil	[illegible]
Foreign, in oil........... "	10¾@ 10⅞
Zinc white, Am extra dry... "	05½@ 05¾
French, red seal, dry .... "	.08½@ 08¾
French, Green seal, dry... "	.10½@ 10¾
PHOSPHATES—Acid	[illegible]
*Fla. [illegible]	[illegible]
[illegible]	[illegible]
†Tenn. [illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
‡So. Car. [illegible]	[illegible]
[illegible]	[illegible]

*F.o.b. Florida or Georgia ports. †F.o.b. Mt Pleasant. [illegible]

POTASSIUM—	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
PYRITE—	
[illegible]	11@11½c.
[illegible]	10@10½c.
[illegible]	[illegible]
Imported, arsenical, furnace size, per unit.....................	12@ 12½
[illegible]	[illegible]
Imported fines, non-arsenical, per unit.....................	10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1 13
N. Y. agricultural ..... sh. ton.	3 80@4 50
SALTPETER—[illegible]	[illegible]
[illegible]	[illegible]
SILICA—	
Ground quartz, ord'ry. .lg. ton.	10 00@15 00
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
SILVER—Nitrate, crystals. .oz.	.37½@ 4
SODIUM—	
Acetate	[illegible]
"Alkali," per 100 lb., 58/48 ..	.80@ .87½
[illegible]	[illegible]
Soda, caustic, per 100 lb., 76/60	1.75@1 85
Soda, caustic, powdered	.02¾@ 03½
Salt cake, per 100 lb., bulk....	.40
Salt cake, bbl..............	65@ 85
Soda, monohydrate, per lb....	1 4@1 75c
Bichromate ....lb.	07¼@ 07½
Bromide	[illegible]
Chlorate [illegible]	[illegible]
Cyanide ("100% KCN")	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Hyposulphite, Am.	[illegible]
German	[illegible]
Phosphate	[illegible]
Prussiate	[illegible]
Sal soda, f.o.b. N. Y.... 100 lb.	.65@ 70
Foreign, f.o.b. N. Y.. "	.80@1 00
Silicate, com'l......... "	80@1.15
Sulphate, com'l (Glauber's salt) ....100 lb.	60@.75
Sulphate, com'l, calcined.....	.65@ 85
STRONTIUM—Nitrate	[illegible]
SULPHUR—	
Louisiana (prime) to New York, [illegible]	[illegible]
[illegible]	[illegible]
Roll.............. ....100 lb	1.85@2 15
[illegible]	[illegible]
[illegible]	[illegible]
TERRA ALBA—[illegible]	[illegible]
TALC—Domestic ..... .sh. ton.	15 00@25 00
[illegible]	[illegible]
[illegible]	[illegible]
TIN—[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
URANIUM—[illegible]	[illegible]
ZINC—	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Note— [illegible]

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ABRASIVES

7380—PRODUCTION of Abrasive Materials in 1907. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1907; 22 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

ALUMINUM

7381—ALUMINUM CARBIDE—Formation and Preparation of Aluminum Carbide. M. Camille Matignon. (Journ. Frank. Inst., Sept., 1908; 10 pp.) Discusses the theory of the formation of aluminum carbide and describes the methods of preparing it in several different ways. 60c.

7382—PRODUCTION of Bauxite and Aluminum in 1907. W. C. Phalen. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 15 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

ASBESTOS

7383—PRODUCTION of Asbestos in 1907. J. S. Diller. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 14 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

ASPHALT

7384—PRODUCTION of Asphalt and Bituminous Rock in 1907. Joseph A. Taff. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 10 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

BARYTES

7385—PRODUCTION of Barytes and Strontium in 1907. Ernest F. Burchard. (Advance Chapter from Mineral. Resources of U. S., Calendar Year 1907; 14 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

BAUXITE

7386—PRODUCTION of Bauxite and Aluminum in 1907. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1907; 15 pp.) See under "Aluminum."

CADMIUM

7387—CADMIUM as a By-Product. Paul Speier. (Eng. and Min. Journ., Sept. 12, 1908; 1/3 p.) Describes the condition of the German cadmium industry and makes certain suggestions regarding an editorial in the JOURNAL of June 11 on this subject. 20c.

CEMENT

7388—BRITISH PLANTS—Some British Cement Plants. (Eng. Rec., Aug. 29, 1908; 1 2/3 pp.) Gives a short general description of three large works controlled by the Associated Portland Cement Manufacturers. Illustrated. 20c.

7389—CEMENT INDUSTRY in the United States in 1907. Edwin C. Eckel. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 19 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7390—SOUTH DAKOTA—The Cement Resources of the Black Hills. C. C. O'Harra, M. F. Coolbaugh. M. A. Ehle and Charles H. Fulton. (So. Dak. Sch. Mines, Bull. No. 8, July, 1908; 55 pp.) Discusses the geology of the Black Hills cement material, and outline for the analysis of cement and cement materials; the preparation of cement from the raw material for experimental purposes; experimental tests on Black Hills cement.

COAL AND COKE

7391—ACCIDENTS from Explosives in 1907. (Coll. Guardian, Aug. 28, 1908; 1 p.). Gives a detailed list from the mine inspectors' reports showing the number of accidents and fatalities, together with the cause of each. 40c.

7392—ANALYSIS—Determination of the Value of Coal for Steaming Purposes. Richard K. Meade. (Min. Sci., Aug. 27, 1908; 1 1/3 pp.) Continuation of article describing methods employed in the analysis of coal in determining its heating quality, with formulas and terms of expression. Illustrated. 20c.

7393—AUSTRALIA—Coalfields and Collieries of Australia. F. D. Power. (Aust. Min. Stand., July 15, 22, 29 and August 5, 1908; 6 pp.) Continuation of article previously indexed. Illustrated. $1.20.

7394—BRITISH COAL MINERS, The Mortality of. (Coll. Guardian, Aug. 21, 1908; 1½ pp.) Continuation of article previously mentioned in this Index. 40c.

7395—COAL CUTTING—The Operation of Coal Cutting Machinery. George E. Lynch. (Eng. and Min. Journ., Sept. 12, 1908; 2¼ pp.) A technical discussion of the use and economy of the various coal cutters, showing the advantages and disadvantages of each type. 20c.

7396—COAL DUST—British Coal-Dust Experiments. (Coll. Guardian, Aug. 28 and Sept. 4, 1908; 7 pp.) Gives some experiments that have been recently carried out to test the explosive qualities of coal-dust and its capacity for intensifying the effect of explosions in mines, whether of gas or dust. Illustrated. 60c.

7397—COAL HANDLING—Inclined Retort Coal and Coke Handling Plant at Bristol. William Stagg. (Mech. Engr., Aug. 21, 1908; 2¾ pp.) Describes the method of handling large quantities of coal which are consumed annually in gas works in Great Britian. Illustrated; to be continued. 20c.

7398—COAL WASHERS—Chemical Control of Coal Washers. Randolph Bolling. (Eng. and Min. Journ., Aug. 29, 1908; 2 2/3 pp.) Methods of sampling, preliminary laboratory and physical tests. Washery determinations where a calcium chloride solution is used. Illustrated. 20c.

7399—COAL WASHING—Dawson Coal Washing Plant. (Mines and Minerals, Sept., 1908; 1¼ pp.) Description of a plant recently installed by the Dawson Fuel Company at Dawson, New Mexico. Illustrated. 20c.

7400—COKE—By-Product Coke Ovens. (Coll. Guardian, Sept. 4, 1908; 1½ pp.) Discusses the growth of the by-product coke oven in the United Kingdom with reference to the production of sulphate of ammonia, in connection with such coke ovens. To be continued. 40c.

7401—COKE—New By-Product Coke Plant at Joliet. (Iron Tr. Rev., Sept. 3, 1908; 6¼ pp.) Describes the installation of this new plant at the works of the Illinois Steel Company. This is the first installation of Koppers ovens in the United States. Illustrated. 20c.

7402—COKE—The Manufacture of Coke in Northern West Virginia. J. W. Knowlton. (Eng. and Min. Journ., Aug. 29, 1908; ¾ p.) Discusses the chemical properties of coke and the characteristics of the Upper Freeport seam of coal. The occurrence of sulphur and phosphorus and the methods of operation. 20c.

7403—COKE ASHES—The Variable Color of Coke Ashes. W. P. Young. (Eng. and Min. Journ., Sept. 12, 1908; 1 p.) Describes experiments in burning and wetting coke in order to determine the effect upon the color of the ash. 20c.

7404—COKE OVEN PLANTS—Koppers Improved Ammonia Recovery Plant. (Iron Age, Sept. 17, 1908; 1½ pp.) Describes an improvement in the Koppers system of by-product coke ovens which consists of the installation of an ammonia recovery plant. In this system the gases are freed from tar before they are passed into the sulphuric acid bath. Illustrated. 20c.

7405—COKING COALS—A Practical Test for Coking Coals. Max A. Pishel. (Eng. and Min. Journ., Sept. 5, 1908; ½ p.) The author observes that some coals adhered more strongly to the mortar while being pulverized than others and that the best coking coals were the ones which adhered most. Abstract of article in *Economic Geology*, June-July, 1908. 20c.

7406—EXPLOSIONS in Swansea District. J. D. Lewis. (Min. Eng., Sept., 1908; 3 pp.) Describes the explosions at the Dulais, and the Seven Sisters Road collieries together with a discussion of the probable causes of these explosions. Illustrated. 20c.

7407—EXPLOSION—Report on the Washington "Glebe" Colliery Explosion. (Coll. Guardian, Aug. 21, 1908; 4 2/3 pp.) Contains a detailed report on the circumstances attending the explosion which occurred at this colliery in the County of Durham on February 20, 1908. Illustrated. 40c.

7408—FRANCE—Operation of Carmaux Coal Mines in France. Lucius W. Mayer. (Eng. and Min. Journ., Sept. 19, 1908; 5½ pp.) Describes a system of mining thick seams in slices and the use of hydraulic and hand filling to prevent surface subsidence in longwall work. Illustrated. 20c.

7409—HAULAGE—Combination Haulage at the Francisco Mine of the Rocky Mountain Fuel Company. E. C. deWolf. (Min. and Met. Journ., Aug. 21, 1908; 2 pp.) Describes a combination rack and rail traction haulage used at this mine which provides the positive pulling feature of the rack rail haulage for operation on grades and ordinary locomotive traction for the level portions of the mines. Illustrated. 20c.

7410—ILLINOIS—The Modification of Illinois Coal by Low Temperature Distillation. S. W. Parr and C. K. Francis. (Univ. of Ill., Bull. No. 24. June 22, 1908; 48 pp.) Gives the results of experiments upon the modification of Illinois coal using atmospheres of nitrogen, oxygen and steam. Illustrated.

7411—KENTUCKY AND VIRGINIA—Coal Resources of the Russell Fork Basin in Kentucky and Virginia. Ralph W. Stone. (U. S. Geol. Surv., Bull. No. 348, 1908; 127 pp.) Gives detailed description of the geology, geography and history and the economic importance of the Elkhorn and Russell Fork coal districts. Illustrated by maps, sketches and photographs.

7412—PEAT—The Utilization of Peat. H. R. Sankey. (Engineering, Sept. 11, 1908; 4¾ pp.) Gives a detailed description of the utilization of peat for making gas or charcoal with the recovery of by-products. Describes the apparatus used and the calorific values of peat and the gases given off during its manufacturing into fuel. Illustrated. Paper before the British Assn. 60c.

7413—PENNSYLVANIA—Coal Mining in Southern Anthracite Fields. Thos. M. Downing. (Eng. and Min. Journ., Sept. 5, 1908; 4½ pp.). Methods in use where seams are gaseous unusually warm, lie at every pitch, and bottom has been known to heave one foot in 10 hours. Illustrated. 20c.

7414—PLANT—Taber Plant of the Canada West Coal Company. Warren Roberts. (Mines and Minerals, Sept., 1908; 2 pp.). Describes the plant at Taber, Alberta, Canada, and the methods of constructing concrete building in a Canadian winter. Illustrated. 20c.

7415—ROPEWAY at a Colliery. (Engineer, Lond., Aug. 21, 1908; 1¾ pp.). Describes a ropeway installed at a colliery where no other means of transport would have been possible. Illustrated. 40c.

7416—TIMBERING ROADWAYS—Supporting Roadways in Deep Mines. (Min. Eng., Sept., 1908; 1 p.) Describes a method of timbering in main intakes and traveling roads at the Deep Yard mine, Abram Collieries. Illustrated. 20c.

7417—VOLATILE MATTER OF COAL—The Nature of the Volatile Matter of Coal as Evolved under Different Conditions. Horace C. Porter and F. K. Ovitz. (Journ. Am. Chem. Soc., Sept., 1908; 20¼ pp.). Describes experiments which have been a part of the fuel investigations conducted during 1907-1908 by the Technologic branch of the United States Geological Survey. Illustrated. 80c.

COPPER

7418—ASSAYING—Methods of Copper Assay. James W. Howson. (Min. and Sci. Press, Aug. 22, 1908; 1½ pp.) Discusses the cyanide and iodide methods for the determination of copper and gives results by these methods as compared with the electrolytic method. 20c.

7419—BLAST FURNACE SLAGS—Alumina in Copper Blast Furnace Slags. S. E. Bretherton. (Eng. and Min. Journ., Sept. 5, 1908; 1 p.) Discusses the question as to whether alumina should be classed as an acid or a base in copper blast furnace practice. 20c.

7420—CALIFORNIA—Mining and Smelting on Shasta Copper Belt. A. H. Martin. (Min. Wld. Aug. 29, 1908; 2 2/3 pp.). Briefly describes the mines and smelters of this district. The principal properties are the Mammoth, Balaklala, Iron Mountain, Hornet, Trinity, Bully Hill and Afterthought. Illustrated. 20c.

7421—CALIFORNIA—The Genesis of the Copper Ores in Shasta County, West of the Sacramento River. William Forstner. (Min. and Sci. Press, Aug. 22, 1908; 1½ pp.). Describes the geology and some of the characteristics of the ore deposits of the district. 20c.

7422—COPPER IN SANDSTONE. William Jenks. (Min. Sci., Aug. 27, 1908; 1½ pp.) Continuation of article dealing with the theory of the occurrence of copper in sandstone and giving the observations of several geologists. 20c.

7423—COST—Official Reports of Costs of Producing Copper. Arthur R. Townsend. (Eng. and Min. Journ., Sept. 19, 1908; 3⅓ pp.) Comparison of tabulated statements of costs of mining, smelting, transportation and administration from reports of 22 companies. 20c.

7424 — MICHIGAN — Ontonagon County Mines, Past and Present. R. H. Mauerer. (Min. Wld., Aug. 29, 1908; 1½ pp.) Describes some of the old mines in this district and the activity at present caused by the finding of a lode, well charged with copper on the Lake property. 20c.

7425—NEVADA—Mining and Reduction of Ely Ores. R. L. Herrick. (Mines and Minerals, Sept., 1908; 4½ pp.) Costs of mining, Star Pointer shaft, Copper Flat, Giroux and Cumberland Ely Mines. Illustrated. 20c.

7426—PYRITIC SMELTING in Tilt Cove, Newfoundland. F. S. Nicholls. (Eng. and Min. Journ., Sept. 5, 1908; 1⅓ pp.) Early experiences in producing matte from pyritous ores without fuel. Campaigns were short, concentration low and costs small. Illustrated. 20c.

7427—SMELTER—The Mammoth Smelter at Kennett, California. Al H. Martin. (Min. Sci., Sept. 10, 1908; 2 pp.) Describes the equipment and methods of smelting at the largest active plant in California. Illustrated. 20c.

7428—SMELTER—The Smelter at Fundicion, Sonora, and El Cobre Mine. (Mex. Min. Journ., Sept. 1908; 1½ pp.) Gives the costs of mining and smelting at this plant where the labor efficiency has been as high as 17½ tons of ore smelted per man employed. Illustrated. 20c.

7429—SMELTING — Douglas Smelting Works, Fundicion, Sonora. W. P. Tucker. (Eng. and Min. Journ., Aug. 29, 1908; 2½ pp.) Describes some of the interesting details of this modern plant which recently began operations. Gives the cost of mining, smelting, refining, and incidental charges. Illustrated. 20c.

7430—WASHINGTON—The Copper Deposits of Lake Chelan, Washington. [illegible] (Min. Wld., Sept. 5, 1908; 2 pp.) Describes the early finding of copper, geological features of the deposits and surrounding country and mentions the occurrence of copper and iron ores awaiting the building of a railroad before development. Illustrated. 20c.

FELDSPAR

7431—PRODUCTION of Quartz and Feldspar in 1907. Edson S. Bastin. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 32 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

FLUORSPAR

7432—PRODUCTION of Fluorspar and Cryolite in 1907. Ernest F. Burchard. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 7 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7433—USES—Fluorspar. (Engineer, Lond., Aug. 21, 1908; 2/3 p.) Discusses the use of fluorspar in metallurgical works and points out that in ten years the annual British production of this mineral has increased from almost nothing to more than 40,000 tons. 40c.

FULLER'S EARTH

7434—PRODUCTION of Fuller's Earth in 1907. F. B. Van Horn. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 6 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

GOLD AND SILVER

7435—ASSAYING—The Relation of the Percentage of Retort Metal in Amalgam to the Gold Fineness in the Retort Metal. Justin A. Haynes. (West. Chem. and Met., July, 1908; 1 pp.) The subject is illustrated by the use of a chart which shows at a glance the percentage of retort metal in amalgam and the gold fineness in the retort metal. The curves are plotted from the actual results of practical work. 60c.

7436—ASSAYING—The Estimation of Silver in Gold Bullion. E. H. Taylor. (Monthly Journ. Chamber of Mines of W. A., July 31, 1908; 2 pp.) Describes the method of determining silver in gold bullion by means of standard ammonium sulpho-cyanide. 60c.

7437—BOLIVIA—Through the Bolivian Highlands. E. P. Mathewson. (Min. and Sci. Press, Aug. 22, 1908; 4½ pp.) Continuation of article, previously indexed, in which the author describes his travels and some of the early Spanish workings. Illustrated. 20c.

7438—CALIFORNIA—The Beach Placers of the South Pacific Coast. C. D. Irvine. (Min. Wld., Aug. 29, 1908; 1 1/3 pp.) Describes conditions at the beaches along the South Pacific coast and tests upon sand shipped from Skakespeare beach near Redondo. 20c.

7439—CALIFORNIA—Mining in Mariposa. (Am. Min. Rev., Sept. 5, 1908; 1 p.) The famous old county of California is still developing gold mines that promise to become valuable to their owners. Illustrated. 20c.

7440—COLORADO—The Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., Sept. 10, 1908; 1⅓ pp.) Sixth article of series. Describes the history, geology, methods of mining and ore treatment at Leadville, Colo. Illustrated; to be continued. 20c.

7441—COLORADO—The Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., Sept. 17, 1908; 2 pp.) Seventh article of a series, describing the geology of the Leadville district. Illustrated; to be continued. 20c.

7442—COSTS OF MINING Quartz Pyrite Gold Deposits. J. R. Finlay. (Eng. and Min. Journ., Sept. 12, 1908; 6 pp.) A study of the costs of mining and milling as shown in the reports of several profitable operations in different parts of the world. 20c.

7443—CYANIDE DEVELOPMENT in Honduras. G. L. Gutherie. (Mex. Min. Journ., [illegible] treating the ore previous to cyanidation at [illegible]

7444—CYANIDING SLIME. E. B. Wilson. (Mines and Minerals, Sept., 1908; 3 pp.) Describes the decantation process, sand distributers, agitators, the Adair-Usher process, and the Nichols slime process. Illustrated. 20c.

7445—DREDGING—Improved English Gold Dredge in West Africa. Frank C. Perkins. (Min. Wld., Sept. 5, 1908; 2 pp.) Construction [illegible] tion compared; differences between a gold [illegible]

7446—DREDGING in the Yukon. T. A. Rickard. (Min. and Sci. Press, Aug. 29 [illegible] country which have done so much to solve [illegible] ably. Illustrated; to be continued. 20c.

7447—DREDGING in the Yukon. T. A. Rickard. (Min. and Sci. Press, Sept. 12, 1908; 4 pp.). Continuation of article men[illegible] thaw frozen ground in Alaska and gives details of dredging. Illustrated. 20c.

7448—ELECTROLYTIC REFINING of Gold, Silver and Copper at the United States Mint, San Francisco, California. Robert L. Whitehead. (Electrochem. and Met. Ind., [illegible] method of [illegible] Illustrated. To be continued. 40c.

7449—INDIA—The Auriferous Deposits of India. Malcolm Maclaren. (Min. Journ., Aug. 22 and 29, 1908; 3 pp.) Describes the geology of the Kolar field, the Gadag field and various other districts from which gold is produced. Illustrated; to be continued. 60c.

7450—MEXICO—Dry Placers of Northern Sonora. F. J. H. Merrill. (Min. and Sci. Press, Sept. 12, 1908; 1¼ pp.) Describes the history of this district and the methods of winning gold by the *batea* and by the Hungarian dry washer. Illustrated. 20c.

7451—MEXICO—Pachua and Real del Monte Silver District. Claude T. Rice. (Eng. and Min. Journ., Sept. 12, 1908; 7 pp.) The silver ore contains little gold; mining and milling methods are being rapidly modernized; much construction is under way. Describes the geology of the district, Real del Monte and Pachuca veins, methods of mining, pumping, the operating mines and the methods of ore sorting. Illustrated. 20c.

7452—MEXICO—Some Metallurgical Processes at Pachuca, Mex. Claude T. Rice. (Eng. and Min. Journ., Sept. 19, 1908; 4½ pp.) The older processes are rapidly being displaced by cyanidation; even the old tailings are treated successfully by this process. Illustrated. 20c.

7453—MEXICO—Zacatecas, a Famous Silver Camp of Mexico. Claude T. Rice. (Eng. and Min. Journ., Aug. 29, 1908; 6¼ pp.) History of the camp, geology of the district, the main vein systems, developments at depth, the ores, mining conditions, the Bote [illegible]

7454—MILL—The Goldfield Consolidated 600-Ton Mill. Percy E. Barbour. (Eng. and Min. Journ., Sept. 5, 1908; [illegible]) Describes the construction of this mill including the plant erected to furnish concrete for the foundations. The ore will be crushed by [illegible] ter tables and the pulp cyanided in Pachuca agitation tanks. Illustrated. 20c.

7455—MILLING PLANT of the Montana-Tonopah Mining Company. G. H. Rotherham. (Min. and Sci. Press, Sept. 5, 1908; 3⅓ pp.) Discusses the methods of treating the ore of this mine which consists of a gold and silver-bearing sulphide. Illustrated. 20c.

7456—MILLING PRACTICE in Nevada Goldfield Reduction Works. E. S. Leaver. (Min. and Sci. Press, Aug. 22, 1908; 1¼ pp.) [illegible] this custom mill. Illustrated. 20c.

7457—ONTARIO—[illegible]

7458—ONTARIO—The Cobalt Silver District, Ontario, Canada. William B. Phillips. [illegible] Discusses some of the conditions in this remarkable camp and gives statistics of pro[illegible] district. 20c.

7459—ONTARIO—[illegible]

Wld., Sept. 5, 1908; 1¾ pp.) Describes the workings and equipment of this Cobalt mine which although four miles long is only 99 feet wide. Illustrated. 20c.

7460—ORE TREATMENT—Apparatus for Extracting and Filtering Ore. J. E. Porter and A. L. Clark. (Min. Wld., Sept. 12, 1908; 1¾ pp.) Describes an improvement upon the construction and operation of ore treating apparatus whereby efficiency is increased Illustrated. Reprint of U. S. patent. No. 887,268. 20c.

7461—ORE TREATMENT PLANT—The Simmer Deep and Jupiter Plant—I. (So. African Min. Journ., Aug. 1, 1908; ¾ p.) Describes the crushing and cyaniding plants and the extractor house. 20c.

7462—ORE TREATMENT PLANT—The Simmer Deep and Jupiter Plant—II. (So. African Min. Journ., Aug. 8, 1908; 1¾ pp.) Describes the method of sorting, crushing and transporting the ore, the milling plant, the sands, slimes and precipitation plants. 20c.

7463—QUEENSLAND—The Etheridge Goldfield. W. E. Cameron. (Queens. Gov. Min. Journ., July 15, 1908; 8¾ pp.) Describes the present condition of mining, the geology, treatment, the mines in the district, and the occurrence of silver lead and of copper. Illustrated. 60c.

7464—RAND—Genesis of the Rand Gold. F. W. Voit. (Min Journ., Sept. 5 and 12, 1908; 2 pp.) Discusses the geology of the Rand goldfields and gives the author's ideas regarding their formation. 60c.

7465—RAND MINING—Costs and Profits on the Witwatersrand. James R. Finlay. (Eng and Min. Journ., Sept. 19, 1908; 2½ pp.) The methods which have been severely criticized compare favorably with those of other fields where conditions are still unsettled. Gives a comparison of records and details of mining at the Robinson Gold Mining Company in South Africa. 20c.

7466—SILVER. T. R. Van Wagenen. (Popular Sci. Monthly, Sept., 1908; 9¼ pp.) Discusses the history of the production of silver and gives statistics of production in the principal countries. 40c.

7467—SILVER ORE TREATMENT—Some Features of Silver Ore Treatment in Mexico. (Journ. Chem. Met. and Min. Soc. of South Africa, July, 1908; 3 1/3 pp.) This is a reply by W. A. Caldecott to discussion of this paper which was read at the January and March meetings and contains additional data concerning the treatment of oxidized and pyritic Mexican gold-silver ores. 60c.

7468—SLIMES TREATMENT—Filtration of Slimes at El Oro, Mexico. D. L. H. Forbes. (Eng. and Min. Journ., Sept. 5, 1908; 2¼ pp.) Gives details of the plant, method of operation, cost and efficiency of this filtration plant designed by Edwin Burt, superintendent of the El Oro Mining and Railway Company. Illustrated. 20c.

7469—SMELTING—Battery and Cyanide Gold Smelting. A. Thomas. (Journ. Chem. Met. and Min. Soc. of South Africa, July, 1908; 3 pp) Contains notes on some present practices in the smelting of gold including the separation of mercury from gold and the final refining. 60c.

7470—TAILINGS ELEVATORS on the Rand. E. M. Weston. (Eng. and Min. Journ., Sept. 12, 1908; ¾ p.) Describes recent installations of sand pumps and other means of elevating tailings which are expected to replace, in some cases, the sand wheels which have been generally used. Illustrated. 20c.

7471—TASMANIA—Gold Mining and Milling Practice in Tasmania. Ralph Stokes. (Min. Wld., Sept. 5, 1908 1¾ pp.) Geology and development of the gold deposit; no machine drills are used because the rock is easily broken by a pick. Describes labor conditions and equipment. Illustrated. 20c.

GYPSUM

7472—PRODUCTION—Gypsum and Gypsum Products in 1907. Ernest F. Burchard. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 10 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

IRON AND STEEL

7473—ALABAMA—The Brown Ores of Alabama—V and VI. William B. Phillips. (Iron Age, Aug. 6 and Sept. 3, 1908; 3 pp.) Discusses the exploitation of a brown ore property and the use of these ores in the blast furnace. 40c.

7474—BAVARIA—The Silberberg Mines in the Bavarian Forest. H. B. Pulsifer. (Min. Wld., Aug. 29, 1908; 1 p.) Briefly describes deposits of iron sulphides which have been worked almost continuously for 800 years. Illustrated. 20c.

7475—BLAST FURNACE—The Shape of the Iron Blast Furnace. Henry M. Howe. (Eng. and Min. Journ., Sept. 12, 1908; 4½ pp.) Factors which have determined the dimensions of the stack in the past are likely to govern changes in the future. Discusses the angle of bosh, the diameter at the top, the hignt of the furnace and other points of interest in the construction of modern blast furnaces. Illustrated. 20c.

7476—BLAST FURNACE PLANT—A Furnace Plant with a History. (Iron Tr. Rev., Sept. 10, 1908; 2 pp.) Gives a description of the furnace plant of the Dunbar Furnace Company at Dunbar, Penn., which, with the exception of a few months' interval for relining, has made pig-iron continuously since 1791. Illustrated. 20c.

7477—CANADA—The Iron Industry and Resources of Canada. (Eng. and Min. Journ., Aug. 29, 1908; ¾ p.) Iron ore in British Columbia, magnetic surveys for iron ore and electric process for steel making. 20c.

7478—CARBON IN STEEL—Loss of Carbon During Solution of Steel in Potassium Cupric Chloride. E P. Moore and J. W. Bain. (Journ. Soc. Chem. Ind., Aug. 31, 1908; 1¼ pp.) Describes experiments and the apparatus used in determining the amount of carbon lost during solution. The authors claim that this loss amounts to an appreciable quantity. Illustrated.

7479—CORROSION—Relative Corrosion of Steel and Wrought Iron Tubing. H. M. Howe and B. Stoughton. (Eng. and Min. Journ., Sept. 19, 1908; 1½pp.) Discusses the question as to whether there is more corrosion in tubes made of steel than wrought iron. 20c.

7480—CORROSION—Rusting of Iron. F. H. Mason. (Min. and Sci. Press, Sept. 5, 1908; 1¼ pp.) Describes a number of tests made to determine the degree of rusting undergone by wire rope under various conditions. 20c.

7481—ELECTRIC FURNACE—The Roechling Rodenhauser Electric Furnace. (Iron Age, Sept. 17, 1908; 2¾ pp.) Describes the operation of the furnace, the uniformity of metal, the manufacture of steel castings and rails, chemical results and physical tests. Illustrated. 20c.

7482—FLUX—Fluorspar in Iron and Steel Metallurgy. (Iron Tr. Rev., Sept. 3, 1908; 2¼ pp.) Rapidly increasing use of fluorspar as a flux in steel plants and foundries. Sources of American product and method of mining. Description of the Fairview operations. Illustrated. 20c.

7483—FOUNDRY—Chemistry Applied to Foundry Work. P. Munnoch. (Foundry, Sept., 1908; 3½ pp.) Discusses the utility of analyses and tests, the character and selection of pig-iron and the use of alloys. 20c.

7484—FOUNDRY—The Arrangement of the Modern Iron Foundry. (Foundry, Sept., 1908; 1 1/3 pp.) Describes a cupola-charging machine, disposal of slag, distribution of iron and the use of molding machines. 20c.

7485—MALLEABLE CASTINGS—The Production of Malleable Castings—VII. Richard Moldenke. (Iron Tr. Rev., Sept. 10, 1908; 3¾ pp.) Discusses molding, sand flasks, molding machines, equipment for handling sand, cores, melting processes and the cupola process in the manufacture of malleable iron castings. Illustrated. 20c.

7486—MOLDS—Production of Ingot Molds. G. B. Waterhouse. (Foundry, Sept., 1908; 2 1/3 pp.) Describes an improved method of molding which involves the use of collapsible cores which are claimed to be economical. Illustrated. 20c.

7487—OPEN-HEARTH STEEL FOUNDRY PRACTICE. (Foundry, Sept., 1908; 4 pp.) Describes the general arrangement, equipment and operating methods of a plant containing one 15-ton acid furnace. Illustrated. 20c.

7488—ORE DEPOSITS—The Pyritic Origin of Iron Ore Deposits. H. M. Chance. (Eng. and Min. Journ., Aug. 29, 1908; 2 2/3 pp.) An examination of the evidence for and against the theory that oxidized ore-bodies are the result of the decomposition of pyrite. 20c.

7489—STEEL RAILS for Present Service; Their Manufacture and Their Failures. P. H. Dudley. (Journ. West. Soc. Engrs., Aug., 1908; 18 pp.) Describes the different forms of permanent-set in light rails, the requirements of rails, defects of ingot structure, cold rolling and head failure. Illustrated. 40c.

7490—STEEL WORKS—The Glengarnock and Ardeer Works of the Glengarnock Iron and Steel Company, Limited. (Iron and Coal Trades Rev., Aug. 21, 1908; 2 1/3 pp.) Describes the equipment of these two works of this company, which are situated in Ayshire. 40c.

7491—TITANIUM—Effects of Titanium on Cast Iron. (Iron Age, Sept. 10, 1908; 1¼ pp.) Discusses some experiments made to show the influence of titanium upon properties of normal cast iron when used in amounts varying up to 1 per cent. Illustrated. 20c.

LEAD

7492—METALLURGY—Modern Developments in the Metallurgy of Lead and Zinc. A. S. Brown. (Eng. Mag., Sept., 1908; 11 pp.) Briefly describes the salient features of the Huntington and Heberlein, Carmichael-Bradford and Savelsberg processes, pot roasting, the Dwight and Lloyd sintering process, the Macquisten process, etc. Illustrated. 40c.

7493—SMELTER—A Peruvian Lead Smelter. Lester W. Strauss. (Min. and Sci. Press, Sept. 12, 1908; 2¼ pp.) Contains a description of the only lead smelter in Peru shipping argentiferous lead bars. Describes the method of treating the ore, the composition of the furnace charge and the cost of smelting. Illustrated. 20c.

7494—SMELTER FUMES—The Bag-House at Selby, California. James C. Bennett. (Eng. and Min. Journ., Sept. 5, 1908; 6½ pp.) A detailed description of the bag-house for large lead smelting works. The use of reinforced concrete proved a complete success. Illustrated by half-tones and detailed working drawings. 20c.

MICA

7495—PRODUCTION of Mica in 1907. Douglas B. Sterrett. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 12 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

NITRATE OF SODA

7496—CHILE—The Nitrate Deposits and Industry in Chile. L. Lema. (Min. Sci., Sept. 17, 1908; 2½ pp.) Describes the geography and climate of Chile, geology and formation of the deposits, physical character and chemical composition of nitratine and the history and extent of the deposits. Illustrated; to be continued. 20c.

PETROLEUM

7497—COLORADO—Geology of the Rangely Oil District, Rio Blanco County, Colorado. Hoyt S. Gale. (U. S. Geol. Surv., Bull. No. 350, 1908; 58 pp.) Describes the district in general, the rock formations, development of the oilfield, occurrence and quality of oil, etc. Also contains a section on the water supply.

7498—RUMANIAN PETROLEUM INDUSTRY.—(Petrol. Rev., Aug. 29, 1908; 2 pp.) Gives production of crude oil during the first half of 1908 and also statistics of the yields of various operating companies. Illustrated. 40c.

7499—SCOTLAND—The History of the Oil Shale Industry of Scotland. (Petrol. Rev., Aug. 29, 1908; 2 pp.) Describes the growth of the oil shale industry. Illustrated. 20c.

PHOSPHATE ROCK

7500—PRODUCTION of Phosphate Rock in 1907. F. B. Van Horn. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 9 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7501—RAW ROCK PHOSPHATE. (Am. Fertilizer, Aug., 1908; 4½ pp.) Reprint from a pamphlet published by the American Fertilizer Association; the statement is made that, according to authorities on the subject, raw rock is worthless as a fertilizer.

PRECIOUS STONES

7502—OPAL—The White Cliffs Opal Field, New South Wales. John Plummer. (Min. Wld., Sept. 19, 1908; 1¼ pp.) Describes the peculiar geological structure of the opal field; origin of the deposits which were discovered by a hunter. Illustrated. 20c.

7503—PRODUCTION of Precious Stones in 1907. Douglas B. Sterrett. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 52 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7504—RUBIES in the Kachin Hills, Upper Burma. A. W. G. Bleeck. (Rec. Geol. Surv. of India, Vol. 36, Part III, 1908; 7 pp.) Discusses the geology with reference to the occurrence of corundum minerals in this district.

7505—TOURMALINE—Memorandum on the Tourmaline Mines of Maingnin. E. C. S. George. (Rec. Geol. Surv. of India, Vol. XXXVI, Part III, 1908; 5 1/3 pp.) Describes the operation of these mines and gives an account of the classification of the stones and the method of mining.

7506 UNITED STATES [illegible] Stones of America. [illegible] supplement.) [illegible] brief history of the discovery and [illegible] of precious and semi-precious [illegible] United States. 20c.

RARE METALS

7507 MONAZITE AND ZIRCON. Production of Monazite and Zircon in [illegible]. Douglas B. Sterrett. (Advance Chapter [illegible] Mineral Resources of U. S., Calendar [illegible] 1907; 12 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

SLATE

7508 PRODUCTION of Slate in 1907. A. T. Coons. (Advance Chapter from Mineral Resources of U. S., Calendar Year [illegible]; 8 pp.) Describes the production and principal features in the industry together [illegible] other statistical data of interest.

TALC AND SOAPSTONE

7509 PRODUCTION of Talc and Soapstone in 1907. (Advance Chapter [illegible] Mineral Resources of the U. S., Calendar Year 1907; 6 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

TUNGSTEN

7510 CALIFORNIA Tungsten Mining in California. (Eng. and Min. Journ., Sept. 19, 1908; 3¼ pp.) Discusses the geology, methods of mining and milling at the plant of the Atolia Mining Company in San Bernardino county, Cal. Illustrated. 20c.

7511 SCHEELITE An Interesting Occurrence of Scheelite in Nova Scotia. A. L. McCallum. (Can. Min. Journ., Sept. 15, 1908; ¾ p.) Describes the discovery of a vein of scheelite which was found by a thorough search after a boulder of this mineral had been discovered. 20c.

ZINC

7512 FERRITES. Compounds of an Iron Acid. J. S. C. Wells. (Eng. and Min. Journ., Aug. 29, 1908; 2 pp.) Oxide of iron form a number of insoluble salts when heated in contact with zinc oxide as in roasting ferruginous blendes. 20c.

7513 METALLURGY Modern Developments in the Metallurgy of Lead and Zinc. A. Selwyn Brown. (Eng. Mag., Sept., 1908; 11 pp.) See under "Lead."

7514 NATURAL GAS The Use of Natural Gas in Joplin District. Doss Brittain. (Eng. and Min. Journ., Sept. 19, 1908; 2½ pp.) Methods of utilizing gaseous fuel in boiler plants and the relative economy of the steam engine and the internal combustion motor. Illustrated. 20c.

ECONOMIC GEOLOGY—GENERAL

7515 ARABIA Note on Some Fossils from the Sedimentary Rocks of Oman, Arabia. C. Diener. (Rec. Geol. Surv. of India, Vol. 36, Part III, 1908; 8 pp.) Contains some notes on a region whose geological structure is as yet very imperfectly known. Illustrated.

7516—BRITISH COLUMBIA—The Correlation of International Strata—IV. Horace F. Evans. (Min. Wld., Aug. 29, 1908; 1½ pp.) Contains the official classification of the strata of the Nickel Plate beds of British Columbia. 20c.

7517 CANADA Minerals and Ores of Northern Canada. J. B. Tyrrell. Journ. Can. Min. Inst., Vol. XI; 20 pp.) Gives a review of the mineral resources of Northern Canada especially those parts of the country which are north and remote from the main lines of transportation. The paper deals with districts other than the Klondike and Cobalt. Illustrated.

7518—IDENTIFICATIONS OF ROCKS of Commercial Value. Evans W. Buskett. (Min. Wld., Sept. 12, 1908; 1¼ pp.) The occurrence, distinguishing features, properties and industrial value of asbestos, asphaltum, barytes, corundum, emery, feldspar, fluorspar, garnet, gypsum, graphite, diatomaceous earth, mica, iron pyrite, sulphur, etc. 20c.

7519 INDIA The Cretaceous Orbitoides of India. Ernest W. Vredenburg. (Rec. Geol. Surv. India, Vol. 36, Part III, 1908; 12 pp.) Stratigraphy of the rocks, age of the orbitoides bearing-beds, zonal distribution of the orbitoides. Illustrated.

7520—INDIA Marine Fossils in the Yenangyaung Oilfield, Upper Burma. E. H. Pascoe. (Rec. Geol. Surv. of India, Vol. 36, Part III, 1908; 9 pp.) Describes the discovery of a second marine fossiliferous bed in the Yenangyaungian or upper part of the Miocene [illegible] Twingon. Illustrated.

[illegible] drophyllia from the Upper Miocene of Burma. [illegible] Geol. Surv. of India, Vol. 36, Part III, 1908; 1½ pp.) Brief description of specimens of [illegible] stones in the Singu oilfield and in the Minbu hills. Illustrated.

[illegible] Yenangyaung Oilfield, Upper Burma. E. H. [illegible] Part III, 1908; 4 pp.) Describes the discovery by the author of three small beds of [illegible] Illustrated.

[illegible] the Taungtha Hills, Myingyan District, Up[illegible] Describes the structure, contortion, lithology and the prospects of oil in this district. Illustrated.

7524 METAMORPHISM Rock Pressure and Metamorphism. H. M. Chance. (Min [illegible] Describes the stresses in rock and the various kinds of thrusts and the conditions effect[illegible]

7525 DEPOSITION—Association of Magnetite with Sulphides in Mineral Deposits. John B. Hastings. (Min. and Sci. Press, Sept. 5, 1908; 2 pp.) Describes the occur[illegible] peninsula, Alaska, with reference to similar deposits in Arizona, Mexico, British Columbia and elsewhere. To be continued. 20c.

[illegible] ORE DEPOSITION [illegible] Magnetite with Sulphides in Mineral Deposits. John B. Hastings. (Min. and Sci. Press, Sept. 12, 1908; 1¾ pp.) Continuation of article previously indexed. Gives an outline of the view of several authors on this subject and discusses the theory of this phenomenon. 20c.

[illegible] ORE DEPOSITION [illegible] Factor in Ore Deposition. Lewis T. Wright. (Min. and Sci. Press, Aug. 22, 1908; 1 p.) Discusses the paper by H. H. Knox in the [illegible] which the author takes exception to Mr. Knox's criticism. 20c.

[illegible] ORE DEPOSITION Organic Matter in Mines, Veins, and Ore Deposits. Arthur Lakes. (Min. Sci., Aug. 27, 1908; 1 p.) [illegible] fossil leaves and fragments of wood in certain districts which has either been replaced by or recovered by metals. 20c.

MINING—GENERAL

7529 ARIZONA—Production of Arizona Mines in 1907. (Eng. and Min. Journ., Aug. 29, 1908; 1¼ pp.) Contains a detailed statement of the gross product of 70 mines and mining claims in Arizona in 1907. 20c.

7530 BLASTING—A Selective Electric Fuse Spitting Device. Robert N. Bell. (Eng. and Min. Journ., Sept. 12, 1908; 2 pp.) Describes a means of solving the problem of blasting without the attendant danger of being caught when the holes are fired. Illustrated. 20c.

[illegible] CAVED GROUND [illegible] Caved Ground After a Squeeze. J. J. Rutledge. (Eng. and Min. Journ., Aug. 29, 1908; 1¾ pp.) Describes a method of recovering a caved stope and the use of a protecting pillar. Illustrated. 20c.

7532 DAM of the Dolores Mine of Chihuahua. George M. White. (Mex. Min. Journ., Sept., 1908; ¾ p.) Describes the construction of a dam to furnish power at the Dolores mine in Western Chihuahua which presented conditions not often encountered in the mining operations in this and other countries. Illustrated. 20c.

7533 DRILLING—The Cost of Drilling Holes with a Well Drilling Machine. (Eng.-Con., Sept. 9, 1908; ¾ p). Gives data on the cost of drilling holes through rock with [illegible]

[illegible] DRILLING [illegible] and the Cost of Maintaining Drills. (Eng.-Con. [illegible] of driving a tunnel 7x12 ft. and 2000 ft. long in the Pine Brook mines of the Scranton Coal Company at Scranton, Penn. 20c.

[illegible] ECONOMICAL MINING [illegible] omy of Winning Ore. W. H. Doherty. (Min. Journ., Aug. 22, 1908; ½ p.) Paper read before the Charters Towers Mine and Mill [illegible] the shaft, levels, underground ore bins, the box rise, stoping, mine timbers, and firing [illegible]

[illegible] EXCAVATION [illegible]

[illegible] Sept. 5, [illegible]

7540 EXPLOSIVES II. E. A. Mann. (Monthly Journ. Chamber of Mines of W. A., July 31, 1908; 5 pp.) Continuation of article previously indexed. Discusses detona[illegible] Western Australia during a period of years. 80c.

[illegible] FLOW OF WATER [illegible] Problems. E. C. Thrupp. (Inst. [illegible] ty under various circumstances. Illustrated.

7542 FLOW OF WATER in Spiral Riv[illegible] water pipes. Illustrated. 20c.

7543 ILLINOIS The Mineral Production of Illinois in 1907. F. B. Van Horn. (State Geological Survey, Circular No. 4, June, 1908; 11 pp.) Gives the production of coal, clay and clay products, stone, sand and gravel, oil and gas, cement, and other products.

7544 MAPPING—Court Maps and Models. T. S. Harrison and H. C. Zulch. (Mines and Minerals, Sept. 1908; 5 pp.) Gives a description of different methods that have been used for representing the workings of mines in court proceedings. The article is illustrated by photographs of glass and solid models of the workings of various mines. 20c.

[illegible] METAL MINING [illegible] Metals. Edwin N. Hawkins. (Am. Soc. Civ. [illegible] sion deals entirely with the method[illegible] ployed in Colorado mines and gives det[illegible] production and cost.

7546 MINE BELL SIGNALS—A Comprehensive Review. G. T. Plumb. (So. African Min. Journ., Aug. 15, 1908; 1¼ pp.) Discusses in a general way the requirements of installations of bell signals in mines and points out some of the faults that are liable to exist. 20c.

7547 MINING LAW Short Talks on Mining Law—IX. A. H. Ricketts. (Eng. and Min. [illegible] cusses trespass at surface, and underground in junctions, waste and "grubstake" contracts. 20c.

[illegible] MINING LAW [illegible] ing Law X. A. H. Ricketts. (Eng. and Min. [illegible] cusses end lines, correction of lines, burden of proof, and when priority of title governs. 20c.

[illegible] MINING LAW [illegible] Journ., Sept. 19, 1908; 2¾ pp.) This in[illegible] ments, licenses, leases, options, deeds and [illegible]

[illegible] ING. W. [illegible] for extending existing shafts by making con[illegible]

[illegible] ING. W. H. Storms [illegible] previously indexed. Des[illegible]

[illegible] ING [illegible]

the country rock, the vein reached through cross-cuts. Illustrated; to be continued. 20c.

7553—MINE VALUATION—Calculating the Value of a Mine—II. J. Bowie Wilson. (Aust. Min. Stand., July 15, 1908; 1 1/3 pp.) Describes the practice of recording the points from which samples were taken which furnishes data as to the value of the mine. This instalment deals with the practice at the Mount Morgan Gold Mining Company. Concluded. 40c.

7554—NOVA SCOTIA—Development of Nova Scotia's Mineral Resources. A. S. Barnstead. (Min. Wld., Aug. 29, 1908; 1¼ pp.) Describes the gold, coal, iron and gypsum deposits which are owned by the government but which are worked by leasers. 20c.

7555—ONTARIO—Cobalt and Northern Ontario. J. B. Tyrrell. (Trans. Inst. of Min. Engrs., June 4, 1908; 14 pp.) Describes the general conditions, the geology and mineral resources and the development of a number of mines in the Cobalt, Ontario, mining district

7556—ORE HANDLING DOCK—The New Ore and Coal Handling Dock of the Pennsylvania Company, at Ashtabula Harbor, Ohio. (Eng. Rec., Sept. 12, 1908; 4¾ pp.) Describes the building and construction of the large dock and ore handling methods at this port which handles the largest tonnage of any port on Lake Erie. Illustrated. 20c.

7557 PERU—Mineral Resources and Mining Laws of Peru. (Mex. Min. Journ., Sept., 1908; 3 pp.) Gives a history of mining and the conditions governing the industry in Peru together with a brief description of the occurrence of gold, silver, copper and other metals and minerals in the country. 20c.

7558—PUMPS—Re-arranging Shaft Pumps. John Wilson. (Min. Eng., Sept., 1908; 1½ pp.) Describes the means employed to cope with an extra influx of water which rendered the shaft pumps useless to handle the volume of water. Illustrated. 20c.

7559—RECORDS—The Importance of Records in Engineering Work. E. E. Howard. (Eng.-Con., Aug. 26, 1908; 2¾ pp.) Points out the necessity for making a systematic arrangement of the records of all details throughout all engineering work. Suggestions are made which differ generally from the advice usually given on this subject. 20c.

7560—SELLING A MINE—How to Sell a Mine. Allen H. Rogers. (Eng. and Min. Journ., Sept. 12, 1908; 1 p.) Discussion of an editorial in the JOURNAL of August 29 in which the author makes several criticisms and offers sugestions. 20c.

7561—SOUTH AFRICA—The Position at Areachap. (So. African Min. Journ., Aug. 1, 1908; 1½ pp.) Describes the development, the method of quarrying the ore and mentions the first shipment of ore from this mine. Ilstrated.

7562—VENTILATION—An Improved System for Ventilation of Mines. W. E. Elliot and J. G. Wilson. (Min. Wld., Sept. 5, 1908; 1½ pp.) Faults of various systems for primary ventilation. By the new auxiliary method explosive gases and mixtures are carried out of the mine. Illustrated. 20c.

7563—ZAMBESIA—More About Zambesia Minerals. Stephen J. Lett. (Min. Journ., Aug. 22, 29 and Sept. 5, 1908; 3 2/3 pp.) Describes the work that has been done up to date in this country and tells of the development of the claims which show promise and points out those which have shown no value so far. The Zambesia district is in Portuguese, East Africa and gold has been found on many claims, besides which there are indications of copper and other minerals. Illustrated. $1.00

ORE DRESSING—GENERAL

7564—CONCENTRATION— Methods of Concentration at Cobalt, Ontario. (Can. Min. Journ., Sept. 15, 1908; 2½ pp.) Describes the operation of the mills belonging to the Buffalo, Cobalt Central, and Coniagas mines and also the Muggley concentrator which is a custom mill. 20c.

7565—GRINDING. Oskar Nagel. (Electrochem. and Met. Ind., Sept., 1908; 3½ pp.) Discusses grinding of raw materials and finished products by means of gyratory crushers, crushing rolls, jaw crushers, stamp mills, ball mills, cominuters, impact pulverizers, etc. Illustrated 40c.

7566—ORE SORTING at the Cabrestante Mines, Santa Barbara, Mexico. Claude T. Rice. (Eng. and Min. Journ., Sept. 5, 1908; 2¼ pp.) Describes the method of sorting ore by contract. The Mexican peon is very efficient at sorting ore by hand. Illustrated. 20c.

7567—SAMPLER—An Automatic Ore Sampler. S. E. Bretherton. (Min. and Sci. Press, Sept. 5, 1908; 1½ pp.) Describes a simple machine for automatically taking the first sample and then completing the sample by hand labor. Illustrated. 20c.

7568—SAMPLING by Machines. John A. Church. (Eng. and Min. Journ., Aug. 29, 1908; 2 pp.) Discussion by the author relative to some of the criticisms of his article in which he refers to Mathewson's table of mill tests. 20c.

7569—SLIMES CONCENTRATION—Concentration of Slimes. Edwin A. Sperry. (West Chem. and Met., July, 1908; 9½ pp.) Discusses the subject under the heads of crushing and grinding, sizing, classification, dewatering and final treatment. To be continued. 60c.

METALLURGY—GENERAL

7570—ALLOYS—The Valuation of Engineering Alloys II. Richard K. Meade. (Chem. Engr., Aug., 1908; 6 pp.) Describes several methods of analysis for tin, copper, antimony lead and zinc in babbitt metal. To be concluded. 40c.

7571—BLAST FURNACE GASES in Silver-Lead Smelting. L. S. Austin. (Min. and Sci. Press, Sept. 12, 1908; 1 p.) Gives the results of tests made at the Gran Fundicion Nacional Mexicana, Monterrey, Mexico, to furnish practical data for use in controling fuel consumption. 20c.

7572—BRASS FOUNDRY ALLOYS—The Color of Brass Foundry Alloys. J. F. Buchanan. (Foundry, Sept., 1908; 2¾ pp.) A discussion of the color problem in so far as it affects alloys for castings. Illustrated. 20c.

7573—COOLING CURVES—On Methods of Obtaining Cooling Curves. G. K. Burgess. (Electrochem. and Met. Ind., Sept., 1908; 5 1/3 pp.) Describes methods of thermal analysis, temperature-time curves, differential curves, direct and inverse rate curves, rapid cooling and characteristics of cooling curves. Illustrated; to be concluded. 40c.

7574—DECOMPOSITION OF CERTAIN MINERALS and Industrial Products by Means of Sodium Peroxide and Metallic Sulphides. J. H. Walton, Jr., and H. A. Scholz. (Am. Chem. Journ., June, 1908; 17½ pp.) Describes the decomposition of galena, lead glaze and slag, manganese glaze, franklinite, ferro-manganese, copper matte, bauxite and titanium ore. The chief advantage of this method is the quickness with which the decomposition can be accomplished. The entire operation including mixing, igniting, cooling and dissolving the melt takes approximately five minutes. 60c.

7575—ELECTROLYSIS AND CORROSION. A. S. Cushman. (Chem. Engr., Aug., 1908; 7 pp.) Discusses the theory of the corrosion of metals and describes several phenomena and interesting experiments in connection with corrosion. 40c.

7576—HIGH TEMPERATURE MEASUREMENT—Cold-Junction Temperature Corrections of Pt., Pt-Rh. and Pt.-Pt.-Ir. Thermo-Electric Pyrometers. C. Offerhaus and E. H. Fischer. (Electrochem and Met. Ind., Sept., 1908; 2 2/3 pp.) Describes briefly the use of thermo-electric pyrometers and discusses the corrections used when wires of different composition constitute the couple. Illustrated. 40c.

7577—ORE TESTING—The Predetermination of Processes for Ore Reduction. H. P. Dickinson. (Min. Sci., Sept. 3, 1908; 2¾ pp.) Discusses the importance of determining the process best adapted to an individual ore and of solving the special problems presented. Illustrated. 20c

7578—SMELTING COST—The Cost of Silver-Lead Smelting. George W. Ritter. (Eng. and Min. Journ., Sept. 19, 1908; 2 pp.) Discusses a former article by W. R. Ingalls and analyzes the cost of smelting and refining silver-lead ores in the United States. 20c.

7579 SMELTER FUMES—The Westby-Sorensen Process. E. P. Jennings. (Eng. and Min. Journ., Aug. 29, 1908; 1¼ pp.) Describes experiments made at the Utah Consolidated Smelter, to determine a method of utilizing the gases from the roasters. The gases are passed over pulverized slag which decomposes the slag and effects a recovery of the valuable metals. 20c.

7580—THERMIT REACTIONS—New Thermit Reactions. Hans Goldschmidt. (Electrochem. and Met. Ind., Sept., 1908; 2¼ pp.) Describes experiments in which other elements or alloys are substituted for aluminum in the alumino-thermic reaction. These alloys consist of calcium-silicon, magnesium-silicon and aluminum-calcium. 40c.

MINING AND METALLURGICAL MACHINERY

7581 CENTRIFUGAL PUMPS. - - The Science and Art of Electricity. George Farmer. (Sci. and Art of Min., Aug. 22, 1908; 1 1/3 pp.) Deals with the use of centrifugal pumps in mining and discusses the theory and advantages of such pumps. This is one of a series of articles. 20c.

7582—COMPRESSED AIR—Moisture in the Atmosphere and Its Effect on the Operation of Compressed Air Machinery. H. M. Prevost Murphy. (Min. and Sci. Press, Aug. 22, 1908; 3¾ pp.) Discusses the effect of moisture and gives a table with formulas giving the weights in pounds of 1 cubic feet of dry air and of saturated steam and the maximum weight of water vapor that one pound of pure air can carry at any pressure and temperature. Abstracted from *Eng. News*, June 18, 1908. 20c.

7583—ELECTRIC MOTORS—Direct-Current Motors for Mine Service. W. B. Clarke. (Mines and Minerals, Sept., 1908; 3¾ pp.) Peculiar characteristics of different types of motors and conditions of work for which each is suited. Illustrated. 20c.

7584—GAS POWER—The Production of Cheap Power by Suction Gas Plants. Philip W. Robson. (Engineering, Sept. 11, 1908; 2 pp.) Gives the essential data of suction producer gas together with a description of the operation of such plants. Illustrated. 40c.

7585—GAS POWER PLANT at the Gary Steel Mills. S. R. Stone. (Power and Engr., Sept. 22, 1908; 3 1/3 pp.) Most of the alternating current units are in position. Gives particulars of the equipment for cleansing the gas for the engines. Illustrated. 20c.

7586—GAS POWER—Suction Gas Producer Power. L. P. Tolman. (Industrial Mag., Aug., 1908; 19 pp.) Discusses the history, government tests, advantages of suction gas producer power, suction gas producers, fuels, and fuel consumption and producer plants in actual service. Illustrated. 20c.

7587—POWER PLANT—Great Northern Power Company's Plant. Claude Aikens. (Power and Engr., Aug. 11, 1908; 5 1/3 pp.) Hydraulic turbine installation in northern Minnesota; some of the operating features; description of the great dam and waterways. Illustrated. 20c.

7588—PRODUCER GAS. J. E. Dowson. (Engineering, Sept. 11, 1908; 1¼ pp.) Describes the progress in gas producers since the author read his first paper on the subject in 1881. 40c.

7589—STEAM BOILERS—The Influence of Velocity of Furnace Gas on the Rate of Heat Transfer. F. Kingsley. (Eng. Rec., Sept. 5, 1908; 1¼ pp.) Some observations upon the evaporating capacity of several types of steam boilers. Illustrated. 20c.

7590—STEAM POWER PLANT. A Modern Steam Power Central Station. (Journ. Elec., Power and Gas, Aug. 22, 1908; 15 pp.) Contains an elaborate description of the recent installation of the plant of the Pacific Light and Power Company of Redondo, California. Illustrated by photographs and four large drawings. 20c.

7591—TUNNELING MACHINES—A History of the Tunnel Boring Machine—VI. George J. Bancroft. (Min. Sci., Aug. 27, 1908; 1¼ pp.) This instalment describes the Proctor tunnel machine which is intended to chip off the rock as a mason spawls a block of granite. Illustrated. 20c.

ANALYTICAL CHEMISTRY

7592—ASSAY FURNACES at the Melbourne University. Donald Clark. (Aust. Min. Stand. July 22, 1908; 3 1/3 pp.) Gives a brief description of the crucible and muffle furnaces and a number of detailed drawings of the furnaces. 40c.

7593—SOLUTIONS—Methods of Obtaining Chemical Solutions of Materials. Evans W. Buskett. (Min. Sci., Sept. 10, 1908; 2 pp.) A brief outline of the most improved methods of reducing various materials to solutions for the purpose of analysis or examination. 20c.

7594—SULPHURIC ACID—Determination of Sulphuric Anhydride in Sulphuric Acid. Evans W. Buskett. (Eng. and Min. Journ., Aug. 29, 1908; 2/3 p.) Describes the standardization of the acid and alkali solutions and the assay of the acid. 20c.

INDUSTRIAL CHEMISTRY

7595—SULPHURIC ACID—The Contact Process To-day—II. (Chem. Engr., Aug., 1908; 12 pp.) Describes the latest development in the manufacture of sulphuric acid by the contact process and includes the method for the determination of arsenic. Illustrated; to be continued. 40c.

MATERIALS OF CONSTRUCTION

7596—CEMENT MORTAR AND CONCRETE—Sands—Their Relation to Mortar and Concrete. H. S. Spackman and R. W. Lesley. (Cement Age, Aug., 1908; 6 pp.) Conclusion of article previously indexed. 20c.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, OCTOBER 10, 1908. NO. 15.

Dredging for Platinum in the Urals, Russia

The Richer Deposits Are Becoming Exhausted and the Gravels Too Poor to Be Worked by Hand Await Development of an Efficient Dredge

BY L. TOVEY*

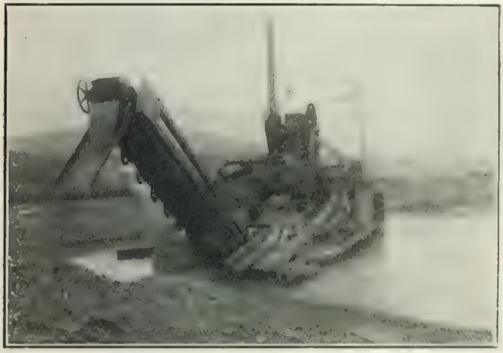
Platinum mining in the Urals is carried on more extensively in two separate fields, the Nijni Tagilsk district on the river Martjan, a secondary tributary to the Tchusowaja in the estates of Demidoff, Prince San Donato, and on the river Iss tributary to the Tura falling into the Tobol. The Tura itself is a platiniferous stream below the mouth of the Iss. Other smaller districts of inferior importance are being opened up to the north on the eastern slope of the Urals, but as yet mining has not attained any serious scale there. However, there is every reason to expect that in the near future a good many of the new districts will come into importance.

All the platinum is produced from gravel deposits; the only primary deposit is in a patch of olivine rock with chromic iron near the principal camp of the Demidoff mines and is not worked. However, the administration of the Demidoff estates is beginning to realize the importance of finding the source of the rich placers which are to a certain degree exhausted, and is trying to solve this question.

The character of the platinum deposits and their relation to the country rock has been the object of work by the Comité Géologique. N. K. Wyssotzki has spent several summer seasons in field work on the Iss and the Martjan; he published [illegible] and his final report covering later field work is expected shortly.

As the geological conditions have been the object of important work by J. F. Kemp, DuParc and others, geological details will be omitted here.

The Demidoff placers are worked on a very large scale. All along the Martjan


WERF CONRAD DREDGE WITH PERRET SCREEN

NEW [illegible] DREDGE

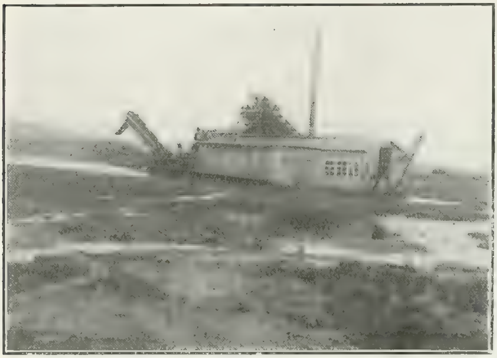
BUCYRUS POUTILOFF DREDGE

BUCYRUS POUTILOFF [illegible]

---

*Mining engineer, Tomsk, Siberia.

for a distance of about 15 *versts* (kilometers) platiniferous gravel is washed on stationary plants of the common Urals type, employing the *botchka*, or conical revolving screen, the *tchasha*, or puddling machine with a bottom of perforated iron plates, or the *boronka*. Details of these operations may be found in *Trans.* A. I. M. E., Vol. XXIX, in a paper by C. W. Purington, and in the *Leoben & Pribram Jahrbuch* for 1902 (Bd. 4, Heft. 3) in a paper by L. St. Rainer. The metal from the Martjan is dark and magnetic. The output in 1907 was about 28,750 ounces.



WERF CONRAD DREDGE, COUNT SHOUVALOFF

BORONKA WASHING PLANT

WERF CONRAD WASHING DREDGE

WERF CONRAD STRIPPING DREDGE

METHODS OF OPERATION

The richer portions of the deposit have been worked out. Some parts are at present worked by small groups, sometimes by families of workmen, or *starateli*, who get from the owners small patches of the gravel deposit and wash it on a kind of long tom. The water is usually pumped from the stream or pond. The work of washing is usually done by women while the men break the gravel from the bank. As this kind of work can be carried on only where water is not abundant in the deposit, a good part of the whole poorer deposit is left unworked. To work these remaining gravels the best means is a dredge, and the administration of the Demidoff estates has been negotiating with the Poutiloff Works, of St. Petersburg, about building a powerful dredge of the Bucyrus type, and also with some English firms.

More important than the Martjan deposits are those on the streams Iss and the Wyia, tributaries to the Tura in the Goroblagodatski district. The upper part of the Iss with its tributaries belongs to the properties of Count Shouvaloff and is an important producer of platinum. The gravels are formed of the different varieties of olivine rock cropping out on the upper Iss in two high mountains, Saranoraja and Katchanar, large masses of diallage and gabbro. N. Wyssotzki calls special attention to two minor hills, the Svetli and Veressovoi Bor, containing large masses of dunite, the source of the precious metal. The main deposit is in the bed and banks of the present stream Iss and its tributaries, and is worked by open cuts and stationary washing plants, and also by two Werf Conrad dredges with Perret patent revolving screens. The average output of the whole estate for the last year has been between 75 and 90 poods, or about 39,560 to 47,500 ounces.

DREDGING PRACTICE

The Werf Conrad boats, built by a firm of Haarlem, Holland, have, on the whole, been successful, but still they do not form the most important part of the washing plant. Their output in 1907 was 5757 oz., or less than 10 per cent. of the whole. The operation of these dredges is very satisfactory; the 4-ft. boats have engines of only 65 h.p., and the 260,000 cu.yd. of gravel that have yielded the above quantity of metal in 1907 have been measured in the bank; consequently the figures are reliable. The dredging conditions are more or less favorable, the depth of dredging being about 2.40 *sagenes*, or about 17 ft., and the deposit being uniform and without great boulders.

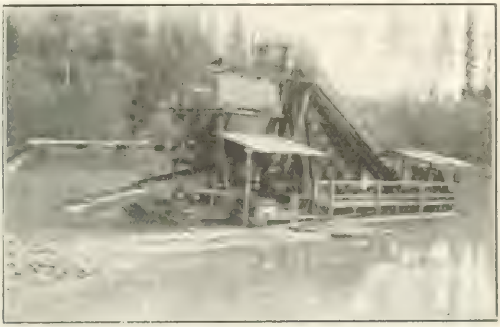
The dredges were designed by the manager, L. A. Perret, a Russian mining engineer, who, in the early nineties, was sent by the government to New Zealand and Australia, and is now one of the leading authorities on dredging. The distinguishing feature of these dredges is the

Perret conical revolving screen made up of 1¼x⅝-in. steel bars. The slots between the bars are from ⅝ to ⅞ in. This kind of screen presents certain advantages over the punched iron screen, the working area being much greater. Also the efficiency of the screen is somewhat increased by the action of the sharp edges of the bars against the gravel. When any of the bars are worn out they are easily replaced; they are held in place between two hoops, one of which has grooves to fit the ends of the bars. The water is introduced under pressure into the inside of the screen from a central pipe, which forms a casing concentric with the shaft of the screen. The shaft and the casing revolve with the screen. The casing has apertures for the water distributed over the entire surface; consequently jets of water work against all parts of the inner surface of the screen and not merely against the side which carries the gravel upward. Other jets of water play upon the outer surface of the screen and keep it clean.

The fine sand and metal fall through the slots of the screen on a long table covered with mats of local manufacture covered with wire cloth. The lower part of the table is covered with riffles, which are taken off for the clean-up. The inclination of the tables is one in ten and is somewhat increased under the screen. The loss of platinum in the tailings is reported to be quite insignificant. Fresh water for the boiler is brought in a small boat from a small stream flowing into the Iss a short distance from the present site of the dredge. The hull of the boat is of iron.

The results of work of the dredges for 1907 have been very good. Dredge No. 1 has worked 114 days at an average of 16.82 hours per day, handling 80.96 cubic [illegible] of gravel and producing one pound [illegible] or about 15.5 oz. of platinum. The whole output for the year was 9226 cubic *sagenes*, or [illegible] cu. yd. of gravel and [illegible] pounds 80 *zolotniks*, or about 1735 oz. of platinum. The results of the work of dredge No. 2 were still more satisfactory. It worked for 135 days at a daily average of 18.26 hours, handling 1058 [illegible] of gravel and producing 24.15 oz. of platinum. The whole output for the year was 2022 oz. platinum.

Dredging is usually begun about the last of April or the first of May, and is continued to early October. No doubt [illegible] if trials were made in this direction. At present the dredges represent only a small part of the operations and are closed down with the rest of the plants when [illegible] comes difficult. In other mines lower [illegible] season is longer, for the climate is milder.



[illegible]

LONG TOM WASHING

[illegible]

COMPAGNIE INDUSTRIELLE DU PLATINE

The most [illegible] on the Iss is that of the Compagnie Industrielle du Platine, the largest producer of platinum in the world. Besides the properties on the Iss it owns claims on the Wyia, another tributary to the Tura, and a good many claims on the Tura itself below the mouth of the Iss. In October, 1907, it bought up the property of the Turinski Platinum Company and in the spring of 1908 a controlling interest in the company, "Platina," formed by Moscow banks. The average production of the Compagnie Industrielle [illegible]

[illegible] open cuts with manual labor, the haulage [illegible] only raised up the incline to the washing screen by means of an endless rope driven by the main engine of the plant.

The washing plants included five *butaras* (conical screens) eight *boronkas* and two sluices. These washing plants have been described by Purington and Rainer.

The only alteration introduced of late has been a combination of the *butara* and *boronka,* the coarse gravel and clay passing from the revolving screen to the *boronka,* a kind of concave screen bent to about a quarter of a circle, on which the stones and clay are rubbed by a sort of double rake run from the main engine. The clay and fine sand separated from the boulders pass to a small table under the *boronka* screen. The main revolving screen *butara* is usually 16 to 19 ft. long with diameters of 5½ and 7 ft. The holes in the iron plates of the screen are ½, ⅝ and ¾ in. and the plates are 5/16 in. thick. In one of the plants there is a combination of this screen with the Perret bar screen which does the preliminary washing. The power required for each screen at 20 to 23 r.p.m. is usually 8 h.p. The water is pumped from the river by centrifugal pumps. The larger plants have usually one horizontal engine of about 75 h.p. running the washing-plant pump and endless-rope haulage of the gravel to the screen and the tailings to the dump.

One of the accompanying illustrations shows one of the more important cuts of the company on the Staritchini and Bogajavlenski claims. The bed of the river is drained and the river turned off into an artificial canal. The open cut is drained by a ditch timbered with wood. This cut is worked by convicts. As the deposit is shallow prospecting is done by small shafts timbered with upright poles. The depth not exceeding 14 to 16 ft., the work is rather easy; the pumping is done by simple Letestu pumps run by a small portable gas engine.

Besides such open cuts the company works some small drifts in the benches of the Iss and its small tributaries. The gravel from the drifts is washed on sluices with a flat screen at the head. The gravel is dumped on this screen and puddled with rakes by six to eight girls standing at the sides of the screen. The fines are washed on the tables under the screens.

Working Poorer Deposits

Since these methods of working are rather expensive, only the richer portions of the deposit can stand the costs. When these are worked out the company will be compelled to work the poorer parts of the river by more efficient mechanical methods. Experiments with this end in view have been carried on since 1901 and 1902, when M. Mongolfier put up two dredges which are still working on the Troitzki and Anno Tonifowski claims. According to Saytzeff, the overburden here was about 14 ft. thick, and the pay gravel from 4½ to 6 ft.; the average depth of dredging is about 16 to 17 ft. These natural conditions caused the company to adopt a special method of mining, i.e., the employment of two dredges, one to strip the overburden, the second to wash the gravel. As the overburden is about three times as thick as the pay gravel, the capacity of the stripping dredge is about three times that of the washing dredge. The dredges were not specially constructed for mining purposes, but were bought at the sale of the Kiel canal excavating machinery; this accounts for some of the defects of the machines.

The stripping dredge has buckets of more than 9 cu.ft., running at a speed of 7 to 10 buckets per minute. The main compound engine is 70 h.p., that of the conveying belt 15 h.p., and the winches 5 h.p. The boiler is 90 h.p. The utmost capacity of the dredge is 2033 cu.yd. per 24 hours. The ground excavated is carried by a conveying belt to the side of the cut where it is dumped. The whole of the placer is worked out by successive cuts parallel to each other. After the stripping dredge has opened the pay gravel in the first cut the washing dredge follows and takes the gravel to the bedrock. In the meantime the stripping dredge takes the second cut and by means of the conveying belt dumps the overburden into the cut made by the washing dredge. As the conveying belt is perpendicular to the direction of the bucket ladder in both dredges, the dumps are more or less uniform. The conveying belt is counterbalanced by a box filled with stones. This work by parallel cuts suits the local conditions, for the deposit is very wide, in some places more than 1000 feet.

The washing dredge is much smaller, the buckets having a capacity of about 4½ cu.ft., running at a speed of 7 to 10 buckets per minute. The power is supplied by two 45-h.p. engines, one running the revolving screen and pump, the other the buckets and conveying belt. The winches and the dynamo for lighting take about 5 h.p. each; the capacity is about 762 cu.yd. per 24 hours. Each of the dredges requires 11 men per shift.

The large number of men is needed because of the antiquated construction of the boat, especially the winches, the operation of which requires three men besides the dredge master. Two men are in charge of the conveying belt, three men at the engines and boiler, one man at the ladder, and one helper for handling the fuel. Such work can be carried on only with the low labor prices prevailing in the Urals, not exceeding 50c. for laborers and $1.25 to $1.50 for skilled workmen. The main defect of the work is the enormous amount of time spent on repairs, etc.; the average daily work does not amount to more than 10 hours. The average daily capacity of the dredge for the 206 working days of the season of 1907 was about 297 cu.yd. The total production for 1907 was about 61,449 cu.yd. of gravel and about 1230 oz. of platinum. Such work is possible only when the prices for platinum are as high as they were in 1907, and is

OPEN CUT, BOGAJAVLENSKI AND STARITCHINI CLAIMS

WASHING PLANT ON THE ISS, COUNT SHOUVALOFF ESTATE

quite unsatisfactory when compared not only with American practice, but also with that of the other Russian dredges. It may be accounted for by the fact that the washing dredge was not specially designed for mining purposes, and was adapted for this service at the mines. Considering the inadequate mechanical equipment of the repair shops, these results are no more than might have been expected.

Improved Design

This unfortunate experience warned the managers against weak and inadequate machinery, and they decided to build the next dredge according to the local requirements. A new 4 ft. dredge began operations in July, 1907, and during the trial days, which lasted with considerable intervals for alterations to the close of the season, it worked 16,556 cu.yd. of gravel recovering about 145 oz. of platinum. A good part of the operations was stripping work. The dredge was constructed by Alw. Taatz, a German firm of Halle a. Saale, willing to adapt itself to the requirements of the company.

The results can be seen in the accompanying illustrations, which prove the dredge to be something not quite ordinary. The iron hull has on the sides iron cylinders intended to increase the flotation capacity of the boat. This makes the hull much too wide and very unwieldy, and the idea must be considered queer in any case. The main gantry is somewhat higher than the washing plant requires. The washing is done by the usual revolving screen and tables. In general the whole dredge exhibits a somewhat experimental character. The Valerianowski claim on the Wyia on which this dredge is working, was chosen for the test with good judgment; the gravel is easy to wash and without large boulders, and the whole depth of the cut to the bedrock is about 16 to 17 ft. The bedrock is soft and easily excavated by the buckets.

The company, it is reported, intends to build more dredges, and has increased its staff of mechanical engineers who are expected to build the dredges at the mines. This seems to be rather an unfortunate plan, for the equipment of even very good repair shops cannot be compared with that of large works like the Poutiloff or Bucyrus. However, the local engineers hope to install home-made dredges considerably more cheaply than those built by special firms. One of the inducements for the adoption of this plan is that the company owns a number of 75-h.p. engines working at present at the old stationary plants washing the gravel from the open cuts. Since these workings are expected to be worked out in the near future the engines will be available for the dredges that will have to work the remaining poorer parts of the deposits. This plan gives a certain saving on the cost of the initial equipment but it is yet a serious question if this comparatively small economy will not cause considerable loss on account of smaller capacity and longer time for repairs, which has been the chief defect in the work of the first dredges. As has been stated the new dredge which the company has been building at the Valerianowski mine even with the coöperation of Alw. Taatz is not very encouraging for a beginning

Prospecting Dredge

The third dredge owned by the company is a small 1½-cu.ft. prospecting boat built also by Alw. Taatz company. It was built independently from local directions and seems to be a rather handy and useful little machine. It worked in 1907 on the river Tura in order to prospect the claims intended to be worked later by more powerful dredges. Like the other dredges of the company it has been somewhat mismanaged and gives for ten hours' daily work the total capacity of about 74 cu.yd. The production for 1907 was 16,207 cu.yd. and 342 oz. of platinum.

The idea of prospecting the river Tura by means of small dredges is not a new one. Such prospecting has been done for years by small dipper dredges worked by hand and described by Purington, Levat and others. Prospecting with the dredge has not been carried on very extensively; it worked all the time in one place, giving no results as a prospector and quite inferior results as a producer of platinum. For the next season the dredge was to be taken to the Iss to work some of the placers in its small tributaries too poor for hand work and too small for a large dredge. This might be a good way of using the dredge and in every way a useful and interesting experiment. The transport of the hull is easy for it is made up of parts bolted together and can be taken to pieces in a very short time and again assembled with rubber in the seams. However, one must not forget that with cheap labor and the possibility of employing whole families working on tribute (*starateli*) the competition will be rather hard for the dredge if it continues working at the rate it has done thus far

Dredge of the Turinski Company

The nearest neighbor of the small dredge just described is a 3½-ft. boat, the strongest on the Tura river and built for the Turinski Platinum Mining Company by the Poutiloff Works after the Bucyrus type, with some alterations introduced according to the requirements of the purchaser and the conditions of the deposits of the Jerusalimski mine which it works. These modifications have not been very successful and at present the Poutiloff Works seems to be more cautious; it builds special dredges according to the miner's ideas, sometimes more peculiar than brilliant, and prefers to follow the standard type described in the *London Mining Journal* of May 30, 1908, which has proved very successful in all the

[illegible]

The chief features of the Jerusalimski dredge are a revolving screen made of strong steel bars for preliminary washing and separating the boulders from the gravel, and two puddling machines for washing the rest of the gravel supposed to have a great amount of tough clay very hard to wash. The original idea of the first owner of the mine M. Imshenetki and of M. Ritoff who designed the puddling machines was to run them by turns, filling one then turning the gravel to the second and washing the gravel in the first as long as necessary for the pebbles to become quite free from clay, then opening a trap in the flat horizontal screen forming the bottom of the puddling machine and dropping the pebbles into a chute to the conveying belt. The fines passing the screen of the machines fell on the usual washing tables. Closing the trap was, however, very difficult and later on the puddling machines worked with an open trap. This made it possible to run both machines without interruption and consequently largely increase their capacity, as one turn of the material in the pan of the machine was sufficient to wash the stones quite clean enough.

The puddling of the gravel was effected by means of vertical stamps suspended on hinges from radial arms fixed to a central revolving vertical shaft. When the shoes of the stamps would encounter a large stone they could rise on the hinges and pass over the stone. At 18 to 20 r.p.m. the centrifugal force developed was very great and caused small stones to fly over the sides of the pans of the puddling machine.

The Present Simplified Dredge

At present the claims of the Turinski company have been sold to the Compagnie Industrielle du Platine and the dredge is being altered according to the results of former work. Instead of the complicated puddling machines it will have the usual revolving screen, which is quite efficient enough for the local gravel. It cannot be denied that this dredge is at present the strongest and best adapted for mining work owned by the Compagnie Industrielle, and is bound to give good results unless the changes introduced this summer will maim it as it was maimed last year by inefficient management.

Late in the autumn of 1907 the Poutiloff works added to the successful gold-dredging boat on the Irdel, two very good 5½-ft. dredges to work in the north of the Urals. One of them working on the Solva river is a producer of platinum. Unhappily I have not had the chance to see them and hope to give an account of their work later on. The universal opinion is very much in favor of these boats; they have proved very powerful, are of the standard type and wash the gravel very clean

Metallic Mineral Resources of the Philippines[*]

By Maurice Goodman[†]

The present article is intended to be a summary of recent discoveries and developments, and does not supersede, but rather supplements, the former publications of the Mining Bureau.

GOLD

Gold is easily the first in importance of the metallic mineral resources of the Philippines. It has been sought for and found in most of the provinces of the Archipelago, but Benguet, Masbate, and Ambos Camarines are rivals for first place in the metal output and in general mining activity. Numerous claims have been located in these provinces and several corporations have lately been organized to develop and operate a number of the more important groups. The success of some of the companies which have entered the field is yet in doubt, while that of others, to judge from their continuous operation and constant output, might naturally be considered assured. There are other corporations which have not yet attempted to break into the producer class, but have exerted their energies toward developing their properties and blocking out ore.

Two new stamp mills have recently been imported into the Islands. One, a Hendy quadruple-discharge six-stamp mill, will be erected in Benguet, and the other, a 10-stamp mill of the Risdon type, has been set up in Masbate. On the other hand, a 10 and a five-stamp mill have been shut down in Masbate, so that the prospects for an increased output this year seem doubtful. However, new discoveries have been made which promise well for the future. At Binanlonan, in the northern part of Pangasinan, some rich but narrow veins of free-milling ore have been discovered and at least two companies are engaged in active exploration work in that field. Unfortunately, internal dissensions have been interfering with rapid progress in this district.

The island of Marinduque also offers a new, but small, field for the prospector. Recent discoveries conclusively prove the presence of gold-bearing veins, and while no bonanzas have been encountered the company most active in prospecting the district declares itself well satisfied with the showing thus far made and is prepared, should the prospects continue favorable, to open up and develop its properties on a larger scale.

The gold-mining industry in the northern Camarines has been showing signs of awakened interest. While this is more true of placer than of quartz properties, the latter have recently been the subject of negotiations which have been successfully concluded, and mining operations here have been resumed. These properties are reported to have yielded much rich ore in the past and were the only mines operated with an approach to modern methods during the Spanish régime. For various reasons these mines were abandoned and are today in such a condition that it will require a considerable expenditure of money to put them in working shape. The most recent information received is that the dredge erected about May 1 of last year is yielding returns, and several quartz prospects are being opened up.

The most interesting and probably most important of the recent discoveries of gold, was made in the Suyoc region of southern Lepanto, where the Igorots have been working and washing gold ore by the most primitive methods for a hundred years or more. Many years ago they were driven out of their richest diggings by water, as, because of the topography of the country, they could not work these placers by their usual method. An American prospector by means of a drainage tunnel has recently removed the water from one of these flooded workings and found the rich ore which tradition reported to be present. A silvery, white mineral since identified as calaverite was observed in association with the free gold, this being the first authentic report of the occurrence of telluride of gold in the Philippines. No report as to the extent of the deposit or the average assay value of the ore has yet been made.

No great amount of bullion was produced during the past year from the placer deposits of the Philippines. One dredge has but recently arrived at its real working field, having been engaged heretofore in making its way through comparatively poor and more or less barren ground. A New Zealand syndicate imported a gold dredge last year which has since been put together and floated in the Paracale river. Another dredge, which is now lying idle in Masbate, may be transferred to the Camarines in the near future to assist in the exploitation of this rich field.

In Nueva Ecija, ditches and flumes have been constructed and everything is prepared for a profitable sluicing campaign during the coming rainy season. Considerable prospecting has been done during the past year in the placer field of northern Surigao, but no extensive mining operations have yet been undertaken.

COPPER

Scarcely a dollar's worth of copper has been produced in these Islands since American occupation. Nevertheless, this metal is conceded to rank next to gold in importance as a natural asset of the Philippines. It holds this position both because of its past record, and of its widespread occurrence throughout the Islands, being a frequent associate of gold in the ores. The non-production of copper of late years must necessarily be attributed to the absence of smelters in the Islands and to the difficulties of transportation from the mountain regions where the ore has been found, to the nearest port from which the product could be shipped to foreign smelters. With the investment of a moderate amount of capital these difficulties could be overcome, either by the erection of a furnace near the mines or the improvement of transportation facilities. The Mancayan copper mines, which are the most important and best known copper deposits in the Philippines, have lately come under the control of a local syndicate composed of American and English capitalists. This company has applied for and obtained a franchise to build a railroad from Mancayan to Bangar, a town on the western coast of Luzon. If this road is built, a most important step toward the upbuilding of the mineral industry of the Philippines will have been taken, for not only is such a road of prime importance to the interests of the copper company, but all of the gold mines of Suyoc and northern Benguet will be benefited by it. The Mancayan property is now being thoroughly examined by a mining engineer from the United States.

Promising specimens of the carbonate ores from eastern Pangasinan have recently come to the Bureau, but no authentic reports have yet been received concerning the extent of the deposits. Similar specimens, but no more data, have been recorded from Cagayan de Misamis. Large bowlders of chalcocite float, carrying appreciable quantities of gold and silver, have been encountered in Marinduque, but up to the present time the mother lode has not been discovered. Native copper occurring as a very thin stringer in igneous rock has been discovered in Masbate, and rich carbonate ores carrying gold and silver have been found in the same region.

SILVER

Native silver has been obtained only from one of the Suyoc mines, a short distance from where the telluride of gold was discovered. Some rich assays of this ore have been made. As an associate of gold it is encountered in many ores, but in most of them it occurs only in inappreciable quantities. It has been found with lead in the argentiferous galena of Marinduque and Cebu, running over 11 oz. per ton in the former, while in the latter the proportion is unknown, although it is reported to be high.

LEAD

No development work was performed on any of the lead deposits of the Philippines during the last year. The outcrops in Marinduque and Cebu were visited by representatives of the mining division of this Bureau, but the lack of development work made it impossible to formulate a conclusive report upon the probable importance of these deposits. A few of the gold ores of the Islands contain a sufficiently high percentage of galena to make it a factor in the estimation of the smelting cost. Large specimens of galena float were found in conjunction with those of chalcocite mentioned above. In Cebu the galena occurs as a stockwerk, in or closely associated with an andesite flow.

---

[*] Abstract from "The Mineral Resources of the Philippine Islands." Issued by the Bureau of Science, Manila, 1908.

[†] Mining engineer to the Bureau of Science, Manila, Philippine Islands.

IRON

No new developments have taken place in the iron industry of the Philippines during the past year. In the Angat region an improvement in the conditions was caused by the termination of the legal disputes which had been causing more or less molestation to the operators for the last four or five years. An increased economy and possible output may follow as a result of this settlement, but no new discoveries or modifications of the methods employed are reported. The new wagon road being built between San Miguel de Mayumo and Sibul may give an impetus to the iron smelters of that district, as it will permit greater economy in the cost of transportation to the railroad. This has always been one of the largest expenses in this region. Iron ore has been discovered in Marinduque, but under conditions which render an iron industry unlikely in that island within the near future. Iron ore carrying manganese has been reported from near Panopoy, Cebu.

TIN

Considerable stir was caused some months ago by the reported discovery of tin ore in Mindanao. As such a discovery had long been hoped for, the statement at first gained considerable credence. A brief investigation, however, proved the news to be false. No authenticated discovery of tin has been made in the Philippine Islands.

A California Pipe Line

SPECIAL CORRESPONDENCE

An event of importance to the oil industry of California is the completion of the 8-in. rifled pipe line from Bakersfield, Kern county, to Port Costa on San Francisco bay, a distance of 282 miles, at a cost of $4,500,000. Oil was started in the pipe a short while since and the flow reached Port Costa Sept. 12. The daily flow through the pipe line will be from 17,000 to 20,000 barrels of heavy fuel oil. The rifled pipe line for carrying heavy oil was the invention of John D. Isaacs, formerly of San Francisco, but now consulting engineer for the Harriman railroad lines, at Chicago. This line was constructed under supervision of A. M. Bienenfeld of the Associated Pipe Line Company. Mr. Isaacs in his original experiments, tried several plans of spiralizing the interior of the pipe, but finally settled on the plan of cutting spirally, on the interior of the pipe, corrugations about 1/8 in. deep, these spiral grooves making a complete circuit every 10 ft., so that the water pumped in with the oil, will go to the outside of the interior of the pipe. Into this rifled pipe two separate engines pump nine parts of the heavy oil and one part of water. The water, following the rifled corrugations, forms a thin sheen or lubricant about the oil, and the two move along together, the oil forming a central core that does not come into direct contact with the pipe. This avoids friction, which, with such oil, would prevent progress. Relay pumping stations are established every 23 miles, while with ordinary smooth pipes, they must be maintained every 14 miles, and the oil must be reheated at each place in order that it will flow more readily. The heating is done away with in the Isaacs pipe line.

At each pumping station on this rifle-pipe line there are two 55,000-bbl. oil tanks and one 10,000-bbl. water tank. The flowing oil and its surrounding sheet of water are received into one of the big duplicate tanks and then the water is drained off from the bottom and again taken up by a duplicate water pump and shot into the big pipe into which the oil is being sent from a duplicate oil-pumping engine. Everything is in pairs to avoid delays. This new system of pumping heavy oil is economically a great saving over the heating method; it also effects a great saving over transporting oil by rail in tank cars. The pipe has been buried at a depth of 2 ft., with an undulating up and down grade, every 400 ft., so that the water would drop to the depressions and float the oil without clogging the pipe, if by any accident the pumping should be stopped and the flow checked. The pipe itself was covered with two coats of asphalt granite paint and then wrapped in burlap, and that is treated to a third coat of asphalt paint to protect the metal from moisture and alkali. The Associated Oil Company, which is now shipping by steamer and rail 70,000 barrels of oil [illegible] through the new pipe line. This should prevent further continuance of oil-car shortage. Branch rifled pipe lines are to be built to the Sunset, Coalings and McKittrick oilfields in the San Joaquin valley.

At some mines where buckets are used for hoisting, ore-pockets are cut under the station; the ore is trammed to them in cars and the buckets are filled from chutes as in the case of skips.

Slime Deposition and Agglomeration

[illegible] position preliminary to cyanidation, H. L. Sulman stated[1] that he is strongly of opinion that a factor of attraction is active between the particles during settlement. A free surface of water possesses physical characters which the interior does not. The free surface shows increased resistance, increased viscosity, increased molecular energy, and even, perhaps, a different chemical constitution. Such properties are summed up in the expression "surface tension."

Solids exhibit some of these properties in a more marked degree; but as phenomena of tension cannot well exist on solid surfaces, the increased molecular attractions resident on a solid surface are usually described as "surface energy."

As between solids and liquids, the phenomenon of "wetting" is to be ascribed to the surface energy of the solid, the liquid being held so tightly by the solid that on withdrawing it the liquid mass is disrupted more easily than the liquid can be dragged from the solid. So also with gases; the surface energy of solids gives rise to the phenomenon of gaseous condensation. These effects are always more intense the greater the surface exposed in relation to the mass. Therefore, the more the surface is increased, the greater is the attraction likely to be exhibited between like particles. Thus the agglomeration of slimes in rivers, if once the particles are deposited within range of their mutual surface attractions, is more to be expected than in the case of larger particles or sands.

This agglomeration, which is accompanied by remarkable dryness of the settled slimes appears to be the central factor in Nichol's continuous slime settler, and also in the Howatson filter and in the Picards settler. The Durant filter, which has lately been introduced in South Africa, utilizes the same factor. The silme, when once agglomerated on the filter surface is sheared off and dropped through the turbid liquid without any tendency to redissemination. Slimes once agglomerated will stand a considerable disturbance without breaking up.

While most people know that Pliny states that the ancients broke ore in mines by pouring vinegar on the heated face of ore, it is less generally known that he further states that they also used bars of [illegible] from the face. These bars were heavy [illegible] battering ram.

Pulleys from which considerable power [illegible] as close as possible to a bearing.

---

[1] [illegible]

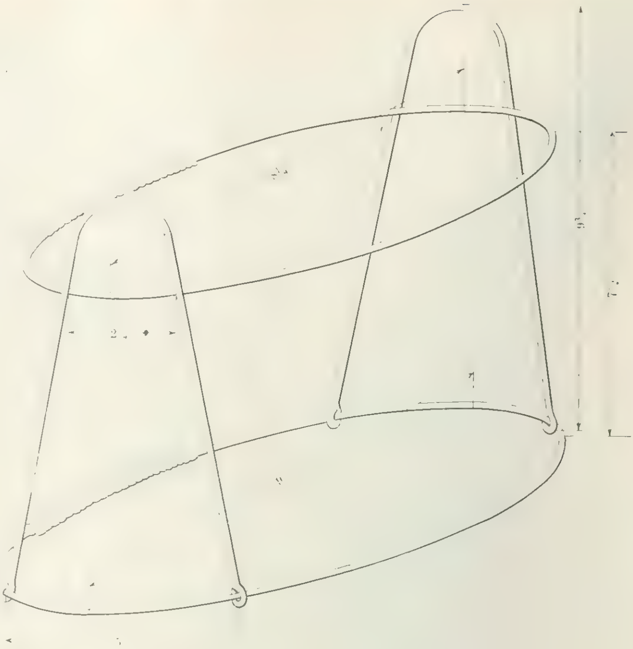
The Anaconda Protective Hood

By Robert N. Bell*

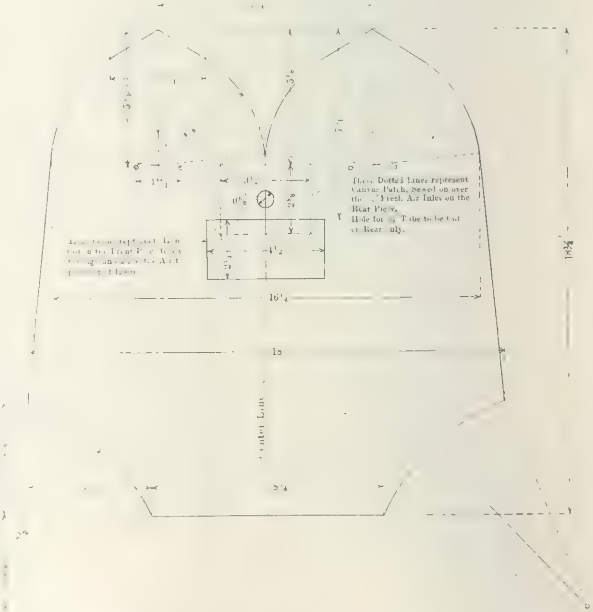
A simple and excellent home-made device for fighting underground fires and poisonous gases, used in the Anaconda mines at Butte, is shown in the accompanying illustrations. It is a simple canvas hood, built on a light wire frame and adjusted for a direct compressed-air line connection with a strong ½-in. hose. It is of such positive action, simple and cheap construction that a big mine can hardly afford to be without it, as its availability may prove priceless in the protection of life and property in the case of underground fires, and other situations that can readily be conceived, where dangerous gases may have to be contended with.

It is made from two pieces of 12-0 duck canvas, as shown in the accompanying pattern, without any dressing or preparation, sewn over a frame made of two 12-gage brass wire rings with A-shaped side braces and black tape cap seams. A loose collar band of dressed lambskin, with the short wool left on, is attached to the lower ring, and is adjusted by a rubber tape puckering string around the neck of the wearer. An open rectangular orifice, without any glass or mica protection, 3½x1½ in., after the tape border is sewed in, affords the principal discharge for the compressed air; and permits the wearer to see, hear, talk and breathe in the discharging air with impunity while surrounded by deadly gas, without any serious hindrance or danger from fogging or sweating. He has full freedom of both arms, kept cool by the expanding air, and is not incumbered by heavy metal attachments. At the back of the hood is a nipple nut-and-washer connection covered on the inside by a square patch of canvas 3x3 in., attached only at the corners, allowing the discharging vents direct contact. The nipple forms the male end for the attachments of a short piece of hose, which has a right-angle self-seating coupling, and a male coupling at the other end, with which the main hose and regulating valve attachment from the air line can be conveniently made or unmade by the wearer, or the air can be regulated by the valve or tap at the main air line.

This device was developed by the staff of the Anaconda mine at Butte, Mont., and has been successfully used by them for the past 15 years in building bulkheads, airtight cemented walls, etc., for combating the poisonous sulphur gases that occasionally break into the workings from a burning body of sulphide ore in one of the middle levels of the mine; and more recently for a similar purpose at one of the other big mines of the company, where it has proved the most effective device ever



WIRE FRAME FOR ANACONDA HOOD


These Dotted Lines represent Canvas Patch, Sewed on over the Fresh Air Inlet on the Rear Piece.
Hole for Tube to be Cut in Rear only.
4½
16¼
15
Center Line

PATTERN FOR COVER, ANACONDA HOOD

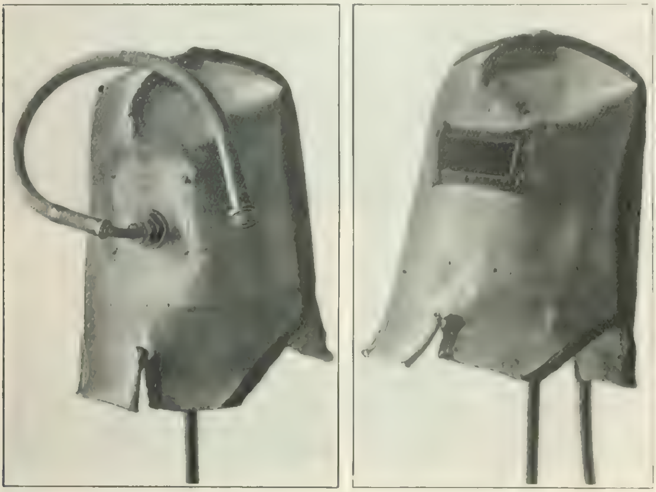
---

*State mine inspector, Boise, Idaho.

employed for this purpose in that district and is still regarded as such.

This device is not patented; the idea was first suggested by one of the miners at the Anaconda mine, who had been nearly smothered by one of the heavy fire-fighting hoods formerly employed, in which the peephole fogged so badly as to be practically useless. The miner then suggested breaking the covering out and attaching a direct compressed-air connection. The company puts these hoods up in the rope house in the Anaconda, and generally keeps a dozen on hand all the time.

These hoods weigh complete, with all attachments, including the short piece of hose connection, less than five pounds; and their cost complete is about $7. A first-class ½-in. steam hose is used for the flexible air connection with the main air line in 50-ft. or 100-ft. lengths. The small gage and strong walls of the hose are such as to make it practically safe against kinking.


BACK VIEW FRONT VIEW

THE ANACONDA HOOD

While this hood lacks the mobility of other devices used for this purpose, it is so much lighter, cheaper, and so much more positive, lasting and simple in operation as to be almost invaluable for the purpose for which it is designed.

Of course, it is essential to its employment that the mine in which it is used is equipped with a compressor plant and metal air lines along its main avenues. This is a condition, however, that is now rarely wanting in a modern metal mine where underground fires are likely to occur. In using this device in Butte, two men generally work together, which greatly increases its safety and the facility of changing connections; and it is much more adaptable than would seem at first sight, for with the use of extra hose connections and valves, air or water lines can be laid hundreds of feet with as much safety as with any other device yet invented; while the material for its construction is on hand at any big mine, and its immediate use in an emergency could doubtless often be made the means of preventing disastrous results.

Value of Galena and Blende in Wales

A correspondent in Wales, who operates an important lead and zinc mine, communicates to us the prices received for its sulphide ores as an indication of the rates on these products in Wales. The prices given are for the ores f.o.b. cars, the buyer paying the freight, and paying cash for the ore in six weeks.

Galena—Net lead value, fire asasy, is computed at the average price of foreign lead for three weeks after the sale, plus the full silver value (average of the London price for fine silver for three weeks after the sale). Smelting charge. £3 5s. per ton (2240 lb.). The freight paid by the smelters is approximately 14s. per ton. The smelters state that after the expiration of this contract (in March, 1909), they must have a smelting charge of £3 10s., instead of £3 5s. The ore averages [illegible] per cent. lead and [illegible] silver per ton.

Blende—The rate for this ore, delivered at the railway, is as follows, the terms being net cash on settlement of assay. The cost of freight to the smelter is approximately [illegible] per ton.

[illegible]

The scale of prices has been steadily falling during the last few years. Thus, on our contract for 1903-1905, with spelter at £24, the scale price was £6 19s.; while in 1905-1907 it was £6 4s. 6d. We consider the prices paid for English ores absurd, but we fancy that the Swansea smelters have formed a close ring and pool the ores. We are selling to the Continent at prices considerably above those paid by the Swansea buyers. Our blende assays somewhat above 50 per cent. zinc [illegible]

Accumulation of Gold on Copper Plates

The amount of gold absorbed and accumulated on battery plates under variable conditions has been investigated by W. F. A. Thomae[1]. Gold is retained on the plates in three ways: (1) In the amalgam which is collected at every clean-up; (2) in a scale of amalgam which adheres to the copper plate and is not removed in the clean-up; (3) In the amalgam which is actually absorbed by the copper plate and is not recoverable until the plate is smelted.

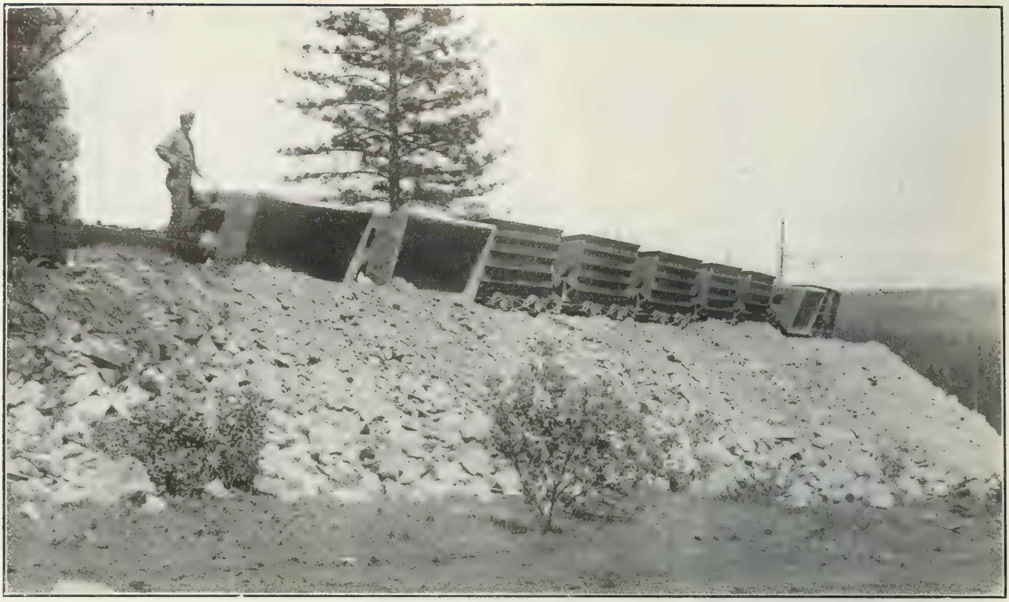
It has been found in practice that the amount of gold actually absorbed by a copper plate, 4 ft. 6 in. wide and 8 to 12 ft. long, is seldom more than 8 to 10 oz.; usually not more than 4 to 5 oz. will affect the first month's crushing returns. This proportion depends upon the rate of absorption which is governed by the temperature, the molecular structure of the copper and other conditions affecting the plates.

The amount of gold retained on a plate in the form of amalgam scale is also a variable factor. It depends largely upon the skill of the millman. The accumulation during the first month's run, when the plates are new, represents only a proportion of the final accumulation.

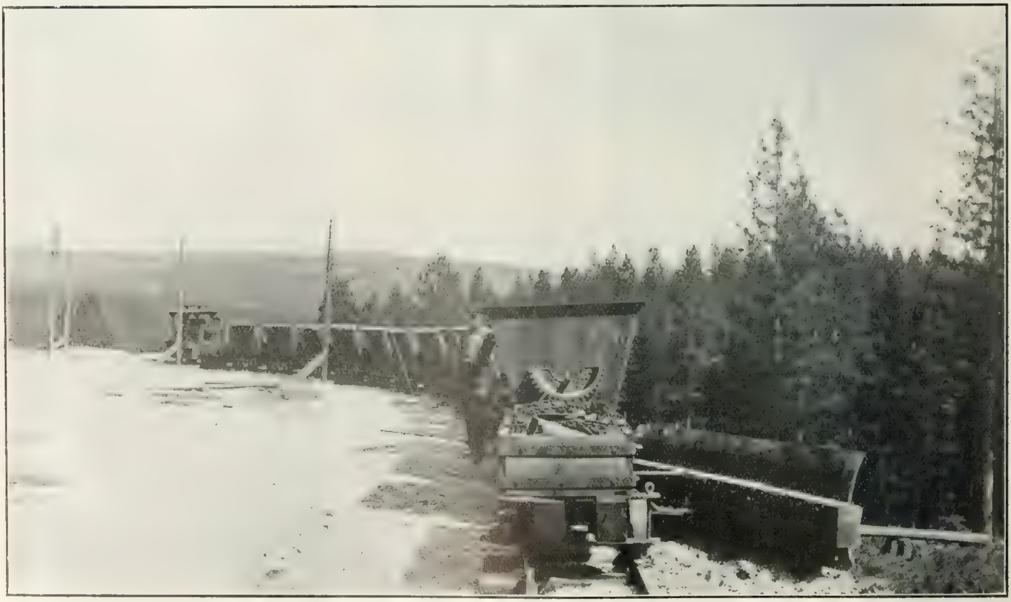
Mr. Thomae advocates the employment of Muntz metal plates instead of copper. They are cheaper than copper and have the additional advantages of practically absorbing no gold and freely parting with the amalgam scale; consequently the plates are more easily cleaned

---

[1] [illegible]



DUMPING A TRAIN, SHOWING ROCK PILED UP AGAINST CARS



TRAIN READY TO PULL OUT, SHOWING PLOW ON REAR CAR

Dumping Waste with a Locomotive Train

By Arthur B. Foote*

At the North Star mines, Grass Valley, California, a rather novel method is used in disposing of the waste rock. About 100 tons of waste a day is dumped into the bins at the collar of the shaft by the self-dumping skips. Formerly this was trammed by hand in one-ton cars and side-dumped from a track laid along the edge of the dump, the track being shifted over sideways whenever necessary to allow the cars to empty freely.

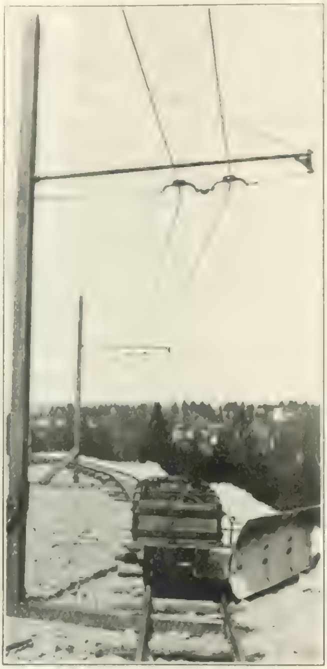
A 5½-ton electric locomotive hauling a train of 15 three-ton side-dumping cars was installed to transport the ore to the mills, and it was naturally desired to use this means of handling the waste also. But it was found that if the track was laid close enough to the edge of the dump to allow the cars to dump over the edge the track would slide off under the weight of the train and locomotive. To build a trestle was too costly. So it was decided to construct a plow that could be coupled to the end of the train and which would push over the edge the rock that piles up along the track by the side of the cars. This plan has proved entirely successful, eliminating the danger of losing the locomotive over the dump, and doing away with the necessity of shifting the track at frequent intervals.

As the track is laid a safe distance, about 18 in. from the edge, the rock remains piled up against the cars, after they are tipped. But the rock does not prevent the empty train from being hauled away by the locomotive. As the train is hauled out, the plow attached at the end pushes the piled-up rock over the edge. The track does not need to be moved again until it is about 4 ft. from the edge.

The plowshare is 2 ft. high by 8 ft. long, constructed by bolting pieces of ½-in. steel plate to a 6x8-in. timber. The plates were cut from an old winding drum, giving the outside of the plowshare a concave surface. This is pivoted at its center to an arm extending from the middle of a four-wheeled, wooden truck loaded with iron. Either end of the plowshare can be swung in close to the truck and pinned there so that the plow will work in either direction. The bottom of the plowshare scrapes the ties. The outer end is 3 ft. 6 in. from the rail, and the inner end is pinned as close to the rail as possible. It is simply a road scraper mounted on car wheels with the scraper all on one side.

The trolley poles, spaced about 30 ft. apart, instead of being set in the ground, are bolted by means of short pieces of angle iron to long ties laid under the rails, and braced to the ties with 2x6-in. diagonals. Both ties and poles are 4x6-in., and the rails are fastened by lag screws to the ties, large washers being used. In order to strain the poles as little as possible, the trolley wires are allowed to be quite slack. The last pole is guyed to the track ahead to keep the poles from falling in a direction parallel to the rails.

The end of the track connected to the switch on the main line is, of course, fixed, and the outer end is swung fanwise with the switch as a center. A short trestle is necessary to support the outer end of the track, otherwise the dump would become continually shorter, as the plow is necessarily backed past the point where the last car dumps. The accompanying photographs will perhaps explain the method of operation and construction more clearly than words.



METHOD OF FASTENING POLES TO TRACK, CAR WITH PLOW

---

*Assistant superintendent, the North Star Mines Company, Grass Valley, Cal.

The 60 new stamps for the New Modderfontein mill on the Rand will weigh 1650 lb. each. Forty of these stamps will be arranged in sets of five to a cam-shaft, while the other 20 stamps will be arranged as usual in sets of ten. The pulp from the stamps will go to three tube mills.

During the year ending May 31, 1908, the Alaska Treadwell 240-stamp mill consumed 53,188 oz. quicksilver, while stamping 377,271 tons of ore. Of this amount the batteries used 46,099 oz., the plates 6,367 oz. and the vanners 722 ounces.

The Geology of Cobalt

Special Correspondence

A report just issued by the Bureau of Mines of Ontario[1] brings as nearly as possible up to date the account of the researches made into the geology of the Cobalt district, and of the Montreal river and Temiskaming areas. It is mainly the work of Professor Willet G. Miller, geologist of the Province and the first explorer of Cobalt.

[illegible]

In the preface to this publication, the first edition of which appeared in 1905, the author states that it has not been found necessary to make any fundamental changes in the discussion of the geology or the ore deposits, his views concerning the relationship of the rocks, the character of the veins and the economic problems presented by the camp remaining practically the same. Much work has been done in the interval, but no new type of orebody has been discovered, with the possible exception of the ore associated with the aplite of the Montreal river area. While both the silver-cobalt ores associated with the aplite of the Montreal river area and those in the veins of the Cobalt area proper are believed to have been derived from the diabase magma, the aplite ores appear to have come more directly from the magma and can be classed as of aqueo-igneous origin, the ores of the Cobalt area proper being of aqueous origin. When the earlier editions appeared it could not be definitely decided what was the source of the silver in the veins, the occurrence of cobalt in association with the diabase which is characteristic of the Cobalt area proper, being considered sufficient evidence to show that the cobalt nickel arsenides originated in the diabase magma. In the Wendigo lake area 30 miles north of Cobalt, cobalt-nickel arsenides were found in the diabase, but not in the accompanying Huronian fragmental rocks, a similar condition prevailing in surrounding areas, silver being absent. As all the rock systems characteristic of Cobalt were not present in these outlying areas it was felt that the evidence as to the source and origin of silver was not conclusive. Since then, however, the discovery of widely distributed veins in the [illegible]

[illegible]

Among the additions to the volume is

---

[1] The Cobalt-Nickel Arsenides and Silver Deposits of Temiskaming. [illegible] By Willet G. Miller. [illegible] Mines, 1907. [illegible]

a description by E. T. Corkill, inspector of mines, of the Cobalt mines which were in operation during the first half of 1908, fully illustrated with photographs showing the plants and mine buildings. Concerning most of these later details have been published, or are elsewhere obtainable, but the report contains some information not previously given out regarding the Provincial mine on the Gillies timber limit operated by the Government. The shaft is down 140 ft., with levels at 65 and 125 ft. At the first level 450 ft. of drifting and 70 ft. of crosscutting have been done, and a raise has been put through to the surface 50 ft. east of the shaft on the vein, timbers put in, and stoping begun for 90 ft. along the vein. On the second level 125 ft. of drifting and crosscutting have been done, and a raise to the first level begun. The machinery installed consists of a 100-h.p. return tubular Jenckes boiler, the high-pressure half of a Rand air-compressor, developing 500 cu.ft. of free air per minute, and a 7x10-in. Jenckes hoist. In the mine a Worthington pump has been placed on the first level, and a Cameron sinking pump on the second level. Three air drills are kept in steady operation and a force of 25 men are at work. The report is reticent as to the output, the value of the ore, and the result of underground development in discovering additional veins; in fact no information is furnished tending to throw any light upon the value of the property. Two shipments were made during the earlier part of the year, amounting to 75 tons.

Montreal River and the Temagami Reserve

The third chapter is devoted to a description of a number of areas surrounding Cobalt in which silver or cobalt discoveries have been made. Cyril W. Knight, assistant geologist, reports upon the Montreal River and Temagami Forest Reserve area. This region, as shown on the map accompanying the report, includes an area of 1080 sq.m., of which something less than one-third has been geologically mapped. The Montreal river flows southeasterly through this territory, dividing it roughly into halves, the southwest portion being part of the Temagami Forest Reserve. Much of the surface of the country is similar to that of Cobalt, the Montreal river area presenting the same kind and succession of rocks. In addition to the Keewatin, Laurentian and conglomerate series of the Huronian, there are considerable areas of the quartzite-arkose series, but no contact was found between these quartzites and the lower Huronian conglomerates, so that the relation to the latter is not clear. The diabase and gabbro in which the cobalt-silver veins occur are the youngest series in the field, as where they occur in contact with the other rocks they are seen to penetrate them. Like similar rocks at Cobalt, they appear to be in the form of sheets or sills, no evidence of surface flows being observed. The diabase of the Montreal river presents somewhat greater variety than that of the Cobalt silver area. It is usually medium in grain, varying from fine-grained types to those in which some of the pyroxene individuals are an inch in length. In some cases it shows very marked magmatic differentiation and may pass into more acid types like syenite, or even granite. Boulder clay, sands, gravels and clays cover much of the area. What is very striking is the wide area over which the mineral cobalt bloom in small quantities has been found—the majority of cases occurring in small cracks in the diabase series. The center of James township is about 37 miles northwest of the town of Cobalt. At many places between these points bloom has been found. Small cracks, some of them containing native silver, have been found in the townships of Van Nostrand, Whitson, Banks, Speight, Barber, Tudhope, James, Farr, Mickle, and Smyth, and some miles farther north at Bloom Lake, in unsurveyed territory. Many of these small veins differ in character from the Cobalt type. They are aplite dikes—sometimes spoken of as diabase pegmatites, having the composition of a granite, but finer in grain and containing few colored constituents, like mica or hornblende. These aplite dikes are supposed to have been formed by cracks appearing in the diabase as it cooled and contracted. They were subsequently filled with vein or dike matter, which probably came from hot solutions given off by parts of the diabase still molten. Small scales of native silver frequently occur in the aplites. Some of the veins contain barite, which is not known at Cobalt. Among the more promising of the mining claims inspected by the writer were the Shane-Darragh, southeast of Silver Lake, Mickle township, where the vein had a width of from 2½ to 7 in., containing native silver, and the Moose Horn mines, James township, where there are six veins carrying native silver, one of them showing silver content equal to the rich ores of Cobalt.

Other Areas

Other areas dealt with are Bloom Lake, some 6½ miles west of Farr township, by W. R. Rogers; Casey and Harrison townships, by R. E. Hore; south of lake Wendigo, by R. E. Hore, and the territory west of Ray lake, on the Montreal river, by J. S. DeLury; but their observations, while of scientific interest, are not of sufficiently recent date to include later discoveries and developments. A. G. Burrows, who was sent into the area south of Lorrain township this summer, contributes some notes on its geological formation which he states is similar to that of Cobalt. The Keewatin rocks vary considerably in appearance. About a mile southeast of Loon lake they are seen in well defined bands with a schistose structure in part and almost vertical dip. Some of the rock has a cherty appearance and some resembles ordinary green schist, in which the characteristic torsion cracks filled with calcite or quartz are developed. The Keewatin belt in the vicinity of Keeley's has a harder, more compact appearance, and breaks with a rounded fracture, and to the eye has a slate-like structure. In the western portion of this area, there is much old diabase, some of which retains the diabase structure, while much of it is apparently altered to amphibolite. This area contains most of the promising veins along the eastern border, and near the contact with the Post-middle Huronian diabase. The western portion of the area is chiefly reddish quartzite. The Huronian formations are comparatively flat and show little evidence of disturbance. The diabase and gabbro rocks may be seen in contact both with the Keewatin and Huronian, and cutting the latter at an inclined angle and overlying it. Most of the promising veins have been found in the Keewatin, but good silver values have been obtained in the diabase on several claims.

The Broken Hill South Silver Mining Company

This company owns an important silver-lead-zinc mine in the Broken Hill district in New South Wales. The report covers the half-year ended June 30, 1908. The receipts from the mine in that period were £112,094; expenses, £91,442; net balance, £20,652. Income account shows a balance from previous half-year of £89,256, making a total of £109,908. Against this were charged taxes, royalty, London office expenses, etc., £5154; new construction, £491; dividends paid, £20,000; total, £25,645, leaving a balance of £84,263 to current year.

Ore raised in the half-year was 79,446 tons. Development work amounted to 1101 ft., and the estimated ore reserve is now 1,350,000 tons. There were 55,748 tons of waste used in filling old stopes. The average number of employees was 968, of whom 545 were employed underground and 423 on surface.

The crude ore treated was 78,803 tons, the contents by assay being 442,854 oz. silver, 12,446 tons lead and 9720 tons zinc. The concentrates produced were 12,613 tons, carrying 235,055 oz. silver, 9149 tons lead, and 651 tons zinc; the recoveries being 53.1, 73.5, and 6.7 per cent., respectively. Other products reported were:

		Assay Contents.		
	Tons.	Silver, Oz.	Lead, Tons.	Zinc, Tons.
Tailings, zinc...	11,259	41,374	562	2,068
Tailings, quartz...	47,533	126,953	1,852	6,074
Slimes........ ...	7,398	39,472	883	927
Total	66,190	207,799	3,297	9,069

The costs reported, reduced to dollars, were: Mining, $2.994; filling old stopes, $0.548; development, $0.276; milling, $1.272; total, $5.09 per ton of ore. The cost, based on final product, was $31.812 per ton of concentrates.

The directors' report says: "During the six months one dividend was paid, absorbing £20,000; £30,000 has been spent in plant and machinery; the Zinc Corporation's deposit of £10,000 and interest has been taken into revenue; and since the closing of the accounts another payment of £10,000 has been received from the same source. The average price of lead per ton for the half-year has been £13 14s. 10d., as compared with £18 6s. 5d.; and of silver, 2s. 3¼d., against 2s. 7⅝d. per oz. of the previous period.

"The amount of development done in the mine during the half-year has been small, and has been confined largely to necessary work, in view of the fact that such large reserves of ore were blocked out when the finances of the company were in a flourishing condition.

"The new mill is now practically completed. It is divided into four sections, two of which have been set to work, and are able to produce all concentrates sold for delivery at present; the remaining two sections are being connected up and adjusted. The manager is more than satisfied with the results obtained, and its capacity largely exceeds what was expected of it.

"Since the last report, further sales of concentrates have been made for delivery during the last four months of this year, and also a large parcel for delivery all next year, on terms about equal to the previous contracts. Recently, further inquiries have been received, but the directors have thought it wise to be content with the sales made, rather than extract further large quantities of ore from the mine to be disposed of at current metal prices, which leave only a narrow margin of profit.

"Recently the original agreement with the Zinc Corporation has been determined, and a new arrangement has been entered into; this provides that all tailings produced by the old mill, and estimated at 1,100,000 tons, are sold at a flat rate of 3s. 10d. per ton. Current production tailings remain the property of this company. A further cash payment of £10,000 has been received, making £49,500 in all, no more payments being due until July, 1909. The new mill is now producing a high-grade tailing, which is being stacked on the surface, and a low-grade product, which is being conveyed underground for filling the mine.

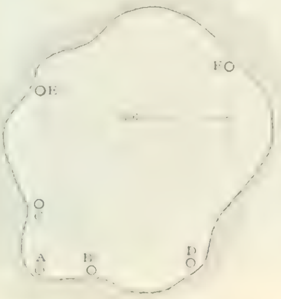
"The item of costs has received careful attention. The rapid increase in the cost of all important materials used by the company, together with increased rates of wages and higher smelting charges, has caused grave concern, coming as they have at a time when low metal prices have had to be faced, and following a period of unusual prosperity.

"No satisfactory advance has been made toward procuring a second and adequate supply of water for Broken Hill. Unfortunately, the government of New South Wales has refused to assist the Umberumberka Water Trust with a loan to enable it to carry out its proposed scheme. The manager estimates that unless heavy rains fall by November, the water now conserved at the Stephen's Creek reservoir will be about exhausted. It is evident, therefore, that Broken Hill is in a very precarious position, and may have to face another water famine before the end of the year."

Sinking a Winze with Long Holes

By George C. McFarlane*

Last spring I had occasion to sink a winze in a hurry so as to make an air connection with a railroad tunnel. I had driven this tunnel from the east side of the ridge and was within about a hundred feet of coming out into the long approach on the west side when warmer weather made the natural air circulation too sluggish to carry out the powder smoke. I had already sunk several feet with hand steel, when I decided to continue the work with long holes.



CROSS SECTION OF THE WINZE SHOWING ARRANGEMENTS OF THE HOLE

The material to be sunk through was a rather hard red granite. I used a donkey boiler to furnish steam to drill the first hole, and when this hole broke through into the heading of the tunnel I ran a hose down the hole and connected with the pipe-line in the tunnel. Five more holes were now drilled, arranged as shown in the accompanying sketch. All the holes were about 30 ft. deep; they were started with a 2¾-in. and finished with a 1¼-in. bit. It took 4½ shifts to [illegible] Rand drill.

The holes were finished at midnight Saturday and three men began the blasting at 3 a.m. Sunday. Starting at the bottom, they continued to blast holes *A*, *B* and *C*. By noon they had a small hole through to the surface, and the winze was blasted to its full size by 4 a.m. Sunday.

The method of blasting was as follows: One of the men in the tunnel heading held a rag in the bottom of hole *A* with a tamping stick, while the men on top rammed in a foot of clay. One foot of dynamite was then tamped down; no tamping was placed on top and the charge was detonated with a drop fuse. This procedure was continued with the three holes in rotation. Every blast broke from 6 to 12 in. of ground. After the first couple of rounds it was not necessary to plug the bottom of the holes, because when one hole was blasted it would close up the bottoms of the two adjacent holes.

When the blasting of the three holes was completed, an irregular, three-cornered hole was made about a foot in diameter and reaching from the tunnel to the surface. Holes *D* and *E* were then blasted alternately, about 6 ft. of the hole being loaded for a shot. Finally hole *F* was loaded from top to bottom and fired. This completed the winze.

The total time required was six shifts for the 30 ft. or 5 ft. per shift. The cost was as follows:

Drilling—1 machineman 4½ days at $4, $18; 1 machine helper 4½ days at $2.50, $11.25; 1 [illegible] 4½ days at $2, $9; steel sharpening, power, etc., $13.50. Blasting—1 [illegible] 1½ days at $4, $6; 2 helpers, 1½ days at $2, $6; 5 boxes, 60-per cent. dynamite, $45; box of caps and 100 ft. fuse, $2; total, $110.75.

This makes the total cost of sinking the 30 ft. [illegible] per foot. No particular pains were taken to plumb the drill in starting the holes and they did not [illegible] throughout. It takes three times the quantity of powder to break the ground with this long-hole method, but in this instance it was three times as cheap as hand sinking for the part of the winze sunk by hand cost more than $9 per foot for labor [illegible]

[illegible] Treadwell mine, the cost for steam power was reduced by more than $50,000 in a year. The cost, using coal, was $125,021, from Oct. 15, 1906 to May 15, 1907, while [illegible] 1907, to May 15, [illegible] the cost, using oil was $74,262. The total cost of the installation has been $28,680 [illegible]

During 1907 the output of oil residue [illegible]

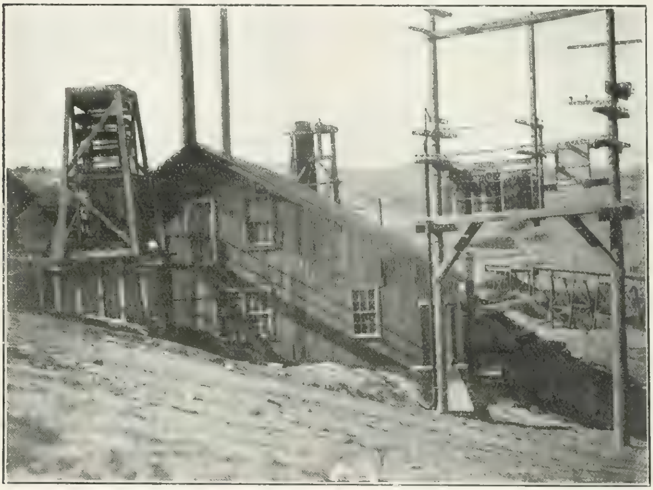
---

*Mining engineer, 312 Bearinger building, Saginaw, Mich.

Electrical Equipment of the Butte-Balaklava Mine

By A. Floyd Bushnell*

The Butte-Balaklava mine, situated in a northeasterly direction from Anaconda hill, and which is electrically equipped throughout, is making a record both for rapid development work and inexpensive operation. In August, 1907, this company began using a steam hoist to sink the shaft to a depth of 500 ft. Early in February of this year an electric hoist and compressor were installed, and with this new and up-to-date equipment the shaft was sunk from the 500-ft. level to a depth of 716 ft. in two months.



HOIST HOUSE, BUTTE-BALAKLAVA MINE. COOLING TOWER ON THE LEFT

The expense in operating and the initial cost of the electrical equipment, as the electric power is purchased and not generated at the mine, are considerably less than when steam is used for power, while the ease and quickness with which the machinery of the entire plant may be started and stopped is a second, and important, consideration. Since the installation of the electrical equipment, the only steam used at this plant is for heating during the colder months of the year.

According to C. N. Newton, superintendent of the property, the expense of installing the electrical plant is half what it would have been in the case of a steam plant. The Butte-Balaklava company saves approximately $400 a month by the use of electricity, and if it were necessary to pump much water a greater amount would be saved; much less oil is used and the need of a fireman is done away with. The cost of maintenance of this electrical plant is 40 per cent. less than that of a steam plant of the same capacity. City water at a considerable expense was formerly employed to cool the air cylinders of the compressors, but recently the company has erected a tower for cooling the water used. The water is pumped to the top of the tower, and cools sufficiently as it filters through the screens to be used again. By using this device the cost of cooling the cylinders has been decreased somewhat.

The electrical equipment has so far proved entirely successful, and unless something unexpected happens its use will be continued. Since the electrical machinery has been installed there has been only one shut-down on account of accident. Power for operating the plant is furnished by the Madison River Power Company and is transmitted a distance of 50 miles.

The hoist has a double drum and was manufactured by the Denver Engineering Works; each drum has a hoisting capacity of 5000 to 6000 lb. A 125-h.p. General Electric Company motor is used to drive the drum. This hoist has sufficient capacity for sinking the shaft to a depth of 1000 or even 1500 ft., but as soon as the 1000-ft. level is reached a larger hoist of the same make will be installed. The rope speed averages 700 ft. per min., which is a good speed for an electric hoist, but as high as 800 ft. per min. can be developed in case of necessity.

The mine is at present equipped with an Ingersoll-Rand compressor, with a capacity at this altitude of 606 cu.ft. per min., driven by a 100-h.p. General Electric Company motor, but the company intends to install a second electric-driven compressor having a capacity double that of the one now in use. The compressor furnishes air for the pumps and drills; compressed air also is used to blow out the smoke after blasting.

The carpenter shop is completely equipped with electrical machinery for sawing and framing timbers. An electric pump has been ordered; this is to be placed as soon as needed in the station on the 700-ft. level. The water is now being raised by sinking pumps to the 500-ft. level and from there to the surface by the station pumps.

Ore is being blocked out on the 500-ft. level, and hoisting will be started as soon as the veins on the 700-ft. level are developed sufficiently. On the 500-ft. level considerable development work has been done on the Edith May vein, and two feet of high-grade copper ore carrying considerable silver has been found.

On the 700-ft. level, stations are being cut both on the north and south sides of the shaft. Crosscuts both north and south are to be started in a short time, and it is expected that the Edith May vein will be intersected also on the 700-ft. level. The crosscuts on the 700-ft. level will also intersect three other known veins, the Bell-Speculator, Old Joe and Sioux Chief, which have been explored on the 50-ft. level.

A new head-frame is to be erected, the timbers having already been ordered. The temporary ore bins on the Butte, Anaconda & Pacific tracks will soon be replaced by permanent structures.

---

*Box 751, Butte, Montana.

Commerce between the United States and Germany

The total imports from Germany in the fiscal year ended June 30, 1908, were valued at $142,935.547 against $161,543,556 in the previous 12 months. The exports during these periods were valued at $276,910,223 and $256,595,663 respectively.

The trade in articles more nearly related to the mining and metallurgical industries is given in the accompanying table:

TRADE OF THE UNITED STATES WITH GERMANY.

	1907	1908
Imports:		
Cement, lb	413,909,830	218,794.
Copper, lb	6,636,210	4,417.
Earthenware, dollars	5,153,943	5,287,2[illegible]7
Pig iron, tons	32,504	2,096
Exports:		
Coal, bituminous, tons	5,053	8,957
Copper ore, matte, etc., tons	212	35
Copper, lb	91,016,167	134,987,671
Fertilizers, tons	261,163	349,150
Oil, illuminating, gal.	120,183,398	151,802,286
Oil, lubricating, gal.	19,591,795	22,158,084
Paraffin, lb	11,898,234	7,457,896

There was also exported in 1908 machinery to the value of $5,726,637 against $6,208,859 in 1907.

Underground Conveyers at the Kleinfontein Mine

By Edward J. Way*

The great bulk of the unskilled colored labor employed underground on the Rand may be divided into three sections: Hand drilling; shoveling the ore down the stopes; and tramming. The system of mining makes it economically impossible to substitute mechanical traction for the method of hand tramming at present in use, while the complete replacement of hand drilling by power drills is not at present feasible. The possibilities of any reduction in the number of unskilled colored laborers employed underground are, therefore, limited for the present to the installation, in place of the existing method of shoveling and scraping the ore down the stope, of some conveyer system for handling the broken rock in those stopes where the dip of the reef is not sufficiently deep to cause it to roll down from the working faces to the stope boxes, in readiness for loading into the underground trucks for conveyance to the shafts; and to the employment of an efficient stoping drill which would drill the equivalent of five to seven hand-holes per day.

As the backs are 200 ft. long, many of the working faces of the stopes are over 200 ft. in length, and it will be readily understood that, under the method of hand shoveling at present in use on the greater number of the mines, a large amount of unskilled colored labor is required to shift the broken rock down the stopes the majority of which are inclined about 26 deg. to the horizontal. Any conveyer system which could economically do this work would result in a large reduction in the number of unskilled colored laborers required.

The chief difficulty which had to be faced in the installation of such a system was the fact that the working faces of the stopes were constantly shifting, and so whatever type of conveyer it was decided to employ it would have been necessary to take it down and re-erect it at each blast. The method of operating the conveyer was a further difficulty, as any system requiring a power drive was impossible, both from the point of view of capital expenditure and running costs, and on account of the mechanical difficulties due to the conditions under which the conveyers would have had to work in the stopes.

Construction of the Swinging Conveyers

These difficulties have, however, been overcome by the adoption of swinging [illegible] from the hanging wall of the stope by chains, and operated, according to the length of the conveyer, by one [illegible] pulling on their upper end. The conveyers are 18 in. wide and vary in length, according to the state of development of the stopes, from a maximum of 224 ft. to a minimum of 32 ft. In order to permit easy handling they are built up in 8-ft. lengths of ⅛-in. iron plates slightly troughed.

The bottom end of each length is designed to fit into the top end of the length below it, and is secured to it by means of two eye-bolts, one on each side. Square heads forged on the shanks of these eye-bolts are passed through square holes in the overlapping sides of the adjoining lengths of the conveyer, and the shanks are then slipped upward into slots which just fit them the adjacent lengths are thus secured together while at the same time a little play is allowed between them and a certain amount of flexibility is given to the whole conveyer. The conveyer is suspended close to the working [illegible] lengths of chain hooked into the eye-bolts. the two chains from each pair of eye-bolts being secured to a single chain hung from a hook-bolt wedged into a hole drilled in the hanging wall of the stope.

This method of construction was found to permit of very rapid handling, it being possible to take down and re-erect a conveyer 224 ft. long in about 45 min.; while each time a conveyer is shifted, owing to the advancement of the working face, it is only necessary to drill one more hole in the hanging wall than there are 8-ft. lengths in the conveyer, that is, for a conveyer 224 ft. long only 29 holes are required.

The conveyer is hung as close as possible to the working face for convenience of shoveling, and is taken down and put up again at each blast. When the working face has advanced about 6 ft. a fresh series of holes is drilled in the hanging wall, and the conveyer is again brought close up to the face of the stope. The conveyers are operated, according to their length, by one or more men pulling on ropes attached to the upper end of the conveyer. The men pull up the conveyer and then let it swing back by gravity, the jerks thus transmitted to the ore causing it to slide down the conveyer and to be discharged at its lower end.

The reduction in the amount of unskilled colored labor employed in the different stopes depends, of course, upon the length of conveyer required, varying from about 22 men on a conveyer 224 ft. long to three men on one 32 ft. long.

The number of conveyers in use at the present time is 55, and 15 more are being made to complete the equipment of the mine, so that the total number ultimately in use will be 70. As the average saving in labor works out at about six men per conveyer, the total reduction in the num[illegible] in shoveling the ore down the stopes, resulting from the installation of the system [illegible]

Proposed Mono-rail System

In order to reduce still further the number of unskilled colored laborers employed underground, I have under consideration at the present time a scheme which includes the lengthening of the backs from 200 to 400 ft. and their equipment with stope conveyers of a maximum length of 448 ft., and the installation of the mono-rail system of tramming in place of the ordinary tramway system at present in use underground. This system, suggested by the success of the mono-rail in connection with electric telpherage, consists, as the name implies, of a single rail suspended in the drive, crosscut or winze by means of iron hangers firmly secured in holes drilled in the roof.

Switches, turntables, crossings, etc., are easily adapted to the single rail. A switch, for example, consists simply of a short [illegible] on the last hanger before the branch, and having the other end supported by a hanger sliding in a slot, curved to the arc of a circle having the pivot of the switch rail as center and the rail itself as radius cast in an iron plate secured horizontally to the roof of the drive. This permits just enough travel to allow the free end of the switch rail to swing from one branch to another, where it is secured by a sliding fish-plate.

[illegible] or V-shaped body, is attached by a pin at each end to a bridle hung by means of two T-shaped drawbars to a pair of two-wheeled trucks running on the suspended rail. The short equal arms of the T-drawbars have fixed axles on which the truck wheels run loose, while the long arm of the T is fitted with a swivel clip connecting it to the bridle. The weight of the car and of its contents and of the bridle is thus transmitted to the trucks through the swivel clips of the drawbars, and each truck is, therefore, free to move [illegible] axis. Since the wheel base of each truck is as short as possible, and the trucks themselves are set as close together as clearness will allow, the cars can negotiate with the greatest ease the very sharp curves on underground tramways.

The main advantage of the mono rail over the ordinary system of hand tramming along a two-rail track laid on the floor of the levels is that both rail and axle friction are reduced to a minimum, owing to the suspended rail and the cars being above the mouths of the ore-chutes, and, therefore, out of the way of the dust and rock which, in the ordinary system of hand tramming, is inevitably spilled on the wheels and the track rails while the cars are being filled at the chutes; and also out of the way of the acid water, mud, etc., which is nearly always present on underground tracks.

---

*Consulting engineer, Hotel Savoy, London, England.

Note—Abstract from an article, entitled "Labor-saving Appliances at the Mines of the New Kleinfontein Company, Transvaal," read before the Institution of Mechanical Engineers, Nov. 15, 1907.

The capacity of the cars ordinarily in use underground is 12 cu.ft., holding ½ ton each. Owing to the bad working conditions, the number of men required to handle each car is usually two, thus necessitating the employment of a large number of unskilled colored laborers in tramming the ore from the stope boxes to the shafts. This number I expect to reduce greatly by the installation of a carefully graded mono-rail system, and also by the introduction of an improved car of 2-tons capacity, fitted with frictionless axle-boxes. This car will be easily handled by one man.

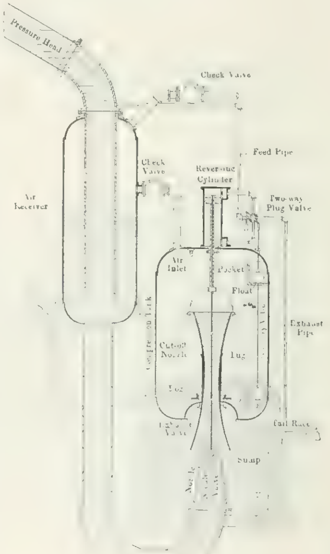
By the adoption of this scheme I hope to bring down the number of unskilled colored laborers employed in the actual handling of rock underground to what is practically an irreducible minimum. The only means by which the number could be further lowered, namely, an electric or compressed-air railway system or other mechanical haulage system, while perfectly feasible in a coal mine or other mining operation where the work is all carried out on one plane, is practically impossible under the conditions prevailing in the mines of the Witwatersrand, and in fact in metalliferous mining generally.

McFarlane Hydraulic Air Compressor

A hydraulic air compressor of the direct-acting, pulsating type, recently patented by Geo. C. McFarlane, effects an economy of water and energy by adapting the pressure of the water to that of the air to be compressed. To compress air to 85 lb. pressure requires a 200-ft. gravity head of water. If this head were turned directly into a tank full of air, it would compress the air to 85 lb. pressure and force it out of the tank at that pressure; however, an enormous loss of energy would take place in the initial stages of compression. To compress the air without loss of energy requires that the water pressure entering the tank should be only slightly greater than the pressure of the air at any given stage, i.e., starting at a couple of pounds pressure, gradually increasing to 16 lb. when the tank is half full, 46 lb. when the tank is three-quarters full, increasing thence to the final pressure, 85 lb. when the tank is 85 per cent. full, then using the full water pressure to fill the remaining 15 per cent. of the tank, thereby expelling the compressed air into the receiver. In the McFarlane system this pressure regulation is accomplished by intermingling various percentages of dead water with the inrushing jet of live water.

A nozzle, or monitor, connected with a head of water, produced either by gravity or a turbine pump, is mounted under an air tank. By an arrangement of a shifting cut-off nozzle and a needle valve, the stream issuing from the monitor sluices in enough dead water from the sump to reduce the velocity head of the stream entering the tank to the air pressure it must overcome. In the initial stages a small opening of the nozzle sluices in a big stream of dead water from the sump, in the final stage the needle valve gives a full opening of the nozzle, while the cut-off valve shuts off all or nearly all the dead water.

The accompanying illustration shows the operation of the system; the pipe head passes down through and nearly to the bottom of the air receiver; from the receiver the water is conducted down a pipe, through a return bend up into the nozzle, whence it is periodically admitted into the compression chamber. The nozzle is opened and closed by a needle valve, and a vertically moving cut-off nozzle regulates the amount of dead water admitted with the live head. The needle valve and the cut-off are moved up and down by separate pistons operating in one reversing cylinder, their movements being controlled by floats, which operate a two-way-plug controlling valve, to admit water above or below these pistons. An exhaust valve for quickly emptying the tank is raised by the upward movement of the cut-off nozzle, the receding water level releases the float-operated dogs and permits the exhaust valve to drop back into place when the tank is nearly empty. The floats which move the controlling valve work in pockets and give a quick reverse to the valve.



MCFARLANE AIR COMPRESSOR

The Cycle of Operation

Starting with a tank full of air, the bottom float being down, the controlling valve directs the feed water into the upper port of the reversing cylinder; this shoves both pistons down, lowering the needle valve and cut-off nozzle. As the water flows into the tank compressing the air, the rising water level raises an auxiliary valve against the drain holes in the upper pocket, and no water can enter the upper pocket until the water level reaches the top of the pocket, when it overflows and quickly throws up the float, reversing the controlling valve, which now directs the feed water into the lower port of the reversing cylinder. Now since the lower piston head rests tightly against the lower cylinder head, the force of the water is expended in raising the upper piston, which closes the needle valve; near the end of this up-stroke, a dog nut on the needle-valve stem engages the bottom of the hollow rod of the lower piston, raising it enough to clear the lower cylinder port. The lower piston now catches the full water pressure, and the cut-off nozzle and the exhaust valve are raised. As the tank empties the receding water level releases the exhaust-valve dogs, permitting the valve to close; the lower float also drops, reversing the controlling valve, and beginning a new cycle.

Each cycle requires ordinarily about 15 or 20 seconds, and a nearly constant air pressure is maintained in the pipe line throughout the cycle by the rising and falling of the water level in the air receiver. While the special field of this system is direct compression from natural heads of 200 ft. and more, it can also be used with an artificial head produced by a multi-stage turbine pump.

Treating Concentrates at Bellevue Limited Mine, W. A.

At the Bellevue Limited gold mine in Western Australia, owing to the copper in the ore, cyanidation cannot be used for treating the concentrates. As a result of pan-amalgamation experiments a unique process has been evolved, according to B. L. Gardiner (*Journ.* Chamber Mines, W. A., May, 1908), which consists of treating the roasted ore by the pan-amalgamation process, minus the mercury. The use of mercury is not required because a scale, consisting mainly of copper and iron salts, bound together by calcium sulphate, forms on the pans, on the riffles of Wilfley tables used to save any unroasted sulphides, and on iron scrap placed in the tailing launder. This scale, formed either by chemical or mechanical action, catches the gold. The gold-bearing scale is subsequently amalgamated in a clean-up barrel. By this method a saving of 90 per cent. of the gold is obtained, scale formed in the Wheeler pans used for grinding.

Professional Ethics for the Mining Engineer*

The Relations of the Mining Engineer to His Clients and to the Public. His Duty to Himself in These Different Relations

BY JOHN HAYS HAMMOND†

This is an era of "expansion;" and, conformably with the change in commercial conditions, the function of the mining engineer, as well as that of his confreres in many other professions, has also expanded. From his capacity of an engineer, limited to the determination of technical questions, the engineer of today has come to assume an economic importance in those branches of industry dependent upon engineering skill for their development.

He is indeed an engineer of limited usefulness who does not go farther professionally than to submit a purely technical report on subjects presented for his consideration. While he has the same responsibility as formerly in the solution of the technical problems involved, he is further expected to supplement his report with advice on the financial and commercial aspects of these problems. For the great majority of problems presented to the engineer ultimately involve the determination of the pecuniary relations of the propositions under consideration.

The great corporation lawyer no longer earns his fee by merely submitting his opinion as to the legal issues involved in law suits affecting the corporation; he now assumes charge of the entire legal work, including both the organization of the corporation and the maintenance of its legal status thereafter. In like manner, the engineer, whose report was, as I have said, formerly confined to the determination of the geological and other cognate features of a mining enterprise, is now expected, not only to embody information on these subjects in his report, but also to give his opinion whether the property offered for sale in pursuance of such an enterprise is worth the price asked for it.

Moreover, if he recommends the purchase of a property, he incurs a certain moral responsibility for its efficient management, inasmuch as his professional reputation depends upon the realization of his predictions as to the outcome of the investment. For this reason, the engineer passes from the rôle of an expert to that of a consulting engineer, bound to supervise both the technical and the business management of the property purchased by his clients.

With this additional responsibility, and the consequent increase of professional opportunity, comes an extension of the field covered by the ethics of the mining engineer. Our professional duty may be regarded from three points of view: First, the relation of our work to our employers; second, its relation to the investing public; and third, its relation to our individual interests.

[illegible]

The question has been often discussed among engineers, whether it is professionally proper to make a report for the seller of a mining property. Such practice has been sometimes condemned; but a little reflection will show that the condemnation is not warranted. For it is neither wrong nor unreasonable that the owner of a mineral property should desire to present such a statement of its nature and probable value as will secure the attention of possible purchasers; or that he should secure for such a purpose the assistance of one who knows how to make such a statement intelligently and in scientific language—that is, the language which will convey a definite meaning to those who know it—or that he should pay such an assistant for his skill and labor. It goes without saying that no expert in such a case, or in any other case, may suppress or misstate facts, or disguise or withhold his honest opinion, in a statement to which he lends his name. Yet, this being understood, it still remains true that a "vendor's report" is not advice to anybody to buy, at a stated price, but only a description of the property—usually without any mention of the price at which it would be to the purchaser a profitable bargain. There is nothing dishonorable or unprofessional in honestly making, for the owner of the property, such a description. But there is often danger that it may be afterward used as if it were advice offered to a purchaser. In any such report, therefore, the fact that it was made for the owner, or vendor, or his representatives, should be clearly stated beyond all misunderstanding, for the protection of both the author and the reader. This precaution being observed, I see no valid objection to the writing of such a report by a mining engineer.

Nevertheless, it is an undesirable kind of work, particularly for young mining engineers, whose reputation for integrity and judgment, not yet established by long practice, may be, justly or unjustly, placed in jeopardy by any such expres- [illegible] destroyed, in public esteem, by the failure of any mining scheme with which their names may have been thus associated. In their own interest, they should accept such engagements with caution, and protect themselves with vigilance against illegitimate or misleading use of their statements. In short, they take, in such cases, a risk which older engineers, backed by a reputation already established, could better afford to take. As between the two classes, the question is one, not so much of ethics as of practical wisdom; yet we may fairly say that the avoidance of folly is, in no small degree, an ethical matter. It is worthy of notice that the wise proverbs and warnings of the Good Old Book often make no great distinction between "fools" and "sinners."

Contingent Fees

In this connection arises the question of the acceptance of contingent fees. It seems to me that an expert of established and unimpeachable reputation is perfectly justified in recommending the purchase of a property and accepting compensation from the promoters, *provided*, first and without qualification, that full publicity be given to the nature of his connection with the enterprise; and secondly, that his compensation be contingent, not upon the successful sale of the property, but upon the subsequent success of the undertaking. In other words, an expert who makes a favorable report upon a mining property for which he is to receive payment in money if the property be sold on his report, must needs have an unparalleled reputation for integrity to endure that revelation of this situation, which he cannot without dishonor withhold. But one who frankly avows that he is to be paid in the stock of the projected company and, therefore, as an investor of time, skill and labor, is on the same foot- [illegible] much less vulnerable position. In either case, and in any case, there is no safety—and, I may almost add, no honor—outside of the frank and full publication of all such circumstances as might be afterward called in question, criticized or condemned.

This is the expert's Golden Rule: "Tell unto others, *now*, whatsoever you would not have them tell on you—with unjust misunderstanding and scandalous comment—hereafter!"

Commissions

Another question involved in the rela- [illegible] concerns the acceptance of commissions from the sellers of machinery, supplies, etc., the purchase of which he has made as agent, or recommended as adviser. In many instances of similar nature affecting other professions, this practice seems to be established and condoned, if not avowedly justified. It is even defended by ingenious sophistry, somewhat as follows: The manufacturers of certain articles are bound by trade agreements not to sell them below a certain price, or, in the absence of such agreements, do not dare to "cut" the price, for fear of, thereby, invoking savage reprisals from their competitors. But this minimum price includes the salary or commission paid to a regular selling agent. If, therefore, the agent of a customer makes a purchase direct, without the intervention of their sales agent, they are willing to pay him "the regular commission," though they are not willing to reduce by the same amount their bill to his employer. The argument is plausible from the manufacturer's standpoint; and indeed it is hard to judge him justly. For if, in a given case, in order to gain a customer, he undersells his competitors, he may be committing the heinous modern sin of granting a "rebate;" whereas, if he refuses to do this, he may be guilty of partnership in a wicked "trust" or "combine." The popular sentiment and legislative furore which condemns at the same time free competition in prices and every agreement to prevent such competition, needs, as President Roosevelt has, in substance, frankly declared, to be modified by common sense.

---

*Address delivered at the Chattanooga meeting Oct. 1, 1908.

†President American Institute of Mining Engineers.

But we are not now concerned with the ethical or legal problems of the manufacturer. From the standpoint of the engineer, acting as a purchasing agent or adviser, the case seems to me as clear in the court of honor as it would be in a court of law. He cannot honorably accept a commission from the seller, while he is the agent of the buyer. If the custom of the trade permits the giving of such a commission, but not its deduction from the face of the bill rendered, he may, of course, honorably accept it and pay it over to his own employer—that being the only way in which he could secure the minimum net price in his employer's interest. But even in that event, he should place his honor beyond suspicion—as, for instance, by demanding the commission in a check to his own order, and indorsing the same check to the order of his employer. There may be exceptional cases in which the taking and keeping of a commission is justifiable, but one thing is clear beyond dispute: it is always wrong when it needs to be kept silent.

Loyalty to Employers

It sems almost superfluous to insist upon the duty of maintaining a spirit of loyalty toward employers. Yet this spirit is by no means as prevalent as a sense of honor, or even of enlightened self-interest, would demand. Loyalty to a corporation should be as unquestionable as to an individual. In neither case should it be sacrificed to feelings of personal resentment or disapproval. If one cannot "stand for" the policies or practices of one's employer, the straightforward course is to seek employment elsewhere.

There are two special spheres in which the mining engineer, like the members of other technical professions, maintains a double relation.

One of these is that in which, being himself an employee, he exercises the employer's authority over other employees. In such a position, while it is his duty to protect vigilantly his employer's rights and interests, he should realize that he cannot do this more effectively than by invariable justice, good-nature, respect and sympathy toward his own subordinates. Nothing contributes more to the success of an enterprise than the mutual exercise of these feelings between workmen and superintendents or managers. It is "team-work" that wins in industrial undertakings, as well as in the athletic field. And in these days especially, it is the cultivation of an *esprit de corps,* based upon truely friendly personal relations, which offers the best protection against the schemes of mischief-makers and demagogues.

Expert Testimony

The other double relation to which I have alluded is that which is occupied by an expert witness in a court of law. In this case, he is theoretically *amicus curiae*, a friend of the court, giving under oath his assistance in the recognition and interpretation of the facts of the case; and, for this reason, he is permitted to do what no ordinary witness can do, namely, to give opinions as well as personally observed facts, and to support these opinions by hearsay evidence or scientific authority and argument, not otherwise admissible as testimony. Yet, on the other hand, he is retained and paid by one of the litigant parties; and he would not appear in court at all, were it not reasonably certain beforehand that his testimony would support the theory and benefit the cause of his clients.

The ethics of this situation may be more clearly perceived, if we consider that, first and foremost, the expert witness must remember the obligation of his oath. He has not the same latitude as the attorney, whose official duty is to present a client's case, without declaring his private opinion about it. Consequently, the expert witness should be thoroughly convinced beforehand of the justice and truth of the cause or the theory in support of which he appears. Such a conviction ought to be based upon a careful and exhaustive previous examination of the case; and no expert should agree to testify in any case until such an examination has established his opinion, and qualified him to defend.

Concerning some aspects of this question, I would here refer, without further discussion in this place, to the suggestive address of Doctor Raymond, printed in the *Transactions* of the American Institute of Mining Engineers for November, 1906.

Relations to the Public

A more simple and congenial, yet more heavily responsible, relation is that which the mining engineer may be called to assume toward the public, as the responsible indorser of a proposed undertaking. In consideration of the confidence which he invokes and expects, notwithstanding the fact that he has been paid by interested parties, he assumes a sacred trust, obligating him to safeguard the interests of a wider and more important *clientele.* The investor has not the time, and perhaps not the technical knowledge required for the thorough study of a prospectus. He risks his money upon his belief in the ability and integrity of the engineer, who is, therefore, bound in prudence and in honor to be especially careful that his indorsement be clear and precise, without mental reservation or opportunity for misunderstanding. This caution applies particularly to what are called "gilt-edge" investments, that is, to enterprises so promising and so thoroughly investigated beforehand as to warrant their recommendation, on the terms stated, to the general public—that is, to unknown and probably unskilled clients. There are numerous instances in which the engineer has to give advice on speculative, though honest and legitimate, undertakings, such as the development of mining prospects, which should be confined to those who are willing, and can afford, to take greater risks in the hope of larger profits, than pertain to the "gilt-edge" class of mining investments.

Relations to Personal Interest

In connection with the class of advisory reports last named, it is good policy for the expert adviser to seek to acquire a special clientage among mining investors who will not be led to judge him by the results of a single case, but, knowing the wisdom and the successful outcome of his recommendations in other cases, will not condemn him when he turns out to have been mistaken. For such a disappointment, sooner or later, is inevitable, since no engineer, however able and careful, is infallible.

In my opinion, a mining engineer engaged in such consulting practice should aim to become himself a capitalist, and a purchaser and developer of mining properties. Should he acquire business experience he might become avowedly a promoter, in a high and worthy sense of that term, and thus assist in driving out the unscrupulous promoters who are really parasites. According to my observation, the swindling in mining enterprises is done mostly by laymen, and not by responsible professional engineers or pretended [illegible] The practical miner, indeed, is, in many instances, himself the victim of the unscrupulous promoter.

As already observed in considering the relations of the engineer to the public, it may also be repeated from the standpoint of his own interests, that he should use the greatest circumspection to prevent the use of his name in support of enterprises of which he has but a superficial knowledge. He may be quite willing to "take the chances," and invest some of his own money in a scheme which he would not be willing to take the responsibility of recommending to another party, dependent upon his judgment as a guide. But even such a private investment of his own money should often be avoided, lest his connection with the scheme as a simple stockholder should be construed as implying his deliberate indorsement of it as an expert.

It often happens that an expert who has won deserved reputation and public confidence is called to give advice concerning a district with which he is not personally acquainted. In such a case, his honest offhand judgment, based upon general knowledge and upon experience elsewhere, might mislead both himself and others. Yet it is practically impossible for an expert, visiting a given property or district for the first time, and, of course, known to all as the possible "advance agent" of capital, to get at the unfavorable conditions which it is everybody's interest to hide. I would earnestly recommend, in such cases, the engagement by the examining expert, at his own selection and cost, and without notice to any other party, of a local expert assistant, familiar with the conditions and history of the property concerned and of the district in which it lies—in other words, with those facts which a visitor cannot easily discover.

Conclusion

I am fully aware that these desultory remarks have covered but a small part of the field of professional ethics, even in a single branch of the professions represented by the institute. But I am not offering a code, or even an official and representative declaration of principles. My remarks are intended, and will, I hope, be accepted, simply as a contribution to that discussion of their theme in which every engineer of experience may participate.

The mineral output of New South Wales for 1907 was the largest in the history of the State, being valued at £10,577,378. An average of 43,758 persons were employed in and about the mines during the year.

It is said that for reheating copper and brass an inclosed muffle in which the flame does not touch the metal is best. However, it takes more fuel to heat this kind of muffle.

Lehigh Valley Coal Company

This company is a subsidiary of the Lehigh Valley Railroad Company, and operates the anthracite coal lands controlled by that company, being the nominal owner of those lands. The report is for the year ended June 30, 1908.

The production of anthracite coal from the lands owned and controlled by this company, and of bituminous from the Snow Shoe district, which it also controls, was as follows, in long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The income account of the company is given as follows: Surplus, July 1, 1907, was $1,787,864; net income for year, $388,606; total, $2,176,470. Royalty settlements and miscellaneous adjustments were $199,615, leaving a balance of $1,976,845 at the end of the year.

The Lehigh Valley Coal Company has outstanding $1,965,000 capital stock; $13,208,500 bonds; $10,537,000 certificates of indebtedness, the latter representing advances made by the Lehigh Valley Railroad Company.

The report says: "The Lehigh Valley Coal Company and affiliated companies mined and purchased during the year 85.7 per cent. of the anthracite coal transported by the Lehigh Valley Railroad Company.

"The policy of extensive underground development of the coal lands for the purpose of not only maintaining the present tonnage, but materially increasing the same, together with the improvement of breakers, haulage and pumping plants and the coal-mining machinery generally, was continued throughout the year. In addition, much has been accomplished in the matter of concentrating the various plants so as to produce the lowest possible cost of operation.

"A new breaker is being constructed at Spring Mountain for the purpose of opening up additional territory in the Jeanesville coal lands, and will be placed in service during the next fiscal year, the expenditures to date being $167,111. When completed, it is proposed to concentrate at that colliery the preparation of coal now handled at Spring Brook and Oneida, the breakers at these two points having reached a condition that will soon prevent further economical operation. Heidelberg No. 1 breaker was enlarged and is now handling, in addition to its usual tonnage, the coal mined at Heidelberg No. 2 breaker, the latter being unfit for further service. Hazelton No. 1 breaker was rebuilt and enlarged during the year at an expense of $90,188, and on a basis that will permit of preparing an increased tonnage at a reduced cost. An underground electric-haulage system was installed at Westmoreland colliery in order to handle the increased output at that point. A new washery was erected at Prospect colliery, and another is now being built at Beaver Meadow.

[illegible] gether with those now in progress, tend not only to offset the increased expense of mining incident to the greater depth of the workings and the longer underground haul, but also result in a greater percentage of prepared sizes of coal, the same having increased 9.4 per cent. in the last five years.

"The new steel and concrete coal storage building and dock with necessary machinery for handling anthracite coal at Milwaukee, and a similar plant at South Chicago, replacing on a much larger scale one at that location destroyed by fire, were completed in the early part of the year. The total cost of these plants, which have an aggregate capacity of 105,000 tons, was $705,970. The coal-storage and shipping dock at West Superior was enlarged by the addition of an egg-coal storage and handling plant. New coal trestles and pockets were built at Geneva [illegible]

"The total additions and betterments made to the property during the year amounted to $755,120.

"All of the capital stock of the Wyoming Valley Coal Company was acquired from the Lehigh Valley Railroad Company in the month of February, the latter receiving in payment therefor treasury stock of the Lehigh Valley Coal Company to the par value of $350,000. The property of the company thus acquired consists of about 1400 acres of valuable coal lands held in fee or by perpetual lease. To the greatest economies in administration, the operations and accounts of that company, including the bonded indebtedness and net earnings from the date acquired, were merged with those of the Lehigh Valley Coal Company."

The coal traffic of the Lehigh Valley Railroad for the year was as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Coal formed 54.8 per cent. of the total tonnage hauled. The revenue from coal was 45.6 per cent. of the total earnings of the road last year. The increase last year was entirely in anthracite, bituminous coal and coke having fallen off heavily in the second half of the year.

Up to the end of 1907, New South Wales had produced 13,034,001 oz. fine gold. The gold production for 1907 was 6624 oz. less than that for 1906, being 247,363 oz. fine gold.

In cyanide plants on the Rand, sands are sometimes distributed into the sand-treatment tanks by discharging them [illegible]

The Nature of the Volatile Matter in Coal*

By Horace C. Porter and F. K. Ovitz

In connection with the fuel investigations being conducted by the technologic branch of the U. S. Geological Survey, a special effort is being made to determine the chemical and physical structure of coal. The chemical investigation is being pursued along three special lines: (1) the chemistry of combustion in the furnace, that is, determining the chemical composition of the hydrocarbons given off during the process of combustion; (2) the hydrocarbons which are given off at different temperatures, starting with a normal temperature and determining the nature of the hydrocarbons given off at each of a series of successively higher temperatures from the normal to the temperature of the ordinary furnace; and (3) the hydrocarbons existing in the coal at normal temperatures to be determined by solution and subsequent analytical methods.

A paper presented by Dr. Horace C. Porter, at the June meeting of the American Chemical Society, of which the following statement is an abstract, relates to the second of these three lines of investigation:

It is a familiar fact to retort coke-oven and gas-works operators that the volatile products of coal are largely affected both in quantity and character by the conditions of temperature and rapidity of the rise of temperature in the coal, and by the conditions to which the products are subjected after leaving the coal. The usual laboratory determination of volatile matter serves almost universally as a more or less valuable indication of the coal's adaptability to industrial uses either for combustion, destructive distillation, or gasification. The method for this determination is, however, an arbitrary one and does not duplicate closely that of any industrial operation, nor is the character of the volatile matter produced by the laboratory method known with any degree of certainty. Furthermore, the results by the laboratory method are sensitive to varying conditions and the influence of such variation on the character of the volatile products has not, heretofore, been the subject of extended study.

Importance of the Volatile Matter

The importance of the rôle played by the volatile matter in all industrial applications of fuel is generally recognized. There are more heat units in the volatile matter in proportion to its weight than in the fixed residue. Pittsburg coal containing 30 per cent. volatile matter and 7 per cent. ash has 36 per cent. of its heat value in its volatile matter, as shown by comparing the heat values of coal and coke. When coal is fired under a boiler either by hand or mechanically, it first undergoes a process of distillation, and both the quantity and quality of the volatile products and the relative ease of their liberation are concerned largely in the boiler efficiency and the production of smoke. It is reasonable to suppose that coals of different origin may yield volatile gases carrying different percentages of tarry vapors and heavy hydrocarbons and may on that account differ in smoke-producing tendencies. A knowledge of the chemical reasons why coals smoke in varying degrees, and why volatile coals are hard to burn with maximum efficiency is a necessary preliminary to the taking of intelligent steps toward improvement in these respects.

The gas producer for bituminous and low-grade fuels is coming more and more into favor. Here also the volatile matter in the fuel plays an important rôle, since at the top of the fuel bed a process of distillation is continually going on. A certain proposed new type of producer will utilize high-volatile fuels, such as bituminous coal, lignite, peat and wood, by passing the hot gases from the producer through the raw fuel in a series of preliminary chambers, thus distilling the valuable hydrocarbon gases (as well as ammonia) out of the fuel before it is charged into the producer itself.

TABLE 1. ANALYSIS OF COAL USED IN EXPERIMENTS.

	Moisture.	V. M.	F. C.	Ash.
Connellsville, Pa	1.10	30.67	60.35	7.88
Ziegler, Ill	7.67	30.38	54.32	7.63
Sheridan, Wyo	9.15	39.93	42.92	8.00
Pocahontas, W. Va.	0.35	20.93	75.51	3.21

Attention need hardly be called to the preëminent importance of the volatile matter of coal in the illuminating gas and by-product coke-oven industries. It is of interest to note, however, the increasing favor accorded by the gas industry to the vertical gas retort as most successfully operated by the Bueb system at Dessau, Germany, and to explain that one advantage of this process lies in avoiding decomposition of certain valuable gases in passing over heated surfaces, as occurs in the ordinary processes, although at the same time a higher gas yield is obtained by using higher temperatures in the retort itself.

Purpose of the Investigation

The purpose of the investigation described in this paper has been:

(1) To throw light on the nature of the volatile products from coal, and on the manner in which they are affected by the conditions prevailing during their formation or to which they are subjected after formation;

(2) To contribute, in the interests of smoke abatement, some data on the comparative amount and character of the gases and vapors distilled from different coals at low temperatures, a subject intimately concerned in the production of smoke;

(3) To prove experimentally that the volatile product of coal is to some extent incombustible, and that the proportion of inert volatile varies in different coals; and finally,

(4) To show that the oxygen of coal is in many cases evolved in the volatile matter very largely in combination with carbon as CO and CO_2 as well as with hydrogen as water, thereby explaining in great degree the discrepancy found in these cases between the determined calorific value and that calculated by Du Long's formula.

Deterioration in Heating Value at Ordinary Temperatures

In connection with a series of experiments not yet completed, on the deterioration in heat value of various coals during storage under different conditions, a liberation of gas in remarkably large quantities was found in certain cases. About 25 lb. of bituminous coal of buckwheat size was stored in a 5-gal. glass bottle closed with a rubber stopper, which was provided with glass tubes for removing gas samples. The bottles stood in the laboratory at a normal temperature. In some of the bottles the coal was immersed in distilled water and the interstices well filled with water by attaching a partial vacuum for one hour. About 400 c.c. air remained above the surface of the water.

The gas liberated during these experiments consisted almost entirely of methane with a slight amount of CO_2, and no more than doubtful traces of CO and heavy hydrocarbons. No hydrogen could be detected by the palladium fractional combustion method. Whether this gas may properly be considered as volatile matter due to decomposition of the coal, or whether it is held in the coal as such by occlusion or absorption cannot be decided without further study. The fact that the oxygen of the air surrounding the coal was rapidly absorbed without forming CO_2, indicates a change of composition in the coal. It is reasonable to suppose that a larger quantity of gas escaped between the mining of the coal and the starting of the experiments than was measured during the experiments. The measurement of quantity of gas formed is, therefore, of little value. The gas pressure in the case of one coal immersed, reached at one time 7 in. of mercury.

A series of experiments conducted primarily for direct weighing of moisture driven off from coal at 105 deg. C. yielded results incidentally which showed the extent of the loss of substances other than moisture, principally CO_2 in small percentages.

---

*Presented with the permission of the director, U. S. Geological Survey.

In studying the nature of the volatile matter at the medium and higher temperatures (500 deg. to 1100 deg. C.) two sets of experiments were run using a different apparatus in each. In one case, a small sample (10 grams) was heated in a platinum retort suspended in an electric-resistance furnace maintained constant at the desired temperature, the gases evolved being collected by displacement of water in a bottle. No attempt was made in this set of experiments to duplicate the methods or results of industrial practice. The apparatus was designed with the idea of maintaining definite and controllable conditions which would yield results comparable with each other in experiments on different coals. The other set of experiments was run on a somewhat larger scale, heating 400 grams of coal in a cast-iron retort resting in a cylindrical electric resistance furnace, the tar, water, ammonia, CO_2, H_2S, and gas being collected in appropriate absorption apparatus and measured. Owing to the heavy nature of the retort and the large sample of coal, the temperature in the coal could not be varied as easily in these experiments as in those using the platinum retort. Accordingly, one set of conditions was adopted approximating as nearly as possible those of industrial by-product coke-oven practice, and a number of typical coals compared under these conditions.

SERIES OF TESTS ON 10 GRAMS OF COAL IN A PLATINUM RETORT

The series of tests on 10 grams of coal in a platinum retort, at various temperatures, is not yet completed but has yielded sufficient results to show their approximate agreement with those obtained on 400 grams of coal and also to indicate the composition of the gas produced from different coals in the early stages of heating at low temperatures. A thermo couple was inserted in the retort so as to determine the temperature under the surface of the coal itself. The tests were run in an atmosphere of nitrogen which was passed through the retort until the exit gases contained less than 1 per cent. oxygen. The tar was collected in two 6-in. tubes of absorbent cotton heated to 100 deg. C. and also weighed on the neck of the retort. The water was collected in a 5-in. $CaCl_2$ U-tube, and always contained a slight amount of light oil driven over from the tar causing an error of 1 per cent. or less.

TABLE 2. AVERAGE RESULTS OF 10 GRAMS AIR-DRIED COAL.

(10 Minutes Heating.)

Coal	High Tem. in Coal.	Tar	[illegible]	[illegible]	Gas Composition. (Calculated to undiluted gas.) CO_2	[illegible]	CO	CH_4	[illegible]	H_2	N
10 minutes heating at 500°											
Connellsville, Pa	335			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ziegler, Ill	325			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 minutes heating at 600°											
Connelsville, Pa	441	4.9	3.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ziegler, Ill	440	6.8	13.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 minutes at 700°:											
Connellsville, Pa	562	11.0	[illegible]	583	3.0	[illegible]	[illegible]	44	17.7	[illegible]	9.1
Ziegler, Ill	545	7.8	14.0	[illegible]	[illegible]	[illegible]	13.7	[illegible]	[illegible]	[illegible]	12.0
Sheridan, Wyo	580	8.2	[illegible]	1020	28.8	[illegible]	20.0	[illegible]	[illegible]	[illegible]	7.0
Pocahontas, W. Va.	599	4.2	1.9	[illegible]	[illegible]	[illegible]	[illegible]	44.4	16	[illegible]	[illegible]
10 minutes at 800°											
Connellsville, Pa	687	12.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24.9	12	33.1	[illegible]
Ziegler, Ill	680	9.3	13.9	1251	3.8	[illegible]	[illegible]	[illegible]	[illegible]	33.7	[illegible]
Sheridan, Wyo		7.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14	4.0	30.0	8.0
Pocahontas, W. Va		6.5	2.4	1590	[illegible]	[illegible]	[illegible]	24.4	11.6	43.2	[illegible]

(a) Includes all higher paraffin hydrocarbons calculated as C_2H_6.
(b) Includes small amount of air

TABLE 3. ABSOLUTE QUANTITIES OF SMOKING AND NONSMOKING PRODUCTS.*

(10 Minutes Heating.)

Designation of Coal.	Temperature. Furnace.	Coal.	Smoking Products. Tar, Per Cent.	Gas (ccs.) Illum.	Ethane, etc.	Total.	Nonsmoking Gases (ccs.) CO_2	CO	CH_4	H	Total.
Connellsville, Pa.	500	335			0.6	0.6	2.4	[illegible]	0.5	0	3.4
Ziegler, Ill.	500	325		0	0	0	[illegible]	[illegible]	7.2	0	25.4
Connellsville, Pa.	600	441	4.9	16	46	61	12	11	71	4	98
Ziegler, Ill.	600	440	6.8	12	39	51	28	[illegible]	33	5	91
Connellsville, Pa.	700	562	11.0	42	103	[illegible]	18	31	256	78	383
Ziegler, Ill.	700	545	7.8	24	0	24	40	64	281	5	391
Sheridan, Wyo.	700	580	8.2	38	69	107	294	204	190	151	842
Pocahontas, W. Va.	700	599	4.2	30	109	138	13	27	[illegible]	[illegible]	532
Connellsville, Pa.	800	687	12.6	76	166	[illegible]	21	95	[illegible]	[illegible]	917
Ziegler, Ill.	800	680	9.3	47	76	[illegible]	47	[illegible]	346	[illegible]	[illegible]
Sheridan, Wyo.	800		7.9	48	72	120	355	381	[illegible]	534	1524
Pocahontas, W. Va.	800		6.5	54	186	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1177

*10 grams of coal

SMOKE FORMATION AND THE COMPOSITION OF LOW-TEMPERATURE GASES

From the results given in the accompanying tables, it may be seen that the low-temperature gases are high in illuminants and the higher homologues of methane, and low in hydrogen. Comparing the four coals at 700 deg. (565 deg. in the coal) where the gas begins to be formed in considerable amount, the Connellsville is the richest of the four coals in illuminants and heavy hydrocarbons and the Pocahontas the highest in hydrogen. The high CO_2 and CO from the Illinois and Wyoming coals accords with other experiments on these coals. The [illegible] the Connellsville coal. The smokeless character of the Pocahontas coal may be connected more or less with the presence of considerable hydrogen in its gas at low temperatures, since the low ignition point of hydrogen tends to assist in the burning of other gases present.

The smoke-producing constituents of the volatile matter are here considered as including tar, and the heavier hydrocarbon gases; benzine, ethylene and homologues of methane (calculated as C_2H_4). While at 440 deg. (in the coal) the Illinois coal (and probably also the Wyoming) has produced more smoky gases than the Eastern coals, at 565 deg. and higher, the Connellsville produces much more. This accords with the finding in practice of greater difficulty in burning coals of the Connellsville type without smoke.

[illegible] MADE

1. Some coals liberate gas during storage, of a composition similar to that of natural gas, and some coals rapidly absorb oxygen from the air during storage without forming CO_2.

2. During drying in air at 105 deg. C. some coals lose appreciable amounts of CO_2, and most coals take up oxygen to a considerable extent, but none of those tested show any considerable formation of combustible gases.

3. The nature of the volatile products distilled from several coals at low temperatures in the early stages of heating varies in different coals in accordance with their smoke-producing tendencies.

4. The volatile matter of coal comprises a considerable proportion of non combustible matter varying with the type of coal.

5. A modification is suggested of Dulong's heat value calculation for coal based on experimental results showing the distribution of oxygen between hydrogen and carbon.

The Mine Telephone and Its Advantages

Special Correspondence

Whether the operations are large or comparatively small, a well organized mine cannot afford to be without a telephone system. An important item in connection with having telephone service in the mines is the saving effected by being able to notify the men working in the different parts of the mines of an unexpected shut-down of some of the various machinery, or a change in the working plans of the mine. Mine operators are frank to say that the cost of the system is soon repaid by the presence of this feature alone. It is a well known fact that the operation of most mines is dependent upon a variety of uncertain conditions, such as scarcity of cars, break-downs of machinery, floods, etc., rendering it impossible to anticipate a temporary suspension of work in advance of its actual occurrence.

The fact that a superintendent of a mine can remain in his office and be in direct communication with every corner of the workings, is an item of importance that we cannot pass without considering seriously.

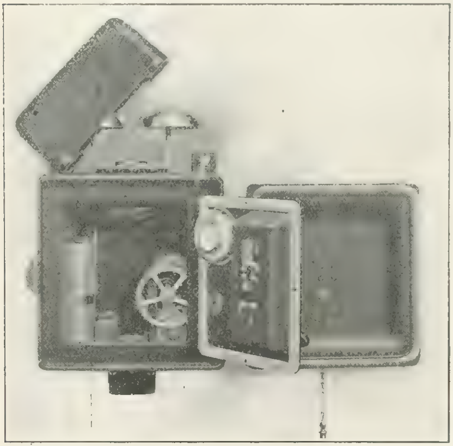


FIG. 1. MINE TELEPHONE SHOWING INTERIOR MECHANISM

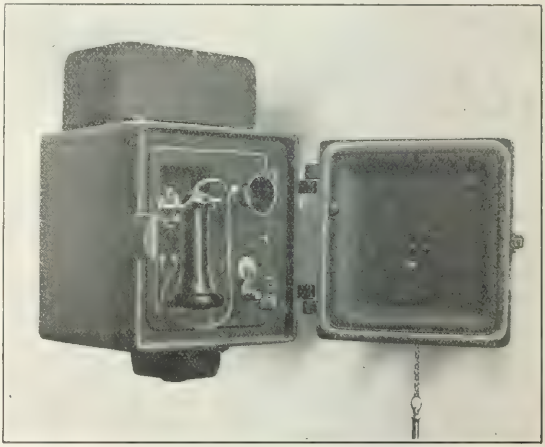


FIG. 2. THE RECEIVER IS GENERALLY ATTACHED TO THE INSIDE DOOR

Method of Installation

The cost of constructing a line underground is usually less than outside, because no poles are required and there are no holes to dig. The magneto system does not require an expert to install it, and about all the work required of the mineowner is the placing of the instruments to the best advantage and the stringing of line wires. This is simply and quickly done by running wires through the various entries and down the shafts on standard wood brackets equipped with the regular common glass insulator. In a large number of mines, rope haulage is used to convey the ore to the surface and where such is the case, a metallic signal line is usually run along the side of the entry to transmit signals to the engineer. If such a condition exists, it is only necessary to connect any number of bridging telephones to the circuit. In this case no expense is incurred beyond the first cost of the telephone and the cost of connecting them up. The expense of maintenance is usually very light, because the lines being underground, are not subject to atmospheric conditions such as are present outside and trouble from lightning is unknown.

Although ordinary iron line wire has been used with success in some mines, the safest construction can be furnished at little additional cost by supplementing rubber covered wire for all the underground circuits which are in any way subject to moisture or dampness from contact with timbers, etc. Some conditions are so uncertain that it has been considered good practice to use lead-covered cable, providing the installation warrants the expense. In any event this part of the equipment should not be slighted, and the best is usually the cheapest; by installing cable, an increased degree of certainty is, of course, assured.

Telephones are Built to Withstand Atmospheric Conditions

Mine telephones are unlike other telephone instruments, and should be complete and compact and especially built for use in mines. The instruments shown in the accompanying illustrations are designed to withstand the severest atmospheric and climatic conditions, and being of the iron-clad type, are suitable for outdoor and underground installations, where an instrument of this kind is required to give service under such conditions. The design should be such as to afford the greatest accessibility of all parts and at the same time provide ample protection, eliminating the exposure of any parts when the instrument is not in use. The door on this type of telephone usually closes against a rubber gasket so as to hermetically seal the entire contents. The only part of the instrument that it is necessary to handle is the receiver, which should be of a thoroughly insulated and efficient type. The design illustrated, Fig. 1, shows the receiver hanging on the inner door, which is temporarily fastened by machine screws and only accessible to the inspection of the man in charge of the system.

Access to the inner compartment is only necessary for replacing batteries. A notable feature in this arrangement is incorporated in the design of the ringer, which is so arranged that its coils are inclosed inside the inner compartment, whereas its vibrating mechanism, consisting of the armature, clapper rod and gongs, mount on top of the case and are protected by an iron dome which is removable after taking out the mounting screws. It is necessary that careful attention is given to the construction of the compartment containing the essential parts of apparatus. In this type of telephone, a felt-ring gasket for the inner-compartment door, as well as a rubber gasket between the ringer-mounting plate and the top of the iron case is provided. Impregnation by water or gases is absolutely impossible.

Individual parts of the mine telephone require special treatment as regards finish. The iron case is treated with a special insulating compound that effectively preserves it from water, dampness and the acid fumes present in mines. All windings for the ringer, induction coil, generator, etc., are especially insulated and boiled in oil as an additional precaution and insulation. Wherever it is possible to substitute brass for iron in the construction of the mechanism, it has been done so as to eliminate a chance of having parts in the instrument that might rust. The parts that are necessarily of steel, because of forming a part of the magnetic circuit, are taken care of by the zinc plating. Every feature in this type of telephone requires the most careful construction as well as assembling.

Dimensions and Equipment

The mine telephone illustrated, is manufactured by the Stromberg-Carlson Telephone Company, Rochester, N. Y., and measures over all, 10 in. wide by 10¾ in. high by 8¼ in. deep, and is considered the smallest and most compact instrument of its type for this particular service. The detachable mounting bars permit the instrument to be mounted without opening the door or the hood, and being detachable, permit fastening the bars in a horizontal or vertical position, depending upon the nature of the surface on which the instrument is to be placed. A standard magneto equipment of the highest efficiency, especially finished, as hereinbefore mentioned, includes a five-bar generator and a 1600-ohm ringer, which is the standard for most installations.

It is quite essential that a door is provided for this type of instrument that is easy to open and easy to close; at the same time producing a pressure that will assist the gasket to make the instrument air-tight. This is conveniently provided in the form of door illustrated, which provides a handle that acts as a lever, which forces the door tight, and is held in place by a dowel pin attached to the outside of the door as illustrated. This form of pin-lock is instantly opened by pulling out the pin. Some mineowners do not prefer free access to the telephones, so a lock on the same principle has been provided that opens with a key and lock as an ordinary spring door lock. These parts are interchangeable and can be put on after the telephones leave the factory by taking out screws from the inside of the door.

It would require much time and space to enumerate the many advantages obtained from the use of telephones in mines. However, the principal benefit is undoubtedly in the case of accidents, whether they be to the working machinery or to individuals. Nothing gives the superintendent of the mine such complete control over all parts of the mine workings as a connecting system of telephones.

In thin seams where coal cutters are employed the rapid clearing of the machine-cut coal necessitates some quick and efficient method of haulage. This difficulty can best be solved by the introduction of mechanical coal conveyers.

Coal Trade and Mining Conditions in Indiana

The thirty-second annual report of the Indiana department of geology and natural resources, compiled by W. D. Blatchley, state geologist, and just received from the printer, includes the annual report of James Epperson, inspector of mines for Indiana. Mr. Epperson's report presents interesting information relative to the coal trade, or mining industry in 1907, coal and labor statistics and mine casualties. Mr. Epperson also recommends legislation for the benefit of miners. The report says that "conditions of mining and coal trade during the last year were exceptionally good. The production for the year was 12,375,482 tons of bituminous coal, an increase of 1,700,125 tons, or a fraction over 15.9 per cent. over that of 1906; 875,233 tons of block coal, an increase of 128,563 tons, or a fraction over 17 per cent. increase in block coal over the production of 1906. The total production of the mines of the State was 13,250,715 tons, a gain of 1,828,688 tons over 1906. Of this tonage, 7,112,376 tons was consumed in Indiana and 6,138,339 tons were shipped to markets outside the State.

The total wages reported from the bituminous mines was $10,487,623, a cost of 84.7c. per ton of coal produced. Total wages reported from the block coalfield was $1,230,199.23, or a cost in wages for production of $1.40 per ton.

Selling prices during a greater portion of the year were fair, ranging from a minimum of 88c. to $1.54 per ton f.o.b. cars at the mine for bituminous mine-run coal. A fair average for the year would probably be $1.20 per ton. The prices of block coal ranged from $2.25 to $3 per ton for screened coal f.o.b. cars at the mine, $2.60 being a probable average for the year.

There were two important factors, which in addition to a strong demand for coal during a greater portion of the year, played an important part in the average increase in the output, namely, the car service on all the railroads was much better than in former years, and strikes and labor troubles of consequence were comparatively few. These conditions enabled the mines to be operated more days than in former years, resulting not only in an increase in production, but a large increase in the total wages earned by the mine employees. The report shows a total of [illegible] employees in 1907, a decrease of 453, or a fraction over 2.3 per cent. under 1906. There was an aggregate of $11,717,822.54 paid in wages, or $616.43 per mine employee; this shows an increase of $107.05, or a fraction more than 24 per cent. over the average wages in 1906 showing a higher average earning per employee than ever before in the history of the coal industry in the State.

In discussing labor conditions among miners in 1907, Mr. Epperson says: "There were no strikes of serious consequence and labor conditions, taking the State as a whole, were generally satisfactory to all concerned. The year was [illegible] operators and miners, resulting in miners being idle, but usually the disagreements involved only employees at individual mines and covered periods ranging in length from two to ten days. Continuing, Mr. Epperson says, "the Terre Haute agreement, providing that when miners come out, or stay out of the mine for the purpose of redressing a grievance, real or supposed, thus partially, or wholly shutting down mine or mines contrary to agreement, each employee so ceasing or refraining from work shall be fined in the sum of one dollar per day during such shutdown, said fine to be deducted from the miner's wages, has had much to do with eliminating coal strikes." This section of the contract, Mr. Epperson says, is one of the most effective ever entered into between two associations and the results of its operation have been gratifying to miners and operators.

Mr. Epperson regrets that his report had to await the report of the geologist, since it might have been made public some time ago.

The Education of Coal Miners

The Lehigh Valley Coal Company is about to inaugurate a school for miners which will give the rank and file of mine employees the opportunity to learn mining from experts. They are to be taught not only mining practice, but how to protect themselves, and furthermore are instructed in the engineering problems met in their daily work. The school is to be located at Lost Creek, Penn. It consists of a regulation school room and a reference room well stocked with mining periodicals and books.

It is expected that this educational work will materially lessen accidents due to carelessness and ignorance. If this venture proves successful, the company plans to establish about a dozen similar schools in the different mining districts. The company's aim is to produce men trained in the theory and practice of mining, and thus fill positions of responsibility. A report of each man's progress is to be made, and those winning the highest marks will be selected for promotion.

The value of coal washing is clearly demonstrated by the results of the tests made by the United States Geological Survey. The 101 tests made showed a reduction in ash of from 20 to 60 per cent., and a reduction in sulphur of from [illegible] to 50 per cent. The cost of washing coal in the United States is from 8 to 18c per ton.

Colliery Notes

Nearly 15,000,000 tons, or more than 36 per cent. of all the coal produced in West Virginia is machine mined.

A tank used for hoisting water at a shaft mine near Hazleton, Penn., holds 2000 gal. and is hoisted 95 times in an hour; 950 tons of water are raised every hour.

The presence of air in a condenser is due to leakage through the glands of the low-pressure cylinder and the joints along the exhaust pipe in which the pressure is below that of the atmosphere.

While open-air storage of coal is cheap and flexible, and is only moderately liable to spontaneous combustion, the coal is apt to deteriorate rapidly. The loss in calorific power may be as high as 50 per cent. in a year.

New Zealand was the first British colony to put in practice the system of state ownership of mines. The available coal supply of the colony is estimated at 1,200,000,000 tons, 1,180,000,000 tons of which are still untouched.

Iron and steel pipe may be distinguished by a flattening test. Soft-steel pipe, cut in very short lengths or rings, flattens smoothly and evenly without breaking, while wrought-iron pipe usually fractures at two or more places when flattened.

A surface condenser should only be installed in extreme cases, when the water available for condensing purposes contains such a large amount of impurities that it is not suitable for boiler feed, or when a high vacuum is of great importance, as for steam turbine work.

A Barcelona, Spain, firm of coal merchants makes contracts with firms employing steam power, to evaporate so many tons of water a week at a given price, the coal merchant employing any kind of coal he cares to use. The system practically means that the coal merchant sells steam instead of coal.

In order to insure a regular supply of timber, it is often advisable for mining companies to own and operate their own timber land. In order to have a permanent supply, the cutting should be carefully done, and ample fire protection should be given the standing timber. All timber should be peeled as soon as it is cut and allowed to season while waiting to be transported.

Recent reports of Welsh colliery owners show that large profits have been made during 1907 and the first half of the present year. In some cases the profits have even exceeded those of the great boom period of 1900-1901, and if the average net gain for all the collieries in the Welsh coalfield could be ascertained, it would be found that the twelve months ended June, 1908, were the most prosperous in the history of the coalfields.

The laws of resistance as applicable to mine ventilation may be stated as follows: 1. Resistance varies directly as the rubbing surface; the greater the area of roadways, sides, floors, etc., the air has to pass over, the greater the resistance to be overcome. 2. The resistance varies as the velocity squared. 3. The resistance varies directly as the area. When planning a system of ventilation, it will be found that these laws embody the whole principle.

The important thing to be borne in mind in making laboratory tests of coal is that the small sample tested should be so procured and prepared as to represent the whole of the coal for which the sample analysis or test will be taken as a basis. The whole should equal the "basis value" of the part. The sampling of coal is always a difficult matter, owing to the fact that the structure of even a small piece of coal is never uniform throughout, and that it is usually large pieces that have to be sampled.

The Dublin and Central Ireland Electric Power Company, in Ireland, has arranged to purchase 500 acres of peat bog to be used for generating electricity by means of the peat gas. The promoters propose to use a process common in Germany by which the expense of drying is somewhat reduced; the process calls for the retention of 50 per cent. of the 90 per cent. of water contained in peat. The revenue from the by-products such as sulphate of ammonia, which alone would pay the cost of drying, will still further reduce expenses.

Where coal has a long distance to drop, when being loaded into the hold of a vessel, the use of an "anti-coal breaker," which consists of a system of buckets balanced to run by gravity over a suspended shaft, the whole being suspended from the jib of an electric crane, will prevent the breakage and consequent loss of value that is sure to result from the ordinary methods of loading. This machine has a lifting speed of 25 ft. per min.; the speed of the bucket chain is capable of being regulated by an automatic centrifugal brake to a velocity of 120 ft. per minute.

Peat coke is being extensively manufactured in Benerberg, Bavaria. The Ziegler process is used. The peat is cut up, pressed and exposed to the air until the water in its composition is reduced to less than 25 per cent. of the whole mass. It is then placed in a retort for 18 hours. The coke is finally received in air-tight iron cars which are allowed to cool six or eight hours before being discharged. The yield per retort per 24 hours is from 8 to 10 tons. The gas generated, after passing the various processes of being separated from its by-products, is employed in assisting the retort process.

When nitro-glycerin or nitro-cellulose compounds fume or burn quietly away instead of detonating, the resulting gases instead of being carbon dioxide and nitrogen, become carbon monoxide and nitric oxide. This latter gas is one of the most treacherous met with in mines. Air containing enough nitrous fumes to irritate the nose and air passages is dangerous and has caused many deaths, as it frequently produces an intense acute bronchitis which is often fatal within 48 hours. Fortunately this gas is readily detected by its characteristic smell of fuming nitric acid; great care should be taken by the workmen in returning to the face after a blast if this smell is distinct.

A roller journal having two recesses, in either of which the spindle of the roller may be placed, is much superior to the ordinary type of roller in that: (1) The roller cannot be forced out of its journals and thereby be a hindrance to the traveling cars; (2) the recesses, to a great extent, are covered, and so prevent the admittance of dust and dirt; (3) there are really two journals in one for a small increase in cost, and (4) if the spindle of the roller is placed in the nearest recess to the traveling cars and a clip unduly strikes the roller, the spindle is forced into the recess opposite, thus reducing the shock on the clip, and, in consequence, to the rope. The journal may be fixed either on a level road or an inclined road, but if used on an inclined road, the spindle should always be placed in the recess nearest to the traveling cars. It will be found that in addition to the advantages above named, roller journals of this kind reduce the amount of oil used, and, in consequence, the cost of labor and oil, while the oiling is done much more efficiently; also the life of the rope may be nearly doubled.

Boys and women employed as slate pickers in Russian coal mines receive from 20 to 25c. per day, while pony drivers receive from 40 to 50c. per day. The miners, who work under a contract system, are paid according to the amount of work done. A contractor takes a contract to mine a certain amount of coal, employing his own workmen at as low a wage as they will agree to accept. The average miner earns 80c. per day, or about 12½c. for every 35 poods of coal mined (36 lb. to a pood). They are also expected to do their own timbering, without additional compensation. Many companies furnish free coal to their employees, and to the unskilled laborers, who earn about or less than $10 per month, with free house rent. Managers and foremen receive about $25 per month, free house rent and coal. Coal mined at a cost of 12½c. per 35 poods retails for 5c. per pood; there is, therefore, a profit of about $1.60 on every 35 poods mined, or $11 on the day's work of each miner. The most competent miners earn about $20 per month. Their wages are, however, greatly reduced by the frequency of holidays, there being but 220 working days in the Russian year.

The Meeting of the American Institute of Mining Engineers

EDITORIAL CORRESPONDENCE

The 95th meeting of the American Institute of Mining Engineers was opened Thursday evening, Oct. 1, at the Hotel Patten, Chattanooga, Tenn., President John Hays Hammond in the chair. Following this session a short informal reception was held. The following day the members and guests of the Institute were taken in automobiles for a ride through Chickamauga Park. On Saturday a visit was made to Hale's Bar on the Tennessee river, where the lock, dam and power plant now under construction were inspected.

On Monday, Oct. 5, a visit will be made to the mines and furnaces of the Roane Iron Company. Tuesday evening, Oct. 6, the party will start for Ducktown, Tenn. Wednesday forenoon will be spent in a visit to the mine of the Tennessee Copper Company; in the afternoon the smelting plant of the Ducktown Sulphur, Copper and Iron Company will be visited. On Thursday the sulphuric-acid works of the Tennessee Copper Company, at Copperhill, will be visited.

THURSDAY EVENING SESSION

The evening session, Oct. 1, was opened, with an address of welcome by H. S. Chamberlain, of Chattanooga; President Hammond was in the chair. Mr. Hammond then read his presidential address on "Professional Ethics."

"This is an era of expansion," said Mr. Hammond, "and, conformably with the change in commercial conditions, the function of the mining engineer, as well as that of his confreres in many other professions, has also expanded. From his capacity of an engineer, limited to the determination of technical questions, the engineer of today has come to assume an economic importance in those branches of industry dependent upon engineering skill for their development."

Mr. Hammond said that professional duty may be regarded from three points of view: (1) The relation of the engineer's work to employees; (2) its relation to the investing public; and (3) its relation to the individual interests of the engineer. These relations and the proper course to be pursued under different conditions were entered into at length.

In closing Mr. Hammond said: "I am fully aware that these desultory remarks have covered but a small part of the field of professional ethics, even in the single branch of the professions represented by the Institute. But I am not offering a code, nor even an official and representative declaration of principles. My remarks are intended, and will, I hope, be accepted, simply as a contribution to that discussion of their theme in which every engineer of experience may participate."

Doctor Raymond announced the deaths of John Wilkes, of North Carolina, and James D. Hague, who for 30 years was president of the North Star Gold Mining Company, of Grass Valley, Cal. Biographical notices will appear in the *Transactions*.

FRIDAY MORNING SESSION

The morning session, Oct. 2, opened with President Hammond in the chair. T. H. Aldrich, Jr., of Birmingham, Ala., reviewed his paper on "The Treatment of the Gold Ores of Hog Mountain, Alabama." Mr. Aldrich, in speaking of the advantages and disadvantages of southern gold mining, mentioned the favorable climate and the low cost of fuel and labor, and said a $4 gold ore in the South would net greater profits than an $8 gold ore in the Rocky mountains. The Appalachian goldfields have been greatly eroded and the upper portions of the veins have disappeared; in general, the veins have been eroded so deeply that present work is being done in the lower portions. The southern gold ores are abundant, but uniformly low grade. The surface ore cannot be concentrated for the reason that it floats. The gold is extremely fine but is not what is known as float gold. Mr. Aldrich exhibited a number of slides by which the porous nature of the gold (this causing it to float) was shown. Another important feature brought out was the presence of a film, or skin, of iron sulphide which in some cases almost enveloped the gold.

P. A. Maignen complimented Mr. Aldrich on his success with southern gold ores and gave his impressions of a visit to several Colorado gold mills.

In answer to a question by Doctor Raymond, Mr. Aldrich said that all of his milling work is done at or near the boiling point. It had been his experience that dead roasting ores was detrimental.

Edward B. Cook discussed the more important parts of his paper on "Experiences with the Gayley Dry Blast at the Warwick Furnaces." He described the effect and efficiency of the dry blast on the different furnaces. Through the use of the Gayley dry blast a saving of 400 lb. of fuel per day is made, and 350 tons per week more iron is produced notwithstanding the use of a more refractory ore mixture.

Doctor Raymond called on Edgar S. Cook, who made some interesting remarks on the subject. J. E. Johnson, Jr., discussed the use of dry blast and the difference between summer and winter work of blast furnaces. In answer to a question by E. W. Parker as to whether he had ever made any determinations of the moisture in his coke, Mr. Johnson stated that he had found that this was a matter of [illegible] importance. John B. Miles stated that the cost of refrigeration can and will be brought down and that other changes now contemplated would further reduce the cost of dry blast.

After some further discussion on this [illegible] some interesting reminiscences of Mr Gayley's early work on his invention, his [illegible] and his first success.

Owing to the lateness of the hour, John B. Miles was enabled to take up only one or two of the important features of his paper on "The Relation to Slow Driving to Fuel Economy in Iron Blast-furnace Practice." Mr. Miles presented and discussed the records of operation of 11 furnaces, and said that, with the data in hand it is not possible to develop a rule for the most economical rate of driving with relation to fuel, for high- or low-silicon irons, but it appears that for either kind of iron, a blast less than 4 lb. is desirable, and it seems probable that a rate as low as 3 lb. may prove still more economical, so far as fuel is concerned.

FRIDAY EVENING SESSION

At this session, on Oct. 2, Charles Butts presented his paper on "The Geology of the Alabama Coal Measures;" some interesting stereopticon views were used in connection with the reading of this paper. Mr. Butts stated that the major topographical features of the area under discussion are the broad anticlinal valleys known as Birmingham valley; Red mountain and Enon ridge in the midst of the valley; Shades mountain, which bounds the valley on the east; and Sand mountain bounds the valley on the west. The general level is 500 to 600 ft. above the sea. The altitude of the ridges mentioned reaches 1150 feet.

Mr. Butts then took up the stratigraphy of the different fields, showed sections of the different beds, and gave the analyses of the coals, closing with a discussion of the mining and preparation of the coal.

Ernest F. Burchard reviewed his paper on "Clinton Iron Ores in the Birmingham district, Alabama." Mr. Burchard said that the Clinton formation in Alabama consists principally of sandstone, shale and beds of hematite. The beds of hematite, where unweathered, are calcareous, ranging from a calcareous, richly [illegible] silicious limestone. The distinguishing feature of the formation is the relatively large quantity of iron oxide disseminated throughout all the sediments, either in the ferric or the ferrous state. Mr. Burchard went into the character, general distribution and probable origin of the ores, and [illegible] used freely.

SATURDAY MORNING SESSION

The morning session, Oct. 3, was called to order at 10 a.m. with President Hammond in the chair. The paper on "Monazite in the Carolinas," by Joseph Hyde

Pratt and Douglas B. Sterrett, was reviewed by Mr. Pratt. "Monazite," said Mr. Pratt, "is used in the manufacture of incandescent mantles, and there are about 40,000,000 of these mantles in use in the United States. In North and South Carolina monazite is obtained from placer, or gravel, deposits. It is also found in the gneissic rocks, which contain from 0.1 to 0.5 per cent. monazite. Unsuccessful attempts have been made to mine the rock." Mr. Pratt states that in working the gravel, everything is concentrated from the grass roots down. Tailings are rewashed about once every two years to obtain any mineral which might have been deposited by the water from the hills. With the introduction of magnetic separation, the sands yield from 98 to 99.5 per cent. monazite. The machines used are the Wetherill, which are especially adapted to this work. The first magnet, wound at 1.5 amp., takes out magnetite, ilmentite and chromite; the second, 2.5 amp., takes out the garnet, and hornblende, if present; the third magnet takes out the monazite; pyrite and zircon are found in the tailings.

Replying to a question by Dr. Raymond, Mr. Pratt stated that commercial monozite is found in small grains, although he had seen some large crystals.

J. J. Rutledge discussed the principal features of his paper on "The Clinton Iron Ore Deposits of Stone Valley, Huntington County, Penn." Mr. Rutledge stated that the Clinton rocks in Stone valley comprise (1) thick layers of deep-red shale; (2) layers of reddish-gray shale interspersed with beds of sandstone and thin beds of extremely fossiliferous limestone, and (3) yellowish-gray shales alternating with thin layers of olive-colored shales. After going into his work in this field, and setting forth the beliefs of others as to the origin of the ores, Mr. Rutledge stated that his conclusions were that but a very small part of the iron content found in the present ore-bed was deposited in it when the bed was laid down. The small amount of iron is represented by the iron content of the silicious concretions. The subject of the origin of these ores was discussed by several members. Doctor Raymond gave an interesting account of his experiences with the ores of this district.

H. Foster Bain presented a paper on "Studies of Illinois Coals." Mr. Bain made a few remarks on the subject, stating that power is now being generated in Illinois as cheaply as at Niagara Falls, and is being transmitted 200 miles. The actual margin of profit in coal mining is only from 5 to 10c. per ton, owing to the many difficulties which beset the operator.

The session was closed with the presentation of a paper on "Investigations on Jigging," by Royal P. Jarvis. On account of the lateness of the hour, Mr. Jarvis made only a few remarks, explaining some of the tests set forth in his paper.

Mine Accidents Due to Electricity

The following letter has been addressed to a number of the larger companies operating electrically equipped bituminous coal mines. It is desired to extend this invitation to all those interested in the subject, and communications in this line with the purposes indicated in this letter will be welcomed by the Geological Survey:

"GENTLEMEN—In connection with the investigation of mine accidents, undertaken by the Geological Survey, it is desired to have the coöperation and assistance of both operators and miners, that the tests made shall have practical ends in view, and that disputed points may be cleared up, so far as possible. With especial reference to the electrical investigations which will be made, it is requested that your superintendents, mine foremen, electricians, machine bosses, and others interested prepare memoranda of tests desired, these tests to determine liability of ignition through electrical means of mine gas, coal dust, mine timbers, or coal. Problems referring to electrical shock, insulation as regards protection, etc., are also invited.

"Facilities are being provided for testing motors, lamps, fuses, etc., and for experiments with arcs from line to ground or between lines, at 100 to 600 volts d.c., and from 100 to 2200 volts a.c.

"It is requested further that such suggestions be forwarded through your superintendents or main office, so that the records may be simplified. Correspondence should be addressed to U. S. Geological Survey, Geo. R. Wood, consulting electrical engineer."

Deterrents in Cyanidation

Duncan Simpson draws attention to the fact that oil and lime act as deterrents to the dissolution of free gold by cyanide solution.[1] In a pronounced case of low extraction on the Witwatersrand, when the sand containing 29 grains of gold per ton was no longer amenable to cyanide treatment, it was found possible by laboratory treatment to reduce this residual gold by further cyaniding to 13 grains per ton. It was found that both oil and lime were present. The sample containing 29 grains to the ton was washed several times with water in order to insure the absence of dissolved gold. One portion *a* was repeatedly washed with ether, and another portion *b* with dilute hydrochloric acid. By evaporating the washings from *a* a substance was recovered which resembled vaseline in appearance. "Touch-lime" was found in the washings from *b*.

Further treatment with cyanide solution now reduced *a* to 15 to 17 grains per ton, but *b* to only 27 grains per ton. On treating, after thorough washing, *a* with dilute hydrochloric acid, and *b* with ether, and again adding cyanide solution (0.25 per cent. KCy), both were reduced to 12 to 13 grains per ton. The oil film had resisted removal by the working cyanide solution of from 0.15 per cent. to 0.05 per cent. of K Cy, during the treatment period of about six days.

Prolonged aëration by circulation in sumps was found to be effective in preventing the precipitation of carbonate of lime to any excessive amount in the leaching tanks. The further leakage of bearing-oil into the cyanide tanks was stopped by a threat of dismissal for the mill hands on its repetition.

---

[1] Bulletin No. 41, Inst. Min. and Met.

An Interesting Hoisting Record

The Superior Coal Company, of Gillespie, Ill., under the management of J. W. Miller, operates three shaft mines. None of these mines has been in operation more than four years and yet each makes a daily output of over 3000 tons. Two days' work at each mine recently gave the following results:

No. 1 Aug. 24, 3270 tons.
No. 1 Aug. 25, 3276 tons.
No. 2 Aug. 25, 3019 tons.
No. 2 Aug. 26, 3015 tons.
No. 3 Aug. 25, 3601 tons.
No. 3 Aug. 26, 3619 tons.

The total for the three mines, two days' work at each, was 19,800 tons. This is an average of 3300 tons per day of eight hours for each mine.

Each of these mines is about 350 ft. deep and is equipped with 24x36 in. first-motion hoisting engines with cylindrical drums 7 ft. in diameter, built by the Litchfield Foundry and Machine Company, of Litchfield, Illinois.

Rhodesian Mines

The gold production of Rhodesia in August was 52,482 oz. fine, being 1755 oz. less than in July. For the eight months ended Aug. 31, the total was 406,027 oz. fine, or $8,392,578. For the eight months in 1907 the total was 400,604 oz.; but the reports last year were made in bullion, while this year they are in fine gold.

Other production reported this year in August was 27,744 oz. silver, 111 tons lead, 9 tons copper, 554 tons chrome ore and 14 tons wolframite. Coal mined was 14,125 tons.

British Guiana Production

Gold exports from British Guiana for the eight months ended Aug. 31 were 43,580 oz. bullion in 1907, and 42,163 oz. in 1908; a decrease of 1417 oz. The bullion reported this year was equal to $746,862, or 36,133 oz. fine gold. Exports of diamonds for the eight months were 2670 carats, valued at $20,313; an increase of 1106 carats and $7942 over last year.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl St., New York
London Office: 6 Bouverie Street, London, E. C. Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or ***its equivalent, 33 shillings; 33 marks; or 40 francs.***

Notice to discontinue should be written to the New *York office in every instance.*

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all news dealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, *was* 40,800 *copies.*

October 3 . .	13,000
October 10 . .	9,800

None sent free regularly, no back numbers. *Figures are live, net circulation.*

Contents

PAGE
Editorials:
The Copper Deposits of Katanga .. 727
Misleading Estimates .. 727
Iron Production in "Hard" Times....... 728
The Mining Laws of Oklahoma 728
The Orphan Copper Company 728
*Dredging for Platinum in the Urals, Russia [illegible] 701
Metallic Mineral Resources of the Philippines................*Maurice Goodman* 706
A California Pipe Line *Special Correspondence* 707
Slime Deposition and Agglomeration 707
*The Anaconda Protective Hood *Robert N. Bell* 708
The Value of Galena and Blende in Wales 709
Accumulation of Gold on Copper Plates 709
*Dumping Waste with a Locomotive Train *Arthur B. Foote* 711
The Geology of Cobalt *Special Correspondence* 711
The Broken Hill South Silver Mining Company 712
*Sinking a Winze with Long Holes. *George C. McFarlane* 713
*Electrical Equipment of the Butte Balaklava Mine *A. Floyd Bushnell* 714
Commerce Between the United States and Germany 714
Underground Conveyers at the Kleinfontein Mine *Edward J. Way* 715
*McFarlane Hydraulic Air Compressor..... 716
Treating Concentrates at Bellevue Limited Mine, W. A. 716
Professional Ethics *John Hays Hammond* 717
Lehigh Valley Coal Company 719
The Nature of the Volatile Matter in Coal *Horace C. Porter and F. K. Ovitz* 720
*The Mine Telephone and Its Advantages *Special Correspondence* 722
Coal Trade and Mining Conditions in Indiana 723
The Education of Coal Miners 723
Colliery Notes 724
The Meeting of the American Institute of Mining Engineers *Editorial Correspondence* 725
Mine Accidents Due to Electricity 726
Deterrents in Cyanidation 726
An Interesting Hoisting Record 726
Rhodesian Mines 726
British Guiana Production 726
Correspondence
The Colliery Law of Oklahoma *N. H. Rowland* 729
Alumina in Slags *Walter F. Koch* 730
Grecian Magnesite...........*F. Meijnan* 730
The San Rafael Mill *Mark R. Lamb* 730
New Zealand Mines 730
Mineral Production of California in 1907 731
New Publications 732
Questions and Answers 733
Personals, Obituaries, Societies and Technical Schools 734
Special Correspondence 735
Mining News.............................. 737
Markets, etc 742
*Illustrated.

The Copper Deposits of Katanga

After several reports that the Rhodesian railway was to be extended from Broken Hill into the southeastern part of Katanga, which have proved to be incorrect, a realization of this development now appears to be in sight. According to a recent press despatch, the British South Africa Company, which is building the Cape-to-Cairo railroad, has agreed to extend the line from Broken Hill to Mabaya on the frontier of the Congo. From that point the railroad company of the Lower Congo and Katanga agrees to extend the line to the Star of the Congo mine, 60 miles, and then onward through Kambove to the Ruwe copper district, 170 miles further.

The delay, heretofore, has been due to sparring between the mining company and the railway company. The mining company is engaged in building the Benguella railway, inland from the west coast of Africa, a distance of upward of 1000 miles. The Rhodesian railway is much nearer to the mines and its extension is the natural way to bring out their produce most quickly, the intervening country being extremely easy for railway construction. However, the railway company has anticipated that if it furnished this outlet for the mines, the mining company would be able more quickly to obtain the funds to complete its own railway, which would then deprive the Rhodesian railway of the business. Consequently, the Rhodesian railway demanded of the mining company a contract for a long term of years.

This developed an interesting situation. The mining company is already engaged in smelting on a small, indeed scarcely more than experimental, scale, but is producing several tons of copper per day and already has four or five hundred tons of the metal piled up. It is impossible to ship this copper to market. The first thought is that transportation by ox-teams to Broken Hill, a matter of two or three hundred miles, would be no serious undertaking, but unfortunately a tsetse-fly region intervenes, wherefore draft animals cannot be used. Wagon transportation to the Atlantic coast is out of the question, the distance being so great that a year is the time for a round trip.

No doubt, the Rhodesian railway company has been all along desirous of building into Katanga, where it will surely obtain business of consequence in spite of the later advent of the Benguella railway, [illegible] exact the best possible terms. What the latter are to be has not been announced. The thing that is chiefly of interest to the world in general is this: If the extension of the Rhodesian railway is really to be built, and the work is prosecuted with ordinary diligence, the mines of Katanga ought to be able to begin shipping copper on a small scale inside of the next 12 months.

Misleading Estimates

The arguments of the National Conservation Commission would be improved if it ceased from publishing thoughtless statements, which magnify the waste of our natural resources. For example, in a recent circular letter it cites a report by the Geological Survey, to the effect that there is about 2,800,000 horsepower, more or less, available from the rivers rising in the southern Appalachian mountains, half of which, at least, could be utilized for power. Taking a minimum of 1,400,000 horsepower, it is figured that its rental at $20 per horsepower per year would amount to an annual return of $28,000,000. It is further stated that "water power is much cheaper than fuel power and will become more and more so as the available supply of fuel is depleted."

These bald statements convey the idea that something worth $28,000,000 per annum is being deliberately allowed to go to waste. We suggest that if the scientists responsible for them take the trouble to secure engineering estimates as to the cost of developing this water power they will find that the net annual value is less than $28,000,000. It is an old fallacy that water power does not cost anything, or at least not much worth speaking of. Sometimes water power can be developed cheaply; at other times the development is costly. Water power is not always cheaper than fuel power.

Incidentally, it may be inquired under what guise of legality the Geological Survey spends its money upon the investigation of engineering problems like the development of water power, when the mining industry is loudly demanding its attention to important problems of economic geology, which concern directly the work of prospecting for mineral deposits. The true function of the Geological Survey is to study the mineral resources of the nation. During recent years a great amount of its time and money has been expended upon the water resources. True, water is, according to Dana and other mineralogists, a mineral, which like mercury occurs commonly in liquid form. Its melting point is 32 deg. F., below which it exists in nature as ice. The annual harvesting of the great crop of ice to supply our cities is a branch of the mineral industry that appears to have escaped the Geological Survey, but unless Doctor Smith confines his staff to the proper field, we shall probably see experts of the Geological Survey on the banks of the Hudson river before long.

Iron Production in "Hard" Times

The general statements received as to the amount of business in the iron and steel trades are probably less discouraging than they appear on their face. We are told that plants are running to 60 or 65 per cent. of "normal," or of "capacity," for instance. But the assumed normal operation is the business done at the hight of the boom of 1906 and 1907, which very far exceeded anything on record. If the capacity is taken as the standard, it includes the great additions to plants made during the period of extraordinary activity. On either basis a level is established which is far above anything known in previous years.

It is not intended to deny the existence of depression, or to say that the fall in production has not been serious, as compared with 1907 and 1906; but the fact remains that there is still a large business being done, and the country is absorbing iron and steel products in large quantities. Thus the production of pig iron—the base of all the iron industries—in the first half of 1908 was only 6,918,004 tons, a decrease of 6,560,040 tons, or 48.7 per cent., from the first half of 1907. The second half of the year will probably show a considerable gain over the first half; but even if it should not do so, and only duplicate the first half, the total for the year would be 14,000,000 tons, which is greater than that of any year prior to 1901. In fact there was no year up to 1900 in which the production of so great a quantity of iron would have been possible. That the capacity for making iron had been doubled in seven years was an indication that production had increased in greater ratio than the ability of the country to absorb it—which is the real normal level of production. Under the stress of speculation and extended credit that point may be exceeded for a year or two, but only to be followed by a more or less disastrous reaction.

The point is that even in these present hard times the country is using and absorbing large quantities of iron and steel—far larger than would have been believed possible 20 or even 15 years ago. Moreover, present production is really absorbed, for it has been brought down to the actual level of demand, and there has been no material accumulation of unsold stocks since the beginning of the year.

The Mining Laws of Oklahoma

The State of Oklahoma, in adopting its constitution, took a radical course in many respects, as is well known. These measures were intended to preserve the rights of the people, which is commendable and proper, providing that the legitimate rights of some are not unfairly injured at the same time. Unfortunately, the latter appears to be the case in connection with some of the Oklahoma proscriptions.

For example, it was forbidden that natural gas should be piped out of the State. In the State there is not at present any great market for gas, and the present inability of persons owning gas property to realize full advantage from it deprives them of a certain value. In certain cases the persons owning natural gas rights in Oklahoma had laid their pipes across the line before Oklahoma became a State and conveyed gas through them. We do not believe that the State can prevent them from continuing to do so.

A correspondent, connected with one of the important coal-mining companies of Oklahoma, elsewhere in this issue of the JOURNAL, calls attention to the troubles that are being entailed by the colliery law of the State. This law, which appears to have been drafted without careful consideration, involves the practical remodeling of many coal-mining operations. The State certainly has the right, under its police powers, to prescribe measures insuring the safety of men working in mines, but certainly it does not possess the right to compel unnecessary, or even ridiculous measures, such as the provision of *safe and convenient stairs* in an escape shaft.

Some of the laws of Oklahoma appear to be distinctly of an *ex post facto* character, and we have no doubt that their constitutionality will be tested in the courts.

The Orphan Copper Company

Some good securities are dealt in on the "curb;" also some that are not good. Trading on the "curb" is free; there is no listing, or passing upon any stock by a committee. Consequently, there are practically unlimited opportunities for the setting of snares for the unwary.

An illuminating example of such methods has been afforded by the recent transactions in the stock of the Orphan Copper Company. This company was offered to public subscription last June at $2.50 per share, the capital stock being 600,000 shares, of which 100,000 were offered. At that time the mine was confessedly undeveloped, i.e., no considerable bodies of ore had been blocked out.

Since then the stock of the company has been a prominent feature in the quotations of the "curb" market and ostensibly rather large transactions were made in its shares. In the meanwhile, Cardenio F. King, of Boston, who is at present under indictment on several charges of larceny, secured a block of the company's stock and has been offering it to the gullible public through the medium of his "financial bulletin."

Advices from Globe, Arizona, have not heralded any developments of importance in the mine; indeed the company has been conspicuously silent in that respect. Nevertheless, the stock of the company was boosted up to $8⅜, representing a valuation of about $5,000,000 for the mine, which is pretty good for a property that last June was expected to be able at the end of four to six months' development to produce 50 tons per day of ore yielding 50 lb. of copper per ton. Last week the stock of the company fell about four points in a single day.

The affair is so transparent that no particular comment seems to be worth while. It is a pity that there cannot be some organization of the "curb" market that can exercise a supervision over the dealings that take place. The standing of the substantial companies is discredited among those who are unable to discriminate by the barefaced manipulation of stocks which have not full value behind them.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

The Colliery Law of Oklahoma

The Territory of Oklahoma and the Indian Territory, before same were combined and the State of Oklahoma formed, had been operating coal for many years in the mining districts, which are now known as districts Nos. 1, 2 and 3. The former comprises the counties of McCurtain, Le Flore, Latimer, Pushmataha, Choctaw, Coal, Atoka, Bryan, Pontotoc, Johnson, Marshall, Garvin, Murray, Carter, Love, McClain, Grady, Stephens, Jefferson, Comanche, Caddo, Washita, Kiowa, Tillman, Jackson, Greer, and Beckham. Mining district No. 2 is comprised of Pittsburg, Hughes, Seminole, Pottawatomie, Lincoln, Payne, Logan, Oklahoma, Cleveland, Canadian, Kingfisher, Garfield, Grant, Alfalfa, Woods, Major, Blaine, Custer, Dewey, Woodward, Ellis, Roger, Mills, Beaver, Texas, Cimmaron, and Harper, while the third district is composed of counties Sequoyah, Adair, Delaware, Ottawa, Craig, Mayes, Cherokee, Haskell, McIntosh, Muskogee, Wagoner, Nowata, Washington, Rogers, Tulsa, Okmulgee, Creek, Pawnee, Noble, Kay, Osage, and Okfuskee.

Until Senate Bill No. 26, by Senator W. N. Redwine, prescribing the mining laws of 1908 for the State of Oklahoma came into force on April 6, 1908, which declared the act of Congress entitled, "An Act for the protection of the lives of Miners in Territories," approved March 3, 1891, and the act of Congress entitled, "An Act to amend an Act entitled 'An Act for the protection of the lives of Miners in Territories,'" approved July 1, 1902, and extended over the State of Oklahoma by Section 13 of the constitution of the State of Oklahoma to be no longer in force in the State, mining operations had been carried on with little restrictions.

It is by no means an easy proposition to remodel a coal mine in five minutes, or one whose workings are by any means extensive in five months, and it seems to me that as a whole the new mining laws, as prescribed by the above bill, are of a most stringent nature, and in order to comply with same, it will be an endless expense to the operators of the State of Oklahoma. The larger concerns operating in the State are suffering considerably, and it seems to me that the small operator will be doomed entirely, unless some modifications are made, or the laws declared unconstitutional.

Section V, Article III, of the State Mining law, says: "When any mine is operated by a shaft which exceeds 75 ft. in vertical depth, the persons employed in the said mine shall be lowered into and raised from said mine by means of machinery, and where the employed are lowered into and hoisted from the mines at the main-shaft opening, the other shaft shall be supplied with safe and suitable machinery for hoisting and lowering persons, or with safe and convenient stairs for use in cases of emergency by persons employed in the said mine," etc.

The company with which I am connected contemplated sinking a circular concrete-lined shaft at one of their mines as an additional air and escape shaft. At this particular mine, whose workings are extensive, there were already two shafts sunk, which complied with this clause of the act. The new shaft was to be sunk purely and simply for additional safety and improved ventilation, and the proposition was to include perpendicular alternating iron ladders with platforms every 10 ft. 6 in., so that a person could not by any means fall further than this depth. The total depth of the shaft was a little over 300 ft. The chief mine inspector was communicated with for his approval to the proposition, which he declined to give, and referred to the section above mentioned of the State mining laws. The result is that now there will be no additional escapeway constructed in connection with this new air shaft, and the only means of escape in emergency cases will be as hitherto. I am quite at a loss to know where the advantage is to be derived regarding the safety of the miners in not allowing such a proposition to be carried through.

Section I, Article V, provides that "the operator of every coal or other mine, whether shaft, slope, or drift, shall provide and hereafter maintain ample means of ventilation affording not less than 150 cu.ft. of air per minute for each and every person employed therein, and 750 cu.ft. of air per minute for every animal employed therein; but in a mine where firedamp has been detected, the minimum shall be 200 cu.ft. per minute for each person employed therein and as much more in either case as one or more of the mine inspectors may deem requisite," etc.

This seems to me to be an exorbitant amount of air as required by other States, and I do not believe that one-tenth of the mines operating throughout the entire State had the requisite amount of air circulating through their workings when the new mining laws came into force on April 6, 1908; nor in most cases were the fans then employed, even when speeded to their utmost capacity, able to produce the required quantity. It therefore necessitated the adoption of larger or additional ventilating machinery to be installed, which was an increased cost to the operator.

Section II, Article V, provides that "not more than 45 persons shall be permitted to work in the same air current, and mines where 10 or more persons are employed shall be provided with a fan or other artificial means to produce ventilation, but no furnace shall be used where mines generate gases in dangerous quantities, and all stoppings between main intake and return airways hereafter built or replaced shall be substantially built of suitable masonry or concrete," etc.

I am personally acquainted with several mines, at which operations, while they had considerably more than the requisite quantity of air per person and animal amployed therein, had more than the stipulated number of persons working in the same air current, but as this was not permissible according to the law, it necessitated the construction of overcasts and additional splits, which meant additional expense to the operator, and little, if any, advantage to be gained, as the mines I have reference to are perhaps the best ventilated mines in the State.

Section V, Article VI, states: "All electric pumps inside of the mines shall receive careful attention while in use at a permanent pumping station; such pumps shall be placed in a fireproof shed, constructed of masonry walls."

If electrical pumping apparatus has previously been installed and adequate pump houses or sheds are already constructed, of suitable material other than masonry, and have been located permanently for years without accident, this clause means that the present pumping stations shall be torn out and replaced by masonry. One can readily see the advantage of masonry over any combustible material, but does such a change justify this additional expense? It might have been advisable to have stated that all pumping stations to be *hereafter* erected should comply with the new law.

Section IV, Article VII, states: "In all haulage roads, on which hauling is done by animal power and whereon men have to pass to and from their work, holes [illegible] obstruction, shall be made at least every

30 yd. and be kept whitewashed, but shelter holes shall not be required in entries from which rooms are driven at regular intervals not exceeding 50 ft., where there is a space of 4 ft. between car and rib. But in no case shall men be permitted to travel to and from their work on haulage-roads where hauling is done by machinery, and where such hauling is done, there shall be a manway provided for men to travel to and from their work. Said manway shall be 6 ft. in width and 5 ft. in hight, and shall be kept clear of all obstructions, and shall be properly timbered."

In many mines in the State of Oklahoma hauling is done both on slopes and entries by machinery, and such slopes and entries have also been used as traveling-ways for the employees.

The air courses in many cases are gobbed up tight, and the ventilation is principally conducted through rooms to the outlet. In order to comply with this law, then, it was necessary to clean up air courses, in some cases 2000 ft. in length, in order to provide a separate traveling-way for the miners. Up to the present time the miners have traveled these entries or slopes, as the case may be, to their respective working places, and the machinery has not been set in motion until they have got clear of the haulage-roads. It can easily be gathered what an enormous expense this will entail on the operators of this State in order to comply with this section, and it seems to me in a good many cases to be an absolutely needless and unjustifiable clause.

Section IV, Article XII, states: "No person other than the shot firers shall tamp any hole," etc. It was the custom previously for persons other than shot firers to tamp holes.

Section VI, Article XII, provides that "It shall be unlawful for any shot firer or shot firers to light the shots in more than one working place at any one time in any one split of air." It was the custom previously for shot firers to light the shots in more than one place at any one time in any one split of air.

N. H. Rowland.

Hartshorne, Okla., Sept. 19, 1908.

Alumina in Slags

The discussion on alumina in slags has rather astonished me. I have lecture notes in chemistry and metallurgy, made in the early seventies, wherein I find that I was taught by very eminent professors in England, France and Germany that at certain temperatures, Al_2O_3 is always an acid in silicates and slags fairly low in silica, and Fe_2O_3 behaves in a similar manner. Have we all forgotten the experiments of Sefström, on combinations of silica, alumina and lime, and his remarks on the effect of temperature? "Those who run may read," but maybe we run too fast to read nowadays. There was a lot of good work done in this line about 1830, nor is it out of date yet. I remember, however, being laughed at, once, when talking about ferrate of lime in the early days of the basic-steel process.

As far as my teaching and observation go, the acid properties of Al_2O_3 and Fe_2O_3 are simply a question of temperature. If you study the periodic tables of Mendeléeff, and the work of Lothar Meyer and others, you will see clearly in the case of Al_2O_3 that it must have acid properties at high temperatures. In Mendeléeff's typical period No. 2, Al stands between Mg and Si; the series being Ne, Na, Mg, Al, Si, P, S, Cl. Na is a strong base, Mg is a base; Al being the third in the series, one would naturally expect it to have properties approaching those of Si, coming next; and as Si is noted for strong acid properties at high temperatures, one would naturally expect a foreshadowing of those properties in Al. There are other reasons, but it would take too long to go into them all. Science is always a long way ahead of practice.

Mr. Bretherton, being a "hot-blast" man, like myself, does not dread alumina as the "cold-blast" man does, or rather did; for Mr. Sticht has proved that by raising the blast pressure to 3 or 4 lb., he gets as good a result as by heating the blast; that simply means more oxygen and greater heat and chemical activity at the tuyeres. Mr. Sticht's brochure on "Pyritic Smelting" (in German) should be studied by every copper smelter. It seems to me that in ordinary low-pressure cold-blast copper smelting, the temperature is seldom high enough for alumina to act as an acid, and so it has got a bad name through ignorance of conditions. I live in hope that someone in a position to make the needful experiments may do so, and tell us definitely the critical temperature of alumina, and help us to put copper smelting on a scientific basis of fact instead of the present slough of conjecture.

Moissan, Ostwald and others in France and Germany have published papers of great value to metallurgists, and as every educated man now reads French and German, or falls astern, there is no need for translations. It seems to me that "mass action" must play a very important part in the formation of slags, but I do not know that any work has been done along this line. Although I know too well that experiment is frowned upon here, still I believe the cents expended would come back in dollars; it was certainly so in the case of the late Sir William Siemens. Under his direction I spent thousands of pounds in pure experiments in the early days of open-hearth steel, and some of them still crop up as new methods, but men of his type are extremely rare, more's the pity.

Walter F. Koch.

El Paso, Texas, Sept. 21, 1908.

Grecian Magnesite

In the Journal of Aug. 29 I read your answer to an inquiry by T. B. with regard to "Magnesite in the United States," being interested especially in the magnesite produced in Greece. Permit me to state that your figures are not altogether correct. The analysis given by you must be of magnesite of Hungarian origin. Grecian magnesite contains much higher proportions of magnesia—MgO—and of carbonic acid—CO_2—as the inclosed analysis of the average product of our mines shows. This analysis was of raw magnesite from the Pyli mines, and was made on a sample dried at 212 deg. F., at which temperature it lost 0.87 per cent. moisture. It is as follows:

ANALYSIS OF MAGNESITE FROM PYLI.

Magnesia	46.28	per cent
Lime	0.41	" "
Ferric oxide	0.03	" "
Alumina	0.07	" "
Silica	2.27	" "
Carbonic acid	49.85	" "
Sulphuric acid	0.02	" "
Phosphoric acid	trace	
Combined water	1.15	" "
Total	100.08	" "
Equivalent to magnesium carbonate	96.74	" "

The price you mention is also too low. It may be considered now as $6.50 per ton for crude and $22 for calcined.

F. Meijnan,
Société Hellenique de Mines
de Magnesite.

Amsterdam, Holland, Sept. 15, 1908.

The San Rafael Mill

In my description of the San Rafael mill at Pachuca, Mexico, published in the Journal of Aug. 15, page 325, I mentioned a scraping classifier and a continuous slime settler of the Dorr type. Although at first it was not planned to use Mr. Dorr's machinery, since I wrote, his machines have been purchased, and inasmuch as his name was mentioned in my article, it seems no more than just to make this correction.

Mark R. Lamb.

Mexico, D. F., Sept. 21, 1908.

New Zealand Mines

Gold exports from New Zealand in June were 47,416 oz. bullion, an increase of 20,714 oz. over June of last year. For the half-year ended June 30 the total exports were 226,870 oz. bullion in 1907 and 254,815 oz. in 1908; an increase of 27,945 oz. The bullion reported this year was equal to $4,905,460, or 237,323 oz. fine gold.

Silver exports in June were 175,549 oz., an increase of 84,318 oz. over June, 1907. The greater part of this silver comes from the gold mines of the Ohinemuri district.

Mineral Production of California in 1907

State Mineralogist Lewis E. Aubury has placed in the hands of the State printer a complete report of the mineral production of California, by counties, in the year 1907. The total mineral output of California last year is announced to have been $55,697,949, or a gain in total value of $8,921,864 as compared with the grand total for 1906. Production by substances and by values is reported by the producers to have been as follows:

Asbestos	70	tons	$ [illegible]
Asphalt	79,718	"	1,058,400
Bituminous rock	21,122		[illegible]
Borax	106,825,000	lb	1,200,913
Cement	1,613,563	bbl.	[illegible]
Chrome	302	tons	6,040
Clay (brick).....	362,167	M.	3,438,951
Clay (pottery)...	160,385	tons	254,454
Coal	23,731	"	[illegible]
Copper	32,602,945	lb	6,311,387
Fuller's earth...	100	tons	1,000
Gems..........	....		232,642
Gold	809,213.52	oz	16,727,928
Granite.........	399,431	cu.ft.	373,376
Gypsum........	8,900	tons	57,700
Infusorial earth..	2,531	"	28,948
Iron ore	400	"	400
Lead	164		16,600
Lime	684,218	bbl	736,576
Limestone	230,985	tons	406,011
Macadam.......	1,544,617	"	1,082,302
Magnesite	6,405	"	57,720
Manganese	1	"	25
Marble.........	37,512	cu.ft.	118,066
Mineral paint...	250	tons	1,720
Mineral water	2,921,269	gal	511,016
Natural gas.....	169,991	cu.ft.	114,759
Paving blocks...	4,604	M.	199,347
Petroleum	40,311,171	bbl.	16,783,943
Platinum.......	300 07	oz.	6,255
Pyrites.........	82,270	tons	251,774
Quartz crystals..	4,000	lb.	10,000
Quicksilver.....	17,379	flasks	663,178
Rubble.........	744,271	tons	832,713
Salt	88,063	"	310,967
Sand (glass)....	11,065	"	8,178
Sandstone......	159,573	cu.ft.	148,148
Serpentine......	1,000	"	3,000
Silver..........	1,138,858	oz.	751,646
Slate...........	7,000	squares	60,000
Tungsten.......	....		120,587
Zinc...........	....		10,598
Total			$55,697,949

The feature of the year was the advancement of petroleum to the first place, surpassing gold in the value of output for the first time. The production of gold and silver fell off $2,070,708 in 1907, as compared with the preceding year. Petroleum, owing to the increase in price, was more largely produced.

Metallic substances, including precious metals, represent $24,896,083 in the total for 1907. The production of zinc, which was first reported in 1906, continued in 1907. In metallic substances the figures for 1907, compared with 1906, show a falling off that amounts to $1,206,610. As the decrease in the precious minerals amounted to $2,070,708, the other metallic substances are seen to have been more largely produced than in 1906. The gains are in copper, pyrites, chrome and platinum. As usual, the value of silver is given at the commercial average rating in New York.

Non-metallic substances were produced in 1907 to the value of $2,405,000. Under this heading are included coal, mineral waters, borax, infusorial earth, salt, magnesite, manganese, gypsum, mineral paint, fuller's earth and gems. The production of the non-metallic substances in 1906 was $2,589,984.

The great increase for 1907 was in hydrocarbons and gases. The combined values of these substances was $18,029,937, a gain for the year over the total value for 1906 of $7,859,664. The hydrocarbons are asphalt, bituminous rock and petroleum. There were produced 7,687,171 more barrels of petroleum in 1907 than in 1906. The production of asphalt rose from 77,756 tons to 79,718 tons and the value from $777,560 to $1,058,400.

Structural materials made a record of production for 1907 of $8,011,810, as against $7,859,126 in 1906. The list of California structural materials includes bricks, pottery clays, cement, lime, limestone, rubble, macadam, concrete rock, marble, granite, sandstone, slate, glass sand and serpentine. The largest gain in any branch of the structural materials industries must be credited to the brick and pottery clays, taken together.

The minerals in 1907 took the following order in values: Petroleum, gold, copper, clays and their products, cement, borax, silver. This is the same order as in 1906 with the exception that petroleum succeeds to the first place and gold takes the second place.

PRODUCTION OF THE VARIOUS COUNTIES

The productions of the several counties are summarized as follows: Placer county produced the asbestos. Asphalt was produced in Alameda, Contra Costa, Kern, Los Angeles, Santa Barbara, San Luis Obispo and San Francisco counties. The bituminous rock all came from Santa Cruz and San Luis Obispo counties. Borax is credited to Inyo, San Bernardino and Ventura counties; cement to Napa, San Bernardino and Solano counties; chrome to Calaveras and Shasta counties. Brick clays were utilized in Alameda, Contra Costa, Fresno, Humboldt, Imperial, Kern, Kings, Los Angeles, Marin, Merced, Madera, Mendocino, Orange, Riverside, Sonoma, Santa Clara, San Joaquin, San Mateo, San Diego, Santa Barbara, San Bernardino, Sacramento, San Francisco, San Luis Obispo, Shasta, Solano, Tehama, Tulare and Ventura counties. Pottery clays are credited to Alameda, Amador, Calaveras, Los Angeles, Placer, Riverside and Sonoma counties. Coal was mined in Alameda, Amador and Monterey counties.

The great bulk of the copper was produced in Shasta county, the copper output of that county alone being more than 27,000,000 lb. Calaveras produced 3,941,883 lb. Fresno stood third in copper production with 250,000 lb. to its credit. The other copper-producing counties in 1906 were Amador, El Dorado, Inyo, Los Angeles, Madera, Nevada, Orange, Riverside, San Diego, San Bernardino and Siskiyou.

Kings county produced fuller's earth. San Diego, Riverside, Sonoma and Tulare counties reported production of gems. The negligence of producers in making reports is responsible for the relatively small showing for gems.

Nevada, Placer, Riverside, Sacramento, San Bernardino and San Diego counties were granite producers, and Colusa, Los Angeles, Santa Barbara, Siskiyou and Yolo the sandstone producers. Some serpentine was quarried in Los Angeles county. Alameda, Colusa, Contra Costa, Los Angeles, Riverside, Sacramento, San Benito, San Bernardino, San Francisco, Santa Cruz, San Luis Obispo, San Mateo, Solano and Sonoma are entitled to credit for the production of macadam. Marble was quarried in Inyo, Los Angeles, Riverside, San Bernardino, San Diego, and Tuolumne counties and rubble in Alameda, Los Angeles, Marin, Napa, Placer, Riverside, San Diego, San Bernardino, Santa Barbara, Sacramento, San Francisco, Solano and Ventura counties. Glass sand was produced in Monterey county; paving blocks in Riverside, San Bernardino, Solano and Sonoma.

The sole producer of iron ore was Shasta county. Santa Barbara was alone in the production of infusorial earth. Kern, Los Angeles and Tulare counties were gypsum producers. Madera, Mariposa, Orange, San Bernardino, Inyo and Riverside were lead-producing counties. The zinc came from Inyo and Orange counties.

Four counties yielded magnesite, i.e., Alameda, Riverside, Sonoma and Tulare counties. Plumas alone produced manganese. Stanislaus is credited with the mineral paint. Mineral waters were produced for market in the counties of Butte, Colusa, Lake, Los Angeles, Mendocino, Monterey, Napa, San Benito, Santa Barbara, San Luis Obispo, Santa Clara, San Diego, Shasta, Sonoma, Sierra, Siskiyou, Solano and Tehama. The natural-gas producers were the counties of Sacramento, San Joaquin, Santa Barbara, Ventura and Solano.

The petroleum-producing counties included Fresno, Kern, Los Angeles, Orange, Santa Clara, San Luis Obispo, Santa Barbara and Ventura. Quicksilver was mined in Colusa, Lake, Napa, Santa Clara, San Benito, Santa Barbara, Solano, San Luis Obispo and Sonoma counties. Pyrites came from Alameda and Shasta counties. Calaveras alone produced quartz crystals.

The counties that reported gold production are Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Fresno, Humboldt, Inyo, Kern, Los Angeles, Orange, Ventura, Madera, Mariposa, Merced, Monterey, Mono, Nevada, Placer, Plumas, Riverside, Sacramento, San Bernardino, San Diego, San Luis Obispo, Shasta, Sierra, Siskiyou, Stanislaus, Trinity, Tuolumne and Yuba. Silver was also mined in each of the gold-producing counties.

New Publications

Cyanide Processes. Fourth Edition, Revised and Enlarged. By E. B. Wilson. Pp. 249, illustrated. 5x7½ in.; cloth, $1.50. New York, 1908: John Wiley & Sons; London; Chapman & Hall, Ltd.

The appreciation with which this little book has been received is manifested by the fact that a fourth edition has been required. Since the first appearance of the work the art of cyaniding has developed marvelously. The present edition of Professor Wilson's book has been brought well up to date, discussing such recent developments as the vacuum and pressure filters, the Adair-Usher slime process, etc.

The Geology and Ore Deposits of the Coeur d'Alene District, Idaho. By Frederick Leslie Ransome and Frank Cathcart Calkins. Professional Paper No. 62, U. S. Geological Survey. Pp. 203, illustrated. 9x11½ in.; paper. Washington, 1908: Government Printing Office.

This is the full report of the study of the ore deposits of the Cœur d'Alene, which previously has been published in the form of a bulletin. It is one of the elaborate contributions of the U. S. Geological Survey, and pertaining to one of the most important of American mining districts, it is of supreme interest. The value of the report is enhanced moreover, by the fact that the district of which it treats is still a live one.

The Design and Equipment of Small Chemical Laboratories. By Richard K. Meade. Pp. 138, illustrated. 6x9¼ in.; cloth, $2. Chicago, 1908: The Chemical Engineer Publishing Company.

Contents: General features. Hoods. Sinks and water supply. Desks. Table and apparatus for rapid filtrations, etc. Ignition table and apparatus for ignitions. Table and apparatus for filtrations. Balance support, balance and accessories. Heating appliances. Preparation of distilled water. Apparatus for electrochemical analysis. Sampling appliances. Assay furnaces and accessories. Miscellaneous laboratory equipment.

This is a useful little book, treating of the apparatus and appliances required in assay and chemical laboratories. The subject is one that has not been exhausted by previous works.

Annual Report of the State Geologist of New Jersey for the Year 1907. Henry B. Kümmel, State Geologist. Geological Survey of New Jersey. Pp. 192, illustrated. 5½x9 in.; cardboard covers. Trenton, N. J., 1908: The John L. Murphy Publishing Company.

The present volume continues in part the work which the Survey has been doing on the waterways and water supply of the State. After the administrative report, 86 pages are devoted to reports on the proposed inland waterway from Cape May to the Manasquan river and Bay Head. A second part, of more interest to geologists, covers 72 pages, with many illustrations; it is on the Petrography of the Newark Igneous Rocks, and is the work of J. Volney Lewis. Notes on the mineral industries of the State, with statistics, by State Geologist Kümmel, complete the volume.

Metallurgy. By Henry Wysor. Pp. 308, illustrated. 6x9 in.; cloth, $3. Easton, Penn., 1908: The Chemical Publishing Company; London, Williams & Norgate.

Contents: Physical properties of the metals. Refractory materials and fluxes. Theory of combustion and thermal measurements. Classification and description of the fuels—the natural fuels. The prepared fuels. Ore dressing. Furnaces. Iron ores and properties. Iron smelting—chemistry of the blast-furnace process. Iron smelting—the blast-furnace plant and process. Cast iron. Wrought iron. Steel—the cementation and crucible processes. Steel—the bessemer process. Steel—the open-hearth process. Further treatment of iron and steel. Copper, ores, properties, etc. Copper smelting. Copper refining. Lead, ores, properties, etc. Lead smelting. Lead refining. Zinc. Tin and mercury. Silver. Gold. Nickel, aluminum, manganese and rarer metals. Alloys.

This is a condensed treatise intended for the use of "college students and any desiring a general knowledge of the subject." It is one of the perfunctory works upon its subject, for the multiplication of which there is no good reason. There is a great field for a condensed treatise on metallurgy that will be up to date, not only from the practical standpoint, but also from the scientific. Professor Wysor's book falls far short in both respects.

Compressed Air Plant for Mines. By Robert Peele. Pp. 325, illustrated. 6x9 in., cloth, $3. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

Contents: Structure and operation of compressors. The compression of air. Wet compressors. Dry compressors. Compound or stage compressors. Air inlet valves. Discharge or delivery valves. Mechanically controlled air valves and valve motions. Performance of air compressors. Air receivers. Speed and pressure regulators for compressors. Air compression at altitudes above sea-level. Explosions in compressors and receivers. Air compression by the direct action of falling water. Conveyance of compressed air in pipes. Compressed air engines. Freezing of moisture deposited from compressed air. Reheating compressed air. Compressed air rock drills. Operation of mine pumps by compressed air. Pumping by the direct action of compressed air. Compressed air haulage for mines.

This is an elaborate treatise by a distinguished authority. Professor Peele has endeavored to present a review of current practice as to the construction and operation of compressors, and the application to mines service of compressed air transmission of power, including machine drills, pumps operated by compressed air and mine haulage by compressed air locomotives. The book is of undoubted value and will surely be welcomed by mining engineers.

A Guide to Technical Writing. By T. A. Rickard. Pp. 127. 5½x8 in.; cloth, $1. San Francisco, 1908: *Mining and Scientific Press.*

This valuable little book should be in the hands of every young engineer, and its perusal would not seriously injure some of the older members of the profession. Specially commendable is the use of full-faced type for distinguishing words and phrases discussed and for emphasizing the author's maxims. It would have been more graceful had the author acknowledged his indebtedness to "The King's English," an anonymous work published by the Clarendon Press in 1906, and which we judge he has used extensively by his treatment of defining and nondefining clauses, and by a curious similarity we find between his page 54, "Anyone who hopes to write well had better begin by adjuring *somewhat*" (adjuring is, of course, a misprint for abjuring), and page 355 of "The King's English," "It is not too much to say that anyone who hopes to write well had better begin by abjuring *somewhat* altogether."

The arrangement of the book could be improved, especially in the handling of words obnoxious to the author which are scattered through much of the work instead of being confined to one section. The author shows his affection for the impossible word "tailing," a word no human being uses in ordinary speech. Doctor Raymond has written against this idiosyncrasy in one of the late issues of the Journal. A grave omission is the neglect to advise the student to read aloud what he has written. This course is recommended by many textbooks, and the author's favorite work, "The King's English," states that it "is indispensable for everyone who aims at a passable style."

The publishing of a work of this character without an index, as this book is published, is inexcusable, and there should be some fitting punishment for this crime of haste, laziness, or false economy. We suggest either boiling in oil, or reading all of the testimony, arguments, and decisions in all of the apex suits tried to date.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

ALUMINUM SULPHATE

Where can I find a market for aluminum sulphate? What is the method of extracting this salt from alunite rock? Can you refer me to any literature on this subject?

P. L.

Aluminum sulphate is a great article of commerce, in which many chemical merchants in the Eastern States are interested. The chemistry of the manufacture was fully described in "The Mineral Industry," Vols. III and VII.

GRAPHITE

How are the different grades of graphite classified and what is the value of each grade? Any other additional information you can give will be appreciated.

S. N. K.

Following is the classification and value per pound of commercial graphite: Flying dust, finest to best, per pound, 1@4c.; dust, 1¾@5c.; chip, 2¾@7½c.; lump, 4@10c.; large lump, 7@10c.

There are three kinds of graphite on the market: crystalline, amorphous and artificial. The last is produced only by the Acheson Graphite Company, of Niagara Falls. The distinction between crystalline and amorphous graphite is purely one of quality, the crystalline being very pure and particularly suited to lubrication, manufacture of crucibles, etc. New York is the chief producer of graphite, and the industry in that State is largely controlled by the Joseph Dixon Crucible Company, of Jersey City, N. J. As a general rule graphites containing 90 to 95 per cent. graphitic carbon are sufficiently pure to meet the requirements of the trade. For further information regarding characteristics of graphite, we refer you to the JOURNAL of Feb. 1, 1908, page 255.

REFINING OF GOLD-SILVER BULLION

Who are the principal refiners of gold and silver bullion in the United States? Have they any official tariff for work done on toll for the public? If so, what is the rate for the various classes of doré bullion from 700 silver, 150 gold to 950 silver, 50 gold? Is it customary to make any definite deduction on the content in gold and silver given by the correct assay? If so, what are these deductions?

H. K.

The principal refiners of doré bullion in the United States are the American Smelting and Refining Company, Balbach Smelting and Refining Company, United States Metals Refining Company, and the Raritan Copper Works. The addresses of these, and of others also, may be found in the advertising pages of the JOURNAL. The United States Mint Service is also an important refiner of bullion. The revised table of charges at the Mint and Assay offices of the United States, as fixed by the Director of the Mint and approved by the Secretary of the Treasury, July 6, 1908, to take effect July 10, 1908, is as follows:

1. *Melting Charge*: On deposits of bullion a charge of $1 shall be imposed for each 1200 oz. of bullion or fraction thereof, except in the case of uncurrent United States coin and mint fine bars, for which no charge is made.

2. *Parting and Refining Bullion* (rate per ounce gross): On bullion containing 0.250, or less, of gold, and not more than 0.100 base, 1c. per oz.; for each additional 0.050 base, or fraction thereof, in such bullion, 0.5c. per oz. shall be added.

On bullion containing from 0.250 to 0.500 of gold, and not more than 0.100 base, 2c. per oz.; for each additional 0.050 base, or fraction thereof in such bullion, 0.5c. per oz. shall be added.

On bullion containing 0.950 to 0.992 of gold, and not more than 0.008 base, 2c. per ounce.

Bullion containing 0.992 of gold and upward and not over 0.005 base shall be accepted free of the parting and refining charge. But no allowance shall be made the depositor for silver.

All other bullion shall pay a charge of 4c. per oz. and deposits of bullion containing more than 0.800 base must be declined.

For bullion where the alloy is all copper with but one of the precious metals present, the charge shall be 0.5c. per oz. This does not mean to include foreign gold coin, for which the only charges imposed are for melting and extra copper required for alloy. When bullion contains less than 0.0005 of gold, the gold contents shall not be reported for the benefit of the depositor.

3. *Refining Silver* (rate per ounce gross): Upon silver bullion free from gold, assaying 0.998 to 0.998½ inclusive (or over when a depositor demands in payment bars of a higher fineness than his deposit), a refining charge of 0.3c. per oz. shall be imposed and collected; and upon such bullion assaying 0.980 to 0.997½ inclusive, the charge to be imposed and collected will be 0.4c. per oz.; and all such bullion below 0.080 shall be subjected to the parting and refining charge of 0.75c. per ounce.

4. *Toughening Charge*: Charges under this head must be imposed as prescribed in Section 1, Article 6, of Rules and Regulations governing Mints and Assay Offices, taking effect March 1, 1908.

5. *Copper Alloy*: Two cents per ounce [illegible]

6. [illegible] can be withdrawn subject to charges actually incurred up to time of withdrawal.

7. *Bar Charge*: For fine bars, and for standard or unparted bars—Bars of fine gold, $5000 in value and over, $0.04 per 100; bars of fine gold (less than $5000), assorted sizes, 0.05 per 100; bars of fine gold (less than $500), assorted sizes, 0.07 per 100; small gold bars (less than $5000), assorted sizes, when demanded in payment of deposits where a parting and refining charge has been made, 0.01 per 100; small gold bars (less than $500) assorted sizes, when demanded in payment of deposits where a parting and refining charge has been made, 0.03 per 100; bars of standard gold, 0.10 per 100; bars of standard silver, per ounce gross, 0.00½; bars of fine silver, not less than 500 oz., per ounce gross, 0.00 1/10; bars of fine silver of less than 500 oz. and more than 125 oz., per ounce gross, 0.00⅛; bars of fine silver of 125 oz. and less, per ounce gross, 0.00¼; bars of unparted bullion, per ounce gross, $0.00¼.

8. *Minor Assay Office Charges*: When bullion is deposited for payment in coin it shall be subject to such charges as would be imposed at the mints and an additional charge of one-eighth of one per cent. of the gross value of the bullion.

When the bullion is to be returned to the depositor, the usual melting charge shall be imposed together with the assay office charge of one-eighth of 1 per cent.

FRANK A. LEACH.
Director of Mint.

The private refiners will buy doré bullion in the New York market on the basis of corrected assay with a deduction of about 75c. per oz. of doré, payment to be made two weeks after sampling. Advances to a reasonable amount may be made upon receipt of the bullion, the remainder of the price being paid upon final accounting.

HYDRAULIC AIR COMPRESSOR

In the JOURNAL of Aug. 1 was published an interesting article describing the operation of an hydraulic air compressor recently installed at Clausthal. Can you give me further details of the construction of the air separator and air suction pipe, or refer me to the manufacturers of the Clausthal installation?

R. Y.

We do not know the manufacturer of the apparatus installed at Clausthal. However, our correspondent will doubtless find answers to his inquiries in the JOURNAL of Jan. 19, May 4 and June 8, 1907, where other installations of hydraulic air compressors were described. The Taylor Air Compressing Company, of Montreal, Canada, introduced originally [illegible] doubtless supply any information that is desired.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

R. B. Brinsmade sailed from New York, Sept. 30, on a professional trip to the Greater Antilles.

Nels Johnson has been appointed manager of the Franklin County Collieries Company at Lesser, Illinois.

Arthur R. Townsend is in Colorado on professional business, and will return to New York about the middle of October.

C. L. Constant, of New York, has taken the management of the Catawba gold mine, in Catawaba county, North Carolina.

Captain A. J. Overton, of Salisbury, N. C., has been appointed manager of the Portis gold mine in Franklin county in that State.

John W. Benson, of Denver, Colo., who has been examining mines and claims in the Philippine islands, recently left Manila for Hongkong, China.

A. P. Rogers left New York last week on a professional trip which will include Colorado, Utah and Wyoming, and will take about three months to complete.

H. G. Emrich, assistant superintendent of the American Smelting and Refining Company at Perth Amboy, N. J., has been visiting in Colorado during the past month.

Bennett Brown has resigned his position as commissioner of the Southwestern Interstate Coal Operators' Association, to take effect Jan. 1, 1909, on account of ill health.

William Loach, manager of the Wolf Tongue Mining Company in the Nederland district of Boulder county, Colo., is making a business visit to Pittsburg and Washington.

P. A. Babb, general manager of the Mexican Mines Prospects Development Company, has left Mexico for a trip to New York and Boston on business for the company.

D. B. Dowling, of the Canadian Geological Survey, is in the Edmonton district, in Alberta, where he will be engaged for a month making an examination into the coal deposits.

J. W. Johnson and Herbert C. Enos, mining engineers, have removed their offices from the Iturbide hotel to the Quirk building, corner of San Francisco and Gante streets, in the City of Mexico.

J. H. Furman is manager of the Piedmont Tin Mining Company, with headquarters at Lincolnton, N. C. He was for some time connected with the Gold Fields of South Africa, Ltd., in the Transvaal.

J. Will Knight, of Provo, Utah, identified with the management of several Utah mines, has been selected by the Democratic State committee as candidate for governor. His father, Jesse Knight, received the nomination at the convention held recently, but declined the honor.

Professor Coleman, of the University of Toronto, Ont., is returning after an exploration of portions of the Rocky mountains west of Edmonton, hitherto untraversed. His party attempted the ascent of Mount Robson, but were prevented by heavy snowfalls from reaching the summit.

Commencing Oct. 1, the official title of Cortlandt E. Palmer with the Guanajuato Development Company is changed from general manager to consulting engineer in charge. Under this title, Mr. Palmer will continue to direct all operations of the company and its subsidiary companies as heretofore.

H. Kenyon Burch, chief engineer and mill superintendent for the Moctezuma Copper Company of Nacozari, Sonora, Mexico, who during the past two years has been engaged in designing and erecting the company's new 2000-ton concentrator, will leave Oct. 1 for a few days' visit at Globe, Ariz., where he is engaged by the Miami Copper Company as mechanical engineer to design a large concentrator and its adjuncts. Before taking up this work Mr. Burch will travel through Colorado, Utah and Nevada, visiting some of the plants placed in operation during the past year. Mr. Burch has been identified with Phelps, Dodge & Co. for the past five years, having built the Detroit Copper Mining Company's concentrator at Morenci. Upon taking his leave of absence Mr. Burch will be succeeded by Edward Buckley as mill superintendent.

Obituary

Wilhelm J. D. Keuffel died in Hoboken, N. J., Oct. 1, aged 71 years. He was one of the best known manufacturers of engineering and mathematical instruments in this country. He was born in Germany, but came to this country when a young man, and engaged in the business which occupied him for all his active life. About 40 years ago he organized the firm of Keuffel & Esser in New York. Some years ago this was incorporated and Mr. Keuffel was chosen president of the company, holding that position up to the time of his death.

John M. Burke, one of the pioneer miners of the Cœur d'Alenes, in whose honor the town of Burke, Idaho, was named, died in Philadelphia, Sept. 21, the burial taking place at Alexandria, Va. Mr. Burke went to Spokane, Wash., in 1882, from Salt Lake, where he had lived 12 years. His mining operations included the development of a number of properties in the Cœur d'Alenes which have been made large producers. After withdrawing from active mining he took a prominent part in Idaho politics and later went to Reno, Nev., where he again engaged actively in mining.

Cabell Whitehead, whose death was briefly noted last week, died at Nome, Alaska, Sept. 7, in consequence of injuries received two days previous in an accident on the Seward Peninsula railroad. The train was derailed and Dr. Whitehead was thrown into a pool of cold, muddy water under some lumber, which was part of the trainload. He was pinned under the lumber for a couple of minutes, so that his lungs were filled with the silt and cold water. On being extricated, he recovered sufficiently to be able to speak, but acute congestion of both lungs supervened. Dr. Whitehead was born in 1863, at Lynchburg, Va., and his education was obtained, first at Lehigh University, where he was graduated in mining in 1885, and then at Columbia University. His work lay mainly in the assay department of mining, first at Boisé City, Idaho, and then at Washington. In 1895 he went to Europe to investigate methods preparatory to the building of a new mint at Philadelphia. He made a special study of electro-metallurgy and wrote several valuable papers on this subject. In 1898 he established the assay office at Seattle. As consulting metallurgist to the United States Mint he was well known at Washington. He went to Nome in 1900 as representative of the Bureau of the Mint, and shortly afterward founded the Alaska Banking and Safe Deposit Company, of which he was president at the time of his death. He made the first trustworthy report on the future of the mining industry on the Seward peninsula; this was in 1900 and was made for the Geological Survey. He resigned from government service in 1901 and soon afterward organized the Topkok Ditch Company, in connection with Henry Bratnober. As a resident of Nome he took an important part in the development of the Seward peninsula. He was manager and president of the Seward Peninsula railroad, on which he was killed, having resigned control a week before the fatal accident. He leaves a wife.

Societies and Technical Schools

American Society of Mechanical Engineers—The first meeting of the season will be held Oct. 13 by the Gas Power Section in the Engineering Societies building, New York. There will also be a discussion of standards to be used in gas-power work. Two papers will be read, one by E. A. Harvey on gas-producer plants, with data upon costs, performance, etc.; and one by N. T. Harrington, giving the results of tests to determine the loss of fuel weight in a freshly charged producer, due to increase of ash contents in the fuel bed.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 2—The Anti-débris Association has again become active in the matter of sending spies out into the mountain regions to see how the injunctions against hydraulic mines now in force are being obeyed. As a matter of fact, most mines of this class have been compelled to quit work owing to scarcity of water.

The dredge of the Calaveras Gold Dredging Company, at Jenny Lind, Calaveras county, owned by W. P. Hammon interests, only worked a part of the time last year, but is now in full operation again, and yielding well. The National Dredging Company, at the same place, has a new dredge called Isabel No. 1, is working in the alfalfa field of the Cutler-Dennis ranch, and getting its power from the American River Electric Company. It has 8½-cu.ft. buckets and is in good paying ground. On the Merced river, near Snelling, Merced county, the Yosemite Dredging and Mining Company started its new machine this month after a long period of preliminary work and arrangement. The dredging ground averages 15 ft. in depth. The company has other tracts under bond and is testing the ground.

After an idleness of two years, the Klau quicksilver mine in San Luis Obispo county, between Paso Robles and Cambria, has resumed operations, impelled by the rising price of quicksilver. The old furnaces and condensers have been placed in good condition, and 25 miners are reopening the mine. San Francisco men have taken hold of the property.

The new find in the West China tunnel of the Brown Bear mine, Deadwood, Trinity county, is proving even better than was at first hoped for. The face of the drift now shows about 11 ft. of $40 milling ore. This vein is supposed to be the Last Chance ore-shoot, which when worked years ago, yielded about six million dollars. The find has brought renewed activity to the district. A few months ago there was not a single lease in Deadwood that was making more than miners' wages, while now the men are eager to continue and will not give up their leases. In the main mine, since the find in the tunnel, Molin & Osgood, leasers, have found a small vein of high-grade ore, and others are searching for the same kind of luck.

Agents of the Oroville Dredging Company have commenced prospecting operations with drills in the Orange Blossom Colony lands in Stanislaus county. Numerous tracts have been bonded and are to be tested as to the value of the gravel under the surface. The colonists will be permitted to remain on their farms at a nominal rental and all but two have signed bonds to sell their property if the drills prove the ground is of sufficient value to dredge.

Goldfield, Nevada

[illegible] The railroad companies are after Goldfield ores in earnest. The Tonopah & Goldfield is the only road of the three competing lines that is hauling ore in trainload lots. The Tidewater and the Clark roads are more or less handicapped by the fact that smelters on their lines are not ready to handle much ore as yet. From seven to ten carloads of ore a day are being shipped at the present time over the Tonopah line consigned to trust smelters throughout the West, but the greater portion goes to the Peyton Chemical Company's smelter at Peyton, Cal. The shippers are compelled to stand a high rate for freight and treatment.

The Tidewater road is after ore for the old Needles smelter which is being remodeled, and a rate attractive to producers is predicted on all kinds of ore.

The Jerome smelter on the Las Vegas or Clark road is also being renovated and enlarged. The agents of the railway companies have been in the field for the past six months studying the situation and the productive capacity of both the old and the new districts. The completion of the Consolidated and Florence mills will not change the situation for they will have not have sufficient capacity for treating other than their own ores.

These three competing railroads, it is reported, will soon be ready to bid for low-grade ores at a rate which will be as good as can be secured at the local plants.

The Goldfield Consolidated at a recent meeting of the directors decided not to grant nor to extend any more leases than those now running. There are 32 different leases on Consolidated ground affected by this decision. Some that have not yet struck ore but have been working diligently, expecting to get an extension, have ceased operations. Others that have some time yet to run have increased their efforts.

Salt Lake City

[illegible] Among the important events of this week was the receipt of instructions by the local management of the Utah Consolidated to exercise the options and con[illegible] aggregating 30,000 acres of land in Tooele county. This movement indicates that the Utah Consolidated proposes to carry out its plan to build a smeltery. Negotiations had been pending for some time with the Guggenheims for a 5-year contract to ship the ore to the Garfield smelter on terms as favorable to the mining company as the existing contract which does not expire until March, 1910, and under the provision of which Utah Consolidated is shipping 800 tons per day. The smelting company has sought a modification and apparently, no agreement could be reached. The building of the Utah Consolidated plant means a new competitor in the field for the Guggenheims, for it is stated that in addition to providing facilities for treatment of its own ore, custom business will be sought. The cost of the [illegible] 000. The Utah Consolidated mine will be connected with the smelter by means of an aërial tramway, eliminating present freight haulage to the Rio Grande railroad of 40c. per ton.

The Boston Consolidated concentrator at Garfield is now treating ore from Bingham on the basis of 1800 tons per day, eight units of the plant being in commission. The feed averages about 1.75 per cent copper and from 16 to 20 tons are put into one; the extraction during September has been about 75 per cent. During [illegible] ton was 50c., but the September costs will be lower. A new compressor has been installed at the mine and everything at that end of the enterprise has been shaped to respond with from 3000 to 3500 tons per day when the balance of the mill equipment is installed.

The August production of the Consolidated [illegible] an increase of $8000 as compared with the previous month. The opening of the Magazine vein recently in the Brickyard mine, one of the properties owned by the company, is regarded as the most important development of the year and has added materially to the available ore reserves of the mine.

The Brickyard ore assays about $6 per ton [illegible] mine. The management has given out figures showing that the combined properties of the Consolidated Mercur company have produced 3,225,767 tons of ore, which [illegible] lion, or a little more than $4 per ton.

The Iowa-Utah Mining and Milling

Company has bonded a portion of its property in Beaver county to a syndicate of Salt Lake mining operators.

Special meetings of shareholders of the Cedar and Talisman Mining companies have been called to ratify the deal made recently between the directors of the two corporations to effect a consolidation of their respective properties in Beaver county. The Cedar-Talisman Consolidated Mines Company has been organized to absorb the others, shareholders to have equal representation.

The Ohio Copper Company has issued a report which gives the personnel of the new board of directors and that an organization has been effected by the election of James MacFarlane, of Denver, president; Russell Hopkins, vice-president; Carlos Warfield, second vice-president; George Baglin, of New York, secretary and treasurer; Colin McIntosh, mine manager. David Keith, N. J. Catrow, J. P. Hutchison, F. A. Heinze and P. A. Carroll are directors. Out of the 1,500,000 shares, 414,000 are unissued, but 200,000 of the latter have been reserved for the conversion of $2,000,000 six per cent. ten-year gold bonds. Of the authorized bond issue, $400,000 worth have been sold. This company is conducting a vigorous campaign at Bingham and should be in readiness to begin the production of copper soon after the beginning of next year.

Butte

Oct. 1—The early part of the week a deed was filed for record with transfers to the newly organized Davis-Daly Copper Company all of the property in Silver Bow county formerly held by the Davis-Daly Estates Copper Company. The property conveyed, in addition to several city lots in Butte, consists of the following lode claims: Baltic, Smoke House, Ramsdell, Silver King, Thomas, Great Republic, Hibernia, Silver Joe, Jumping Jack, Broker, New Era, Maximillian, Morning Sun, Yellow Jack, Pawnbroker, Charlotta, Mount Moriah, Plymouth and the Carrie.

Douglas B. Sterrett, in an advance chapter of "Mineral Resources of the United States, states that the sapphires mined in Montana during 1907 had an estimated value of $299,800. Fergus and Deer Lodge counties were the principal producers.

The Boston & Montana smelter at Great Falls is now in readiness for operation at full capacity. During the long shutdown subsequent to the flood last spring the reverberatories were remodeled with a view to more economical operation. The new stack, nearly completed, will, it is expected, save the company $15,000 per month by the recovery of flue dust.

At a meeting of the creditors of the Butte Central & Boston Copper Company, bankrupt, held last week, Samuel McConnell was elected trustee of the bankrupt's estate. It is estimated that the company's indebtedness aggregates about $150,000.

Denver

Oct. 2—Although summer is ended, and the first snowstorm of winter has fallen on the mountains of Colorado, it may now be asserted that the mining industry is once more in fine form, and in a more active condition than at any time during the year. There is but little activity in mining stocks, and few properties changing hands, or purchasers looking for mines, but mines closed since last year's money scare are being reopened, and an active winter's work is promised in all the mining camps; this, and investment in mines, appear likely to increase after election.

With the improvement in demand and prices for tungsten ore, operations in the Boulder county belt are beginning to show activity again. The head of the American Smelting and Refining Company, who has just been here, has been predicting better prices for all metals that have suffered a decline.

A meeting of experts of the British, German and Belgian governments, accompanied by the chief of the Bureau of Technology of the United States Geological Survey, and other members was held at the Chamber of Commerce, which was attended by coal-mine operators of this city, and members of the American Mining Congress. The object of the visit of the foreign experts is to investigate the causes of coal-mine disasters, and to devise methods for the better prevention of these horrors. The party has been in Utah and Wyoming, and is now visiting the Trinidad fields south of here, accompanied by the State coal-mine inspector.

Four trainloads of the members of the American Bankers' Association went over the line of the Denver, Northwestern & Pacific Railway (Moffat road). They were accompanied by the mining engineer in charge of the industrial department of the road, who will explain to them the magnitude of the new coalfields and other mineral resources to be opened by that line of railway.

Houghton, Michigan

Oct. 5—A decision was finally rendered by Federal Judge Knappen in the suit brought against the Calumet & Hecla Mining Company by Albert S. Bigelow to restrain the defendant company from voting its stock in the Osceola Consolidated company.

Judge Knappen decided that the Calumet & Hecla company had not violated the Sherman anti-trust law; that it had a right to acquire and vote stock in the Osceola company; that the Osceola company was not guilty of contempt of court; that the temporary injunction restraining this company from holding its annual meeting was dissolved; and the request that the Calumet & Hecla company be permanently enjoined from voting its Osceola stock was refused.

The victory was a sweeping one and the Calumet & Hecla company won on every count. It is believed in certain circles that A. S. Bigelow will attempt to carry the case to the Supreme Court of the United States.

London

Sept. 27—The Cullinan diamond which was presented to King Edward by the Transvaal colony, was sent to Amsterdam for cutting and polishing. The stone has been cut into two large pieces, weighing 1700 and 1000 carats, respectively. The smaller stone has now been cut and finished, and is a circular brilliant of 330 carats of great beauty. This stone is the largest cut diamond in existence. The other half of the original stone is being cut in pendant shape, and is expected to weigh 600 carats. The balance of the stone will cut into several smaller brilliants of great value.

The South African mine-share market, which has had a great rise during the last week, continues strong. The deep levels with long life and producing handsome dividends are in special request. Several of them pay from 7 to 10 per cent. on their present market valuation. There is a general improvement in the profits earned, and the tendency is for profits to be increased along with the reduction in working costs, brought about by the larger scale of operation which is the order of the day. It is now recognized that the lives of the mines have been underestimated. Past estimates of life, although correct for the conditions of a few years back when the limit of payable grade was much higher than it is today, are now out of date. Having regard to the increased life, that is now promised, the investor is justified in accepting a smaller dividend than when the sinking fund for redemption of capital was a matter of greater importance. The native labor returns are at present favorable, but the opening up of new mines may before long make the labor question again a serious difficulty. The general improvement in the position of the producing companies has had the effect of raising the prices of shares in the nonproducing companies.

Investors would do well to examine carefully into the merits of such companies before making a purchase. Among the large number of securities quoted on the South African Exchange there must be plenty of rubbish which the holders will sell to the unwary in a buoyant market. Several new batteries will be adding to the output before the end of the year. The increased output and the general increase in dividends in December which is now assured, are as certain as anything can be to make speculation in South African mining shares active before next Christmas.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

BIBB COUNTY

Little Cahaba Coal Company—This company has purchased the property of the Blocton Cahaba Coal Company at Coleanor. The tract consists of about 800 acres of leased land and several hundred acres in fee. The price paid is said to have been in the neighborhood of $200,000.

JEFFERSON COUNTY

Blossburg Colliery—An explosion of gas at mine B of the Tennessee Coal, Iron and Railroad Company this week killed three miners. It is said to have been their own fault. By direction of the fire-boss, notice had been posted that a part of the mine was unsafe. Before this section could be cleared of gas, several miners disregarded the warning and entered the dangerous section, the explosion following.

Arizona

GILA COUNTY

Miami—This company is reported to have struck ore in shaft No. 2, which is situated 2150 ft. due north of the present mine workings. A churn drill is also said to have struck ore 3000 ft. southwest of the Red Rock shaft.

YAVAPAI COUNTY

Pick & Drill Mining Company—At the properties of this company, near Humboldt, a force of men is completing the installation of the new power plant. A 10-stamp mill is also being installed, and as soon as the power plant is ready for operation the mill will be started and a large force of men put to work in the mine. The ore is of high grade, and about half the value can be saved by amalgamation, the remainder going into the concentrates.

Knight Copper Company—This company has let a contract for driving the main tunnel in 75 ft. farther. Practically all the stock of this company is owned by local men. The formation is in schist, the lode being in contact with a large iron porphyry dike, and the ore occurring as lenses in this dike. The property is three miles from the Humboldt smelter.

Mount Tritle—Application has been made by the creditors of the Mount Tritle Copper Company for the appointment of a receiver. The application is to be contested.

Gold Ridge Mining Company—This company has put a force of men at work on the Mark Hanna and Grub Stake claims in the Congress district. Byron Smith has been placed in charge as general manager. The United Mines Company, which is operating the Ohio group immediately adjoining the Mark Hanna, is installing a 10-stamp mill.

Shylock—The company has let a contract for 300 ft. of sinking, and the work has been begun.

Tip-Top Heath—This company has completed building a wagon road into its property from the railroad, at a cost of $5000. Work is now being carried on to clean out the old workings to reach the rich orebodies known to exist. Superintendent Wager states that the company will commence shipping tungsten ore within the next 30 days, and silver ore will be shipped until reduction works can be put on the property.

Esperanza—W. J. Martin and C. K. Hartzsell have finished sinking 60 ft. on this claim in the Sols Wash district, in the southern part of the county. They have now reached a depth of 250 ft., and have about 10 inches of high-grade gold ore. They will continue the work by contract.

Mount Elliott Consolidated—The mill has been shut down for repairs. It is stated that grading will soon be commenced for the site for a new and larger mill, as the 10-stamp mill has been proved inadequate to handle the output of the mine. A force of men is at work blocking out ore and doing development to increase the output sufficiently to supply 50 more stamps.

California

AMADOR COUNTY

Argonaut—Good ore has been discovered on the 2700 level of this mine at Jackson, and developments in the Hoffman ground are also encouraging. The management has withdrawn the proposal to deed to the Apropos company the mineral rights on the Hoffman ground.

CALAVERAS COUNTY

Washington—At this mine, at Sheepranch, work has been commenced by the Nevada company, which has bonded it.

[illegible] Star—In the north extension of this mine at West Point, Zavella & Marchand have struck rich ore.

Kittie—It is expected that 10 stamps, concentrators and a cyanide plant will be installed.

HUMBOLDT COUNTY

[illegible]—Some sample shipments of copper ore from these mines have been made to the Tacoma smelter.

INYO COUNTY

Lead Crown Group—H. M. Gibson, P. W. Forbes and other owners of this group of silver-lead mines in Black cañon in the White mountains, are sinking a shaft and driving a tunnel on the property. Good galena ore has been found.

[illegible] Company—The company will shortly have the stations for the 9-mile tramway between Cerro Gordo and Keeler in place, and when this and the smelter are finished the chloriders on Cerro Gordo hill can sell their ore to this company.

[illegible] COUNTY

Mariposa Commercial and Mining Company—Manager Frank T. Maguire, of this company, has machinery and lumber on the ground at the Mariposa mine and expects to complete the new mill in a few weeks.

NEVADA COUNTY

Prudential Mining Company—This company, formerly the New York-Grass Valley Company, has settled its differences with the ditch company and has started pumping out the old Perrin mine in Grass Valley. The mine is about 500 ft. deep and it will take two months to unwater it.

Norambagua—H. S. Abbott, acting for the company which has purchased this Grass Valley mine from the Campbell estate, has made the first payment of $5000 on the purchase price. The shaft is down about 600 ft. and the company has its own water rights, sufficient for power purposes.

Deadwood—This property, adjoining the Lecompton at Willow valley, has been bonded to A. M. Gilbert, of Santa Barbara, who will begin development work at once.

Ironclad—Money has been raised by a Mansfield, O., company to reopen, unwater and develop this property at Rough and Ready. A three-compartment shaft is to be sunk and a pumping plant installed. A new [illegible] has been ordered.

[illegible] COUNTY

Lost Emigrant—This mine, near Truckee, idle for some years, is being reopened and developed. A 10-in. vein of $40 free-milling ore is being worked.

Colorado

Boulder County

Jaeger—This group, at Glendale, has been sold to Denver men for $20,000. E. G. Hurst and associates are the purchasers and they may install a plant of machinery.

Annuity—Manager Yates has returned from Boston, Mass., and resumed work on the Dolly Varden holdings at Sunset. The company will remove the mill in Pennsylvania gulch to the mine and install modern machinery for economical handling of ores.

Tungsten—The Phillip Bauer Company has announced that it will pay $5 a unit for 60-per cent. ore and on account of the increased price for tungsten ores, more work has been started up on several properties in the Nederland section. Two carloads of tungsten concentrates worth about $12,000 have been shipped to the Firth Steel Company, Pittsburg, during the past two weeks.

Ward Gold Cyanide Milling Company—Contracts have been awarded during the past week for the erection of two units of 25 tons each, as the preliminary for a 150-ton mill at Ward to treat the iron sulphide ores of the district.

St. Louis—Kansas City men, owning this mine at Glendale, have resumed operations with William Emmett as superintendent, having overhauled machinery and unwatered the shaft.

Blossom Mining Company—A decree of foreclosure has been entered in the district court against this company, owning property near Springdale, the amount being $120,676.

Clear Creek County

Conqueror Mining, Power and Reduction Company—Massachusetts men are interested in the purchase of six patented claims and placer property on Silver mountain, at Empire and are arranging for the installation of additional machinery.

Alice—A. H. Roller and W. R. Shaffer, of Idaho Springs, who have been testing the large low-grade orebody of the Alice in Upper Fall river district have concluded their tests with a 25-ton experimental plant, and have gone to Utah to look over some of the big cyanide plants, with the intention of building a 200-ton plant, which may be later increased.

Indiana

Clay County

A number of coal mines in the Blockcoal district resumed operation Oct. 5. These mines were closed last April, at which time the operators requested the miners to continue work under the old scale till a new one was agreed upon, but they refused. The mines were then working almost full time, and a number of important contracts were switched to other fields. As a result the miners sought work elsewhere, but many of them failed and returned to the district. They have been idle all summer and admit they made a mistake in refusing to work on under the old scale. One of the largest of the mines to resume is No. 3 of the Miami Coal Company, which employs about four hundred men.

Pike County

The mines in this county are now running on a little more than two-thirds time. The new mine at Massey, opened since the old mine was destroyed by back water from the Patoka river, will soon be employing a large force of men. The tipple-house is completed, and the main switch with the railroad will be ready in a few days. The mine is owned by the Peacock Mining Company of Indianapolis but will be operated by Commodore Bugg, of Oakland City.

Michigan

Copper

Atlantic—The shaft on the Section 16 tract of this company is nearing the 18th level and continues in very shattered and disrupted ground requiring close timbering. The south drift from the 12th level is within 30 ft. of the company's boundary line. At the 13th level encouraging ground is being exposed and rock coming from these drifts will soon be shipped to the mill. The 12th-level drift will eventually connect with the drift from the same level of the Baltic, which will then afford better ventilation and a second means of communication with the surface.

Centennial—Work on the two additional heads in the stamp mill, owned jointly by this company and the Allouez, is being pushed. When this additional stamping capacity is complete the mines will increase their output. In case the full capacity of the mill is not required, the Calumet & Hecla, which owns control of both properties, may use it for treating rock from some of its other properties. Underground conditions at the Centennial are encouraging; the drift to the north is entering a highly mineralized zone tributary to the South Kearsarge.

Ahmeek—This company has secured a mill site on the shores of Torch lake, in close proximity to the Tamarack-Osceola mills; work on a modern 4-head stamp mill has been started. Excavations are being made on the sites of the two new shafts and about 40 ft. of overburden will have to be passed through before the ledge is reached.

Superior—The new frame shaft-house on the site of No. 1 shaft has been erected and will soon be in shape to handle rock. A new engine-, boiler- and change-house is in course of construction and when finished the surface equipment will be complete. The crosscut from the 10th level showed the lode to be nearly 50 ft. wide at that point and highly mineralized.

Calumet & Hecla—This company has completed the electrification of its pumping station on the shores of Lake Superior, a 3,000,000-gal. electrically-driven centrifugal pump replacing two steam reciprocating pumps of a combined capacity of 2,800,000 gal. At the stamp mills work on the new regrinding mill is progressing favorably and a portion of it will soon be ready to treat the tailings. The company has just started two additional 200-h.p. motors, driving the washing machine for 11 heads in the Hecla mill.

Rhode Island—A good grade of rock is being encountered in the winze, which this company is putting down in the south drift from the 10th level.

Quincy—A hoisting plant is being installed on the site of the company's new Pontiac shaft. The old shaft has been cleaned out and sinking will soon be resumed. This shaft will command the ground tributary to the tract purchased from the Arcadian about two years ago.

Missouri

Joplin—Zinc-lead District

Center Creek Mining Company—This company, of Kansas City, capitalized at $1,000.000, has refiled its papers of incorporation in Jasper county and established its main office in Webb City.

Osyka—This company has developed a 40-acre lease east of the Kalitan mine east of Joplin on Turkey creek; 22 drill holes are in ore.

J. E. Snavely & Co.—This company of Springfield men has leased the Wheat & Smith land southeast of Aurora, and will drill the land at once.

Toreador—This company at Alba will build a new mill of 400 tons capacity and remodel its old mill into a tailing mill of 300 tons capacity.

Silver Moon—This company has incorporated with a capital stock of $20,000. The stockholders are G. J. Patterson and Robert Milne, of Joplin, and W. E. Foreman, of Kansas City.

Lucky Budge—This company, operating at Prosperity, has reduced its capitalization from $400,000 to $100,000.

Lichliter Milling Company—This company has started its tailing and sludge mill on the Calumet lease at Neck City. It has about three years' run on rich tailings.

Wattes Brothers—These mine operators will move their San Gabriel mill of 500 tons capacity from Porto Rico to their tract west of Joplin where 24 acres have been proved with four shafts and 36 drill holes in ore.

C. W. Edwards—A good lead strike has been made at 35 ft. depth on the Edwards land in Kansas City bottoms at Joplin by G. W Seibert, J. T. Risler and associates. There are now nine prospects in Kansas City bottoms.

Granby—The same run of lead ore as found on the Yale & Leonard lands in Leadville Hollow, was struck on the Granby land, and 65,000 lb. of ore was taken out the second week from a shaft 22 ft. deep.

Montana

BUTTE DISTRICT

Butte Milwaukee—The [illegible] a shutdown of several months, has resumed operations on its Colonel Sellers claim. A crosscut is being run south on the 200-ft. level for the purpose of intersecting two veins, the outcroppings of which appear on the surface. The recently installed Nordberg hoist, good for 3000 ft. depth is in use.

Butte-Carlisle Copper Mining Company—The company has recently been formed by Duluth and Michigan men, and is capitalized at $1,100,000, with shares of the par value $1. The company will operate the Carlisle and Protection claims which lie north of the Berlin claim of the North Butte Company, and in the vicinity of the Butte & Superior properties and W. A. Clark's Elm Orlu mine. The directors are M. A. Ryan, Charles Bergson, Henry Kimpel, Edward Lynch, and Fred. C. Harris. The company intends, as soon as the surface plant can be installed, to sink to a depth of 1600 ft. before doing any crosscutting or other development work.

Butte Montana—An initial payment of $10,000 on the option of the company's stock was made last week by eastern capitalists. It is understood that work on the company's Alec Scott mine will begin shortly under the direction of R. A. Kerr. The shaft is down 1200 ft. Work will be directed principally toward the development of the orebodies from the 100-ft. level to the 1200-ft. level, with a view to determining the apexes of the veins.

North Butte Extension—At a meeting held in New York, Oct. 6, the directors appointed a committee to prepare a plan of reorganization for the company for submission to stockholders as early as possible. The stock of the company is non-assessable, but it is expected that the plan will call for a subscription of 50c. a share. The committee appointed to work out the reorganization consists of R. J. Horner, George N. Orcutt, C. H. Moore, A. M. Andrews and J. O. Morris, of Chicago. W. D. Rollins is secretary; and W. H. Dowe and W. J. Patterson are counsel to the committee.

Nevada

CHURCHILL COUNTY—WONDER

Hidden Treasure—Work has been started on the Hidden Treasure adjoining the Nevada Wonder on the northwest. The shaft is 180 ft. deep, and shows a vein 72 ft. wide; the ore consists of porphyry alternating with streaks of quartz rich in silver.

Wonder View—Operations are to be resumed on this property; the adit is 800 ft. long and has exposed considerable milling ore.

Wonder Queen—Work on the first lease on this property has begun. During the first day 17 sacks of ore averaging about $200 per ton were taken out. The lease has 18 months to run.

[illegible]

Output—The production last week amounted to 2371 tons valued at $213,750. The Combination mill treated 525 tons of run-of-mine ores and 84 tons of high-grade ore valued at $33,000. The Western Ore Purchasing Company handled from: Mohawk Jumbo, 295 tons; Engineers lease, 252; Florence Consolidated, 242; Consolidated Red Top, 151; dump ore, 14; Kinkead concentrates, 11 tons. The Nevada Goldfield Reduction Company treated from: Combination Fraction, 257 tons; Baby, 7; Mohawk Jumbo, 40; Little Florence dump, 39; Consolidated Red Top, 30; Mohawk Florence, 25; Florence Annex, 35; Mohawk Combination, 25; Begole Syndicate, 280 tons.

Engineers Lease—This lease on Florence ground has just declared its fourth dividend of $90,000 making a total of $360,000 paid since the ore was cut June 15. It has shipped and received settlements for $650,000 of ore and is now producing at the rate of $6000 per day. All this ore comes from above the 300-ft. level.

Kewanas Extension—Sinking has been resumed; the shaft will sink to a depth of 600 feet.

Consolidated Red Top—Returns from the last four shipments consisting of 60 tons each show that the ore averaged $125 per ton. The ore carries $1 silver, the rest in gold. Stoping is now in progress on the 225-ft. level; considerable ore is coming also from the raise from the 150-ft. level.

[illegible] Annex No. 2—The Florence Gem has been reorganized and is now known as the Florence Annex No. 2. The lease has six months to run from Sept. 1. The lease now consists of a block of ground, 250x300 ft., lying between the Baby and the Engineers leases.

Rustler Fraction—This lease has let a contract to sink the shaft from the 500 to the 600-ft. level.

[illegible] is the deepest shaft on any lease in Goldfield as it is now 642 ft. deep. The next station will be cut at the 750-ft. level.

Goldfield Souvenir—A contract has been let to sink the Souvenir shaft 100 ft. deeper.

Goldfield Consolidated—The Claremont shaft which is to be the main working shaft for all the company's properties is 580 ft. deep. A new hoist capable of working to a depth of 1400 ft. has been ordered for this shaft. The Combination mill during August treated 2672 dry tons of ore, the average return from which was $44.41 per ton.

[illegible]

The ore production last week amounted to 5243 tons, valued at $141,225. The Tonopah Extension company shipped 90 tons; MacNamara, 300; Tonopah Mining Company, 3200; Belmont, 550; Montana-Tonopah, 733; Midway, 100; West End, [illegible]

[illegible] ground was opened up last week. The winze in the big vein on the 1000-ft. level has reached a depth of 100 ft. The raise from the east drift on the South vein on the 900-ft. level shows a 4-ft. vein of good ore.

MacNamara—The No. 3 stope on the 275-ft. level this week broke into a body of high-grade ore. This vein has always had an average width of 3 ft. of good ore, but the ore has now widened to 5 ft., with 3 ft. showing large bunches of ruby and brittle silver. Arrangements have been made with the Montana-Tonopah Company to use 10 stamps in their mill for treating MacNamara ore. Last week four carloads were shipped to the smelter and one carload to the Belmont mill. Nearly all of this ore came from No. 2 and No. 3 stopes on the 275-ft. level.

Midway—The first or 200-ft. level is being prospected. A station has been cut and all the necessary equipment put in place.

[illegible] the week, the total depth now being 1195 ft. The formation in the bottom is calcite, showing no change. No progress was made in the drive hole from the bottom of the Red Plume shaft.

NYE COUNTY—MANHATTAN

Stray Dog—Work has been resumed on the Stray Dog, one of the "Larry Sullivan" properties, after a long idleness; 20 men are at work. The ore will be treated at the Peterson mill, which is owned by the same people who have taken the Sullivan properties under a five-year lease.

Mineral Hill—The shaft has been unwatered, and sinking has been resumed. The shaft is at present 236 ft. deep, and will be sunk an additional 200 feet.

Manhattan Consolidated—A trial run on 60 tons of ore at the Peterson mill averaged $32 per ton.

[illegible]

[illegible] purchased by the Blue Bell Mining Company [illegible] The track and pumps which were removed when the mines closed down are being replaced. Mining and milling will begin within 30 days. The lowest workings are 800 ft. deep.

Nye County—Round Mountain

Operations on the Melvin group of tungsten claims which adjoins the famous Round Mountain Monster tungsten property, are progressing rapidly. The adit is now 200 ft. long, and at that point a crosscut 80 ft. long has been driven. The entire distance of 280 ft. has been seamed with stringers of tungsten ore, the richer portions of which have been sacked as broken. About 500 tons of milling ore is on the dump.

Lincoln County—Searchlight

Searchlight Consolidated Company—Work has resumed at the Oregon. The main shaft is now being unwatered.

Duplex—A large shipment of machinery is en route for the Duplex. This consists mainly of improvements for the mill.

Cyrus Noble Mining Company—Creditors of this company bought the property at sheriff's sale at Pioche last week for $30,000. The Searchlight Parallel has leased the Cyrus Noble mill, and is treating dump ore.

White Pine County

Giroux—It is reported that operations in the concentrating mill and the smelter will be begun immediately.

Oklahoma

Ottawa County—Miami

Miami-Yankee—This company has purchased the McCord mill at Joplin and will have it moved to its mine at Miami.

Barnes—J. W. Barnes and associates have struck rich ore at 144 ft. depth and a 19-ft. face has been shown in seven drill holes. The Emma Gordon and other Miami mines are at the 100-ft. level.

Oregon

Josephine County

Almeda Consolidated Mines Company—This mine, in the Galice creek district, has been opened by six adits and about 3000 ft. of development work has been done. The ore carries gold, silver and copper. The main vein is 20 ft. wide.

Pennsylvania

Anthracite Coal

Delaware, Lackawanna & Western Coal Company—This company is putting down one of the largest air shafts in the anthracite field. It is to be sunk to the Baltimore seam, and when completed will be 850 ft. deep.

Bituminous Coal

Latrobe Coal Company—After having been down to 16 ovens part of the time and 55 ovens the balance of the time, since early last winter, the company has fired its plant in full, putting the entire 138 ovens in blast, and putting a full force of men at work, every day in the week. The outlook throughout the Connellsville region has improved materially during the past week.

South Dakota

Custer County

Saginaw—The annual meeting of stockholders resulted in the election of the following directors: I. W. Herber, Custer; Louis Hahn, New Hamburg, Ont.; E. A. Abbott, and George Thompson ,Columbus, O. and B. Eilber, Ubly, Mich. The company is successfully operating its new mill and will make a cleanup about the first of the month.

Lawrence County

Branch Mint—The work of unwatering the mine will be commenced at once which will require about 10 days. The old drifts will be further developed by a large force of miners.

Pennsylvania—Superintendent Hayes is preparing to unwater the 150-ft. shaft before commencing an adit into the hill to discover the main orebody. The property in Rutabaga gulch has been idle for years.

Golden Crest—Work has been resumed by the Detroit owners and grading for the new 200-ton mill has commenced. The plant will use the Moore process and tube mills for regrinding and is expected to be in operation by late fall.

Gilt-Edge-Maid—The operating cost has been reduced and the company is now handling ore averaging about $2 a ton gold at a profit.

Crown—St. Paul, Minn., capitalists have taken hold of the property in the Caliboga district and will operate at once. Two shafts are down 65 ft. and one will be sunk to the 300-ft. level. There is a body of free-milling gold ore that will be opened up.

Pennington County

Hymalulu—A gold orebody has been encountered at shallow depth. The body has been stripped for 18 ft. and the walls not found.

Crown—A. E. Wyatt, of Rockport, Mo., and associates have taken hold of the property on Castle creek and are developing. The lode is 30 ft. wide and carries gold. A mill will be erected to reduce and treat the ore.

Reder Placer—Receiver Kamman, of the Harney Peak Tin Mining Company is awaiting a decision from the Government on the nature of the ground. The Government believes it to be agricultural and not mineral.

Utah

Juab County

Mammoth—This Tintic company has resumed ore shipments, the product going to the Independent smelter at Ogden for treatment. The ore averages about $30 per ton, net.

Lower Mammoth—Since the closing of the Tintic smelter production from this property has ceased, but energy is being vigorously applied toward development. A new orebody, one that is relied on for large returns, was encountered in a raise from the 1600-ft. level.

Gemini—Ore shipments have been resumed from this Tintic property. The mine has been opened to 1900-ft. depth.

Salt Lake County

Silver Shield—This company has recently purchased new equipment for its Bingham mine and the order includes an electric mine locomotive. The mine has been opened by an adit 9280 ft. long.

Wisconsin

Zinc-Lead District

Benton—The Frontier mine is shipping three cars of concentrates weekly that assay 44 to 49 per cent. zinc, besides making a considerable tonnage of low-grade ore and about a ton of lead concentrates daily; the net earnings after paying 10 per cent. royalty range from $1500 to $2000 weekly. The Etna and Pittsburg-Benton mines continue to make large shipments.

Baxter—This mine is shipping regularly and is again being successfully operated under local management.

Blackjack—The stockholders are in litigation among themselves, which is likely to keep the mine closed down for some time.

Bureau—This mine, formerly the Swift & Looney, is about to build a new 50-ton mill to replace the one lost by fire.

Cuba City—The Dall mine has declared a dividend of 10 per cent. and has become a large shipper of lead as well as zinc. A new shaft is being sunk and another boiler is being installed.

Fox Mining Company—The stockholders decided to erect a roasting plant of 20 tons daily capacity at the recent annual meeting.

Galena—The Vinegar Hill mine is operating again, after a temporary shutdown. The water inflow, formerly very heavy, has largely decreased since the local basin has been exhausted and there is now barely enough water for milling.

Hazel Green—The new 100-ton mill of the Kennedy mine is now in operation. It is located at a new shaft on the West hill; it is run by gasolene engines. This is the first company in the Wisconsin district to operate two mills on one orebody.

Murphy Mining Company—This company is pushing new developments by drilling.

United States Zinc Company—This company, formerly the Mills Mining Company, is making the largest output of the district, as the mill is treating 200 tons a day; the company has let a contract for a roaster-magnetic plant of 50 tons daily capacity.

Canada

Alberta

The Canadian Northern Railway Company, which owns 20,000 acres of coal lands in the vicinity of the Brazeau river, in Alberta, has had a preliminary survey made for a projected line from the property to tap the Grand Trunk Pacific Railway at a point between the Pembina and McLeod rivers. The line will be about 50 miles in length, and the grades will be all in favor of the traffic. Tests have been made of the coal which has been found well adapted for steam purposes and much harder than the coal found near Edmonton.

British Columbia—Boundary District

Granby Consolidated—At the annual meeting in New York, Oct. 6, William A. Nash was elected a director to succeed George A. Baker, Jr., who resigned. Other directors were reëlected. President Langeloth reported that the total tonnage of Granby and other ore amounted to 882,661 dry tons, against 665,955 in the previous year, and there were produced 21,126,926 lb. of copper, against 16,403,497 lb. in the previous year, the cost per pound of copper produced, after deducting the value of gold and silver, being 10.24c. The business depression, bad fires in districts where the company owned property, including the Crow's Nest Pass coal fires, and the great decline in the price of copper, worked against the company's net earnings, which were $606,522, a decrease of $1,318,415, leaving a deficit of $320,577, which with the previous surplus of $2,775,758 left a surplus of $2,455,181 at the close of the year. The average price realized for fine copper was 13.3c., and the net cost 10.31c. per pound.

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending Sept. 25 were as follows: Buffalo, 62,000 lb.; Cobalt Central, 50,000; Drummond, 60,000; La Rose, 146,000; McKinley-Darragh, 52,530; Nipissing, 231,590; O'Brien, 122,480; Right of Way, 61,660; Silver Queen, 249,000; Temiskaming, 60,000; Temiskaming & Hudson Bay, 60,000; total, 1,155,670 pounds.

Amalgamated—A narrow vein has been found with wall rock heavily shot with leaf silver. This discovery is within 100 ft. of the Nipissing property, and runs toward that mine.

Silver Bird—This property has been leased to Samuel D. Madden, of the Little Nipissing mine, who will commence work at once.

Watts—A new vein, 10 in. wide, has been struck at the 200-ft. level; silver also shows freely in the wall rock which is about 4 ft. wide. More than 5000 ft. of development work has been done and a three years' supply of ore has been blocked out. A 20-stamp mill has been installed with a capacity of 50 tons of ore daily.

Nova Scotia

Dominion Coal Company—The output for the eight months ending Sept. 30, amounted to 2,865,619 tons, as against 2,587,911 tons for the corresponding period of 1907. The September output, however, shows a falling off, accounted for by some of the company's steamers being delayed for a considerable time by the smoke from forest fires, interfering with navigation on the St. Lawrence.

Yukon Territory

Recent official advices from the Yukon state that the gold production of the Territory for the current year will be larger than for years past, owing to the new method of hydraulic mining introduced. For the first time in the history of the Territory the dredges will be busy until the ice forms late in October. Individual claim-owners have had a busy season. The big ditch of the Guggenheims, which gave employment all season to over 2000 men, is nearing completion. Some discoveries of quartz were made during the summer. Little work is in progress in the White Horse copper district. The White Pass & Yukon Railway has suspended operations on the new branch line to the mines as the mine-owners declined to guarantee a certain monthly tonnage.

Mexico

Chihuahua

Parral Output—The estimated production of the Parral camp for the week ending Sept. 25 was 9280 tons, of which 5390 tons were treated locally and the remainder sent to outside smelters. The August output amounted to 43,010 tons, of which 17,820 tons were of smelting class.

El Rayo—This Santa Barbara company produced $53,000 worth of bullion during the month of August and $30,000 worth during the first 15 days of September.

Hidalgo Consolidated—This company is prosecuting vigorous developments at its Reforma and Clarines mines in the Santa Barbara camp. Ross B. Watkins was lately appointed general manager to succeed W. W. Elmer resigned, while J. J. Hollister, formerly in charge of the Peregrina mines has been selected for the position of assistant manager.

Concepcion—Silver-bearing lead-carbonate ore is reported opened up in minable quantities at this property in the Rio Florida district about 35 miles from Jiminez. R. J. de Morambert and John Harvey are the operators.

Greene Concession—It is given out on apparently reliable authority, that Col. W. C. Greene's 3,000,000-acre concession in this State and in Sonora has been extended to Jan. 12, 1900, one year longer than the original grant.

[illegible]—The sale of this lead-silver property in the Terrazos district for a stated consideration of $30,000 is announced. The property belonged to Anderson & Scabell, of Chihuahua and the purchaser is J. P. Hutchinson, of Chicago. This makes the third property transfer in that camp during the past six weeks.

Rio Tinto—Corrigan, McKinney & Co., who lately acquired the Rio Tinto mines and copper-matting plant, as well as other properties in the Terrazos camp, 25 miles north of Chihuahua, are reported to be planning the immediate erection of a 300-ton smeltery. Better facilities for the transportation of the ore from the district mines to the reduction works will also be provided. R. B. Hutchinson is the manager and Capt. M. D. Murray is superintendent.

Gavilana—Metallurgical tests are now in progress at these silver mines in the vicinity of San Jose del Sitio, with a view to the early erection of suitable reduction works. The tests are being made under the direction of F. C. Pierson, of El Paso, Texas.

Guanajuato

Tajode Dolores—The Catlin & Powell Company, acting on behalf of the Proprietary Mines Company, of America, has taken over the option held by W. Murdock Wiley on this mine situated in the Peregrina-Cubo district. The property is owned by W. H. McCord and L. M. Fairbanks, and is developed to a depth of 500 feet.

Pinguico—The company paid on Oct. 1 its regular semi-annual dividend of 3 per cent. amounting to $60,000 to its preferred stockholders.

Cuba

[illegible]

[illegible]—In August this company shipped $20,000 in gold bars. This mine has been taken over by a Cuban company under the direction of Jose M. Govin, the editor of *El Mundo*. New installations are contemplated, and the engineer, W. F. Grey, has recently reported some excellent prospects on a number of new claims acquired by the company. The adjoining mine, La Casualidad, has about 20 men employed under the direction of J. F. Abelspies. Another undeveloped mine, on the same vein to the east is the Relampago.

New Caledonia

[illegible] July and the seven months ended July 31 are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	July.	Seven Mos.
Nickel ore	[illegible]	[illegible]
Cobalt ore	[illegible]	[illegible]
Chrome ore	[illegible]	[illegible]

In addition there were reported 3 tons [illegible]. The exports of chrome ore in July were all [illegible] United States.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 7—Coal trade in the West seems to be about at a standstill. The cold snap lasted only a few days, not long enough to stimulate domestic trade to any great extent. Steam coal is not in any better demand, but the question of winter supplies is coming forward.

The Lake trade is disappointing. Coal for the North and Northwest usually carried on Lake Superior docks for the summer demands is still standing. It is usually moved by Sept. 1 to make way for the winter supply. This moving is in progress now, but operators fear that before the usual supply for winter can be hauled to replace it, navigation on the lakes will be closed. Should demand revive, a good deal of coal may have to be moved by rail.

The miners and operators in Montana and Wyoming have reached agreements on the mining scale, and work in both those States has been resumed. In Washington a meeting is being held in Seattle this week to form a new agreement.

In the East trade continues quiet, with no special feature. Pennsylvania mines are still in trouble on account of short water supply.

In the matter of the commodities clause of the inter-State commerce law, an appeal from the decision of the Circuit Court to the United States Supreme Court has been allowed.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Sept. 26, in short tons:

	1907.	1908.	Changes.
Anthracite......	4,176,304	3,728,132	D. 448,172
Bituminous.....	28,746,087	24,120,590	D. 4,625,497
Coke.............	10,407,260	5,035,728	D. 5,371,532
Total..........	43,329,651	32,884,450	D. 10,445,201

Total decrease this year to date was 24.1 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad up to the end of September were 749,674 tons in 1907, and 443,470 tons in 1908; a decrease of 306,204 tons.

New York

Anthracite

Oct. 7—No change has taken place in the hard-coal situation during the week and business continues dull. Buckwheat coal continues in fair demand, but other sizes are inactive.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Steam size prices are unchanged: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

There is a little activity displayed in certain consuming districts, notably the Sound, and to a lesser degree at shoalwater ports. It is not believed in the trade that this is any more than a slight flurry. In New York harbor trade has not improved and good grades of steam coal fetch $2.50@2.65 with poorer qualities selling around $2.40. A little demurrage coal is reported to have been offered at as low as $2.25@2.30. Transportation is better and there does not seem to be any scarcity of cars.

In the Coastwise vessel trade large vessels are still in short supply and the demand is not particularly good.

Nevertheless rates are firm, although unchanged from last week. Rates for large vessels from Philadelphia are: Boston, Salem and Portland, 50@55c.; Lynn, 60@65c.; Portsmouth and Bath, 60@65c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@$1; Providence, New Bedford and the Sound, 40@50c. per ton.

Birmingham

Oct. 5—Coal operations in Alabama cntinue to improve. Good prices are obtained, there being but little change from those that prevailed while the strike was on.

A battery of coke ovens at Bessemer, will be in full operation by the end of this week. Efforts are to be made to accumulate some coke if possible before cold weather.

Chicago

Oct. 5—Sales of domestic coals have been somewhat better, owing to cool weather, but show signs of weakening. Steam-coal sales have not increased notably. Supplies of most coals are large and the consequence is depression of prices.

Lump and egg from Illinois and Indiana mines hold at $1.85@2.25; run-of-mine, $1.50@1.75; screenings, $1.20@1.40. Brazil block is fairly firm at $2.25@2.35.

Eastern coals are not so strong. Smokeless is down to $3.05@3.30 for run-of-mine, from a circular price of $3.45, with lump at $4.05@4.30. Hocking is rather dull at $3.15. Youghiogheny holds to $3@3.15 for ¾-in., with the movement steady on contracts.

Cleveland

Oct. 6—An unusual transaction this week was the shipment of a cargo of coal from Cleveland to Buffalo. It was West Virginia coal, consigned to the Lackawanna Steel Company, and was the second cargo of the kind this season. The water rate from Cleveland to Buffalo was 20c. per ton. It is said that there was a considerable saving as compared with delivery to Buffalo by all rail.

Indianapolis

Oct. 6—During the past week, or since the advent of the first cold day following the breaking of the drought, the local coal trade has been unusually brisk. During the last six weeks the quantity of domestic coal sold here was considerably less than half that usual at this season. However, orders are now coming in in bunches and dealers are busy. Prices have not advanced, though consumers seem to anticipate it. Most of the orders now are for Indiana, Ohio and West Virginia coals. The market for hard coal is quiet.

The conditions at the Indiana mines, while considerably improved, are not up to expectations. The low stage of water in the Ohio river is giving Indiana some orders for shipment to points in the South usually supplied by the Pittsburg district. This is being shipped by rail.

Pittsburg

Oct. 6—The coal situation continues dull. Conditions are worse than a week ago, operation of the mines in the Pittsburg district not being more than 50 per cent. The railroad mines are merely running to keep up shipments on Lake contracts with little doing for local consumption, and the river mines are down entirely. Despite the dull conditions, prices are being held firmly by the large producers on the basis of $1.15 for mine-run coal at the mine, and slack is selling at 40@50c. The Pittsburg-Buffalo Company, which is increasing its capacity and has plans for extensive additions, is not rushing the work.

Connellsville Coke—There is no change and prices remain the same as last week, furnace coke on contract selling at $1.65@1.85 and foundry at $2.10@2.25 at oven. Some new contracts were taken during the week and several sales of spot coke were made at a trifle under the regular price. The *Courier* gives the production in both regions at 198,239 tons.

Shipments amounted to 7649 cars as follows: To Pittsburg, 3151; to points west of Pittsburg, 4050; to points east of Connellsville, 448 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal from the United States, eight months ended Aug. 31, long tons, together with coal furnished to steamships in foreign trade:

	1907.	1908.	Changes.	
Anthracite.	1,811,062	1,825,902	I.	14,840
Bituminous.	6,792,022	5,856,077	D.	935,945
Total exports..	8,603,084	7,681,979	D.	921,105
Steamer coal	3,879,112	3,864,411	I.	75,299
Total coal. ...	12,482,196	11,636,390	D.	845,806
Coke.	591,165	401,013	D.	190,152

Canada was the chief customer, taking 6,483,331 tons of the coal exported this year.

United States Coal Imports—Imports of coal into the United States, eight months ended Aug. 31, long tons:

	1907	1908	Changes.	
Anthracite. .	132	15,023	I.	14,891
Bituminous	1,318,793	1,015,301	D.	303,492
Total coal	1,318,925	1,030,324	D.	288,601
Coke	90,186	81,192	D.	8,994

Canada supplied this year 701,310 tons of coal and nearly all the coke; Australia, 276,838 tons of coal. Imports were chiefly on the Pacific Coast.

French Coal Production—Official reports give the production of coal in France for the half-year ended June 30 as follows, in metric tons:

	1907.	1908	Changes.	
Coal.......... ..	17,722,280	18,116,143	I.	393,863
Lignite........	367,438	383,499	I.	16,061
Total	18,089,718	18,499,642	I.	409,924

The production this year is the largest on record for a half-year.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Sept. 26: Best Welsh steam, $3.78; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.30; seconds, $3.12; best small steam, $1.92; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 7—There is manifest little relief from the quiet which has settled down on the markets, and which will hardly be broken before election. Users of iron and steel are not disposed to order material ahead further than is required by their immediate needs.

In pig iron small sales of foundry have been made, and there is some inquiry for basic. Southern furnaces seem to be better supplied with orders than those at the North. No attempt to advance prices for early delivery is possible in the face of the large idle capacity.

Structural material shows a little more movement, but it is chiefly in inquiries and negotiations. Railroad orders are still small, being limited to some bridge work. Orders for rails do not come, and complaint is made that specifications on contracts are slow. There is some movement in light rails and some cutting in prices.

It is reported that the Steel Corporation has taken a contract for 56,000 tons of sheet-bars for delivery in Great Britain. Price is not given; but taking current quotations there, it works out about $17.50 or $18 at mill in Pittsburg district. This is over $9 below the domestic price.

Baltimore

Oct. 6—Exports for the week included 1267 tons steel billets to Liverpool, and 461,771 lb. tin scrap to Rotterdam.

Birmingham

Oct. 5—Southern manufacturers of pig iron are confident that the market will shortly improve. Expecting a strong demand and having already accepted orders for considerable iron to be delivered during the last quarter of the year, efforts are being made to get every possible furnace in shape for operation. Three furnaces are to start by Oct. 10 and two others by the last of the month. There is very little iron to be seen in furnace yards. Deliveries are being kept up. That there is some hesitation until after the election appears, however, to be a universal opinion.

Quotations are firm; No. 2 foundry is $12.50@13. There are no sales of any consequence being made just now, the demand being in small lots for immediate delivery.

Chicago

Oct. 5—The iron market continues quiet. Sales are limited to small lots for delivery this year. A few contracts are being made for 1909 business at $13 Birmingham for Southern No. 2 ($17.35 Chicago), and $17 for Northern No. 2. On last-quarter business 50c. less obtains. These figures are generally on small lots; on a large sale they doubtless would be shaded considerably.

Notwithstanding increased production, Northern iron runs more steadily as to sales and terms of delivery than Southern.

In iron and steel products there is a fair market, with structural steel and heavy rails still light. Coke remains firm at $4.90 for first-class Connellsville, but [illegible]

Philadelphia

Oct. 7—Furnace representatives agree in saying that there are more inquiries for pig iron on the market this week than there has been for months. The discouraging feature incident to it is that the lots asked for are small in amount. The situation at the foundries and mills is not over-encouraging for the placing of large orders. Southern competition is not seriously felt. The price for No. 2 X is $16. Basic sales are quietly made.

[illegible] mand for early delivery of small lots is reported.

[illegible] stricted volume of business transacted. The city trade has further improved. Blacksmithing and small shop demand is noticeably stronger.

Pittsburg

Oct. 6—All hope as to a general improvement in the iron and steel trade before election has been abandoned by well informed men. There are a few who still give out encouraging information, but it cannot be based on tangible grounds. It was expected that the railroads would start things going early this month by placing large orders for steel rails and equipment, but so far they have not shown any signs of coming into the market. Consumers continue to place orders for various lines of finished material for immediate requirements and these orders are keeping the mills running to about the same capacity as for several weeks past. There is no change in the operations of the Carnegie Steel Company. The big order for sheet-bars for export has not resulted in the starting of the idle steel plant at Mingo Junction, as expected, and the present works are said to be able to take care of all the new business going. The National Tube Company is operating to about 70 per cent. of capacity. The American Sheet and Tin Plate Company is not operating quite 50 per cent. of its work.

Pig Iron—The market has not been in as bad shape for many years. No sales are recorded this week and but few inquiries are reported. Representatives of large producers and selling agencies agree that prices have sagged. The Pittsburg Steel Company does not admit that it bought any iron during the past few weeks or that it will come into the market. It is generally believed, however, that this company is negotiating to close a deal for 150,000 tons a year of basic pig iron for a period of from three to five years. If the transaction is made it will go to the Shenango Furnace Company. The number of blast furnaces in the Shenango and Mahoning valleys has been increased to 21, of which 12 are running.

Prices are nominally as follows: Standard bessemer, $15; malleable bessemer, $14.50; basic, $14.25; No. 2 foundry, $14.50; gray forge, $13.50, all f.o.b. Valley furnaces. It is certain that all of these prices could be shaded.

Steel—Some sales of billets are recorded, but all were for small lots for prompt delivery. Prices remain unchanged at $25, Pittsburg. Sheet-bars are $27.50; plates, 1.60c.; merchant-steel bars, 1.40 cents.

Sheets—The market is fairly active. Prices firm, 2.50c. being quoted for black sheets and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese—A number of good inquiries are in the market, one calling for 700 tons for delivery during the next five months. Prices are firm at $45@46 per ton, Pittsburg.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 7.

At all U. S. Ports in August and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1908..	$ 6,597,101	$ 4,257,255	Exp. $ 2,339,846
" 1907..	4,596,879	3,223,772	" 1,373,107
Year 1908..	64,960,348	33,614,330	" 31,346,018
" 1907..	48,375,977	28,103,201	" 20,272,776
Silver:			
Aug. 1908..	4,130,853	3,194,426	Exp. 936,427
" 1907..	6,748,085	4,882,622	" 1,865,463
Year 1908..	34,576,144	27,375,355	" 7,200,789
" 1907..	41,922,336	30,665,458	" 11,256,878

Exports of specie from New York week ended Oct. 3: Gold, none; silver, $806,139, to London and Paris. Imports: Gold, $144,850, from the West Indies and Panama; silver, $95,163, from Mexico and South America.

Specie holdings of the leading banks of the world, Oct. 3, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$311,896,300
England..... ..	$190,087,725	....	190,087,725
France...... ..	648,284,785	$179,031,660	827,316,445
Germany	179,045,000	74,295,000	253,340,000
Spain...........	78,620,000	169,045,000	247,665,000
Netherlands....	38,848,000	20,476,000	59,324,000
Belgium..	20,080,000	10,040,000	30,120,000
Italy......... .	185,185,000	22,500,000	207,685,000
Russia	600,260,000	36,285,000	636,545,000
Aust.-Hungary	242,725,000	65,185,000	307,910,000
Sweden.........	20,160,000	....	20,160,000
Norway...... ..	8,145,000	....	8,145,000
Switzerland....	23,020,000	....	23,020,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

		Silver.				Silver.	
Oct.	Sterling Exchange.	New York, Cents.	London, Pence.	Oct.	Sterling Exchange.	New York, Cents.	London, Pence.
1	4.8630	51⅝	23 13/16	5	4.8610	51⅞	23 15/16
2	4.8625	51½	23¾	6	4.8630	51¾	23⅞
3	4.8630	51⅝	23 13/16	7	4.8640	51⅞	23 15/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Sept. 24:

	1907.	1908.	Changes.
India.......	£8,975,154	£6,882,913	D. £2,092,241
China.......	....	516,400	I. 516,400
Straits......	625,950	112,385	D. 513,565
Total......	£9,601,104	£7,511,698	D. £2,089,406

Imports for the week, £4000 from Mexico, £8000 from the West Indies and £164,000 from New York; £176,000 in all. Exports, £325,850 to India.

The outlook for silver, while showing as yet no speculative tendencies for a rise, is regarded as more steady and there seems to be less effort now to depress the price than has been apparent for some months past; the feeling is more cheerful.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

	Copper.			Tin.	Lead.	Spelter.	
Oct.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
1	13⅜ @13⅝	13¼ @13⅜	59⅞	29½	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
2	13⅜ @13⅝	13¼ @13⅜	59⅝	29½	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
3	13⅜ @13⅝	13¼ @13⅜	....	29½	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
5	13⅜ @13⅝	13⅛ @13⅜	59 11/16	29⅜	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
6	13⅜ @13⅝	13⅛ @13⅜	59⅞	29½	4.42½ @4.47½	4.75 @4.80	4.60 @4.65
7	13⅜ @13⅝	13⅛ @13⅜	59 11/16	29⅝	4.42½ @4.47½	4.75 @4.80	4.60 @4.65

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis. New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been devoid of interest throughout the week. There has been no material business from Europe where trade, generally, is hesitating on account of political developments. Domestic consumers are supplied for the next few weeks and inclined to wait until after election before entering into further commitments. Still, here and there, there is some belated buying of goodly quantities, but only of electrolytic, the market for Lake being almost stagnant and nominal. One lot was sold at 13⅝c., which represents the top of the market. In spite of the dullness the sentiment continues optimistic. The market closes at 13⅜@13⅝c. for Lake copper; 13⅛@13⅜c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 13@13⅛ cents.

The upward tendency in the London market received a severe shock on the first of the month when the publication of the statistics disclosed an increase in the visible supplies for the second half of September of 1800 tons; but considering this and the subsequent upheaval in the speculative markets owing to political causes, the market held its own very well, closing steady at £59 13s. 9d. for spot, £60 10s. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@75 10s.

Manufactured Copper—Sheets, cold-rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 14¾c. base, carload lots at mill.

Tin—There were no special features to the London market and in consequence it hardly fluctuated. The close is cabled as firm at £134 5s. for spot, £135 12s. 6d. for three months.

The domestic market has been steady and transactions between traders continued. The consumption of tin leaves still a great deal to be desired, and for that reason no interest at all is taken in future delivery by the users of this metal. Spot tin at the close can be bought at about 29⅝c. per pound.

Statistics for the month of September show an increase in the visible supplies of 1400 tons.

Receipts of tin at Pacific Coast ports for the eight months ended Aug. 31 were 1678 long tons in 1907, and 1343 tons in 1908; a decrease of 335 tons.

Lead—There is a great deal of pressure to sell on the part of the Missouri producers and dealers, but orders are few and far between. The market has eased off further and closes weak at 4.40@4.45c. New York.

At St. Louis lead is dull and salable only in a retail way. Missouri brands can be had at 4.32½c., East St. Louis.

A squeeze of the shorts in London, timed during a period of small arrivals from Australia and Spain, resulted in a sharp advance, and the market closes firm at £13 11s. 3d. for Spanish lead, £13 13s. 9d. for English lead.

Spelter—Nothing of importance has transpired. Buyers are holding off for the time being, but on the other hand sellers are well supplied with orders and are not offering. The close is steady at 4.75@4.80c. New York, 4.60@4.65c. St. Louis.

The London market is unchanged at £19 15s. for good ordinaries, £20 for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

German Zinc Trade—Paul Speier, Breslau reports imports and exports of spelter and zinc products in Germany, eight months ended Aug. 31, metric tons.

	Imports.		Exports.	
	1907.	1908.	1907.	1908.
Spelter......... ...	20,415	18,554	40,873	43,064
Zinc sheets.......	80	248	12,741	10,758
Zinc scrap.........	716	1,078	4,750	3,691
Zinc dust..........	646	762	1,462	1,640
Zinc pigments....	5,493	4,902	18,741	17,307
Zinc ore...........	115,398	127,353	21,703	23,715

Zinc pigments include zinc white and zinc sulphide.

Other Metals

Antimony—The market is weak and there is a pressure to sell. A number of dealers unloaded at low prices during the week. Quotations are 8@8¼c. for Cookson's, 7¾@7⅞c. for Hallett's and 7½@7⅝c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

The production of cadmium in Silesia, Germany, in the half-year ended June 30 was 15,901 kg., a decrease of 692 kg. from last year.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is higher, at $46 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about $43 for domestic orders, and $41 for export. London price is again higher at £8 10s. per flask, but £8 7s. 6d. is done with jobbers.

Platinum—Quotations are $22.50 for hard platinum, $20 for ordinary and $16 for scrap.

Imports and Exports of Metals

Exports and imports of metals in the United States for the eight months ended Aug. 31 are reported as follows, in the measures usual in the trade:

	Exports.	Imports	Excess	
Copper, long tons	215,361	51,800	Exp.	163,561
Copper, 1907..	112,649	86,127	Exp	26,522
Tin, long tons....	156	23,441	Imp	23,285
Tin, 1907.......	399	28,694	Imp	28,295
Lead, short tons.	47,606	72,033	Imp	24,427
Lead, 1907.... .	30,053	49,289	Imp.	19,236
Spelter, sh. tons.	2,111	503	Exp	1,608
Spelter, 1907....	391	924	Imp	533
Nickel, lb.........	7,406,645	11,849,238	Imp	4,442,593
Nickel, 1907....	6,584,699	12,698,671	Imp	6,113,972
Antimony, lb		5,291,489	Imp	5,291,489
Antimony, 1907.		5,598,118	Imp	5,598,118
Platinum, oz.....		19,385	Imp	19,385
Platinum, 1907.		51,300	Imp	51,300
Quicksilver, lb...	109,936	....	Exp	109,936
Quicksilver, '07	522,250	....	Exp.	522,250
Aluminum, value	$267,524	..	Exp	$267,524
Aluminum, 1907	237,556	....	Exp	237,556

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include re-exports of foreign material. Zinc dross exported, 15,805,362 lb. in 1907, and 12,859,411 lb. in 1908. Zinc ore exported, 12,141 tons in 1907, and 18,887 tons in 1908. Zinc ore imported, 16,624 tons calamine and 13,681 tons other ores; 30,305 tons in all, in 1908; not reported in 1907. Antimony ore imported, 2,253,851 lb. in 1907, and 974,732 lb. this year.

Missouri Ore Market

Joplin, Mo., Oct. 3—The highest price paid for zinc ore was $40.50, the assay base opened the week at $38 per ton of 60 per cent. zinc, dropping to $37 Thursday and closing the week at $36 for best grade ores. One remarkable point of the market was a base offering of $38.50 for ore heavy in iron, the penalties on which would bring it to a low price even at that. Silicate sold as high as $20, on a base of $20 per ton of 40 per cent. zinc. The average price, all grades, was $34.84. The lead-ore market, in proportion to the pig-lead market, is the lowest in years, having dropped back to the old scale of the Picher Lead Company in vogue in the early days of mining. The highest price was $54, while a large amount of the best ore brought only $53 and down to $52. The average price, all grades, is $53.64 per ton.

Following are the shipments of zinc and lead ore from the district for the week ended Oct. 3:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin....	[illegible]	290,120	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Oronogo	[illegible]	1,[illegible]	12,361
Alba-Neck	[illegible]		11,048
Spurgeon	[illegible]	[illegible]	9,031
Prosperity	[illegible]	[illegible]	6,166
Aurora	[illegible]		6,108
Granby	[illegible]	17,[illegible]	5,990
Duenweg	[illegible]	[illegible]	5,346
Miami	235,050		2,820
Badger....	[illegible]		[illegible]
Quapaw	[illegible]		[illegible]
Carl Junction	[illegible]		[illegible]
Zincite	[illegible]	[illegible]	[illegible]
Wentworth	103,120		1,404
Cave Springs	[illegible]		1,195
Carthage	[illegible]		1,122
Peoria	[illegible]		[illegible]
Totals ...	[illegible]	1,14[illegible]	$207,[illegible]
40 weeks...............	**382,177,200**	**57,929,820**	**$8,054,913**

Zinc value, the week, $177,189; 40 weeks, $6,4[illegible]
Lead value, the week, 30,792; 40 weeks, 1,[illegible]

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

	ZINC ORE.				LEAD ORE.	
Month.	Base Price.		All Ores.		All ores.	
	1907	1908	1907	1908	1907	1908
January	[illegible]	[illegible]	$45.84	[illegible]	[illegible]	$46.88
February....	48.30	[illegible]	47.11	34.92	84.58	49.72
March	[illegible]	36.19	48.66	34.19	82.75	49.90
April	[illegible]	[illegible]	48.24	34.08	79.76	52.47
May	[illegible]	34.19	[illegible]	[illegible]	[illegible]	56.06
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60.48
July	[illegible]	34.55	45.79	31.67	58.18	59.90
August ..	[illegible]	36.53	43.22	[illegible]	[illegible]	60.34
September	41.00	[illegible]	40.11	34.44	53.52	54.59
October	41.75		39.83		[illegible]	
November	38.60		35.19	..	43.40	
December	31.50		30.87	..	[illegible]	
Year	$44.[illegible]		$43.68	......	$68.90	

[illegible] **Lead ore prices are the average for all ores sold.**

Wisconsin Ore Market

Platteville, Wis., Oct. 3—For the week ended Sept. 26 base price for zinc ore was $38; highest price for lead ore, $55 per ton. The highest price paid for zinc ore this week was $39, on a basis of $38 per ton of 60 per cent. zinc. The best price paid for lead ore was $55 per ton.

Shipments from the district, two weeks ended Oct. 3:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,20[illegible]	[illegible]	
Cuba City	903,380	88,200	
Hazel Green	742,690	[illegible]	
Platteville	592,170	45,000	[illegible]
Days Siding	[illegible]		
Rewey	[illegible]		
Galena	[illegible]		
Livingston	[illegible]		
Dodgeville		[illegible]	
Highland..............	**499,600**		
Linden	[illegible]		
Harker	[illegible]		
Total	[illegible]	[illegible]	[illegible]
Year to Oct. 10..	[illegible]	[illegible]	[illegible]

Shipments to Electrostatic Separator, Platteville, two weeks, 282,482 lb.; to Joplin Separator Works, Galena, 722,900 lb.; to Enterprise Roaster, Platteville, 396,800 lb. zinc concentrates.

Chemicals

[illegible] shows some improvement and inquiries are coming in more freely. Present prices are firm.

[illegible] weak and buyers are timid. Prices are 3⅛@3¼c. per lb. in carloads.

Copper Sulphate—Demand is light and business small. Prices unchanged at $4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the statistics of nitrate of soda in the United States on Oct. 1 as follows, in long tons:

	1908	1907	Changes	
Stocks, Jan. 1	[illegible]	[illegible]	I.	[illegible]
Imports, 9 months	[illegible]	[illegible]	I.	[illegible]
Total supply	[illegible]	[illegible]	I.	[illegible]
Deliveries, 9 months	[illegible]	[illegible]	I.	[illegible]
Stocks, Oct. 1	[illegible]	[illegible]	I.	[illegible]
Afloat for U. S. ports	[illegible]	[illegible]	I.	[illegible]

Quantities afloat include all cargoes known and due to arrive before Jan. 15 next.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States eight months ended Aug. 31 were as follows:

	Exports.	Imports.	Excess.	
Copper sulphate, lb.		[illegible]	I.	[illegible]
Bleaching powder, lb.	[illegible]	[illegible]	I.	[illegible]
Potash salts, lb..	**139,729,119**	**734,514**	**I.**	**138,994,605**
Soda salts, lb.	[illegible]	[illegible]	I.	[illegible]
Acetate of lime, lb.		[illegible]		[illegible]
Nitrate of soda, tons	[illegible]	[illegible]	I.	[illegible]
Phosphates, tons	[illegible]	[illegible]	I.	[illegible]
Sulphur, tons	[illegible]	[illegible]	I.	[illegible]
Pyrites, tons	[illegible]			[illegible]

Estimating sulphur contents of pyrites, the total sulphur imported this year was approximately 202,784 long tons.

Mining Stocks

[illegible] markets have been irregular, with small changes. The close sees a heavy market due to large sales of stocks on foreign ac- [illegible] turbed by the troubles in the Balkans, which, it is feared, will cause diplomatic complications and possibly war. These sales reacted on New York, and the Exchange today is rather weak and pessimistic.

There was one sale of Homestake, of [illegible] changing hands at $88.25 per share.

The Curb market was rather dull and irregular. Copper stocks were not especially active. Orphan Copper, which sold up to $8.37½ last week, was quoted at $2.62½ today, on small sales. Cobalt shares were fairly active.

Boston

Oct. 6—Another week of a gradual hardening of prices is to be reported in the mining-share list. The announcement of the Calumet & Hecla decision in the United States Court, of Michigan, proved to be a fillip to stocks Monday, when a period of old-time buoyancy was manifested, particularly in the issues in which Calumet & Hecla interests figure. Calumet itself jumped up $40 to $680 per share reacting but $10. Osceola shot up to $124.50, reacting to $118.50 tonight, which is $12.50 above the price of a week ago. Centennial rose $4.50 to $36.50, losing $1.75 of it, and Allouez rose $5.50 to $39.50. Lake Copper rose $2.75 to $14.75.

Amalgamated advanced $3.37½ to $76.62½, closing at $75.75 tonight. Arizona Commercial has been a distinctive feature, having risen $3.87½ to $34. Copper Range rose $2.50 to $75. Champion Copper directors have declared another $1 dividend making three thus far this year, against $10 paid in 1907. North Butte spurted almost $4 to $83.75, with $1 setback. There is always a broad market for the so-called Cole-Ryan stocks, owing to Western buying.

Ahmeek, a Bigelow property, shot up to $120, almost a $20 gain in a day. Davis-Daly has been conspicuous with a sharp advance to $3.75, assessment paid.

STOCK QUOTATIONS.

NEW YORK Oct. 6		BOSTON Oct. 6	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	½	Adventure	8⅝
Amalgamated	76	Allouez	37
Anaconda	43⅞	Am. Zinc	†23
Balaklala	‡2⅛	Arcadian	3⅝
British Col. Cop.	6½	Arizona Com.	33⅞
Butte & London	....	Atlantic	18¼
Butte Coalition	25	Bingham	.30
Colonial Silver	11/16	Boston Con	13½
Cum. Ely Mining.	7¾	Calumet & Ariz.	117
Davis Daly	2	Calumet & Hecla.	670
Dominion Cop	13/16	Centennial	34¾
Douglas Copper	3½	Con. Mercur	.40
El Rayo	3½	Copper Range	74¾
Florence	3½	Daly-West	9½
Foster Cobalt	.60	Franklin	12¼
Furnace Creek	.16	Greene—Can.	10¼
Giroux	4½	Isle Royal	23½
Gold Hill	5/16	La Salle	14½
Goldfield Con.	5¾	Mass	6
Granby	102	Michigan	14
Greene Gold	⅜	Mohawk	63½
Greene G. & S	⅛	Nevada	16⅛
Greenw'r & D. Val.	‡ 75	North Butte	82⅜
Guanajuato	1⅝	Old Colony	.60
Guggen. Exp.	‡160	Old Dominion	43½
Hanapah	‡ 20	Osceola	119
McKinley Dar.	92	Parrot	26
Micmac	2⅛	Quincy	94
Mines Co. of Am.	1¼	Rhode Island	4
Mitchell Mining	⅛	Santa Fe	1¾
Mont. Sho. C	⅞	Shannon	14⅞
Nev. Utah M. & S	3	Superior	26¼
Newhouse M. & S	5¼	Tamarack	73
Nipissing Mines	8⅜	Trinity	17¾
Old Hundred	½	United Cop., com.	11⅝
Silver Queen	1.16	U. S. Oil	25¾
Stewart	11/16	U. S. Smg. & Ref*.	39½
Tennessee Cop'r	41¾	U.S.Sm. & Re., pd*.	44½
Tri-Bullion	1 1/16	Utah Con.	43
Union Copper	⅝	Victoria	4½
Utah Apex	4½	Winona	5⅛
Utah Copper	41	Wolverine	137
Yukon Gold	4 5/16	Wyandotte	2⅞

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	27¾
Am. Smelt. & Ref.	87
Am. Sm. & Ref., pf.	104
Bethlehem Steel	22¼
Colo. Fuel & Iron	35⅝
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	83½
National Lead, pf.	102½
Pittsburg Coal	‡10⅛
Republic I. & S.	22
Republic I. & S., pf.	79
Sloss-Sheffield	60½
Standard Oil	625
U. S. Red. & Ref.	‡9
U. S. Steel	45½
U. S. Steel, pf	109
Va. Car. Chem.	33⅝

BOSTON CURB	
Ahmeek	‡120
Black Mt	‡3⅞
East Butte	8¾
Hancock Co.	6
Keweenaw	4
Majestic	.75
Raven	.88
Shawmut	19
Superior & Pitts.	14
Troy Man.	‡.30

ST. LOUIS Oct. 3

N. of Com.	High.	Low.
Adams	40	.30
Am. Nettie.	04	.03
Center Cr'k	2.25	1.50
Cent. C. & C.	68.00	66.00
C.C. & C. pd.	75 00	73.00
Cent. Oil	105.00	100.00
Columbia	5.00	4.00
Con. Coal	21.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	12.50

LONDON Oct. 7

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 0
Esperanza	3 4 4½
Tomboy	1 2 6
El Oro	1 5 0
Oroville	0 11 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 7.
Furnished by Weir Bros & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.16
Belcher	.23	St. Ives	25
Best & Belcher	.43	Triangle	04
Caledonia	.13	BULLFROG STOCKS	
Chollar	.17	Bullfrog Mining	.03
Comstock	.24	Bullfrog Nat. B.	04
Con. Cal. & Va	.70	Gibraltar	03
Crown Point	.30	Gold Bar	03
Exchequer	.30	Homestake King	22
Gould & Curry	.16	Montgomery Mt.	07
Hale & Norcross	.38	Mont. Shoshone C.	.75
Mexican	.70	Original Bullfrog.	.01
Ophir	1.89	Tramp Cons.	.16
Overman	14	MANHAT'N STOCKS	
Potosi	.18	Manhattan Cons.	.05
Savage	.28	Manhat'n Dexter.	.04
Sierra Nevada	.20	Jumping Jack	.03
Union	28	Stray Dog	.03
Utah	.05	MISCELLANEOUS	
Yellow Jacket	.50	Golden Boulder	.06
TONOPAH STOCKS		Bonnie Clare	.05
Belmont	1 20	Lee Gold Grotto	...
Extension	.66	Nevada Hills	1.00
Golden Anchor	.01	Nevada Smelting.	.87½
Jim Butler	24	Pittsburgh S. Pk.	.93
MacNamara	.51	Round Mt. Sphinx	.15
Midway	30		
Montana	95		
North Star	06		
Tono'h Min. of N.	6.75		
West End Con.	.50		
GOLDFI'D STOCKS			
Adams	04		
Atlanta	.21		
Booth	.37		
Columbia Mt	.21		
Comb. Frac	1 19		
Cracker Jack	.06		
Dia'dfield B. B. C.	.14½		
Goldfield Belmont	.05		
Goldfield Daisy	.75		
Great Bend	.30		
Jumbo Extension	.34		
Katherine	...		
Kendall	.14		
Lone Star	.08		
May Queen	.06		
Oro	.10		
Red Hill	.21		
Roanoke	..		
Sandstorm	.23		

COLO. SPRINGS Oct. 3

Name of Comp.	Clg.
Acacia	6⅜
Black Bell	....
C. C. Con.	3¾
Dante	....
Doctor Jack Pot	6½
Elkton	66
El Paso	38¾
Findlay	20
Gold Dollar	‡7
Gold Sovereign	3
Isabella	25½
Index	....
Jennie Sample	‡2⅜
Jerry Johnson	‡4
Mary McKinney	30
Pharmacist	3⅛
Portland	1.05
Un. Gold Mines	4
Vindicator	‡83½
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
Bald Eagle, Cal.	Sept. 25	Oct. 15	$0.10
Belcher, Nev.	Sept. 15	Oct. 6	0.10
Birchville, Cal.	Nov. 2	Nov. 20	0.03
Brunswick Con., Cal	Oct. 20	Nov. 19	0.03
Bullion, Nev.	Oct. 29	Nov. 20	0.05
Caledonia, Nev	Oct. 21	Nov. 11	0.05
California, Cal.	Oct. 17	Nov. 7	0.02
Colo. Hydraulic, Cal.	Sept. 23	Oct. 17	0.025
Con. Imperial, Nev.	Sept. 29	Oct. 22	0.01
Gould & Curry, Nev.	Oct. 7	Oct. 29	0.10
Graciosa Oil, Cal.	Sept. 16	Oct. 14	0.10
Lady Washington, Nev.	Oct. 26	Nov. 16	0.05
Massasoit, Utah	Oct. 17	Nov. 5	0 01
Nonpareil, Utah	Sept. 15	Oct. 15	0.01
Old Mission Oil, Cal	Sept. 18	Oct. 8	0.075
Oro Cobre, Cal.	Oct. 3	Oct. 26	0.02
Overman, Nev	Sept. 23	Oct. 14	0.05
Sierra Nevada, Nev.	Oct. 14	Nov. 4	0.10
Wheeler, Utah	Oct. 5	Oct. 23	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55.678	31.769	25.738
February	68.835	56.000	31 852	25.855
March	67 519	55 365	31 325	25.570
April	65 462	54 505	30.253	25.133
May	65.971	52.795	30 471	24.377
June	67 090	53.663	30 893	24.760
July	68 144	53.115	31 366	24.514
August	68.745	51.683	31 637	23.858
September	67.792	51.720	31 313	23.877
October	62.435	......	28 863	.....
November	58.677	......	27 154	...
December	54.565	.....	25.362	
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106 739	62.386
February	24 869	12 905	25.236	13 098	107.356	58 786
March	25 065	12 704	25.560	12 875	106.594	58.761
April	24 224	12 743	25 260	12 928	98 625	58.331
May	24 048	12 598	25 072	12.788	102.375	57.387
June	21 665	12 675	24 140	12 877	97.272	57.842
July	22 130	12.702	21 923	12.933	95.016	57.989
August	18 356	13.462	19.255	13.639	79.679	60.500
September	15 565	13.388	16.047	13.600	68 375	60.338
October	13.169	......	13.551	.....	60 717	....
November	13.391	....	13.870	.....	61 226	.....
December	13 163	..	13.393	..	60 113	.
Year	20 004	......	20 661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36 689	28.815
April	40.938	31.702	October	32 620	......
May	43.149	30 015	November	30 833	.....
June	42.120	28 024	December	27.925	.... .
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3.691	19 828	14 469
February	6.000	3.725	19 531	14 250
March	6.000	3 838	19 703	13 975
April	6.000	3.993	19 975	13 469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20 188	12.600
July	5.288	4.447	20.350	13.000
August	5 250	4.580	19 063	13.375
September	4.813	4.515	19 775	13.125
October	4.750	......	18 531	......
November	4.376	......	17.281	.....
December	3.658	.	14.500	
Year	5.325	......	19.034	....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27 125	20 563
February	6.814	4.788	6.664	4.638	25.938	20 875
March	6 837	4.665	6.687	4.527	26 094	21 075
April	6.685	4.645	6 535	4.495	25 900	21 344
May	6 441	4.608	6.291	4.458	25 563	19.906
June	6.419	4.543	6.269	4.393	25 469	19 000
July	6 072	4.485	5.922	4.338	23 850	19.031
August	5.701	4 702	5.551	4.556	21 969	19.350
September	5 236	4.769	5.086	4.619	21.050	19.563
October	5.430	......	5.280	......	21 781	......
November	4.925	...	4.775	......	21.438	......
December	4.254	.	4.104	.	20 075	. ....
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, OCTOBER 17, 1908. NO. 16.

Operation of an Anaconda Copper Converter

Reactions of the Process, Details of Lining, Charging, Blowing, Pouring and Changing the Vessels and Methods of Overcoming Difficulties

BY C. OFFERHAUS

GENERAL VIEW OF CONVERTER HOUSE, ANACONDA COMPANY

In smelting sulphide ores or mixtures containing sulphide ore, matte is obtained as a first concentration product.

Matte is cuprous sulphide with a varying quantity of ferrous sulphide (Cu_2S, $x\,FeS$). It contains more or less magnetic oxide of iron and the silver and gold, which were present in the ore. It may contain metallic iron and copper, depending upon its grade. The outcome of researches of different experimenters regarding its constitution do not agree (Gibb & Philip, *Trans.* A. I. M. E., XXXVI, p. 665; Paul Röntgen, "Zur Kenntniss der Natur des Kupferstein," *Metallurgie* 1906, p. 479; H. O. Hoffman, "Constitution of Ferro-Cuprous Sulphides," *Trans.* A. I. M. E., 1906, LXXIII). The definition given above will serve our present purpose, however. The valuable substances in the matte are copper, gold and silver. If a matte is rich in silver and gold, different wet processes are practiced to extract the valuable metals directly from the matte. In producing copper from matte (applying dry processes) the gold and silver remain with the copper.

Two dry processes are practiced to make copper from the matte, the blister process and the converter process. Both work on the same principle; the impurities (mainly iron and sulphur) are burned off and since the affinity of sulphur for copper is greater than that of sulphur for iron, we get rid of the ferrous oxide formed in the form of ferrous silicate, copper still being present as cuprous sulphide. The sulphur burns off as sulphur dioxide. The blister process oxidizes matte in the melting phase; it is the older process and the slower one. The converter process oxidizes matte in the molten state, by forcing air through it. It is much more rapid and has replaced the blister process almost entirely

THE CONVERTER

A suitable apparatus for carrying out the oxidation of the molten matte by forcing air through it is the converter. Apparatus as well as process are taken from the iron industry. The operation can be divided into two periods.

The products of oxidation formed during the first or slag-forming period are cuprous oxide, ferrous oxide and sulphur dioxide. The cuprous oxide formed, however, reacts immediately with the ferrous sulphide, reforming cuprous sulphide. Ferrous oxide as soon as it is formed, combines with the silica of the lining of the converter. Sulphur dioxide goes off as such. At a certain moment practically all the iron is oxidized to ferrous oxide and is present as a silicate, the copper being in the form of cuprous sulphide and this moment can be recognized distinctly by the appearance of the flame at the nose of the converter. The slag is now poured off and the second period starts in.

---

*Metallurgical and chemical engineer, Columbia University, New York City.

The content of the converter is now practically pure molten cuprous sulphide (white metal containing about 70 per cent. copper; cuprous sulphide contains 77 per cent. copper). The oxidation of this white metal is carried on as before in the same converter. Cuprous oxide is formed, but interacts promptly with unoxidized cuprous sulphide, forming copper. Finally practically all the copper is present as metal, and this state is again indicated by the appearance of the flame. At this time practically all the sulphur is burned off and copper oxides are not yet present in a noticeable quantity.

The following are the main reactions which take place during both periods:

$$\text{1st period.}\begin{cases}\mathrm{Cu_2S.xFeS \ldots\ldots Cu_2O + FeO + (CuO)} \\ \qquad\qquad\mathrm{+ (Fe_3O_4) + SO^2} \\ \mathrm{Cu_2O + FeS = Cu_2S + FeO} \\ \mathrm{FeO + XSiO_2 = FeO.x.SiO_2}\end{cases}$$

$$\text{2d period.}\begin{cases}\mathrm{Cu_2S + 3O = Cu_2O + SO_2} \\ \mathrm{2Cu_2O + Cu_2S = 6Cu + SO}\text{[1]}\end{cases}$$

[1] O. Doeltz, *Metallurgie*, 1907; p. 442 and 468.

The process of matte converting proceeds without the help of external heat. The heat of combustion of the sulphur and the iron and the heat of combination of the ferrous oxide and silica provides the necessary energy to heat the blast, to decompose the matte and compensates for the heat lost by the escaping gases, with the slag and by radiation. Considering the reactions, which take place in each period, the quantities of the different elements present and their heat of combustion, one will find that the heat developed during the first period is much greater than that generated during the second period. The first period blow produces the initial temperature for the second period.

The first experiments of blowing matte in a bessemer converter date from 1878. Manhès (1880) replaced the bottom tuyeres of the bessemer converter by horizontal tuyeres in the side of the converter some distance above the bottom, leaving in this way a bottom space, where the copper collects and stays protected from the direct action of the blast. In doing so he made the bessemerizing of matte a practical process. Matte converting in a vertical converter with bottom tuyeres is possible, provided the size of the converter surpasses a certain limit; the size of the converter being under this limit, its content will freeze up some time during the second period. Vertical converters work more quickly, the mechanical wear of the lining is less than in the horizontal converter and the wear of the lining even. A blast of higher pressure is necessary, however, and the critical points are far more difficult to recognize. The operation of lining a vertical converter is more difficult. The tendency is to use horizontal converters with side tuyeres and low-pressure blast.

The main difference between iron and matte converting is, that in bessemerizing iron the product to start with is comparatively pure and the impurities (about 6 per cent.) have a high combustion value. The greater part of the oxidized impurities are volatile and the oxides which are not volatile require a proportionally small quantity of flux to slag them. Only a part of the flux required is provided by the lining. In bessemerizing matte, however, the impurities have a comparatively low heat of combustion, but they are present in large quantities (50 per cent. and more). The product of combustion, which is not volatile (ferrous oxide) needs a large amount of silica to slag it, and this silica is provided by the lining. The main function of the lining in this case is, therefore, to be eaten away, rather than to protect the shell of the converter.

Lining the Converter

The Anaconda converters are of the horizontal barrel type. They are 8 ft. in diameter and 12 ft. 6 in. long. The shell is of boiler plate. It consists of two parts, body and top, to facilitate the operation of lining. Both are first lined with 9-in. firebrick at the ends and 4-in. firebrick around the shell (bricks 4x9 in.). They are then transferred to the lining stand.

The material for the lining of the converter must be sufficiently plastic and cheap, and should contain as much free silica as possible. Since there is a considerable quantity of lining material consumed, it will be profitable to use silicious ores containing gold, silver or copper. The extracted metals pay for the cost of the operation of lining, or at least reduce it. The material that will be used for the lining will depend upon local conditions. In Anaconda Snowstorm ore from Idaho (a silicious ore with about 85 per cent. silica and 3.5 per cent. copper as carbonate) is used with pond slum (precipitate of the settling ponds, which receive the slum water from the mill) containing 2.5 per cent. copper and 60 per cent. silica, as a binder. The ore is ground, sized (all sizes are used) and then mixed with the pond slum. Two to four parts by volume are mixed with one part of pond slum, the relative proportion depending upon the humidity of the materials. The proportion of the constituents of the lining material, its size, humidity and also the operation of tamping the lining in, are matters which require a good deal of experience.

The lining material is dumped in layers by means of wheelbarrows and each layer is rammed in place by a special Ingersoll-Sergeant tamping machine, 5 in. diameter and a 20-inch stroke. This is supported by a revolving jib crane and is movable in the direction of the axis of the crane. The vertical motion of the crane is controlled hydraulically. As the tamped material in the body of the converter reaches the tuyere openings, an oval pear-shaped mold for the cavity, consisting of three pieces, is set in place, lining material is filled in around it in layers, each layer being rammed. The tuyere-openings are then punched through and the mold is withdrawn. The top of the converter is lined around a mold in the same way and then fastened to the body by means of bolts having a slot in the end, through which a wedge is inserted and driven up tight. The joint is made with a plastic material. The brick part of the lining, as a rule, only needs local repairing and the old lining is not always entirely taken out, but is trimmed and cut away to expose a fresh surface to which the new lining may adhere.

The operation of lining requires about an hour and a half; the weight of the lining is about 16 tons and that of the converter with lining 42 tons.

Drying

A freshly lined converter is transferred to the other side of the building by a 60-ton electric traveling crane and here dried by means of a scrap-wood fire within and by forcing a current of air, provided by an ordinary Root blower, through the tuyeres. It takes two hours to bring the fire to its heat and five hours to dry a lining sufficiently, that is seven hours in all.

A dried converter is taken up by the crane, placed in a stall, and the connection with the airpipe is made by means of a stuffing-box connection. The converters are operated hydraulically, water pressure of 40 lb. per square inch being used. At the side of each converter are two levers, one for tilting the converter and one for the admission of the blast. The operator stands between them, protected by two sheet-iron walls covered by a roof. Above each converter there is a telescopic hood, which conducts vapors and gases to the dust chamber and then to the main flue. For each converter there is a puncher and a helper; for every four converters there is one skimmer.

The next operation is to dump the ashes. The converter is then turned back in the blowing position and the end section of the launder, which conveys the matte from the charging floor is turned over the mouth. The air is turned on (air pressure 16 lb. per sq.in.) and the converter is ready to receive the charge

Charging

The molten matte from the reverberatory and blast furnaces comes in lined sheet-steel ladles of 10 tons capacity, mounted on cars, to the charging floor of the converter building, which is 23 ft. above the working floor. The grade of matte charged varies but slightly and averages 45 per cent. copper. The limits between which matte is converted vary generally from 35 to 65 per cent. copper; at Anaconda they vary from 38 to 52 per cent. copper. The grade of the matte preferred by the men who run the converters is about 45 per cent.; a higher matte is apt to run too cold and a lower matte will run hot and consume considerable of the lining. The chosen concentration, however, will depend upon the amount of work each plant is to do in order to work most advantageously, and this depends again upon the character of the ore, its supply, kind, cost of fuel, etc.

The temperature of the blast-furnace matte as it flows into the ladles averages 1170 deg. C., that of the reverberatory furnaces 985 deg. C. The average temperature of the matte entering the converter is 900 deg. C. There are three men on the charging floor, two to dump the ladles (one man can dump a ladle which is in good working condition) and one sampler. The operation of dumping a ladle takes about five minutes. Three samples are taken from each ladle during the flow at equal intervals; the average sample goes to the assay office. A freshly lined converter takes but a small charge (seven tons), the second and succeeding charges may be larger as the cavity increases; but it is not customary to charge more than nine tons at a time. A considerable quantity of frozen matte accumulates in the ladles. These ladles are then dumped out in an annex to the converter building and relined or patched up there. The dumped matte is taken to the blast furnaces.

Before or during the charging a few lumps of coal are thrown into the mouth of the converter. They prevent the shooting out of matte which occurs during the charging and for several minutes after. The cause of this shooting out of matte may be, in the case of a freshly lined converter, due to insufficient dryness of the lining. In the case of a converter which has been used and in which a charge has been finished, the cause is due to a sudden liberation of sulphur dioxide, formed by the reaction of the matte with the copper-oxides or copper silicates respectively, which have remained in it. This reaction has caused serious explosions in pouring molten matte on an overblown charge. Simple overloading may be a cause of "shooting." The main reason, however, may be, an insufficient initial temperature of the charge, which causes irregularities in the reaction (local overblowing). If the initial temperature of the charge is comparatively high, shooting out of material during charging will rarely occur.

Blowing a Charge

During the first part of the blow, dense white vapors due to the volatilization of zinc, lead, etc., leave the mouth of the converter. The color of the flame is red, but it soon turns to a greenish yellow. A small flame or a jumping flame indicates that the blast is not properly received and consequently that the tuyeres need punching. If the tuyere openings are hard to punch and cannot be punched by hand, which rarely occurs during this first or slag-forming period, the punch-rod, which is a ¾-in. cylindrical iron rod with a knob at the end, is driven in with a hammer, and then pulled out by means of a small but heavy iron rod, bent at one end to an eye. This rod is hooked on the punch-rod and knocked against the knob. Only in case of a cold run will continuous punching be necessary during the first period. The products of oxidation formed during the first period are ferrous oxide, cuprous oxide and sulphur dioxide. Higher oxides of iron and copper may be formed locally. They are, however, again reduced by matte still intact. Ferrous oxide as soon as formed is slagged by the silica of the lining, cuprous oxide, scarcely formed, reacts with the ferrous [illegible] long as ferrous sulphide is present, [illegible] copper can exist only in a limited and very small quantity. Sulphide dioxide goes off as such. Observing the flame one notices that after some time pale blue flashes appear in the greenish yellow. These pale blue flashes increase in number and finally become constant. Soon the pale blue, which is probably a cuprous-silicate flame, will dominate and this indicates that practically all the iron has been oxidized and is present as silicate, the copper being in the form of cuprous sulphide, white metal with about 70 per cent. copper. The average time required to bring a charge of seven to nine tons up to this point, the end of the first period, is one hour.

[illegible] poured off. The converter is turned and the [illegible] tuyeres are [illegible]. The slag is poured into cast-steel [illegible] placed

TAMPING CONVERTER LINING.

on the floor in front of the converter. It is difficult to recognize the slag from the matte at this high temperature. However, by cutting the back part of the stream, where the heavier white metal may be expected, slowly with a rabble having a blade of 5x3-in. forming an angle of about 135 deg. with the handle one is able after some practice to recognize the first few drops of white metal. This white metal looks like boiling grease against the darker smooth surface of the slag, which adheres to the rabble blade. As soon as the skimmer sees the matte on the rabble blade, he indicates to the man at the lever by a rapid to and fro motion of the rabble, to pour more slowly or to stop altogether. The white metal should boil on the rabble, which indicates that the temperature is high enough to raise all the slag.

The full slag-ladle is taken by the crane and placed in a hydraulic cradle, which pours the contents into the passing molds of a casting machine of the conveyer type. The slag is chilled by sprays of water and drops into a steel bin outside the building, from which it is loaded on railroad cars and transported to the storage bins of the blast furnaces. Some white metal collects on the bottom of the slag-ladles and will cause explosions if it falls into the wet slag molds. The last slag in the ladles is, therefore, poured out very slowly. Finally a good deal of frozen material accumulates in the ladle; this is then dumped out and the empty clean ladle is provided with a thin coating of lime, by rinsing it out with limewater to prevent the slag from sticking to it. The quantity of the slag produced depends upon the grade of the matte and consequently upon the temperature during the blow. A low-grade matte takes a disproportionately greater amount of lining than a high-grade matte. It produces more heat, and a lighter, more silicious slag is formed. Not only the chemical but also the mechanical wear of the lining is greater in case of low-grade matte. The chemical wear takes place especially at the tuyeres, the mechanical wear opposite the tuyeres at the top of the body of the converter. In converting matte with 45 per cent. copper, the quantity of the slag produced amounts to 60 or 70 per cent. of the weight of the matte charged.

The slag is practically a ferrous silicate. It contains the silicates of the lining, which lowers its melting point and makes it lighter and more fluid. The average copper content is 2.39 per cent. taken over a period of six months. This copper is almost entirely present as suspended white-metal. This explains why a heavy slag from a high-grade matte will contain much more copper than a light slag from a low-grade matte. The slag has, of course, to return into the process. It forms in consequence of its basic character a very suitable and desirable constituent for a blast-furnace charge, the bulk of our sulphide ore having a silicious gangue.

METHOD OF HANDLING LADLES

SECOND PERIOD

The slag being poured off as clean as possible (a thin layer of slag always remains on the top of the white-metal), one or two boats of "dope" are charged in the tilted converter by means of the traveling crane, the blast is turned on and the converter is turned back in the blowing position. "Dope" consists mainly of solid white-metal, but matte, slags, old lining, floor cleanings, shortly all materials which can be found on the working floor are intermixed. This is charged to cool the contents of the converter.

In blowing white-metal, which is the contents of the converter in this stage of the process, the cuprous sulphide is partly overoxidized to cuprous oxide and locally perhaps to cupric oxide. As long as cuprous sulphide is present it will interact, respectively, with the oxides of copper forming copper. The copper oxides formed can, however, also react with the silica of the lining, and this reaction seems to be preferred at high temperatures. It is found, that if the converter runs too hot during the second period, the tuyeres will very likely become stopped up; they will not only be hard to punch, but will need continuous punching due to cuprous silicate, which is formed and which is rather infusible. The desired reaction between cuprous sulphide and cuprous oxide on the other hand will progress very slowly. The quantity of dope charged depends upon the temperature of the white-metal in the converter, and the latter is judged by the color of the flame. The color of the flame should be brownish, yellow, or orange; a reddish flame indicates too low a temperature. Then coal is charged. A white yellow flame and hard punching indicates too high a temperature, and that more dope has to be charged. In such a case dope is charged from buckets with dumping bottoms, the converter remaining in the blowing position. At the side of each converter is a hoist by means of which a filled bucket is taken up and turned over the mouth of the converter. Previously the converter is tilted somewhat, so that the hood will not be in the way. With one stroke of an iron rod at the lever of the dumping bottom arrangement, the contents of the bucket drop into the converter, which is then turned back under the hood. Recent practice is to charge all the dope into the converter by crane, a third crane being in operation for this purpose.

Another means for regulating the temperature is changing the direction of the tuyeres by tilting the converter somewhat.

The end of the second period is reached when practically all the copper is present as metal. The time required for the second period of the blow with an initial charge of seven to nine tons of matte is 60 to 90 minutes. The critical point is recognized by examining the copper on the punch rod, or by the appearance of the flame. The brownish yellow or orange flame becomes darker, takes a bronze color and slows down. Little balls of metal, which leave the nose of the converter, no longer stick to the hood, but rebound from it. They are no longer dull, but brilliant (burning copper). This is the moment when practically all the sulphur has burned out and only a small amount of copper oxides are present.[3] It takes long experience to discover this moment and to recognize it with certainty. The distinctness with which one recognizes this final point depends greatly upon the size of the charge. A medium charge shows this critical point best. The flame reaction gets less distinct with the depth of the charge. A small charge, on the other hand, gives a small flame and throws up little material.

---

[3] For a graphical representation of the relative elimination of iron, sulphur and arsenic and concentration of copper during a blow see: E. P. Mathewson, *Bull*. A. I. M. E., 1907: 7.

Pouring the Metal

The converter is then called down and a small sample is poured on the floor. The metal stream as it leaves the converter must show a bright luster; the copper sample on the floor may or may not show blisters. It is called clean or honey copper, blister copper or black blister, depending upon its sulphur and oxygen content, respectively. Clean copper does not show blisters; it contains more sulphur than blister copper, and blister copper contains more sulphur than black blister, which contains considerable oxygen. The contents of the converter poured into a sheet-steel ladle of about five tons capacity, lined with fireclay. In pouring a wooden pole is inserted into the nose of the converter to keep the solid second period slag back. This slag consists of small balls ordinarily having a nucleus of silica. The quantity of these balls is small, and they remain in the converter, provided it is in good condition. If it is necessary to change the converter they are dumped out. The following is a partial analysis of a second-period slag, which shows that it runs high in copper: Cu, 21.43 per cent.; SiO_2, 22.7 per cent.; FeO, 39.4 per cent.; S, 0.4 per cent.

The copper ladle is removed by means of the traveling crane to a hydraulic cradle, which pours the contents into the refining or casting furnace. The converter copper in Anaconda is refined in reverberatory furnaces before it is cast in anodes The first ladles charged into the casting furnace may contain clean copper, i.e., copper somewhat high in sulphur; the last ones (a furnace takes 20 to 30 ladles of four tons on the average) should be finished carefully, for, when the last ladles, which complete the charge, are poured in, the copper in the refining furnace contains oxides and the adding of copper comparatively high in sulphur might cause the furnace to boil over by sudden escape of sulphur dioxide.

After a time the copper ladles become filled with solid metal. They are then dumped, patched up or relined. The dumped copper and matte bottoms and other large lumps are broken by the sudden blow of a heavy weight dropped on them from a certain hight, and the broken material goes back to the working floor. The blowing causes matte, slag, etc., to be thrown up, and part of it sticks to the inside of the nose and to the hood of the converter. If the material, which is sticking to the inside of the mouth, interferes with the blowing, it is removed by hook and crane; that which sticks to the hood is removed by knocking with heavy iron bars. While changing a converter the time is utilized to clean the hood thoroughly and to give it a lime coating.

Very little fluedust is made by a converter. The 11 converters of the Anaconda plant made 140 tons of fluedust in one month, with an average of 71.23 per cent. copper and 12.5 per cent. sulphur. The fluedust is shipped to the reverberatory furnaces. The material that is too heavy to reach the dust chamber drops down and is caught in a cylinder directly behind the converter. From this it is carried back to the working floor.

The material spilt under the converter sticks to a chain, which is placed on the clean floor. The traveling crane may be hooked on to this chain and employed to remove it to the place where the material is to be broken up.

SKIMMING SLAG

Irregularities of the Blow

The above description refers to a single charge and a very regular and smooth run. We will now consider the prevailing irregularities and difficulties which may arise and how to overcome them. If the matte charged happens to be comparatively cold, there will occur during the first 10 minutes a shooting out of a considerable amount of matte and it will require a long time to raise the slag, as has already been mentioned.

It usually takes 60 min. to blow a charge of approximately seven tons up to the end of the first period, but a cold charge requires a disproportionately longer time. We can raise the temperature by charging a few lumps of coal, or by preventing an accumulation of slag, which might possibly obstruct the blast,. As a result of lack of heat during the slag-forming period, one is sometimes unsuccessful in raising all the slag. In this case it will be found that in pouring off the slag, the white-metal does not boil on the rabble blade. Another seven tons of matte are generally charged; they will furnish the desired heat to raise all the slag. This is called "doubling," or "double tap." In converting low-grade matte the charge must be doubled in order to obtain sufficient white-metal in the converter to cause its level to be above the tuyeres. For the same reason two white-metal charges are often poured together. Also if there is a large supply of matte and two converters are at the same stage, i.e., ready to start the second-period blow, the white-metal of one is poured into the other and finished in it in order to free the first one. All these operations are called "double tap."

If the end of the slag-forming period is reached, the color of the flame being blueish white, and if the pouring of slag is delayed, the white-metal will be oxidized and cuprous oxide will enter the slag and will be slagged by the lining, at the existing high temperature. As soon as suitable conditions arise for the reaction between cuprous oxide and silicate with cuprous sulphide, a large amount of sulphur dioxide will be set free in a relatively short time. As a result of this the slag foams out of the mouth of the converter, or worse, terrible explosions may take place. This may occur as the converter is in a blowing position, but it occurs especially at the moment the converter is tilted for pouring the slag. Skimming twice, thus avoiding the accumulation of slag, will reduce the violence of the explosion. The foamy, mushy slag runs high in copper; it is practically a ferrous-cuprous silicate, containing cuprous and cupric oxides mechanically mixed.

Foaming may also occur during the second period. The results however, are much less serious in this case, the quantity of slag present being limited. A few lumps of coal ordinarily keep the foamy slag in the converter. The presence of considerable slag during the second period may be due to the fact that not quite all the slag was raised during the first period; in charging much dope, a good deal of iron in the form of matte and in consequence slag may come in occasionally. The following is a partial analysis of a mushy slag, formed during the second period: Cu, 27..9 per cent.; FeO, 29 per cent.; SiO_2, 29 per cent.; S, 3.4 per cent. The foamy slag goes back into the converters as part of the charged dope.

TABLE 1. TIME LOST FROM BLOWING.

Stall	Charging.		Waiting for Matte.		Changing Converters.		Stall Down.		Total Time Lost.	
	Hours.	Min.	Hours.	Min.	Hours.	Min.	Hours.	Min.	Hours.	Min.
1		50	1	10		30	2	20	4	50
2		50	2	25		30			3	45
3		55	1	55		30			3	20
4		20				30	15	25	16	15
5		15		15		30	16		17	
6		25		30		40	13	25	15	10
7		55	1	50		30			3	15
8		40		55			7	15	8	50
9		25	1	15			9	30	11	10
10		50	2			30			3	20
11		40	1	20		30			2	30
Total......	7	05	13	35	4	40	64	05	89	25

Number of stalls running, 7.26.
Total time blowing, 174.35 min.
Draft, 0.30 in.

The product underneath the foamy slag is copper containing cuprous sulphide. It is called "Regal." The following is a partial analysis of a regal: Cu, 92 per cent.; FeO, 0.8 per cent.; S, 1 per cent. After the removal of the foamy slag a charge is finished in a very short time.

Overblowing

Due consideration has already been given to the case of too high a temperature during the second-period blow. Too low a temperature sometimes occurs at the end of the blow; this is remedied by charging a few lumps of coal, or by doubling, i.e., pouring a hot white-metal charge in the converter; also matte may be charged to raise the temperature.

Overblowing in the second-period run occurs very seldom. If it occurs, the reason for it can generally be attributed to the skimmer's mistaking a slightly overblown charge for a charge in the early stage of the first-period run. In overblowing a charge, copper oxides are formed; they enter the slag and are slagged by fresh lining. The heat evolved during an overblow is not sufficient to oxidize and slag all the metal. The contents of the converter soon freezes up; it consists then of frozen metallic copper, copper oxides and copper silicates. An overblown charge is worked up with the material on the floor, as part of the dope, or is charged in the refining furnace. In doing so, however, a good deal of slag is brought into the refining furnace.

The lining of a converter usually endures five or six charges or pourings of copper. If in the judgment of the skimmer the lining will not stand another charge, the converter is replaced by a freshly lined one. In case the skimmer decides to change a converter when a charge is completely finished, the second-period slag is first dumped. It returns into the converters as part of the dope. The lining of the converter is coated with copper in this case, and it is very hard to cut this out. If possible the converter is washed with matte or changed at the end of the first period. The matte or white-metal is poured into a lined ladle and transferred to another converter.

TABLE II. DAILY OFFICE REPORT, CONVERTER OPERATION.

Shift.	Charges.		Pours Copper.	Boats Dope.	Buckets Dope.	Converters Changed.
	Blast Furnace Matte.	Reverb. Furnace Matte.				
1	16	6	19	8	21	0
2	18	6	23	10	23	3
3	24	4	22	16	18	6
Total......	28	16	64	34	62	9

The best shape of the barrel converter, the place of the tuyeres and their direction are not yet settled. Experiments concerning these are being conducted all the time; the average time of finishing a charge, taken for a very long period, is the basis for improvements. A converter handles two to four charges per shift of eight hours. The time required for each period and consequently that to finish a charge, depends very much upon the temperature. In order to get a better idea regarding the time required for a blow, I give below some actual runs in an Anaconda converter:

	Hrs.	Min
Matte charged......................	12	25
One ladle slag tapped (flame still greenish yellow)..........................	1	5
Blue flashes appear in the flame.......	1	25
All slag poured and white metal transferred to another converter.........	1	35
Matte charged......................	7	20
One ladle slag tapped (flame blue).....	8	10
Rest of slag tapped and one bucket dope charged..........................	8	30
Blister poured ...	9	25
Matte charged......................	8	25
½ ladle slag poured (flame greenish yellow)............................	9	35
Blue flashes break through...........	10	15
½ ladle slag poured..................	10	20
Rest of slag poured and one bucket dope charged..........................	10	35
One bucket dope charged ready for blister pouring.......................	10	55

Considerable time is lost in waiting for matte, in repairing stalls, etc. To control the delays and to find the actual number of stalls running and the total time of blowing, a daily "time lost report" is made out in Anaconda. Table I represents such a report. Table II is the daily report of the converter plant recorded the same day as the above. It gives us a quantitative idea of the working of the plant as a whole.

Efficiency of Mexican Labor

Special Correspondence

As to the greater dollar-efficiency of Mexican labor, note these contract prices current at a mine of which I am consulting engineer. The vein is about 3½ ft. wide, and varies in hardness, being frequently quite soft. The crosscuts are in hard slate. Values are given in United States currency per foot: Main drifts, 5x7 ft., hand labor, $2.30; intermediate drifts, 4x6 ft., $1.85; crosscuts, 4x6 ft., $2.15; winzes, $1.85 to 2.25. This does not include hoisting and pumping. Cananea, I understand, has practically eliminated white labor underground.

In Central Mexico an ordinary miner gets 37½ to 50c. gold per day, except in some of the larger camps. Guanajuato, I believe, has raised the scale, but is not paying as much as Cananea does.

During 1907 Trinidad exported to the United States 4145 tons of land asphalt.

Talc and Soapstone in Vermont

By G. H. Perkins*

Talc and soapstone are found at many places in Vermont, especially east of the Green mountains. Usually the deposits are not very large, at least so far as surface showings indicate. Most of the outcrops have never been worked to any extent, and it is not only possible, but probable, that both talc and soapstone exist in the State in much greater quantity than is at present known. Inasmuch as soapstone is simply a compact form of talc, the two materials are usually found in the same locality. Occasionally, however, one is found by itself, and we have in Vermont several beds of talc where there is little or no soapstone, and soapstone without talc. This is true of all the quarries which are at present worked. For this reason it will be better to consider the two minerals separately.

Talc

This mineral occurs in beds of noticeable size in or near the towns of Bridgewater, Roxbury, Lowell, Duxbury, Moretown, Rochester, Granville, Stockbridge and Johnson; smaller deposits are to be found at many other points. The talc in these localities is usually massive, but beautiful foliated specimens may be obtained in some of them. This form is nowhere common, however, and plays no important part in the output of the State. During the last four or five years the increased demand for ground talc has caused increased activity in the industry and, while one long-worked mine, the New England, at Stockbridge, has been closed, several others have been opened up. The production has increased greatly and the industry will probably continue to grow.

For several years talc has been mined in Moretown, East Granville, Rochester and Johnson. In Moretown there is a bed 80 ft. wide near the opening, and of unknown depth. This has been worked by several different companies, and machinery for grinding and bolting has been installed. This mine has the disadvantage of being six miles from the nearest railroad, and the quality of the talc is not always such as is desired. At East Granville the bed is reached by a shaft 100 ft. deep; that at Moretown is reached by an open cut and tunnel. The talc at East Granville is shipped in the rough, to be ground by mills in Maine. A few miles east of Rochester is the plant of the United States Talc Corporation. So far as I have information, the work here thus far has been mostly preliminary.

About a year ago the American Mineral Company began work on what is apparently a fine deposit of talc in the town of Johnson. Previously there had been some months of prospecting on this property. The manager states that both quality and quantity are extra good and that with good fortune 2000 tons of talc will be produced yearly. The deposit is well situated and near a railroad.

Soapstone

As has been noted, this material is sometimes found by itself and sometimes in conjunction with talc. Soapstone has been much more extensively mined in Vermont than talc, the demand for the latter being of recent growth. In the early days, probably because of the case with which soapstone is worked, it was used for many purposes quite different from those for which it is now sold. Window sills and caps, door sills, hearths, stoves, and even dwellings, were often made of this material, the work in some of the quarries dating back at least 75 years.

There are extensive beds of soapstone in Cavendish, Grafton, Chester, Weathersfield, Athens and Windham; and minor occurrences, some which have been worked at one time or another, in many other towns. Although there is some excellent soapstone to be found in the State, there is a large quantity which is unfit for use.

There are quarries in many sections of the State which for different reasons have been abandoned; only a few are now worked. In Chester, the Union Soapstone Company works two quarries, situated a few miles south of the village on high ground. The soapstone is inclosed by gneiss and is exposed by open pits. One of these is 100 ft. long, 70 ft. wide and 60 ft. deep; the other is a short distance south and is 70 ft. long, 60 ft. wide and 30 ft. deep. The material from these quarries is variable in quality, much of it being broken or cracked, so that good slabs cannot be obtained, while some, unfortunately the less part, is of excellent quality. The stone is quarried by using channeling machines and splitting out the blocks with wedges; it splits easily and in regular blocks, ordinarily 6x4 ft. and of variable thickness. The soapstone lies in the gneiss in lenses from 4 to 20 ft. thick and from 20 to 30 ft. wide. These lenses overlap each other so that the deposit is practically continuous and, as they occur one below another the depth may be considerable. The stone is soft and can be worked up easily; it is sawed, turned, planed, grooved, etc., much as if it were wood. Water is not necessary except on the rubbing beds where the surface is smoothed. The mill where this is done is at Chester depot where the blocks are drawn from the quarries as needed. This company grinds as much of the waste as possible, the powdered stone being used as paper filling, in certain kinds of paint and in various sorts of plaster. Another plant, that of the American Soapstone Finish Company, is situated at Chester depot. The product of this plant is similar to that just described.

In the neighborhood of Chester there are several beds of soapstone, especially north toward Ludlow, where there has been some work done. The only deposits now worked, however, are those near the town of Weathersfield, where a rather large quantity of stone is quarried. The quarry now worked has been in operation for over 60 years. Near this quarry is an older one which has been idle for many years, but from which large quantities of stone have been taken. The quarries are on a hill, the mills being in the village a mile or so away. Here the blocks are sawed and worked as at Chester. Most of that which is sufficiently sound is sawed into slabs to be used for tubs, sinks, and a great variety of objects. Formerly wood-burning stoves were manufactured in large number, but now very few are to be found.

There is also a mill in Windham which has been in operation at least a part of the time during the last three years. In and about Windham there are deposits of both soapstone and talc; some of the latter appear promising, but they have not been developed.

Production

Vermont now stands third among the States in the production of talc and soapstone, and if the deposits already opened are fully worked the output will certainly be largely increased. In one year, 1904-1905, the amount of these minerals produced increased tenfold, from about 1000 to 10,000 tons. I have been unable to secure full reports from the various manufacturers in the State; it is quite possible that if all the facts were known the above figures would be considerably increased.

---

[*] State geologist, Burlington, Vermont

It is stated that the best method for estimating arsenic and antimony is by the distillation method; and for bismuth the method depending upon the brown coloration produced by dissolving bismuth iodide in potassium iodide.

Most of the silver-lead ore produced in New South Wales comes from the Broken Hill district; during 1907 an average of 8900 men were working in that district.

The production of white arsenic in the [illegible] lb., valued at $101,000, as compared with [illegible]

The cost of milling at the mill of the North Broken Hill Company, New South Wales, for the last half of 1907 was 4s. [illegible]

A Remarkable Car-dump

By Frank A. Ross*

Four years ago, annoyed by excessive repairs to end gates and latches of the mine cars, G. P. Jones, superintendent of the mines belonging to the Daly Reduction Company, Ltd., Hedley, B. C., built a car dump, or tipple, designed to do away with the necessity of gates on the cars by automatically receiving the car, turning it upside down, and delivering it to a side track for empties. The present well equipped machine shops of the company did not exist at that time, so that the tipple shown in the accompanying illustration was roughly constructed by the mine blacksmith as an experiment, and with little expectation of permanancy.

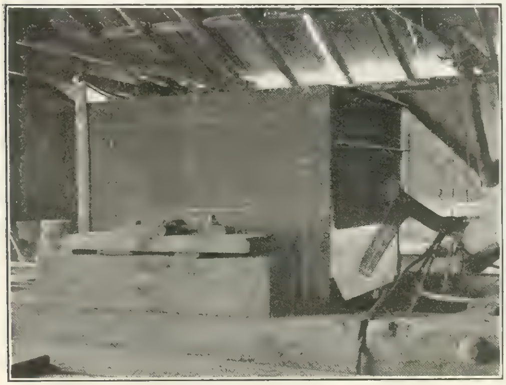


FIG. 1. SIDE VIEW OF TIPPLE

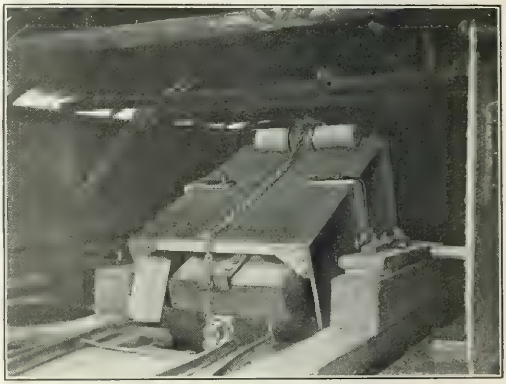


FIG. 2. TIPPLE DUMPING CAR

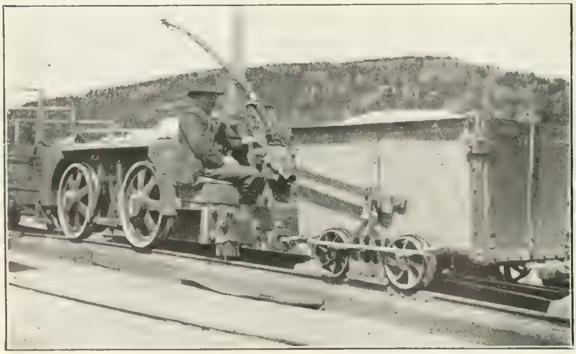


FIG. 3. IRON CAR FORMERLY USED SHOWING BRAKE

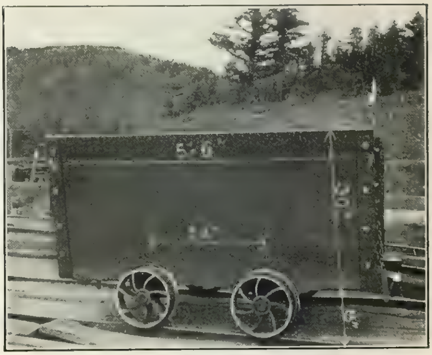


FIG. 4. WOODEN CAR NOW USED

The Tipple

This tipple, however, was a success from the beginning, and has been allowed to stand exactly as first erected, no improvement having been found necessary. In the past four years it has dumped more than 80,000 cars, holding two tons each, without a hitch and at an exceedingly low cost for repairs. Most of the repairs that have been necessary have been due to inexcusably rough usage, for so perfectly does this tipple work that the trainmen are in the habit of shunting the first car into it at full speed and the shock is sometimes excessive. Once a loaded car, that had broken loose from the train and run away, entered the tipple, was turned over, dumped and set out on the side track as though it were the usual thing. Naturally this gave the trainmen great confidence in its absolute reliability.

As will be seen from the cuts, the tipple is 5½x4x4 ft. It is made of ⅜-in boiler plate and 3-in. angle iron. The trunnions are set equidistant from the ends and 18 in. above the bottom, or about 2½ in. below the center of gravity of the empty car.

The Cars

The first car used, shown in Fig. 3, is 6 in. shorter than the inside of the tipple, for it was supposed that the car must pass center before the tipple would begin to turn over. But it was found that this was not necessary, since the impact of the car upon the bell crank, or knuckle, on the back end of the tipple, shown in Fig. 1, is more than sufficient to start the tipping motion, so that cheaper and stronger wooden cars are now made, as shown in Fig. 4. The bell crank serves a three-fold purpose: It cushions the blow of the car; it starts the tipple to turning; and it kicks the car out upon the side track, at the same time easing the shock of return.

Were a new tipple to be made in a more workmanlike manner, no change in design would be necessary or desirable except, perhaps, to substitute dash pots or rubber cushions for the cables that now limit the motion of this bell crank and absorb much of the shock.

In Fig. 5 will be seen the spring-switch and the spring-frog, respectively, of the ingoing and outgoing tracks. The outgoing track, or side track for empties, passes under the ingoing track on a heavy grade; the empties mount this grade through the momentum given them by the kick of the bell crank.

---

*Managing director, Daly Reduction Company, Hedley, British Columbia.

No stronger or simpler car can be devised than that shown in Fig. 4. With solid, gateless body, pedestal bearings, solid axles upon which are forced and riveted special manganese-steel wheels, the cars stand an amount of hard usage that is remarkable.

THE TRAMWAY

The electric tramway upon which they are run is 11,000 ft. long with an average grade of 5 per cent., which necessitates the use upon every fourth car of track brakes, such as are shown in Fig. 3. These brakes are made fool-proof in that they either lock the wheels or lift the car from the track, according to the direction in which the brake wheel—not shown in cut—is turned.

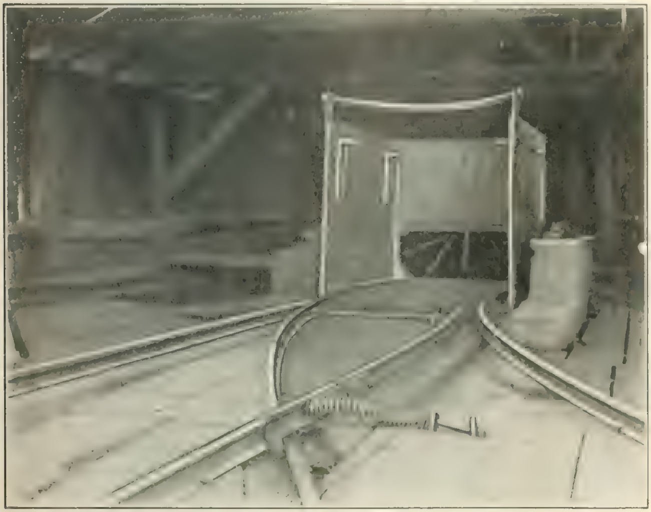


FIG. 5. TIPPLE SHOWING ARRANGEMENT OF [illegible] AND SWITCHES

From the ore bin, where the tipple is located, the ore goes to the mill in six ton skips running on a three-rail gravity tramway 10,000 ft. long, with an average grade of 43.1 per cent. and a maximum grade of 71.2 per cent., the rise being 4000 ft. in the entire length.

At the Alaska Treadwell mine, in the year ended May 31, 1908, each machine drill broke an average of 29.35 tons of rock per shift of 10 hours.

During 1907 there was exported from Trinidad to the United States 86,824 long tons of pitch lake asphalt; to other countries 53,500 tons.

During 1907 the United States produced 65,579 short tons of crude barytes, valued at $251,308, and imported 18,344 tons, valued at $77,683.

Effect of Temperature on the Electrolysis of Copper

[illegible] (Journ. Am. Chem. Soc., [illegible], pp. 81-87), has investigated the influence of temperature upon the electrolytic precipitation of copper from a nitric-acid solution. The author, in determining copper electrolytically with stationary cathodes occasionally had the common experience of having the precipitated copper slowly redissolve when the precipitation was nearly complete. While the current conditions did not change on such occasions, there was evidently some slight change in the other conditions whereby the free nitric acid was able to overcome the influence of the current. It was soon found that the copper redissolved when the temperature of the electrolyte was higher than usual. It was then decided to determine just what were the safe limits of temperature for a variety of concentrations of nitric acid, using a fixed amount of current in order to avoid this trouble.

The cathodes were platinum-iridium dishes of about the usual form, 9 cm. in diameter and 5 cm. deep, and when they contained 100 cc. had a cathode area of about 100 sq.cm. The anodes were of platinum-iridium wire about 1.5 mm. in diameter, coiled into a spiral 4 cm. in diameter, having three turns. The amount of the wire exposed to the electrolyte was about 26.5 sq.cm. The current was supplied by storage batteries and the current conditions were calculated to "normal density" from instrument readings. The distance between electrodes was 2 cm., and the current strength was maintained at 0.08 amp. per 100 sq.cm. The total dilution was maintained at 125 cubic centimeters.

The copper deposits, when nitric acid was used, were all bright and compact, except at temperatures above 70 deg. C. When nitric acid was not used the deposits were of a different character, but in no cases was sponginess observed; in fact, the condition of the deposits was such that the use of a drying oven was not necessary.

The deposits were washed with distilled water by siphoning without interrupting the current. When the washing was completed, the dish was removed and rinsed with dilute alcohol, then with absolute alcohol, and finally with absolute ether. The dish was then wiped on the outside and placed in a dessicator for 15 to 20 min. The ferro-cyanide test for copper was applied to the washings.

[illegible]

To determine a standard from which to judge the effect of the addition of nitric acid to the electrolyte, solutions of pure copper sulphate were electrolyzed for various lengths of time. It was found that 0.25 gram of copper in solution could be deposited completely in 16 hours. In the absence of nitric acid the deposition of copper was slower in appearing and the solution took on an olive-green tint before the copper became visible; this was also noticeable in a copper nitrate solution in which there was no free acid. When using sulphate electrolytes the conductivity of the solution increased as the electrolysis progressed. The main objection to electrolysis with sulphuric-acid electrolytes is that the deposits weigh high if the determinations are run too long.

A series of tests, using copper nitrate electrolytes, gave better deposits than with the sulphate, but the rate of deposition after the first hour, was slower. The next tests were made with copper-sulphate electrolytes using varying quantities of nitric acid, the other conditions except time remaining constant. Even with 0.25 c.c. of nitric acid in 125 c.c. of electrolyte its retarding effect was very noticeable. When 6.25 c.c. of nitric acid was present in the same volume, the retarding effect was so great, even after a lapse of 17 hours, that it was deemed unnecessary to proceed longer on that line. The excellent character of the deposits when nitric acid was present proved plainly that it was a desirable addition.

[illegible]

The question of the influence of temperature upon the rate of deposition was next taken up. The minimum amount of [illegible] was used and the temperature ranged from 25 to 90 deg. C. In [illegible] the temperature from 25 to 90 deg. C., a marked [illegible] of the time [illegible] for deposition was observed.

while a further elevation to 60 deg. decreased the time but not to a proportionate extent. At 70 deg. the results were about the same as at 60 deg., while beyond 70 deg. a retarding effect was noticed. During the first hour the rate of deposition was lessened as the temperature was raised, and it was not until after the first hour that the beneficial effect of higher temperature was noted.

The conclusions of the author are as follows: (1) Even the smallest amounts of nitric acid have a tendency to retard the electrolytic precipitation of copper, under the conditions used. (2) The presence of nitric acid is, nevertheless, desirable because of its beneficial effect on the character of the deposit. (3) While increased temperature generally means accelerated precipitation, yet with the low current strength and conditions used, the reverse is the case above 70 deg. C., no doubt owing to the rapidly increasing solvent action of the acid.

A New Railroad in Mexico

United States Consul Thomas W. Voetter, at Saltillo, Mexico, reports that a new railroad is projected to pass through parts of the States of Coahuila and Chihuahua, which are at present without railway facilities. The eastern terminus of this road is to be at Monclova, Coahuila, on the line of the Mexican International, and it is to extend in a northwesterly direction to Chihuahua, the capital of the State of the same name. The length of the new line will be about 375 miles.

The road will pass through excellent coalfields near Monclova, will then traverse timber, grazing, and agricultural lands, and near the western line of Coahuila it will go through a region with good iron and salt deposits. In Chihuahua it is to pass through a mineralized region, the ores of which are not now utilized for lack of transportation facilities and cheap fuel. The projectors believe that a line can be built with low grades so that cheap transportation of coal from the coalfields of Coahuila to the Chihuahua mining region can be made possible, while at the same time the iron ore along the line can be transported to some point where fuel for smelting is plentiful.

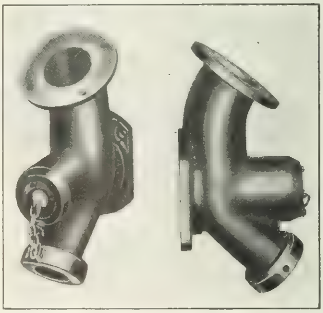
An authority on copper and brass states that in a brass-rolling mill the use of brazed or tinned copper is inadvisable, but this material may be used for casting in sand. Old arsenical copper tubes and plates make good gun-metal, but inferior sheet brass.

The Cobar district is the largest gold producer in New South Wales. Its output increased in 1907.

Loss by Leakage of Blast in Lead and Copper Furnaces

The loss of power due to the escape of blast through leaking tuyeres and through chinks between the jackets may be large enough to warrant careful investigation, especially in places where fuel is an important item in smelter costs. The introduction of the Robinson tuyere in the smelting works at Mapimi, Mexico, led incidentally to the discovery that fully one-third of the power driving the blowers had been consumed in forcing blast through leaks about the furnaces. The latest report of the superintendent shows a power consumption of 23.1 horsepower-hours per ton of charge as compared with about 36 horsepower-hours per ton of charge before the new tuyeres were adopted.

It is not claimed that all or more than a very inconsiderable part of this saving was due directly to the Robinson tuyeres. These tuyeres are tight enough to prevent whistling, and when the noise about the tuyere ceased it was easy to detect numerous leaks about the jackets and to stop them. Since the furnaces have been made air-tight the air consumption has gone down from 72,000 to 54,000 cu.ft. per ton charge delivered at a pressure of 48 oz. The accompanying illustration shows the latest form of the Robinson tuyere. The disk which seals the lower slag escape was at first made of an alloy of lead and tin; later it was found that the ordinary base bullion of the furnace answered the purpose quite as well. At present the disks are cast in a suitable mold on the furnace floor, the metal being returned to the stock when it has served its purpose.



ROBINSON TUYERE, IMPROVED FORM

The total pitch lake and land asphalt exported to the United States from Trinidad during 1907 was 90,969 long tons; there was exported to other countries 53,760 tons.

Consolidated Mining and Smelting Company of Canada, Ltd.

The report of the Consolidated Mining and Smelting Company, of Canada, Ltd., for the year ending June 30, 1908, issued to the third annual meeting of the stockholders, Sept. 22, states that, although the financial results were not satisfactory owing to the decline in the price of metals, the year was an improvement upon the one preceding; the tonnage handled was much greater, the value higher and the recovery of metals better. The stock of ore and metals on hand at the beginning of the year, June 30, 1908, was very large. Before it was possible to market these metals the prices began to decline, resulting in a loss of profits of more than $430,000. The operating profits for the year were $43,416; dividends amounting to $66,940 were paid; for depreciation of plant and equipment $132,843 was written off, and $564,226 expended for development. During the year additions to the various plants amounted to $315,562, and the cost of new properties and their development to $621,895.

Development work on the Centre Star and Idaho, Rossland, amounted to 11,370 ft., and diamond drilling 10,033 ft.; 12,639 ft. of development work was done on the St. Eugene and 4569 ft. of diamond drilling. The ore reserves in the Centre Star group, Rossland, were increased. Shipments from the properties were 175,799 tons, having a value of $1,915,954, as compared with $893,249 during the previous year.

The lower workings of the War Eagle and the Iron Mask mines at Rossland, produced high-grade ore, this development of higher grade in depth being considered one of the encouraging features of the year.

The probable ore reserves of the St. Eugene group, Moyie, are nearly 50 per cent. greater than a year ago, and ore of better grade than the average of last year has been found between the 600- and 800-ft. levels, on the main vein above the 1500-ft. level and between the 1900- and 2000-ft. levels. In the report of 1907 it was stated that the 2000-ft. level did not promise to yield as much as the 1900-ft. level; but present indications are that the 2000-ft. level will produce more ore than any other level in the mine.

New equipment installed during the year included an aërial tramway for the Richmond Eureka mine; buildings and equipment at the Phœnix Amalgamated; a sorting plant and extension to the St. Eugene mill; additional plant at Trail, electric locomotives and other electric installations.

The company has $5,500,000 authorized capital stock of which $5,355,200 has been issued.

Advancing the Hot Time Lateral of the Newhouse Tunnel

By Henry M. Adkinson*

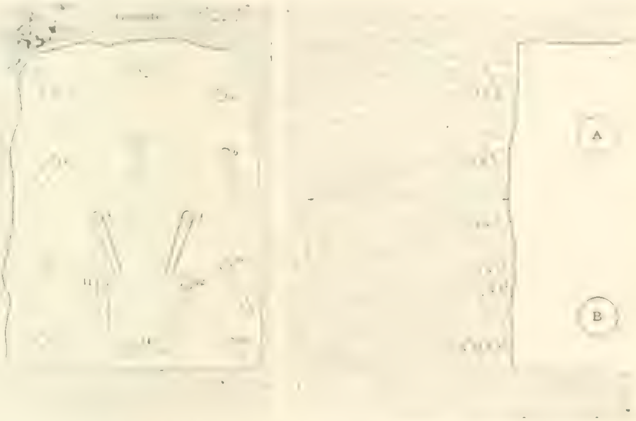
Some of the most ordinary work of mining is not pushed forward with the excellence of result that might be expected; especially is this noticeable in the common work of drifting or crosscutting, where the methods generally in use are deemed good enough, and a monthly progress of from 100 to 150 ft. is found satisfactory. In most cases the less rather than the greater figure is reached. These advances are accepted with satisfaction in spite of the fact that higher records in driving have been made and are made every day.

S. A. Knowles, now superintendent of the Boston Consolidated mine at Bingham, Utah, in driving the 12x12-ft. Newhouse tunnel at Idaho Springs, Colo., advanced the face a total of 2925 ft. in 12 months, or at an average rate of 244 ft. monthly, and at an average breaking cost of $21.45 per foot, as was carefully described by H. Foster Bain in the Journal of April 19, 1902. His record of 7½ ft. average advance per shift in the 6x9-ft. Central tunnel of the Big Five company, at Idaho Springs, was detailed in a pamphlet published by the Leyner Engineering Works Company, of Denver. Lindsay Duncan published in *Engineering-Contracting*, June 20, 1906, the details of cost in Mr. Knowles' work at the west end of the Gunnison irrigation tunnel of the Reclamation Service, in Montrose county, Colo., where advances of 100 ft. in five days were made in adobe ground.

In reading these descriptions of high-pressure work the mine manager is too apt to dismiss the subject with the thought that such rates of progress are possible in bores of the larger dimensions, but are not possible in the kind of work he is carrying on, where the smaller drifts and crosscuts offer increasing difficulties to rapid advance, by making impossible the working of the large force of men which in his experience is the only means to this end. Mr. Knowles has demonstrated that it is possible to make equally satisfactory progress in bores of smaller dimensions. He has described to me, and given me permission to present in some detail, the method he employed in driving an adit 5x7½ ft., the normal size of mine workings. By this method he made monthly advances of more than 250 ft. with a force of 11 men, while the cost of breaking and tramming was approximately $13.50 per foot.

The notable results briefly stated above were obtained in the work of driving the Hot Time lateral, a connection between the Newhouse tunnel and the 2200-ft level of the Old Town shaft, at Idaho Springs, Colo. During 1907, Mr Knowles pushed this connection from a length of 1834 ft. on Jan. 1, 1907, to a length of 4333 ft. at the end of the year, or a total distance in the twelve months of 2499 ft. The rate of advance of the different months was: January, 1907, 253 ft.; February, 237; March,[1] 84; April,[1] 185; May, 263; June, 251; July, 200; August, 200; September, 254; October, 224; November, 260; December,[2] 88; total advance, 2499 ft; average monthly advance, 208¼ ft.; average monthly advance, excluding March, April and December, 238 feet.

The adit was driven through granite, gneiss and schist, very hard to drill and so tough and tenacious that it broke badly. There were no soft seams nor any defined walls to follow. The fact that there was no timbering to be done; that the ground was not wet enough to require rubber coats; and that the size of the bore, 5x7½ ft. in the clear above the rails, corresponded so closely with the usual size of mine workings, made the problem, in all essential conditions, the counterpart of the problem hundreds of properties are working on every day. For this reason the following details of this rapid progress, made at such a reasonable cost, are the more interesting and valuable



METHOD OF DRILLING THE HOLES IN THE [illegible]

Drilling and Blasting the Holes

The machineman and helper set up the drill without waiting for the dirt from the previous shots to be cleaned up. The set-up was on a cross-bar placed high enough in the drift and far enough away from the face to allow the upper row of holes (1, 2 and 3 in the diagram) to be started close to the back and to be drilled with very little rise in their depth of six feet. The muckers at work loading the cars gave what additional assistance the drill crew required in setting up. The accompanying diagram illustrates the position and direction of the holes

From the first set-up of the cross-bar at position *A*, all the holes except the three bottom ones, the "lifters," were drilled. Holes 1, 2, 3, 4, 5 and 6 were drilled with the machine above the cross-bar, to which it was attached directly without any arm. When these holes were finished the drill was swung under the bar and all others except the three "lifters" were drilled from this position. By the time these 12 holes were completed the muckers had cleaned up the face. Then the bar was torn down and set up in position *B*, close to the bottom, so that the bottom holes might be put in after the same manner as the back holes. The usual round was 15 holes, each 6 ft. or more deep and having a diameter of 1½ in. at the bottom. When the ground showed any peculiarities which indicated that another hole or two would be necessary in order to break the ground well these were drilled where needed. The ordinary round contained 90 ft. of drill holes, so that to make the set-ups, drill the round, tear down, load and shoot the holes required the full 8-hour shift

Mr. Knowles used the Model 6, Water-Leyner drill. The use of hollow steel flushed with a stream of water makes it possible to keep the bottom of the hole clear of cuttings, and the bit cool, so that each blow is struck full on the clean face of the rock. By using this drill the crew gained the time usually lost in scraping the hole, and in changing the steel frequently. The saving of this lost time, [illegible] large part of the drilling period, is one of the most important features of this work, and one to which Mr. Knowles ascribes a large part of his success. The power consumption in the use of a hammer type of drill, rather than a piston drill, was here a negligible quantity, since air was purchased at a flat rate of $4 per shift.

---

[1] Work was held up by the Old Town company

[2] Work was completed and connection made with this 88 feet

*Mining engineer Telluride, Colo

As soon as the drilling was finished the machinemen loaded the entire round of holes. Shoveling plats (steel turn-sheets 4x5 ft. and ¼ in. thick) were laid in the drift for a distance of about 25 ft. back from the face.

Mr. Knowles used a 40-per cent. gelatine of the Du Pont brand; 60-per cent. dynamite was also tried, but the results were not enough better to compensate for the extra cost. By using the plastic gelatine any possible air spaces in the holes were avoided, the explosion was equally effective in breaking the ground, and the gas was less trying on the men, so that the muckers were able to get to work sooner after the holes were blasted. No definite amount of powder was assigned to any of the holes, the matter of loading being left to the judgment of the machinemen, except that holes 8, 9, 11, 12, 13, 14 and 15 were loaded more heavily than the others. In the process of loading, a full stick of powder was put in the bottom of the hole; next came another stick containing the fuse and a XXXXXX cap in its lower end, and after that what other powder was necessary. Experience showed that the greatest shattering took place in the ground nearest the primer, and for this reason it was placed as near the bottom of the hole as practicable. On this theory it would have been better to have placed the primer at the very bottom of the hole, but this was not done because the hard tamping of a primer against the rock might have exploded the cap prematurely and with fatal results. To increase still further the effectiveness of the explosion the strongest cap obtainable was used.

Each round broke from 4 to 4½ ft. of ground. If, after the round was fired, it chanced that some of the shots did not break the entire hole, or misfired, these holes were re-loaded and fired again before the work of mucking began. The holes were fired in the following order: Nos. 8, 9, 11, 12; then 5, 7 and 10; then 4 and 6; next 2, followed by 1 and 3, with 14, 13 and 15 at the last. The latter three holes, loaded more heavily than the upper holes, as previously noted, were fired in as close succession as possible, with 14 just before the others. The object of this was to throw the dirt back from the face with the last shots, and leave a space for the following set-up to be made without the extra labor of mucking back.

In this work of loading and firing the holes the important factor is the use of the gelatine with the most powerful detonator possible, thus breaking the ground in an effective manner and also reducing the amount of gases so that the work could be closely followed up. Mr. Knowles believes that there is no economy in making a saving on explosives, and thus losing ground, after incurring the heavy expenses of labor, air and machines to drill the holes. The labor of mucking back was also saved by the judicious method of loading.

Mucking and Tramming

When the last shot was fired compressed air was blown into the face and the smoke exhausted through a 12-in. ventilating pipe connected with a positive blower. The ventilating pipe was carried to within 100 or 150 ft. of the face, that being as close as it could be brought without endangering it. Thirty minutes after the shots were fired the air was clear enough to allow the muckers to begin work. There were three muckers, two of whom loaded cars while the third trammed the rock to the point where the mule trains were made up. By alternating in this tramming work each mucker obtained a rest without any loss of time.

The mine cars used had a capacity of 36 cu. ft. and held about two tons of the rock handled. These cars were provided with roller bearings, and six to eight cars constituted a mule train. The muckers used No. 5 square-point, short-handled shovels, and in four or five hours the entire pile of muck was removed, about six or eight cars being handled per shift From the preceding statement it will be seen that it required two muckers to load 8 or 10 cars per shift, while in Mr. Knowles' work in the Newhouse tunnel the same number of cars of the same size were filled by one mucker in one shift, and that, too, without any rest such as the tramming work afforded here. The variation is accounted for by the fact that the muckers were working in the Hot Time lateral under the handicap of the unavoidable interference by the drilling crew, which interference was a necessary accompaniment of double-shift work.

After clearing out all the dirt, the muckers laid what additional track was necessary. The tracking was of 20-lb. rails, laid on a 1-per cent. grade, and until it was possible to lay the full lengths of rails the cars were run on the shoveling plats. The dirt was trammed by mule train through the Hot Time lateral to the Newhouse tunnel. This was a distance of 1800 ft. in January, 1907, and a constantly increasing distance, until at the last the mule train hauled dirt 4300 ft., or about four-fifths of a mile. From the junction of the Hot Time lateral with the Newhouse tunnel the cars were hauled by electric motor the remaining 12,000 ft. to the dump. For this latter service a transportation charge was made by the "Tunnel" company.

The Crew and the Work Accomplished

The full crew was composed of two machinemen at $4 per shift each, two machine helpers at $3.50 each, six muckers at $3.50 each, and one foreman. The wages paid were higher than usual because the best men were wanted on the work, and because the conditions under which they worked were very trying. At these higher wages the men were required to complete their allotted work before leaving, and if necessary they worked overtime, with no additional pay. On the other hand, they frequently completed their work before the expiration of the eight hours, and no objection was made to their leaving when they were through.

The day machineman and helper began work at the face at 8 a.m. They usually completed the round and fired by 4:30 p. m. The muckers on the night shift began work at 6 p. m. and completed their work within the eight hours, laying any necessary track in addition. The night drill crew came on at 8 p. m. and usually completed their round by 4:30 a. m. The day muckers began work at 6 a. m. and worked till the dirt was out. Thus it will be seen that both drilling and mucking went on simultaneously, and the set-ups were made with the pile of dirt in the face. Mr. Knowles recognized that this was not the cheapest method of driving the adit, since it would have been possible to save $2 or $3 per foot if the drill crews and muckers had worked alternately, and each crew had no interference in its work. But in this work speed was the chief object sought and the difference in cost was not important. Mr. Knowles' work is characterized by rapid progress made under high pressure, rather than the striving for a minimum cost.

Nevertheless, when it is taken into consideration that the mucking crews were working under most unfavorable circumstances in respect to atmospheric conditions, and that in this work all the crews were crowded on account of the size of the drift, the cost per foot shows a very good figure. In order to analyze the costs during the period when the most rapid progress was made, the months of May to November, 1907, inclusive, are chosen. In these months the advance never fell below 200 ft. monthly, and ran as high as 263 ft., averaging 236 ft. per month for the entire seven months. During this time a total advance of 1652 ft. was made at a total cost of $22,186.36, or an average cost per foot of $13.43. Mr. Knowles has kindly consented to my presenting the following cost per foot of the different items: Labor, $5.646; air, drilling, $1.236; air, blowing, $0.054; explosives, $2.828; transportation, $1.072; supplies, $0.784; drill repairs, $0.651; blacksmith shop, $0.545; mules, feed and shoeing, $0.112; miscellaneous, $0.500; total, $13.428.

Important Factors of the Work

In examining closely the elements which entered into this work to make it the success that it was, we find a combination of several important factors which may have been used singly elsewhere, but which were here coördinated into a working whole with most gratifying results. It would perhaps be difficult to point to any one factor as preëminently noteworthy, but certainly, without the drilling of the holes in rapid time, the rest of the work would have gone for naught. The constant high pressure used at the drill made this machine especially effective. The use of a less gaseous, high-power explosive, such as the gelatine powder, combined with the strongest detonator, was a second factor which may not be lightly passed by. These factors both contributed in a great degree to the rapid breaking of the ground. In the removal of the dirt, the use of shoveling plats and wide, square-pointed shovels, instead of the commonly used round point, were very efficient agents in rapid progress. All these mechanical contrivances aided in no small measure in the work, but Mr. Knowles points to the very efficient work of his foreman, T. W. Grasser, as one of the most important elements in his success. Mr. Grasser has worked with him for years, and he put every ounce of his energy and foresight into the work, and worked diligently in order to bring the work to a successful conclusion. But, after all, a most effective agent was the wonderful *esprit de corps* which was developed in a picked crew of men doing a particular work. This kept them toiling not alone for the money reward, but also because of the determination not to be beaten by the other shift.

Duties of the Cyanide Chemist

C. H. Jay (*West. Chem. and Met.*, IV, pp. 157-164) describes the various duties of a "cyanide chemist" which consist not only of the routine analyses connected with the operations but of experimental tests to improve the metallurgical work, such as the reduction of the cyanide consumption and increased extraction at least cost.

The first essentials are standard solutions, which are made up in convenient quantities. The use of distilled water is imperative. The following solutions are used.

Normal sulphuric acid is made by adding about 30 c.c. of pure sulphuric acid to about 900 c.c. of water. Weigh 0.53 gram of pure ignited but not fused bicarbonate of soda which has been ignited for about fifteen minutes and then cooled in a dessicator. This is dissolved in about 100 c.c. of water and titrated with the sulphuric-acid solution using, as an indicator, a 1-per cent. solution of phenolphthalein made up with 50 per cent. grain alcohol. This titration gives an approximate value for the sulphuric-acid solution and the proper amount of water is then added. The solution is then carefully restandardized in duplicate or triplicate using 5.3 grams of sodium carbonate per liter. 1 c.c. $\frac{N}{1}$ H_2SO_4 = 0.053 gram Na_2CO_3 = 0.04 gram NaOH = 0.028 gram CaO.

Normal caustic-soda solution is made up with about 40 grams of sodium hydrate per liter and is exactly adjusted to equal the sulphuric-acid solution. Phenolphthalein or a 1-per cent. methyl orange solution is used for an indicator.

For standard silver nitrate solution, weigh out 6.52 grams of c.p. silver nitrate and dissolve in chlorine-free distilled water and dilute to 1 liter. One gram of ignited c.p. sodium chloride is dissolved in exactly 100 c.c. of distilled water. With a pipette 10 c.c. of this solution is transferred to a titrating flask, diluted to 100 c.c., a little sodium bicarbonate added and also a few c.c. of a neutral potassium chromate solution. The solution is then titrated to a faint blood-red color with the silver nitrate solution. 1 c.c. $\frac{N}{10}$ NaCl contains 0.0058378 gram NaCl and is equivalent to 0.016966 gram $AgNO_3$. One c.c. of the 6.52 grams $AgNO_3$ per liter solution = 0.005 gram KCN or 1 lb. per ton. The silver nitrate solution gives the best and most accurate results in nearly all cases. A standard iodine solution is made up so that 1 c.c. = 0.005 gram KCN and is standardized with c.p. sodium thiosulphate.

Another standard solution that is sometimes used is one of mercuric chloride. This solution is made of such strength that 1 c.c. = 0.005 gram KCN and is standardized against the silver nitrate solution indirectly by means of a cyanide solution. With the standard solutions prepared the chemist is now in position to start his tests.

Titration of Cyanide Solutions

Measure 10 c.c. of the clear cyanide solution into a clean flask and dilute to about 150 c.c.; add a few c.c. of a neutral 1-per cent. solution of potassium iodide and titrate to the first permanent opalescence with standard silver nitrate solution.

For standard iodine solution proceed as above to the 150-c.c. dilution point, add a little pure sodium bicarbonate and titrate to first permanent yellow-brown color, which shows an excess of iodine. This method is useless in the presence of sulphides.

For standard mercuric-chloride solution proceed as before to the 150-c.c. dilution point, add a few c.c. of dilute ammonia water and titrate to first permanent bluish opalescence. The end point in this titration is slowly reached and the solution should be well agitated after each addition of the bichloride.

Sodium hydrate or lime is usually added in excess to the tank solutions to neutralize the free and latent acids in the ore. The excess should be small, usually about 1 lb. per ton of ore and is determined by taking 28 c.c. of the solution and ore from the agitation tank, measuring the relative proportion of ore and solution in the sample as in the tank, and adding an excess of normal sulphuric acid. The excess of acid is then titrated back with the normal sodium-hydrate solution. One c.c. $\frac{N}{1}$ H_2SO_4 represents 2 lb. of lime per ton. The alkali value of the cyanide, if present, should be deducted.

To determine the amount of protective alkali present in the clear cyanide solution, first titrate to opalescence with silver nitrate, then add as much silver nitrate as was required for the titration, then add phenolphthalein and titrate with $\frac{N}{10}$ H_2SO_4. Tenth-normal solutions of acid and alkali give better results than solutions of other strengths.

Assay of Cyanide Solutions

Of the different methods, the evaporation in a lead boat is not satisfactory on account of the time consumed and the small quantity that can be treated; nor is the evaporation of 5 to 10 a.t. of the solution in a porcelain dish wholly satisfactory on account of the time necessary. The latter method consists of evaporating the solution, with a little litharge, to complete dryness, and then transferring the residue to a crucible and completing the assay in the usual way.

The most satisfactory method is that originated by Alfred Chiddy, in which 5 to 10 a.t. of the solution, containing about 5 lb. cyanide per ton, is heated slowly to the boiling point with 10 c.c. of a 10-per cent. lead acetate solution and 2 grams of zinc shavings. When at the boiling point 15 c.c. of hydrochloric acid are added, the boiling continued for 10 or 15 min. longer, the solution cooled by the addition of cold water, the lead collected, squeezed into a ball and cupelled.

The larger field for the cyanide chemist lies in experimental tests such as the determination of the proper strength of solution and fineness of the ore for the maximum extraction. The amount of lime to neutralize the free acid in the ore as well as the latent acid, fall to the lot of the chemist to determine. These and similar problems are worked out in the laboratory on a small scale. Different ores present different problems and the author has outlined several tests that are indicative of the line to be followed.

In West Australia the signal for hoisting men on the cages is four bells instead of three bells as in the United States. In hoisting men the law provides that the speed shall not exceed 200 ft. per min. within 100 ft. of surface, and 500 ft. per min. in any other part of the shaft.

The old tube mills at the Luipaards Vlei Estate mill were 14x3½ ft. The new one is 14x5 ft. These are smaller than the general size of tube mill used on the Rand.

The New Esperanza Mill at El Oro, Mexico

Drag Classifiers Are to Be Employed for Separating Slimes and a New Method of Washing Colloidal Slimes in Merrill Presses

BY CLAUDE T. RICE

The present cyanide plant at the Esperanza mine at El Oro, Mexico, is one of the oldest in the district; it has been gradually enlarged to its present capacity and shows many peculiarities, most of these due to its being built many years ago. The most striking feature is that Huntington mills are used to crush the ore broken to ¾-in. size by jaw breakers. The company had decided to increase the capacity of the mill by adding Huntington mills to recrush the pulp from the stamp batteries. These were ordered, but it was found that the difference of elevation between the stamps and the cyanide tanks was not sufficient to allow the Huntingtons to be used in this way unless the pulp were afterward raised to the level of the cyanide tanks. Therefore, it was decided to use the mills as direct crushers.

The cyanide plant has become so antequated that the company has decided to remodel it. This would probably not have been done immediately had it not been that the company has 435,000 tons of old tailings, averaging 4.6 grams gold and 48 grams silver per metric ton, which now can be re-treated at a good profit. Indeed the engineers of the company estimate that these tailings can be re-treated at a net profit of $250,000, and that the mill to treat this will cost about $195,000. Screen tests on the tailings show the following results: Above 40 mesh, 2.2 per cent., 40 to 60 mesh, 11.9; 60 to 80 mesh, 12.6; 80 to 100 mesh, 19.8; 100 to 200 mesh, 38; below 20 mesh, 15.5 per cent. At the same time that the plant for re-treating the tailings dumps is being erected, the old mill will be modernized by making a few changes and additions.

In the new mill, designed by H. A. Guess, milling superintendent for the Guggenheim interests, and Charles Hoyle, resident manager for the Esperanza Mining Company, many new features will be introduced. The most noteworthy are the new type of classifier and the new method of using the Merrill press for filtering slimes. The crushing plant consisting of 120 stamps, weighing 950 lb., and 13 five-ft. Huntington mills and the old concentrating system consisting of 9 Wilfley tables will be retained.

Plan of Treatment

In the re-modeled mill the oxidized ore will be crushed in the stamp batteries, while the sulphide ore will be crushed in the Huntington mills, both classes of ore having been previously crushed in Blake breakers, the oxidized ore fine enough to pass a 1½-in. and the sulphide ore a ¾-in. grizzly. The following is the plan of treatment that is to be used in the new mill:

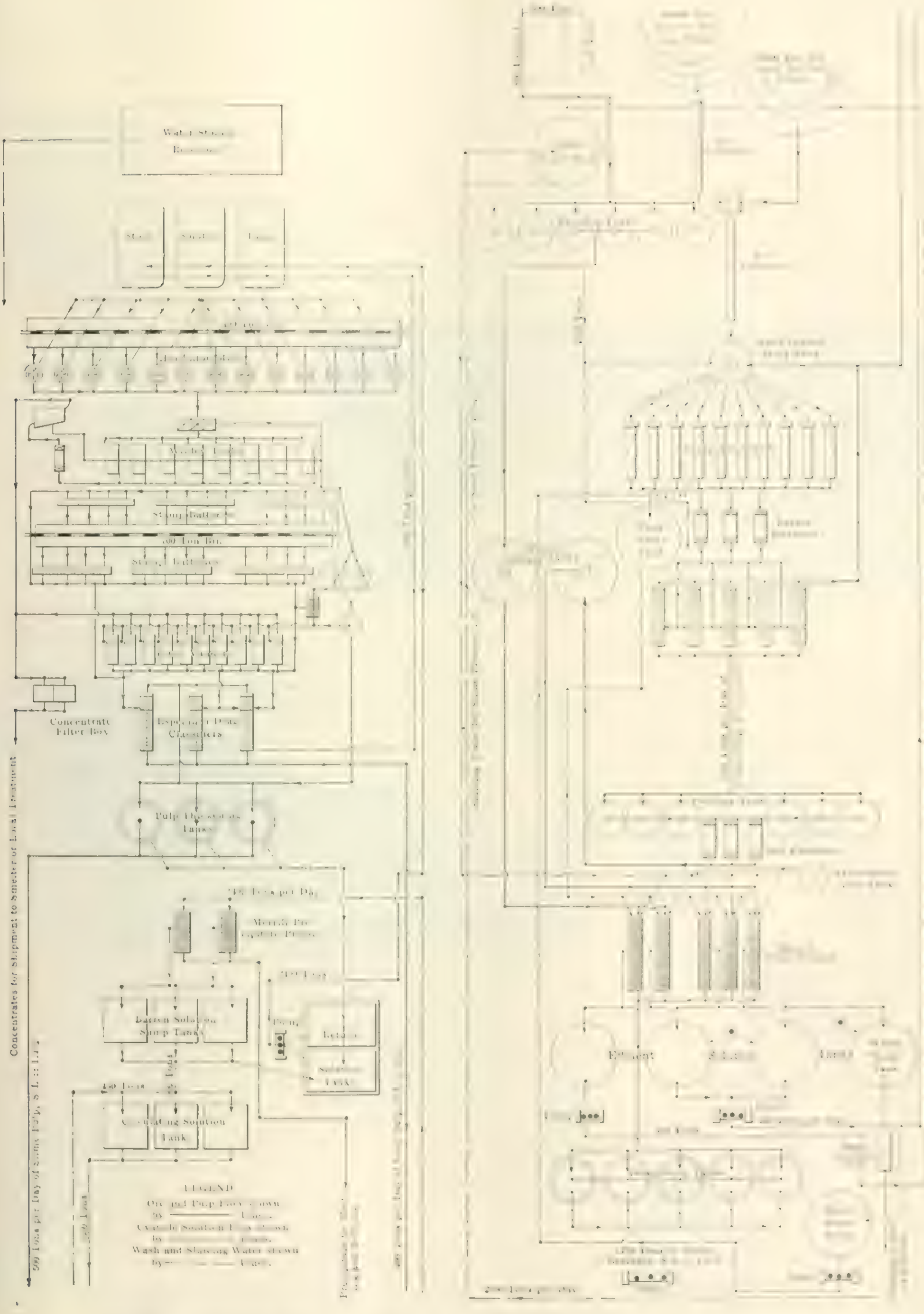
The stamps make 102 drops, 6.5 in. high per min. and crush through a 20-mesh steel-wire screen. The hight of discharge is 8 in., and seven tons of solution titrating 0.12 per cent. KCN are used per ton of ore; 4 kg. of lime are added per ton of ore crushed. The Huntington mills run at 90 r.p.m., and crush through 60-mesh slotted screens; two to three tons of water are used per ton of ore crushed. The crushed sulphide ore from the Huntington mills is to go to a classifying box. The underflow from this classifier goes to 8 No. 5 Wilfley tables running at 244 r.p.m. and making ¾-in. strokes. The concentrates are elevated to another No. 5 Wilfley table running at 250 r.p.m. and ¾-in. stroke for further treatment. The tailings from the Wilfleys rejoin the overflow from the box classifier and go to two 4-ft. cone classifiers. The overflow from the two small cones goes to a 6-ft. cone, the underflow from which goes to ten 6-ft. vanners of the suspended type for concentration; the overflow from the 6-ft. cone goes to three 16x16-ft. tanks for thickening the pulp that goes to the Pachuca tanks and for obtaining clear solution to return to the three stock-solution tanks, 30x18x8 ft. The underflow from the two 4-ft. cones goes to a 24-in. duplex Callow screen using an 80-mesh silk bolting cloth. The oversize goes to the Esperanza drag classifier; the undersize goes to the vanners. The concentrates from the vanners join the concentrates from the Wilfley tables and go to two-compartment filter boxes, each compartment being 6x8x2 ft. In this the concentrates will be dried for shipment.

The tailings from the vanners join the pulp from the stamp batteries and go to three two-compartment Esperanza drag classifiers. These classifiers have a two-compartment box, each being 2 ft. 6 in. by 14 ft. 7 in. These classifiers have from a side view a lop-sided V-shape. The short side has a steep slope, while the long side along which the scrapers travel has a slope of 4 in. to the foot. The water stands 2 ft. 6 in. deep at the apex of the V where the lower wheel, over which the scraper belt travels, is placed. The link-belt chain has drag blades on it at intervals of 12 in. These drag blades are 3 in. wide by 30 in. long, made from steel trommel plate having 2-mm. slots in it. These drags scrape the sand out of the pulp and up the incline, letting the slime flow back through the perforations to overflow from the classifiers. The slime overflows at the short side. The travel of the belt is to be 25 ft. per min. The sand goes to the tube mills below the tailings dumps, and the overflowing slime to the thickening tanks. The overflow from the thickening tanks amounting to 2400 tons per day is to go to two masonry sumps, 16x26x10 ft., and returns by an 8x8-in. belt-driven Deane triplex pump to the stock-solution storage tanks. The settled slime, containing one part solid to 1½ parts liquid, is then diluted to three parts liquid to one part solid, and fed to one of six 15x44-ft. Pachuca tanks where the pulp is to be agitated for 24 hours. Each tank holds 50 tons of dry slime when the dilution is three to one. After this treatment in a Pachuca tank the slime goes to a slime-storage tank, 30x12 ft. deep, where the slime is kept in suspension by stirring arms moving at 5 r.p.m. The level of the slime in this tank is to be kept 3 ft. below the collar so that the pressure at the Merrill filter presses is constant, being 20 lb. per sq.in. The slime from the storage tank goes to two Merrill filter presses. About 400 tons of mine ore will be crushed per day, 200 to slime and 200 to sand.

Treatment of the Tailings

The sand tailings will be loaded by scrapers upon a belt that dumps into the hopper feeding a 16-in. belt conveyer, 380 ft. long running at 380 ft. per min., and delivering the tailings to the tailings mill; 300 tons dry weight of tailings will be treated each day. This conveyer delivers the ore to a steel distributing tank, 8x13.5 ft. in diameter, where it is joined by the sand from the mill ore. In this tank the sands are diluted with 1050 tons per day of standard solution. This tank delivers equal streams of pulp to any 9 of 10 No. 5 Krupp tube mills, 3 ft. 11 in. by 19 ft. 8 in., one mill always being in reserve. Each mill is directly connected to a 60-h.p. motor making 240 r.p.m., but the speed of the tube mills is reduced to 32 r.p.m. by the gearing.

These tube mills discharge into two of three bucket elevators, 62 ft. centers, having 6.5x16x8-in. buckets on an 18-in. belt, run at 360 ft. per min. The elevators discharge into five Esperanza drag classifiers similar in construction to those used in treating the mine ore. The belt in these will run at 15 ft. per min. The


Water Storage Reservoir
Stamp Batteries
100 Ton Bin
Stamp Batteries
Concentrate Filter Box
Esperanza Dorr Classifiers
Pulp Thickening Tanks
Metallic Precipitation Presses
Barren Solution Sump Tanks
Circulating Solution Tank
Pump
Effluent
Solution
Concentrates for Shipment to Smelter or Local Treatment
LEGEND
Original Pulp Flow shown by Lines.
Overflow Solution Flow shown by Lines.
Wash and Sluicing Water shown by Lines.

FLOW SHEET OF REMODELED MILL AND PLANT TO BE ERECTED FOR CYANIDING TAILINGS AT ESPERANZA MINE sand from these returns to the tube-mill distributing tank; the overflowing slime is charged into one of six 15x4-ft. tanks at a dilution of one part solid to 2½ parts solution. The slime from the Pachuca tanks goes to two of three bucket elevators, 54 ft. centers, similar in other respects to those elevating the pulp from the drag classifiers. These deliver the pulp to a slime-storage tank similar to the one for holding the treated pulp from the mill. This feeds the slime at 20 lb. per sq.in. to three Merrill filter presses.

THE PRESENT ESPERANZA MILL AT EL ORO

Filter Presses

The three Merrill presses for filtering the reground sands will each have 75 frames. The two Merrill presses for filtering the original slime from the mine ore will have 90 frames. The filters treating sand will make a solid 4-in. cake, but the filters treating the current or original slime will make a 3-in. cake and use central washing on the cake. This is an entirely new method of operating the Merrill press. Heretofore some difficulty has been experienced in washing colloidal, original slime in Merrill presses, but experiments on original Esperanza slime show that by central washing a 3-in. cake can be successfully treated on a Merrill press. In this way of operating the press the frames are filled almost full with slime, a slight parting being left in the center. The wash water, admitted to the press, enters the cake through the central charging channel. This halves the thickness of cake washed, for the wash water flows both ways through the cake. Experiment has indicated that 8 tons of water at 65 lb. per sq.in. will be required to wash and sluice one ton of slime out of the presses treating original slime, and 3¼ tons to wash and sluice one ton of slime out of those treating reground sand. The treatment cycle is three hours per charge. A 12x10-ft. wooden tank, having a capacity of 1000 cu.ft., is to be provided for holding dilute hydrochloric acid for washing the filter cloths. This tank feeds the dilute acid to the presses at 4 lb. per sq.in. pressure.

The effluent solution goes to three tanks, 30x12 ft. deep. The wash water goes also to a tank 30x12 ft. deep. A 3-ft. cone is used to mix zinc dust with the effluent solution, and a similar one is used for the water wash. The slime discharged from the slime presses goes to five 20x20-ft. dewatering tanks from which the slime is to be discharged at a dilution of one to 1½. The overflowing solution will be pumped back to the sluice-water tank by a 6x8-in. Deane triplex pump having a capacity of 140 gal. per minute.

The wash water from the slime presses after being mixed with zinc dust is to go to a 5-ft. 10-frame Merrill precipitate-press. The effluent water is pumped by a 9x10-in. Aldrich pump, having a capacity of 400 gal. per min. to the 30x12-ft. tank holding waste water for the Merrill slime filters.

ESPERANZA MILL, SHOWING PORTION OF TAILINGS DUMPS

The effluent solution from the slime presses after being mixed with zinc dust is pumped by a 6x8-in. and a 9x10-in. Deane triplex pump, having a combined capacity of 480 gal. per min., to two Merrill 5-ft., 20-frame precipitate-presses. The barren solution goes to three 15x15x5-ft. barren-solution tanks which feed to the two masonry mill-solution sump tanks and to the three 15x15x5-ft. circulating-solution tanks that supply the tailing plant. The precipitate will be dried in the presses with hot air; clean-ups will be made twice a month.

For permission to print this description of the new mill together with the flow-sheet I thank not only Mr. Hoyle and Mr. Guess, but also Cortlandt E. Palmer, consulting engineer to the Esperanza company, and Murry Guggenheim.

Packages for Blasting Powder in Ohio

The following circular letter has been issued by George Harrison, State inspector of mines of Ohio; it is of interest to makers and users of blasting powder.

The new law, passed April 2 last, regulating the sale and handling of blasting powder to miners and by miners in the mines in Ohio, is now in force and effect. It provides that: "All powder sold to miners by the keg shall be packed in kegs which have an opening at the edge 2 in. in circumference, and that can be conveniently opened to avoid the dangerous use of picks to open same."

All shipments must hereafter be in compliance with this law. The penalties provided in section 2 of the law are: "Any person violating any part of this act, shall be deemed guilty of a misdemeanor, and upon conviction be fined, not more than $100, nor less than $5, at the discretion of the court."

For the purpose of uniformity and convenience, the Mines Department advises a screw bung opening within ¼ in. of the rim of the keg, the bung hole not to exceed 1 in. in diameter.

In a coal mine with an incline of 10 deg., where the roof is hard, with a tendency to creep and the coal is free, breasts should be narrow, about 14 ft. wide, with pillars from 24 to 30 ft. wide between them; this is done so that the tendency to creep may be overcome by the thickness of the pillars, and the running of coal thus prevented by the narrowness of the breasts. Tracks should be placed close to the rib. Not much timbering will be necessary, but what little is used should be somewhat underset in the coal.

Removing Accretions in Crucible of Lead-Furnaces

By J. N. Goddard*

Those who have charge of the operation of lead blast-furnaces are well acquainted with the difficulty of keeping the crucibles and lead wells in satisfactory condition. Soon after blowing in a furnace, the crucible begins to collect accretions of metallic iron or copper, sulphides of zinc and other substances, depending upon the character of material smelted. In time the flow of lead through the lead well is entirely shut off by these accretions and the furnace discharges lead through the slag tap-hole into the forehearth, or matte-settling furnace, causing inconvenience, additional labor and probably a greater loss of lead in the slag.

Up to this time it has been the usual practice when this condition obtained, either to shut down the furnace, remove the tap jacket and endeavor to cut a passage through the crucible from the slag tap-hole to the lower end of the lead well, or to drive long bent bars in the same direction between taps while the furnace is in operation—in either case a laborious undertaking and usually affording only temporary relief.

Within the past 18 months a new application of dynamite has come into use at the smelting plant of the St. Joseph Lead Company at Herculaneum, Missouri. As a cure for crucible accretion troubles, J. O. Bardill, mechanical engineer at the plant, has designed a bomb of simple construction and great efficiency.

The construction of this bomb, which is made from standard pipe fittings, is shown in detail in Fig. 1. The materials required for one bomb are one nipple about 4 in. long, two sleeves and two plugs. These parts may be of any size to suit the conditions, but at Herculaneum 1-in. fittings are used. The iron cylinder is lined with a piece of asbestos paper ⅛ in. thick and 4 in. square, and is filled with about one-seventh of a stick of 50 or 60 per cent. dynamite, both ends being protected with a plug of shredded asbestos. The iron plug at one end of the bomb is drilled and tapped to receive the threaded end of a ½-in. round, iron rod from 4 to 7 ft. long. The position of the bomb in the furnace at the moment of explosion is shown in Fig. 2. It is introduced through the lead well using the long rod as a handle. Although the operation of passing the bomb into the furnace appeared at first to be a somewhat hazardous undertaking it has proved to be not at all so. The time required for explosion is from 15 to 25 seconds, giving, at the minimum, ample time for the manipulator to move a few steps to one side and observe in safety the effects of the shot.

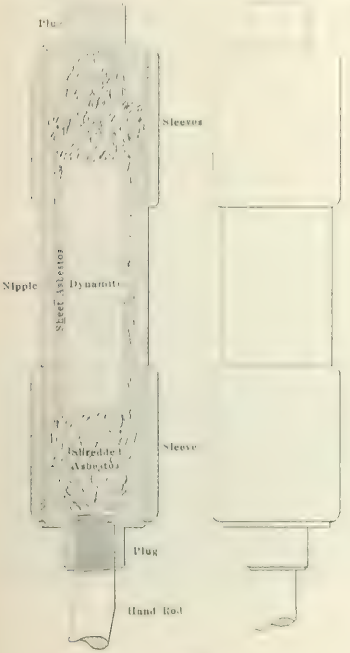


FIG. 1

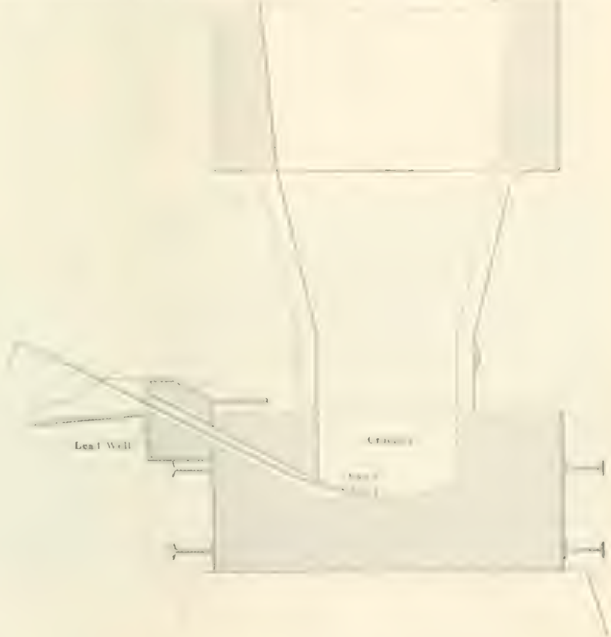


FIG. 2

POSITION OF BOMB IN FURNACE AND DETAILS OF ITS CONSTRUCTION

The best results have been obtained at Herculaneum by "shooting the lead wells" whenever lead appeared in the forehearth, even if only in small quantity. [illegible] this is done just previous to tapping slag. The force of the explosion is often so widely felt throughout the crucible as to splash slag into all the tuyeres of a furnace 160 in. long. The lead in the well is violently expelled and the rush of fresh lead from the crucible carries with it a great quantity of mushy material and small fragments of accretion which have been dislodged by the explosion. This, of course, must be cleared away from the mouth of the well at once with a suitable scraper. The broken pieces of the bomb sometimes float out with the lead, but as often are thrown up [illegible] the slag and are never seen again.

Usually one bomb is sufficient to re-establish a perfect circulation, but when a furnace has been in operation for some time and the use of the bomb has been too long delayed, three or four shots at half-hour intervals may be necessary.

Observations made after clearing out [illegible] bombs exploded in it during a campaign [illegible] damage to the brickwork of the crucible was very slight when the quantity of dynamite used per shot was not greater than that previously mentioned.

These bombs are protected by United States and foreign patents.

---

*Assistant metallurgist, St. Joseph Lead Company, Herculaneum, Mo.

Manganese in Russia During 1907

By I. I. Rogovin*

Manganese ore is produced in the south of Russia, near the town of Nikopol and in the Caucasus, Sharopon district, Province of Kutais. The output in these two provinces, during the last three years, was in poods as follows:

	1905	1906	1907
Caucasus	20,876,487	50,170,000	40,833,000
South Russia	9,235,794	9,580,000	15,500,000
Total	30,112,281	59,750,000	56,333,000

This table shows that as compared with 1905 the output of manganese in the Caucasus increased by 29,293,000 poods. This rapid increase was due to the increased demand for manganese ore and to the difficulty of securing supplies elsewhere, Brazilian manganese especially being kept out of the market by floods and lack of transportation.

The bulk of the manganese ore was exported through the ports of Poti, Batum and Mariupol, the quantities in poods being reported as follows:

	1905	1906	1907
From Caucasus	21,466,000	30,895,000	33,530,000
From South Russia	1,182,000	4,169,000	4,154,000
Total	22,648,000	35,064,000	37,684,000

Thus of the total production of manganese ore from 60 to 70 per cent. was exported, the remainder going to supply the needs of metallurgical works in southern Russia.

Condition of the Market

In regard to the specific conditions with which the Caucasian manganese industry has to reckon, the year 1907 may be divided into two almost diametrically opposed parts. The first half of the year, until the end of July, was marked by considerable activity. An immense demand for ore and unheard-of prices attracted to Chiatury a number of small producers. Intensive working, increased railroad tonnage which called forth a premium on railroad cars, were the characteristic features of this period. Beginning with the month of August this boom began to subside, and when the general financial crisis abroad arrived with many bankruptcies in its train, there was a sudden standstill, which continues until the present time. The crisis affected first the prices for ore, which fell considerably; further it resulted in a reduction in the amount of ore stored and lastly in a decrease of output, which ceased almost completely toward the end of the year.

The chief disadvantage under which the manganese industry is laboring is the inadequacy of the Chiatury narrow-gage railroad. Owing to the inability of this road to meet the requirements of the industry there was a great demand for railroad cars which are allowed in proportion to the quantity of ore in storage, one car being allowed per 20,000 poods. These cars were sold at 100 rubles each, the amount being charged to the sale of manganese ore stored in cars, in contradistinction to that stored on the platform. Whereas ore stored on the platform was quoted at 10 to 11 kopecks per pood, that in cars was sold at from 18 to 20 kopecks and even from 22 to 23 kopecks per pood. Adding to this the high tariff of the Chiatury railroad and other charges, it is plain to see where the high prices came from. The prices were so high last year that the consumers found it more profitable to ship manganese ore from India, where old deposits were intensively worked and new ones explored.

The Outlook

As stated above, the manganese industry in the Sharopon district suffered a considerable decline in the second half of 1907, the yield being 40,833,000 poods against 50,170,000 poods of 1906, a reduction by 9,337,000 poods. The quantity exported through the ports of Batum and Poti amounted to 33,530,000 poods; thus in 1907 the production of the district exceeded the exports by 7,302,000 poods. This surplus accumulating from year to year at the railroad stations reached on January 1, 1907, the excessive figure of 90,000,000 poods.

Owing to the exorbitant prices and the difficulties of exportation, foreign consumers began to look for new markets, chiefly in Brazil and India, and therefore the Russian manganese industry lost its important position. Several years ago the Sharopon ore constituted 47 to 53 per cent. of the world's supply, whereas in 1905 the proportion amounted to 31.46 per cent., and in 1906 to 36.85 per cent. The total output of manganese in all countries amounted in 1905 to 1,339,082 tons and in 1906 to 2,117,816 tons; of this quantity the Sharopon district in 1905 supplied 336,717 tons or 25.15 per cent. and 809,193 or 38.21 per cent. in 1906. No correct data for 1907 are at hand; but it is certain that the share of the Russian manganese industry in the world's market has declined considerably from its proportion of several years ago when it contributed 44 per cent.

---

*Nevsky 134, Petersburg, Russia.

According to an authority on brass, high-grade brass sheets should be made only of the best metals, whereas sheathing metal may be made of ordinary material.

Mexico Mines of El Oro

Special Correspondence

The Mexico Mines of El Oro, Ltd., owns a mine adjoining the Esperanza and El Oro mines. The company was formed in 1904 with a capital of £180,000 in £1 shares by the Exploration Company of London. The report for the year ended June 30, 1908, has just been issued. The realized profit for the year amounted to £132,897, and the balance brought forward from last account was £41,900. Out of these sums a dividend, No. 1, of 5s. per share has been paid, absorbing £45,000, £50,963 has been written off development account, £20,000 off plant machinery and buildings account, £8000 is reserved for income tax, leaving a balance for next year's accounts of £50,834.

A new 40-stamp mill and cyanide works commenced operations in October, 1907, and up to June 30, last, 62,394 dry tons of ore were treated, from which bullion to the value of $807,971 gold was recovered, being at the rate of $12.95 per ton. The average extraction was 84.4 per cent., or 89.6 per cent., if the estimated gold and silver in the precipitation boxes is allowed for. The practice of sliming all the ore by tube mills is adopted and found a satisfactory method of treatment, especially in getting good extraction of the silver.

Besides the income from the mill the company secured a net profit of $278,686 gold, or $136.74 per ton, by shipping 2038 tons of high-grade ore to smelters. The ore reserves exposed in the mine are estimated at 205,310 tons of an average value of $11.72 gold and 6.6 oz. silver per ton. At the end of the previous year—June, 1907—the ore reserves were 178,000 tons of approximately the same value.

Working costs for the period averaged $6.33 per ton, the figures for the month of June, 1908, being as follows, in gold, on 8131 tons worked:

	Per Ton.
Mining	$2.13
Development	0.60
Milling	0.30
Cyaniding	1.27
Water supply	0.03
Taxes	0.66
General expenses	0.31
Total	$5.30

The manager, R. M. Raymond, says that actual development work has been rather light during the year, and that very little has been done except on the fifth and sixth levels. The principal work was in opening out the stopes and running drifts along the sill floor on the hanging portions of the vein, and in opening up the Footwall vein, a short distance east of the Main vein, which has developed into a very important orebody on the fifth and sixth levels. The main shaft has remained at the sixth level, but sinking operations have just been resumed and will be carried on steadily.

Mining Methods at Seaton-Delaval Colliery

A Thick Coal Seam with Strong Cover Is Mined by Longwall, Which under Similar Conditions Is Considered Impracticable in America

BY LUCIUS W. MAYER*

The Seaton-Delaval Coal Company operates four collieries nine miles south of Newcastle-on-Tyne, in Northumberland, England. Northumberland is a county with approximately 750,000 inhabitants, and lies on the extreme northeast coast of England, adjoining Scotland to the northwest, Cumberland to the southwest and Durham to the south. The largest city, Newcastle-on-Tyne, is the center of a great mining district which is one of the chief coal-exporting ports of Great Britain.

The coal, which is of a semi-bituminous variety, is found in flat seams generally, which vary in thickness from a few inches to 8 ft. and are often overlaid by a hard sandstone formation. Coking is generally practiced, though considerable fuel is shipped in the crude state.

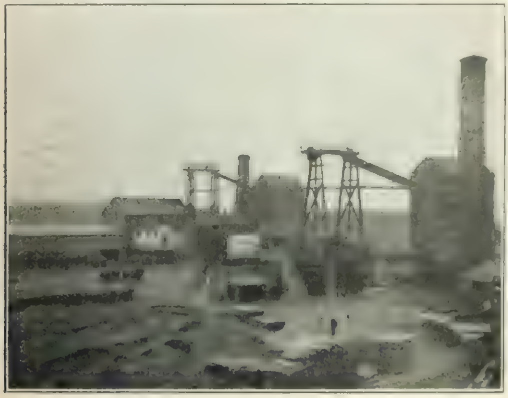


FIG. 1. GENERAL VIEW OF THE CD AND EF PITS IN NORTHUMBERLAND, ENGLAND

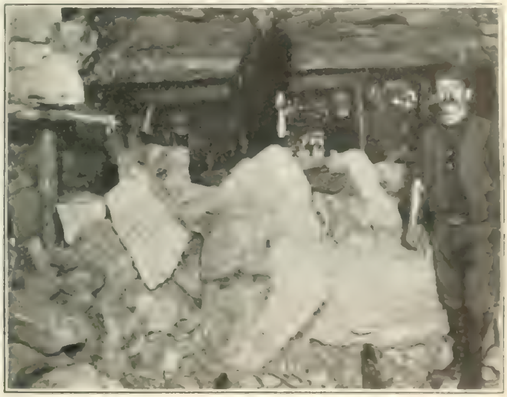


FIG. 2. SHOWING FALL OF HARD SANDSTONE [illegible] IN THE CD AND EF MINE

The mines embraced in the Seaton-Delaval group are the Foster, Relief, CD and EF, and the Hastings. The total number of people employed at these collieries is 2880, who in six months ending July, 1907, produced 474,129 tons of coal. The company provides living quarters for its employees as far as possible, charging nothing therefor. The houses, of stone, are built on the party-wall plan in long rows, with pleasant gardens and good facilities. When more miners are employed than can be accommodated in the available houses, the men necessarily have to rent houses for themselves. An allowance [illegible] per week is made to help defray the additional expenses of those men who cannot be accommodated by the company. By the payment of 6c. per week, medical attendance is afforded employees.

THE NORTHERN COAL DISTRICT

The Northern coal district presents conditions of roof not found in other parts of England. The roof over the coal seams in this district is uncommonly hard. Outside of the information that certain thick seams in India have particularly strong roofs and are very thick, the roof over certain Northumberland seams is the strongest of which I have record. The Main coal, which lies on a 2- to 3-per cent. dip, averages from 6 to 7 ft. in thickness, with a 6-in. band of dirt 2 ft. above the floor.

The longwall system of mining is here largely and successfully operated. The two conditions, first, hard roof, and second, comparatively thick seams, makes this district of distinct interest. While the roof is not as hard as that encountered in some coalfields, it is much harder than coal-mining experts in America consider within the sphere of the longwall system.

The CD and EF pits are the collieries on which this report treats. They produce about 1300 tons of hard steam coal daily. Fig. 1 shows a view of the CD and EF surface plants. Note the peculiar arrangement of headframes. The hoisting [illegible] counterbalance, the chain lowering into a well. The construction of the hoist house might be called reinforced stone, the reinforcement being timber. Note also from Fig. 1 [illegible] of the pits in each case, the balance being effected between the two shafts over the same frame.

A typical section of strata over a section of the Main coal or Gray seam at the CD and EF pits is strong, hard sandstone, as shown in Figs. 2 and 3. The floor under the seam is often a gray metal for about 2 ft. and then setter clay comes in, which at times is of sufficiently good quality for the manufacture of [illegible]. The depth of the Main coal below the surface averages about 360 feet.

THE LONGWALL SYSTEM IS USED

Both the longwall and the bord-and-pillar system of mining are in operation, and work which may have been carried on for a time on the bord-and-pillar plan may be changed to longwall, and continued to the boundary on these lines. Fig. 6 illustrates the condition where the ordinary method of bord-and-pillar has been in operation, the work being changed to the longwall system. In making this change certain precautions must be taken. Pillars must be left to protect the main haulage way, should the work emanate in the vicinity of such a roadway, as shown in Fig. 6. In longwalling, it is desirable that the roof should throw its weight on the coal face in certain measure. This is a feature. With a roof of this strong make-up, the benefit so involved would not accrue if merely a small area was set off for longwall operation.

---

*Mining engineer, 71 Broadway, New York City.

Longwall Gives Larger Tonnage

It has been proved that by longwall a larger tonnage per man can be maintained and that the coal breaks better. It is stated, however, that by longwall, the cost per ton of coal is slightly higher than by bord-and-pillar. Nevertheless, when a large tonnage is desired, the longwall system is favored. It has been found at Seaton-Delaval, nearly twice as much coal is cut per man each day by the longwall system.

It is not proposed here to cite the advantage of one system of mining coal over another, but the evidence here offered certainly controverts the prevailing American disfavor of the longwall system in general; and more important yet, as regards the conditions under which it may be successfully operated.

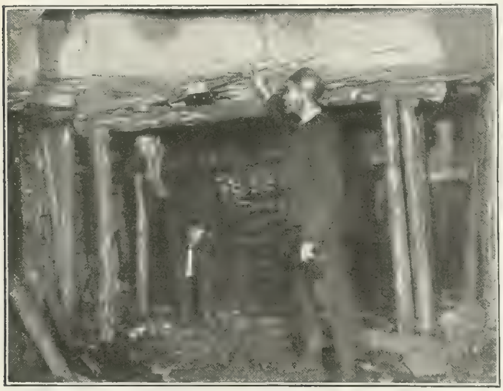


FIG. 3. SHOWING STRONG SANDSTONE ROOF OVER THE GRAY SEAM

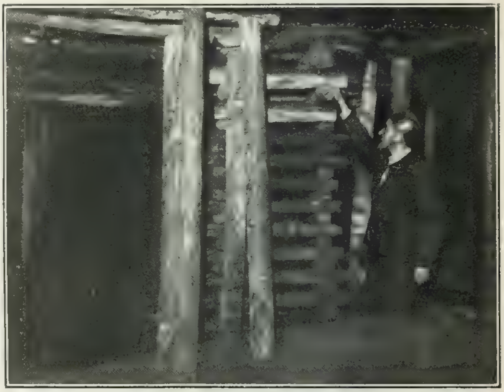


FIG. 4. SHOWS TIMBER CRIB WEDGED TO ROOF AT INTERSECTION OF TWO ROADS

In general the plan of mining at Seaton-Delaval by longwall is to drive out from the shaft with a main gateway, and its parallel air course, as at *a* and *b*, Fig. 5, driving cross-headings *c, c* at intervals. The barrier pillars, *d, d, d*, vary in size according to conditions. The road *e, e*, is protected by packs of rock, *f, f, f*, built up against the main road barrier, and from this road *c, c*, start mother-gateways, which are set off at right angles. These are shown in detail, in Fig. 7. The mother-gateways and the intervening subgates are maintained with pack-walls of rock, which material is shot down from the roof in the gateways for the purpose of building these walls.

In Illinois, a 3-ft. seam of bituminous coal is worked by longwall and the roof brought down to make room in the gateways. This rock was used for packing. I venture to state that had the seam been 6 ft. thick, longwall mining would never have been carried on, in spite of the favorable conditions existing as regards action, influence and control, in the light of American ideas. At Seaton-Delaval lies a thick seam of coal, and in spite of the fact that sufficient head-room is available after the seam is removed, and that the roof is very strong—and would be considered impossible in the United States—the longwall system is not alone practiced, but looked upon with favor over other systems.

Mother-gateways are Protected By Stone Walls

Between the mother-gateways which are turned off 300 to 600 ft. apart—see Fig. 7—are the subgates. The mother-gateways are maintained until the boundary is reached, and the district divested of coal. Auxiliary gateways are abandoned in the course of the work, and cross-gates *e*, Fig. 6, which are set off from new auxiliary gates, are started. This is in accordance with the prevailing roof conditions.

The main haulageway is driven 12 ft. wide; intervening pillars are 35 to 45 ft. wide, and the return airway 8 to 9 ft. wide. The barrier pillars *d, d*, Fig. 5, are about 140 ft. wide and 180 ft. long. Walls *f, f*, protecting roadway *e, e*, are 12 ft. wide. Mother-gateways are 12 ft. wide, protected on either side by walls 9 ft. wide. On either side of the mother-gateways there may be four or five auxiliary gates *h, h*, Figs. 5 and 6, which are kept up usually not more than 300 ft., when cross-roads *e, e*, Fig. 6, are driven, protected in a similar manner by rock walls.

Fig. 7 shows typical longwall workings in detail at the face. The main gateways *g* are protected on either side by stone walls, which are built close up to the back. The walls are not built solid, but have a 1½-ft. shell, small stuff being thrown in the center. Details of wall are shown in Fig. 8. It is noted that the roof is brought down only in the gateway itself, Fig. 9, and only to such an extent as to afford sufficient rock material of proper size to build the walls.

The Coal Face is Stepped to Prevent Roof Breaking at Face

Note in Fig. 7 how the coal face is stepped, *j, j, j*, each stall being about 60 ft. wide and stepped 30 to 45 ft. deep. This layout, as previously described, counteracts the tendency of the roof to break at the face.

The rock walls are kept up within about 10 ft. of the face. At intervals, as shown in Fig. 7, stone cribs *m, m*, about 6 ft. square, are built, and these are supplemented by timber cribs *t, t*, sometimes filled with stone. Fig. 4 shows a crib built and wedged up to the roof at a point where two roads intersect. The thickness of seam at this point, it is seen, approximates 8 ft. and is exceptional, rather than the rule. It is not to be inferred that these walls keep the roof up permanently; there is no intention that they should.

In spite of the hard roof conditions here, a regular subsidence is effected. Just what the result would be if the floor were of the same hard nature as the roof, is hard to state. I am inclined to believe, however, that the walls would be crushed, for nothing can stop the roof if it starts to come down. As it is now, the walls are crushed to a certain extent, but the main subsidence is due to the walls being forced into the floor, and the heaving up of the floor due to roof pressure.

As in the softer formations where longwall is used, the mother-gateways have to be gone over periodically, and settlement occurs to such an extent that head-room has often to be recut two, three, or more times, during the life of a roadway.

WORK IS DIVIDED INTO THREE SHIFTS

The mining work is divided into three 8-hour shifts, the first two shifts being hewer, and the third stonemen. During this last shift nothing but stone work is carried on, the men so engaged being called "stonemen" and "shiftmen," the former being wall builders and the latter rock drillers. The foreman over this work is called the master shifter. Rock work is always done by the same crew and during the same hours, the stonemen or shifters always working at night. Shifters are in the mine from 4 p.m. until 12:30 a.m., and have some roof rock broken down ready for the stonemen, who come in at 6 p.m., and remain until 2:30 a.m.

Figs. 2 and 3 show a mother gate within about 15 ft. of the face. In Fig. 3, the roof rock is intact up to the point where the man points his finger. In Fig. 2 the timber has been removed, and two shots have been fired, having produced the fall illustrated. On the extreme left is shown the wall which protects this side of the gateway. In bringing down the roof, certain timbers are removed and others left. It is surprising to see how the form of break desired is readily controlled by the arrangement of these sticks. The longwall face is seen in the rear of both illustrations, at the head of the mother-gateway; also the 6-in. dirt band about 2 ft. above the floor in Fig. 3. The modifications shown in the rock, Fig. 2, are not necessarily general; at times this sandstone formation is most uniform.

Two men [illegible] get from $1.28 to $1.44 per day; [illegible] down as much rock as can be packed in a single shift by the stonemen, who in turn get $1.08. The coal men were getting $1.24 plus 38 per cent. at the time of my visit. It may be mentioned here that for work in England there is a base price, settled on by a conciliation board, which includes representatives of both operators and workmen. In Northumberland, the board meets every three months and graduates the additional percentage to be added to the base price according to the prosperity of the trade.

The stone builders work four men in a gang, and [illegible] build [illegible] of wall on each side of the road per shift. It is seen in Fig. 8 that cross-walls are built at [illegible] ft. [illegible]. In Fig. 8 [illegible] roof is brought down over the 6-ft. seam, so that the [illegible] high. This is also shown in Figs. 2 and 3, although [illegible]

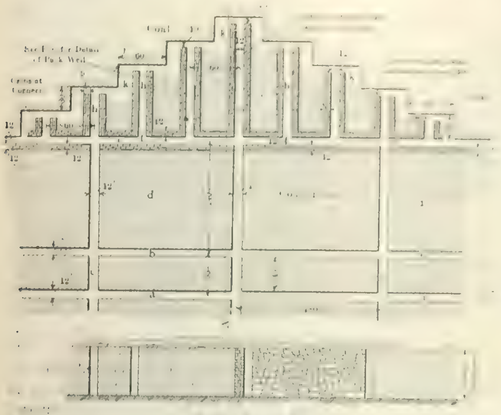


FIG. 5. LONGWALL PLAN OF MINING SHOWING MAIN GATEWAY

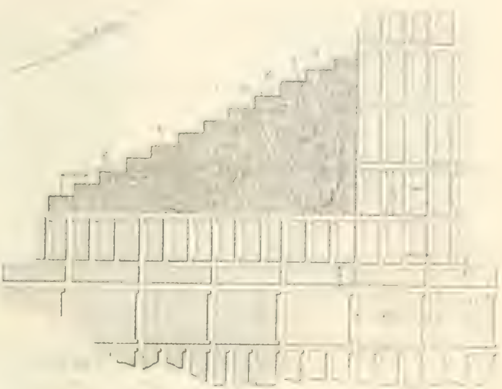


FIG. 6. SHOWING WHERE BORD AND PILLAR HAS BEEN CHANGED TO LONGWALL

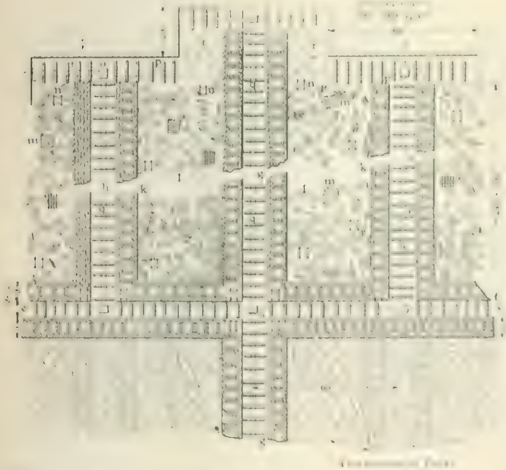


FIG. 7. DETAILED PLAN OF LONGWALL AT THE FACE

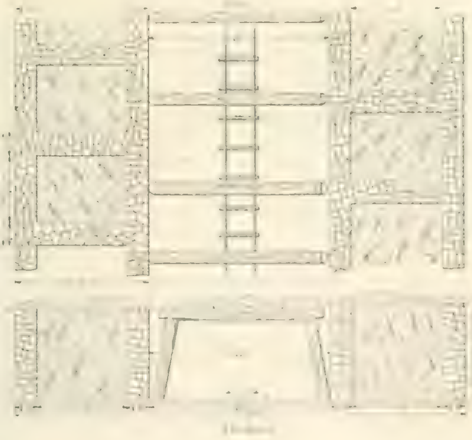


FIG. 8. DETAILS OF SHELL WALLS USED IN [illegible] GATEWAYS

about 5½ ft. thick. In a 6-ft. seam, each man handles 162 cu.ft. of wall-building material in eight hours. Each 6-ft. advance on both sides of the road means 36 lin.ft. of rock wall built, and 324 cu.ft. of gob. This is 81 cu.ft. of each class of material handled by each man.

Building the Walls

The rock which makes up these walls must not be too large. Usually it is broken up so small that two men can handle any piece without over-exertion. The limit of 200 lb. might be placed, though perhaps for the lower tiers of rock, heavier material can be handled with impunity. The wall building, it is seen, is entirely dry work. Placing short lengths of round timbers in the walls horizontally, as was practiced at the Baltic copper mine in Michigan, in the built-up stone drifts, has been tried with good effect at Seaton-Delaval.

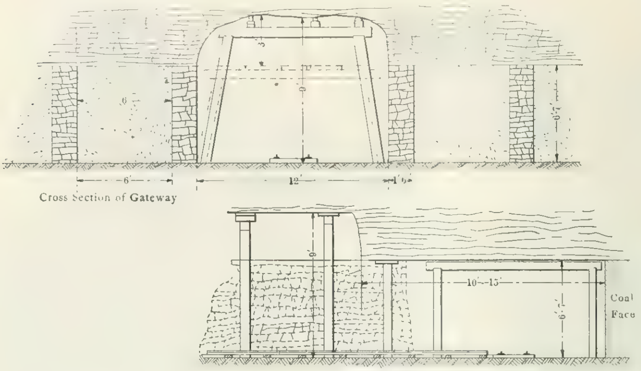


FIG. 9. THE ROOF IS BROUGHT DOWN IN THE GATEWAY TO AFFORD ROCK MATERIAL FOR WALLS

Hand-boring machines are used for drilling the holes. Ordinary augur drills are rigged up, to be set to a 9- to 10-ft. back, the hight being adjusted by telescopic standard. In hard rock, the augur is turned by two men, and ¾-in. diameter holes are drilled 4 to 5 ft. in length, slightly inclined upward. The speed of this drilling is variable. A hole 4 to 5 ft. in length may be drilled in from one to five hours, according to the texture of the rock. In just such a place as is shown in Fig. 3, the telescopic standard will be set up and the hole drilled at a point a little above where the man's finger points. Two such holes may be placed to produce the effect shown in Fig. 2. Four to seven sticks, equaling 20 oz. of ammenol powder, are used per charge in dry work, with 5 ft. of black Bickford fuse No. 7 cap. Where the ground is wet, gelatinite made by the Alfred Nobel company, is used. Sticks are 4 in. long by 1¼ in. diameter. This explosive is stronger, but produces considerably more smoke than ammenol.

The roof is necessarily timbered in a thorough manner, as is required by law, though the absolute necessity of the timber is not always urgent. Maximum bracing between spaces and props is stipulated for all conditions of roof, and the law allows little variance. While a certain amount of timber is always used under certain conditions, considerably more is set up than is apparently required. This, of course, is dependent on the nature of the floor, quite as much as it is on the nature of the roof. Where the roof acts too quickly, the coal may be shattered more than is desired, the aim being to produce as much large coal and as little slack as possible. The amount of timber used in the mine is also dependent, to a great extent, on the prevailing atmosphere in the workings.

The Floor and Roof

World-wide conditions seem to indicate that the floor of coal seams is generally of a softer nature than the roof. In the course of the investigation in hand, there has been no exception found to this condition. At Seaton-Delaval the floor is sometimes found to be quite hard, but not as hard as the roof. There are certain disadvantages involved in a condition of hard floor, in that where the roof does take weight with the hard floor, the timber fails, while with a softer floor, the posts would have been driven into the bottom and eventual recovery made possible.

The roof having taken weight, removal of timber is made difficult and the use of a stick of powder, or otherwise shattering the post, may be the only means of extricating the props. Again, with a hard floor, undue pressure is thrown on the coal face, with the result that the coal is subjected to excessive crush, which reduces its market value, owing to the excessive amount of slack made. A few sticks of timber standing in the seam may interfere with the regular subsidence of an area; but this rather refers to a softer roof than is here described.

At Seaton-Delaval a large amount of coal is produced from the bord-and-pillar workings, and where the production is not being hurried, it might be that the greatest percentage of the production is obtained by that method of mining. By robbing operations, it is claimed that the yield per hewer is about the same as in longwall, which amounts to approximately five tons per man; whereas in the blocking out of pillars in ordinary bord-and-pillar operations, the production per man approximates 3½ to 4 tons at Seaton-Delaval.

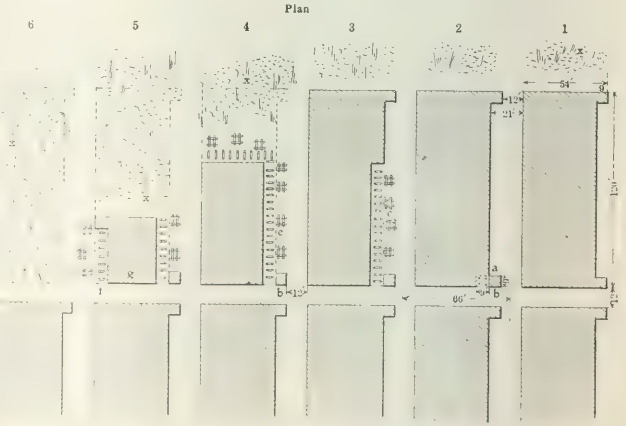


FIG. 10. A SINGLE PILLAR, SHOWING VARIOUS STAGES OF ATTACK

Robbing Pillars

Pillar-robbing operations, called "broken work" are always started from the boundary, and progress on the retreat, but where excessive evolution of gas is not likely to follow the roof falls, the work of robbing may be carried on in isolated districts, pillars being left for the support of haulageways, etc. Fig. 10 shows a single pillar in various stages when under attack. Starting at 2-a, a place is cut 9 ft. wide; *b*, called a "stock," 9 ft. square, is left as a pillar of protection. A cut-out *a*, is run out the length of the pillar, maintained 9 ft. wide. As this work progresses, timbers are set continually, and withdrawn. The timber sets, consisting of two posts and a cap, are augmented by cribs, as seen in 3, 4 and 5, of Fig. 10. These cribs are set at intervals as required, perhaps 12 ft. apart, and are approximately 6 ft. square; they are often made of old, discarded timbers. On reaching the goaf, a headway lift 9 ft. wide is cut across the short end of the pillar, next the goaf end, and successively other 9 ft. slices, until finally the pillar is all removed within about 15 ft. of the near end. Up to this time the timber has been set and removed, following the judgment of the deputy overman. Only a small portion of the coal now remains in the pillar, and its complete removal is not always certain. The last part of the work is carried on with particular speed, until finally the coal stock *b*, remains to be drawn.

Letting Down the Roof

The letting down of the roof does not always follow according to plans. This work is directed by deputy foremen, whose special duties are to oversee the removal of timbers. They are held accountable for the safety of the working places.

It is not unusual for the roof to hang over an area of two or three pillars, and then to fall suddenly, although never without warning. This condition of sudden fall is, of course, undesirable. When the roof does come, more or less crushing of coal, with ensuing loss, occurs in the adjacent standing pillars.

It has been explained how subsidence is dependent on thickness of seam, nature of overlying formation, depth of seam from the surface, and other conditions, such as whether other seams have been worked above or below. At Seaton-Delaval, experience as regards subsidence of the surface has been variable. In one place, a 5-ft. seam of coal 672 ft. from the surface, with 300 ft. of strong stratified post and blue metal, followed by a hard formation to the surface, was mined for an area of about 1500 acres. The floor in this case was hard; there was no surface effect noticed. This was in an area called the "Low Main" seam. Another instance was cited of a seam 5 ft. 8 in. in thickness under a 360-ft. cover, consisting of 12 ft. of strong post over the seam, followed by 20 ft. of gray post and other soft strata, which involved complete subsidence; the floor in this case was considerably softer than in the former instance. It appears that where longwall has been operated, the subsidence was not so severe, the cover being allowed to fall in a more gradual manner.

Colliery Notes

The keeping of rescue apparatus in coal mines is compulsory in Austria.

All men before being allowed to engage in rescue work should be subjected to a searching medical examination.

Load out all old disused wood of any kind, for if allowed to remain in the mine, it is an added source of danger in case of fire.

The quantity of air passing through each district of a mine should be measured at least once in every month, and the air in gaseous mines once a week.

One of the earliest mentions of coal mining in England is where Alexander de Compton in 1275 A.D., accounted $8.64 received for one perch of sea coal sold. In 1338, pits were sunk near Nuneaton, England.

Foremen should see that all hygrometers, anemometers and water gages are kept in good order. They should be tested from time to time to see that they register the correct quantities or satisfactory results will not be obtained.

When working entries or other narrow places where gas feeders are found, barrels of water conveniently located afford the means by which the miner may early extinguish a fire, and thus prevent what might with delay become a serious mine fire.

Canada has recently made uniform the regulations governing the issues of leases of Dominion and school lands for coal-mining purposes. The ground rent is to be made $1 per annum, and the royalty 0.5c. a ton. Not more than 640 acres are to be leased to one person.

Experience has shown that soft rubber or graphite packing causes less friction than harder packings. Packing friction may be greatly reduced by oiling the piston rod. The amount of frictional loss that may be caused by the careless using of wrenches is almost unlimited.

During the year 1906, in one of the English mining districts not a single accident from explosives or shot firing was reported, in spite of the fact that twenty-nine different kinds of explosives were used and about three million shots were fired, consuming 1⅞ million pounds of explosives.

In cold weather, oil barrels should be kept in the oil house for a few days before they are emptied, so that the oil may become thoroughly warm and thus easily drain out. A place should be provided outside the oil house for the empty oil barrels, which should be laid on their sides with the bung hole down to prevent dust from entering.

The average wage of a breaker boy in the anthracite coalfield is $0.85 per day, or about $18[illegible] per year. Door boys and helpers in the mines average $1 a day. [illegible] are over 16 years old, average $1.25 per day. It is estimated that the 38,000 anthracite employees who are under 21 years of age, earn about $870,000 a year.

Mine foremen can do much to improve the foreign-speaking miners working under their directions, if their attitude is one of personal interest, and if they make an attempt to gain the confidence of the men. The result of such charitableness and breadth of mind will be a lower percentage of accidents, a more competent staff of miners and, as a natural result, a larger output of coal.

The advantages of mineral over vegetable or animal lubricating oils are: (1) they are much cheaper; (2) they do not become thick or gummy from exposure to the air; (3) they do not corrode metals; (4) they are capable of being separated into many grades from the lightest to the heaviest cylinder oil; (5) they are free from the danger of spontaneous combustion as they have a low cold test.

The following is a table of tests, made with a Davy lamp, giving the length of cap for the percentage of firedamp:

Percentage of Firedamp	Length of Cap
2 per cent.	[illegible] in.
2½ "	[illegible] "
3 "	[illegible] "
4 "	[illegible] "
5 "	1[illegible] "
5½ "	2 "
6 "	3 "

The length of cap increases rapidly as the proportion of firedamp rises over 4 per cent.

Lubrication is the chief essential that contributes to the efficiency of compressed air machines, since they are usually small and of light weight and operated at high speed; the closeness of the fit of the different parts is important. As the air used for operation is expanded from a high pressure to a lower pressure it absorbs much of the heat of the surrounding metal and produces intense cold; hence, oil used on these machines should be a pure petroleum with a low cold test.

A check weigher at the South Normanton coal mine in Derbyshire, England, has [illegible] a method of [illegible], which is claimed to reduce the liability of accidents, by insuring the firing of every charge. The end of a tube with a loose central needle is inserted into a cartridge of explosive material, and the cartridge with the tube and needle are placed in the prepared shot hole. The hole is then rammed, after which the needle is withdrawn from the tube, and the detonator, attached to a suitable carrier, is then passed through the tube into the space left in the explosive by the withdrawal of the needle. The detonator is then coupled to the battery and fired; if from any cause the explosive is not fired, or the detonator misses fire, it can be withdrawn and another detonator attached to the carrier and placed in the explosive, as in the first case.

Meeting of the West Virginia Mining Association

The most important meeting of coal operators and mine experts ever held in West Virginia was called to order in Charleston, on Wednesday, Oct. 7, by President W. N. Page. More than 300 coal operators and mining men attended the conference, which was the first general meeting of the association since its organization in Washington last winter.

After an opening address by President Page, the following papers were read and discussed:

1. The Effect of Legislation on the Mining Industry in West Virginia. By E. W. Knight.
2. The Proper Relationship Between Capital and Labor in West Virginia Coal Mining. By B. F. Bush.
3. Recent Mine Disasters—Causes and Remedies as far as Ascertained. By J. S. Cunningham.
4. Is Dust, as such, Explosive, and if so, What are the Chemical Reactions and the Most Efficient Preventatives. By Frank Haas.
5. The Standardization of Powders and Explosives for Underground Workings. By J. W. Heron.
6. The Advisability of Standardizing Electrical Appliances in Mines. By W. H. Keller.
7. The Education of Mine Managers in Rescue Work and the Danger Involved by Untrained Men Attempting such Work. By William Leckie.
8. Mine Fatalities in West Virginia as Compared with other Countries and the Present Methods Pursued by the Mine Department of West Virginia in Tabulating the Same By Neil Robinson.

Among those attending the meeting were Captain Desborough, inspector of explosives for Great Britain; Victor Watteyne, head of the Department of Mines of Belgium, and Carl Meissner, one of the councilors to the Department of Mines, of Germany. Accompanying these experts, who were previously invited by the Federal Government to inspect mining conditions in this country, were Dr. J. A. Holmes, chief of the Bureau of Technology of the United States Geological Survey; Edward W. Parker, Chief of the Bureau of Mines and Mining, and R. Y. Williams, of the Experiment Plant at Pittsburg. Messrs. Watteyne and Meissner made short talks concerning mining conditions and investigations as carried on in their respective countries.

On Thursday morning a special train was placed at the disposal of the association, and caried the operators and their guests on an inspection trip over the new Virginian railway. The special train was arranged through the courtesy of President Page of the Virginian railway, and President Stevens, of the Chesapeake & Ohio. Short stops were made for the inspection of the mines of the Loup Creek Collieries Company at Page, and at other operations located along the line. Returning, the party reached Charleston about 9.30 p.m.; all of those attending were unanimous in stating that the trip was both beneficial and pleasant.

It is doubtful if this country has yet witnessed a meeting of coal-mining men, that has been more representative of the industry as a whole, than this meeting of the West Virginia Mining Association.

Abstracts of the excellent papers read will be published in early issues of the ENGINEERING AND MINING JOURNAL.

American Institute of Mining Engineers

EDITORIAL CORRESPONDENCE

As stated in the last issue of the JOURNAL, the opening session of the 95th meeting of the American Institute of Mining Engineers was held at Hotel Patten, Chattanooga, Tenn., on Thursday evening, Oct. 1. By Saturday evening the reading of papers was finished, and no further sessions were held.

At 7:30 a.m. on Monday, Oct. 5, the members and guests of the Institute, numbering about 120, left Chattanooga on a special train for a visit to the mines and furnaces of the Roane Iron Company, at Rockwood, Tenn The Chamberlain mines were first visited. In the afternoon the party went through the plant at Rockwood, returning to Chattanooga at 8 p.m. on that day.

At 9:25 p.m. on Tuesday, Oct. 6, a special train left Chattanooga for Copperhill and Ducktown, Tenn., carrying 26 members of the Institute. All of Wednesday and most of Thursday were spent visiting the mines, smelters and sulphuric-acid plants of the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company. On Thursday afternoon, Oct. 8, the special train left Copperhill for Knoxville, whence most of the members returned to their homes. Several of the party went to Birmingham, Ala., to inspect the iron mines and furnaces of that district.

The silver mines of Mexico (A. F. J. Bordeaux, *Trans.* A. I. M. E., Sept., 1908) represent deposits of three principal classes: (1) veins and stockworks in eruptive rocks; (2) fissure veins crossing the crystalline schists, granite, diorite, etc.; and (3) veins and replacement deposits in limestone. The true fissure veins in some districts contain, in value, more gold than silver. In other deposits, the silver is decreasing in depth, leaving galena and zinc blende as the principal ores.

Granby Consolidated Mining, Smelting and Power Company, Ltd.

This company owns extensive copper mines and smelting works in the Boundary district of British Columbia. Its report is for the year ended June 30, 1908. The capital stock authorized is $15,000,000, of which $1,500,000 is held in the treasury. The balance sheet at the close of the year shows: Stock outstanding, $13,500,000; dividends held, $1324; accounts and bills payable, $896,895; surplus, $2,455,181; total liabilities, $16,853,400. The assets were: Cost of property, $15,238,458; stocks, bonds and bills receivable, $1,008,013; fuel and supplies, $185,324; cash and copper on hand, $421,625; total assets, $16,853,400.

The ore smelted during the year was 858,432 tons Granby ore and 24,179 tons purchased ore; a total of 882,611 tons. The product was 21,126,926 lb. copper, 300,593 oz. silver and 40,139 oz. gold. The average price realized for copper was 13.333c. per lb.; for silver, 56.625c. per ounce. The average cost per ton of ore, including all expenses was $3.486. The average cost of copper, after deducting values of gold and silver, was 10.31c. per pound.

The income account is as follows:

Sales of product	**$3,790,184**
Working, selling and general expenses	$3,013,396
Foreign ore purchased	170,266
Total expenses	$3,183,662
Net earnings for the year	$606.522
Surplus from previous year	2,775,758
Total	$3,382,280
Bonus to employees	$23,100
Dividends paid	675,000
Allowance for depreciation	228,999
Total charges	$927,099
Surplus at close of year	**$2,455,181**

Expenses given above include all development work, renewals and repairs. The total mine development during the year was 9338 lin. ft.; diamond drill, 3129 ft. There was expended for additional mining property, $23,743; new construction and equipment at mines and smelter, $242,574; total, $266,317 for additions.

The president's report says: "The new Victoria shaft and surface equipment, including crusher, electric hoist, belt conveyer, etc., have now been in operation 12 months, and have given satisfaction, both in quantity of ore handled and economy of cost. The Curlew tunnel was connected by an upraise with the workings of the Gold Drop mine, and the ore output now comes through this tunnel, the temporary outlet over another property having been abandoned. At the mouth of the Curlew tunnel, a complete equipment of ore bins, large crusher, motor and conveyer belt for loading have been installed. The tunnel is also equipped with an electric haulage system, consisting of electric locomotive and cars, motor generator set, etc. Electric haulage was installed at the upper level of the Gold Drop mine, likewise on the 400-ft. level of the Granby mines, which connects the Victoria shaft with all lower workings. This latter consists of a 75-h.p. electric locomotive and 20 steel cars, each having a capacity of about 6 tons. They are self-dumping and automatic in every way and were put in service about Jan. 15 of this year.

"The mechanical devices now in operation, such as hoists, shafts, belt conveyers, mine cars and electric locomotives are able to handle about 5000 tons of ore daily. The mines shipped to the smelter a total of 858,432 tons during the past year against 644,549 tons during the previous year. The grade of ore mined was not as good as in the previous year, carrying about 1 lb. less of copper and 10 to 12c. less per ton of ore in gold and silver. The extraction per ton of ore on the average was 23.42 lb. copper, 0.2865 oz. silver and 0.0454 oz. gold; as compared with 24.43 lb. copper, 0.3088 oz. silver and 0.0503 oz. gold in 1906-1907; and 24.30 lb. copper, 0.3107 oz. silver and 0.0513 oz. gold in 1905-1906. During the summer months a lower-grade ore was shipped, due to mining the Glory holes on the surface, which are low grade and which cannot be mined during the winter months. Consequently, the ores will average richer in winter and spring and poorer in summer and fall. The quantity of ore developed by diamond drilling has been larger than the ore extracted.

"During the entire past year improvements were made at the smelting plant, among the most important being the erection of additional ore and coke bins, which increased the ore storage capacity to about 13,000 tons, while the total storage capacity of coke will be about 8000 tons in bins, besides that stored on the ground. Further improvements for increased coke storage are contemplated. The old flue-dust chamber having been found to be too small and in the way of further enlarging the present blast furnaces, a new steel flue-dust chamber immediately back of the furnace and on a higher level than the previous one was erected, and the brick flue leading from the steel flue chamber to the stack was enlarged. The charging system was greatly improved by installing larger locomotives and larger charge cars.

"As indicated in the last report, it has been decided again to enlarge the furnaces, which have worked very satisfactorily. This will be done successively. One of the furnaces is now being so enlarged, and if found satisfactory, the remaining seven will be rebuilt as fast as practicable. The old wooden blowing engine building has been removed and replaced by a new one of steel and brick and enlarged sufficiently to accommodate two large rotary blowers of 10,000 cu.ft. per minute capacity. All former blast pipes will be replaced by larger ones. The converter building and converters have also to be enlarged, in order to take care of the proposed increased quantity of matte. This will be done by extending the present steel building 80 ft. in length. Three large and modern electrically operated converter stands will be installed, replacing one of the present small stands, and when completed there will be two old small stands and three new large ones. A new 40x40x42 blowing engine will be installed driven by 500-h.p. electric motor to take care of the large converters. When completed, the converter plant will have a capacity to turn out 35,000,000 to 40,000,000 lb. of copper per annum.

"All new construction, with the exception of the ore and coke bins, has been either of steel or of steel and brick, thereby greatly lessening the fire risk. It is estimated that all the above improvements will be finished next year, when the benefit from large and continuous tonnage may be expected. The plant and equipment have been kept in a high state of efficiency and all repairs and minor improvements have been charged to current expenses.

"In consequence of a great many changes made at the mines and smelters, some machinery together with the buildings containing it became obselete, and a careful re-appraisement shows that there should be writen off for depreciation at the mines about $115,000 and at the smelter about $45,000. In addition it is estimated that further changes will result in depreciation to the extent of about $45,000 at the smelter during the coming year, and your board has thought it wise to write this amount off during the business year ended June 30, 1908, making the total written off for depreciation about $205,000.

"The total tonnage of Granby and [illegible] to 882,011 dry tons against 665,915 tons in the previous year, and there were produced 21,126,926 lb. of copper against 16,403,497 lb. The cost per lb. of copper produced, after deducting the value of gold and silver, was 10.24c. against 10.14 and 8.35c. in the two previous years.

"Smelting operations were greatly interfered with by the construction work and frequent vexatious interruptions. During mid-summer of 1907 the smelter still suffered greatly from a shortage of [illegible] Nov. 1, 1907, to Jan. 1, [illegible] the entire plant was shut down. At that time, an adjustment of wages, in harmony with those ruling in neighboring camps, was effected.

"Early in August a disastrous fire broke out in British Columbia, laying waste an [illegible] in length and 5 to 10 miles in width, and doing great damage to the properties of the Crow's Nest Pass Coal Company, from which we receive our coke and in which we are large stockholders; besides, a great many bridges belonging to the Canadian Pacific and Great Northern were destroyed, and the supply of coke [illegible] cut off, necessitating the closing down of one half of the furnaces. Since Sept. 1 the smelter is again in full operation.

"Almost immediately after issuing our last annual report a most severe panic broke out, and among other disastrous consequences the consumption of all metals decreased very materially and prices showed a heavy decline. Of the different metals, copper was among the heaviest sufferer, due perhaps, to the abnormally high prices that ruled throughout the greater part of 1907 and which had not been known before, except when the copper-mining industry in this country was in its infancy. Prices fell from about 25c. to close to 12c. and showed very little recovery during the first six months of the present year, due to the great falling off in the consumptive demand for home trade. Fortunately, Europe was a continuous buyer, thereby preventing large accumulations of stock. Of late, the demand for home trade has shown great improvement, and if this continues, as appears to be the case, it may be confidently hoped that prices will show a further improvement.

"The enormous decline in the price of copper and the marked influence on the cost by reason of the difficulties with which the smelter had to contend, permitted the declaring of only two dividends, one of 3 per cent. on Sept. 30, 1907, and one of 2 per cent. on June 30, 1908."

Transvaal Gold Mines

The production of gold in the Transvaal in September, as reported by the Chamber of Mines, was 587,034 oz. fine, being 179 oz. less than in August. Considering the shorter month, there was really an advance, the daily average for August being 18,962 oz., while that for September was 19,588 oz. For the nine months ended Sept. 30, the total production was 4,864,782 oz. in 1907, and 5,159,-[illegible] crease of 295,077 oz., or 6.1 per cent

In the Blue Ravine district, near Folsom in California, where drift mining has [illegible] deep came into vogue, they had to drift [illegible] the new machines the Blue Ravine bids [illegible] drifting field

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, was 40,800 copies.

October 3	13,000
October 10	9,800
October 17	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
  The Utah Consolidated Smelter....... 772
  The Trinity Copper Company........ 772
  The Temagami-Cobalt Mines, Limited 773
  Calumet & Hecla Osceola.......... 773
  Connellsville Coke.................. 773
  Speed in Small Drifts............. 773
*Operation of an Anaconda Copper Converter............*C. Offerhaus* 747
Efficiency of Mexican Labor. *Special Correspondence* 752
Talc and Soapstone in Vermont. *G. H. Perkins* 753
*A Remarkable Car-dump. *Frank A. Ross* 754
Effect of Temperature on the Electrolysis of Copper.......................... 755
A New Railroad in Mexico............ 756
*Loss of Leakage of Blast in Lead and Copper Furnaces................. 756
Consolidated Mining and Smelting Company of Canada, Ltd............... 756
*Advancing the Hot Time Lateral of the Newhouse Tunnel. *Henry M. Adkinson* 757
Duties of the Cyanide Chemist......... 757
*The New Esperanza Mill at El Oro, Mexico............*Claude T. Rice* 760
Packages for Blasting Powder in Ohio... 762
*New Bomb for Lead Furnaces. *J. N. Goddard* 763
Manganese in Russia During 1907...... 764
Mexico Mines of El Oro. *Special Correspondence* 764
*Mining Methods at Seton-Delaval Colliery............*Lucius W. Mayer* 765
Colliery Notes 769
Meeting of the West Virginia Mining Association 770
American Institute of Mining Engineers. *Editorial Correspondence* 770
Granby Consolidated Mining, Smelting and Power Company, Ltd......... 770
Transvaal Gold Mines............... 771
Correspondence:
  Pull Switches for Electric Mine Signals .... *Sydney F. Walker* 775
  Rights of Junior Locators. *Albion S. Howe* 775
  Peon or Mexican Indian. *Cyrus Robinson* 775
  Ore Sampling by Machine. *E. P. Mathewson* 776
Iron and Steel in Sweden............ 776
West Virginia Mine Regulations....... 776
Dredging Troubles in California *Special Correspondence* 776
New Publications..................... 777
The Virginia Geological Survey........ 777
Questions and Answers................ 778
Personals, Obituaries, Societies and Technical Schools.............. 779
Special Correspondence.............. 780
Mining News 782
Markets, etc 787
Illustrated.

The Utah Consolidated Smelter

The intention of the Utah Consolidated Mining Company to build new smelting works near Salt Lake City is interesting because of the prospect it offers for further competition in smelting at that point, although, of course, such competition will be limited to pyritic ores and such dry ores as can be smelted upon a copper basis. The management of the company has been criticized for its decision to incur this great expense, estimated roughly to be $3,000,000, in view of the fact that the mine of the company has only about four years of ore supply developed; and the doubt as to the continuance of ore. With these circumstances it is pointed out that a renewal of the contract with the Garfield Smelting Company would be cheaper in the end.

The management of the Utah Consolidated Mining Company has a good deal of intelligence and also some regard for decency in its actions with respect to the stockholders of the company. Consequently, it is only fair to suppose that it has given due consideration to the important question by which it has been confronted. At the end of 1907 the mine of the company had a development of 1,202,930 tons of ore, against 1,100,000 tons at the end of the previous year. Several new orebodies were discovered during 1907, and the outlook for the mine was regarded as promising. In 1905-1907 the company smelted at the rate of a little less than 300,000 tons per annum. We do not know the terms of the existing contract between the Utah Consolidated Mining Company and the Garfield Smelting Company; it has been rumored that they are about $1.50 per ton higher than the cost used to be to the mining company when it was smelting its own ore. If the mining company were to build a new smeltery at a cost of $3,000,000 to treat 1,200,000 tons of ore, and that amount only, an amortization of something a little less than $2.50 per ton of ore would have to be figured, besides the interest on the investment, but the expenditure of $2,000,000 for construction only ought to build works of much larger capacity than 300,000 tons per annum, at least twice as much, and the Utah Consolidated Mining Company is undoubtedly reckoning on smelting a good deal of custom ore, besides a good deal more than 1,200,000 tons from its own mine. Consequently it is not a question of amortization in the brief period of four years.

The Utah Consolidated Mining Company has always been noted as one of the commendable concerns that make good reports to their stockholders, these reports comprising a statement of an essential factor, namely, the amount of ore developed remaining in the mine at the end of the year, which is commonly kept a secret. The company has had, and still has, a high order of management and technical advice of the best character, and it is only reasonable to suppose that it knows how to figure the difference between the yield of a smelting contract and the cost of smelting on its own account.

The Trinity Copper Company

An illuminating example of one of the greatest evils in modern corporate management was afforded by the recent annual meeting of the Trinity Copper Company. As everyone knows, this is a concern which has been extensively advertised by Thomas W. Lawson, who was the original promoter of the company, and is still its president. According to newspaper reports, the secretary of the company was the only officer present at the last meeting of the stockholders. After the submission of an annual report and balance sheet of the usual perfunctory type, which communicates scarcely any important information, one of the stockholders endeavored to secure more specific information and made a motion that the management issue to the stockholders a detailed statement respecting the financial condition of the company, and the physical condition of its property. This motion was promptly tabled by the representative of the management who through proxies controlled the meeting. This is a reminder of former meetings of the Bigelow companies, and many others which arrogantly consider that minority stockholders have no rights.

The inability of stockholders in a corporation to obtain specific information respecting its affairs is as amazing as the fantastic events in "Alice in Wonderland." Macaulay's "New Zealander" would not recognize this as a part of sober business transactions in the 20th century. The managements say that no one dissatisfied with the règime need continue to be a stockholder, but that talk is made only after the distribution of the stock has been effected. Any company which offers its stock to the public incurs an obligation to be frank and fair toward its stockholders. In the case of the Trinity company, the stock was not only offered to the public, but the latter was urged, begged and implored to buy it through the medium of spectacular newspaper advertisements. It will be a good day when the public refuses to touch the stock of any company that does not make adequate official reports, such reports comprising not only a properly audited set of accounts, but also a specific statement respecting the physical condition of the property.

As to this notorious Trinity company, the fact is simply this: When the company was brought out in 1901 it developed a lens of ore containing about 400,000 tons, averaging about 3 per cent. copper and 80c. per ton in gold and silver. With that development the orebody was delimited, i.e., its top, bottom and sides were defined, so no continuation of that orebody was to be expected, and moreover the prospects for finding similar orebodies elsewhere in the property were not considered good. No other orebody has since been discovered. The developed orebody was not big enough to justify the erection of an economical smelting works, and the mine remained idle until the Balaklala nearby developed a large orebody and erected smelting works at which the Trinity ore could and is to be smelted. The Trinity mine will begin to produce when the Balaklala smelting works is ready to begin operations.

The Temagami-Cobalt Mines, Limited

We dislike to waste our space upon such a miserable attempt to secure money as that of Julian Hawthorne, to which we have previously referred. In commenting upon his affair we gave him originally the benefit of all doubt and assumed that he was an amateur in the business, but he has disclosed that he does not belong in that class. A fortnight ago we reported his misuse of the name of Ricketts & Banks. He wrote to that firm a feeble letter of apology, in which he said: "I could have easily gotten along without mentioning any name, and in order to avoid any criticism in this regard, I shall certainly be careful in the future." He promptly showed how he could get along without the mention of any name by bringing out a new circular letter, in which he substitutes for his original phrase, "the firm of Ricketts & Banks, of New York," the following: "A prom- [illegible] New York." Also, he refrains from mentioning that the capitalist whom this prominent firm [illegible] ber of the Tiffany firm. The circulation of this latest letter is, of course, a wilful deception.

W. Fischer Wilkinson, of London, whose name was also used by Mr. Hawthorne, writes to us as follows: "A friend of mine in New York recently received a begging letter about Temagami which made out that all sorts of people were dying to get the property, including myself. It said that I had not done business because I could not get the control. All this is moonshine. I may have met Hawthorne on the Cobalt excursion of the American Institute of Mining Engineers, and perhaps saw him out of civility in New York, but that is all. The use of my name or that of my company is quite unwarranted."

Calumet & Hecla—Osceola

The termination of the long litigation of A. S. Bigelow and associates against the Calumet & Hecla Mining Company to restrain the latter from voting its stock in the Osceola company is a cause for congratulation, although no great principles were involved. The litigation was merely an irritating attempt to block the legitimate expansion of a distinguished industrial enterprise, that has always been characterized by honest methods, and was based upon and sustained by misleading allegations, which could not fail to be exposed.

Connellsville Coke

The production of Connellsville coke is a very fair gage of the condition of the iron trade; partly because it is used so largely in that trade, and partly because the current statistics are readily available. The figures collected by the Connellsville *Courier* show that the coke production in the region for the week ended Sept. 19 was 201,485 tons, which contrasts with 142,346 tons for the first week in January. Taking the middle week of each month as an average, the make of coke for this year has been as follows, in each week:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		

The spurt in February and March only resulted in the accumulation of stocks which were not cleared off for some time. The net result shows a steady, but slow gain, until now the weekly output runs from 50 to 60 per cent. of that of a year ago.

Notwithstanding this present depression, new development and the construction of new coking plants in the Connellsville region are proceeding actively.

Speed in Small Drifts

In this issue we print an article by Mr. Adkinson on the rapid driving of a crosscut 5x7½ ft. in size. The speed maintained for a year, including two months during which only 84 and 88 ft. were driven, was 208¼ ft. per month. For the nine full months worked the average speed was 236 ft. per month; the greatest for one month was 263 ft. We believe that this is the best on record for drifts or crosscuts of this size. The figures appear even more remarkable when it is considered that the men were working for day's pay.

In rapid drifting, raising, or sinking, three things are essential: First, the details of the system must be thought out so as to economize time to the uttermost. Second, a foreman must be found who will see that the system is followed; who will obtain the right crew of miners, and who will engender a spirit of wholesome rivalry among the different shifts. Third, miners must be found to work with their brains as well as with their hands, and do good work even when hurried. S. H. Knowles especially deserves credit for welding these three diverse elements into a whole with such eminent success. The noteworthy point is that instead of obtaining speed by contracting the work or by using a bonus system, Mr. Knowles used the old Cornish policy of "stints" and increased the daily wage only enough to obtain the best miners in the district. But it was the foreman who begot the [illegible] very beginning that each shift did its work efficiently. This prevented any [illegible] instead there arose the healthful rivalry so essential to speed.

In driving mine crosscuts or drifts more study than is usual should be given to the choice of the explosive. In driving or sinking, the rock should be broken no smaller than is necessary for rapidly loading it into a car. Yet in such work, on account of the nearness of the holes to each other, the tendency is to break the rock too small. If the rock is broken smaller than necessary, it entrains an undue amount of gas that later bothers the shoveler. To prevent this the dynamite in most of the holes should have a rending rather than a shattering effect. But in the cut holes a shattering effect is essential as the rock around these holes cannot well be rended but must be shattered, or, as the miners say, "burnt out." In rapid driving the miners should be sufficiently intelligent to use two strengths of explosive, viz., a quicker higher-grade dynamite in the cut holes and a slower, lower-grade dynamite in other holes.

On account of the entrained gases, which are larger in quantity than a person that has not driven a drift would imagine, the nature of the gases generated by the explosion of the dynamite is very important. But of equal importance is the obtaining of a perfect explosion of the charge. Therefore, unusually strong caps should be used, not only to obtain the full effect of the dynamite, but also because the explosion of the dynamite is the more complete the more sudden the shock of the initial detonation.

By using turn-sheets for flooring and also low cars, by supplying a quantity of good air, and by keeping the tracks in good condition and as near the face as possible, the time required for cleaning the drift can be greatly shortened. Broad square-pointed shovels are the best for shoveling the rock off the turn-sheets, but round-pointed shovels are quicker for cleaning the rough bottom ahead of the turn-sheets. Correct loading of the lifters, as is well known, greatly aids in decreasing the amount of rock that falls off the turn-sheets.

The problem in small, narrow drifts is far different from that in large, wide drifts approaching railroad tunnels in size, for the wider the drift the greater the amount of rock broken per foot of hole drilled. Not only does the relative amount of drilling decrease as the size of the drift increases, but the number of rock drills that can be used also rapidly increases; for instance in a drift 5 ft. wide only one drill can be used, but in a drift 10 ft. wide three drills can be used. On the other hand, as the size of the drift increases, the distance that the broken rock must be shoveled also increases. But the shoveling area increased only as the width of the drift, while up to a certain point the tonnage of rock broken increased more nearly as the square of the width. The only constant, after the width becomes sufficient for a shoveler to work freely, is the amount that a man can shovel. Consequently the problem in a large drift is not the drilling, but the shoveling.

By the same process of reasoning it becomes evident that when the drift becomes narrow so that only one machine can be used at the face the problem changes. Then it is easy enough to get the shovelers; the problem is to get the machinemen.

Small drifts, therefore, require that the most study shall be devoted to aiding the miners. In order that the machinemen may devote their entire time to their work, the shovelers should go on shift earlier than the miners so that they can have the face, roof and sides picked down before the miners come. Then without loss of time the miners can set up a crossbar and begin to drill.

A high air pressure should be maintained at the drill, plenty of sharp steel of varying lengths and a blowpipe should be furnished, a spare machine and spare parts, such as valves, chuck bolts, etc., and an extra hose should be stored near the face. Water for the wet holes should be handy.

The time that is lost cleaning holes is not important, provided that the miners are good machinemen, for if the miner "tending chuck" works a small wire, called in Butte, Mont., a "picker," back and forth in the hole while drilling the dry holes, and properly waters the down holes, he will not lose much time cleaning out the holes. If the ground is damp, drills made from cross steel aid greatly in preventing loss of time while drilling flat or "dry" holes. With round or octagonal steel, unless the hole is scraped out frequently, the drillings gum up and hold the drill steel in the holes, but with cross steel the rotating of the drill bores out the drillings. Provided that a standard type is used, the make of the drill is far from being as important as the advocates of each represent.

An important thing in rapid driving is good ventilation, for then the gases after blasting are quickly driven away, and the men are given good, pure air that keeps them active. The best way to ventilate the drift is to blow the air back from the face by means of compressed air and then to remove it by means of a suction fan. With a blower the smoke and gases are only driven away from the breast to linger along the rest of the drift. Some provision should be made for laying the dust while drilling the dry holes. Great care must also be taken to avoid "missed" holes. In the most important holes, cuts and lifters, double primers should be used.

The method of loading the holes described in Mr. Adkinson's article is, in our opinion, not the best. Experiments have shown that, provided there is no intervening air spaces, no difference in the effect of the explosion is noticeable whether the primer is near the bottom, near the top, or in the middle of the charge. Therefore, the primer should be placed near the top of the charge as then there is less danger of the dynamite's burning instead of exploding. Mr. Knowles is right in believing that in drifting it is poor policy to economize on explosives.

The Cornish policy of "stints" or a bonus system seems to be the best methods of insuring rapid driving. The trouble with contracting is that the details of the work are turned over, more or less, to the man having the contract. The man drives as fast as his conception of mining allows him, generally no faster than the speed usual in such work. He rarely is capable of working out the details in the manner that a good manager, who has had some experience at drifting, would do. On the other hand the "stint" policy or the bonus system leave the control of all operations, even to details, in the hands of the manager.

Rapid driving is obtained at additional expense per foot. This increased cost per foot is warranted only under special conditions. Yet by studying the methods used in the rapid driving of both large tunnels or adits and mine crosscuts or drifts, the managers at many mines will learn details that will aid materially in increasing the speed, and also in lowering the price of driving below the cost of such work when the planning of the work is left to the foreman and the miners.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Pull Switches for Electric Mine Signals

In the JOURNAL of August 15, there is a description, and a very clear illustration of the Q & C electrical pull switch for mine signals. The arrangement of the switch consists of two stout springs, fixed to a piece of insulating material, with a rod carrying at one end a copper disk, and at the other end an eye for the attachment of a cord, and between these a stout spiral spring, the copper disk making contact between the two fixed springs, when the cord is pulled. The apparatus appears to me to be a very good one, and one that should answer its purpose very well indeed, if it is properly constructed.

I should like, however, to give one or two words of warning. The drawing does not give sizes, or strengths of material. In my experience, I have found that electrical men are too apt to make electric contact arrangements, particularly those designed for use in mines, too weak. The electrical signaling current is very small. It will pass easily through very small wires, and it is, therefore, too often assumed that small wires will answer the purpose for contact making. This view leaves out of account two very important considerations; the rough usage that every switch necessarily receives in a mine, and the water, usually impregnated with salts, that is nearly always present in a mine.

Let me suggest that the fixed springs shown in the drawing, between which the moving disk makes contact, when the switch is pulled, should be very large and very strong. Stout, hammered brass rod, 2 in. wide by at least 1/8 in. thick, will be none too large. In any case they should never be less than 1 in. wide, and 1/16 in. thick. The rod, the disk, and the spiral spring may be in proportion, but it is not of such great importance to make the disk so strong, as it is not subject to chemical action to the same extent as the fixed springs. The fixed springs which receive the current, are always exposed to electro chemical action, particularly the one that is connected to the positive signal wire, and it is upon them that the water does its principal work. The copper disk, the rod, and the spiral spring, should, however, be sufficiently strong to stand pulling into contact with the strong fixed springs suggested, bringing the contact well clear again, when the pull is released, and to stand the wear of repeated use.

[illegible] taining the apparatus, and should also be made very large. The springs should be fixed to substantial insulating blocks, on the sides of the containing case, by substantial screws, and one substantial screw should pass right through the center of the insulating material, being metallically connected to the spring on the inside, and fitted with a stout washer, and a clamping screw on the outside. The hole through which the screw passes, should be well bushed with insulating material, that will stand a certain amount of moisture, and the hole in the case should be filled with the insulating material, and the hole in the insulating material filled quite tight by the screw shank passing through. The object of this arrangement, which is dictated by my experience of about 30 years is, to confine the chemical action to the outside of the case, where it can be seen. If holes are drilled in the case, and covered wires are led through the holes to screws on the inside, it is absolutely impossible to prevent water finding its way along the surface of the covering of the wire, to the screw and the spring to which the wire is attached. Another reason is, that when fixed on the outside in the manner described, the screws can be made large and substantial, and any chemical action that is going on can be seen. The terminal screws may be as large as there is room for. One, 1½, or even 2 in. will not be too large. These figures may seem extravagant, but they are dictated by experience gained in the usual painful manner.

When the connecting screws are on the outside, there will be no necessity for opening the case, except at rare intervals, and the working parts will, therefore, remain in very much better condition.

SYDNEY F. WALKER.

Bath, England, Sept. 20, 1908

Rights of Junior Locators

In the JOURNAL of Sept. 5, page [illegible], A. H. Ricketts in "Short Talks on Mining Law," says: "The junior locator does not acquire title to the surface within the overlap because of the subsequent abandonment or forfeiture of the elder claim, as in that sense the overlapping location was prematurely made."

This opinion is directly contrary to the following statements from "Martin's Mining Law," edition 1908, section 328, page 241. Martin says: "In the absence of ob- [illegible] cator may extend his lines upon and across the surface of such senior claims, and by so doing he acquires both surface and extralateral rights, as against the Government and subsequent locators, as fully as if his entire claim was laid upon unappropriated ground, subject only to the rights of such senior locator from, and in, his prior locations. (Cases: Empire State-Idaho Mining and Development Company vs. Bunker Hill & Sullivan Mining Company, 131 *Federal Reporter* [illegible]

"So, too, if there is no objection on the part of the senior locator, a junior locator may extend the lines of his location upon and across the surface of the senior claim; and in case there is unoccupied land on both sides of the senior location, he will by such location, acquire rights, surface and extralateral, therein against the Government, subject only to the rights of prior claimants. (Cases: Bunker Hill & Sullivan Mining Company vs. Empire State-Idaho Mining and Development Company, 109 *Federal Re-* [illegible] *Reporter* 317).

"And after crossing such planes of senior locations he may resume and follow the vein on its course without regard to the rights of junior locations. (Cases: Bunker Hill & Sullivan Mining Company vs. Empire State-Idaho Mining and Development Company, 134 *Federal Re-* [illegible]

Where expert mining attorneys and writers of law books disagree, how are the layman and engineer to determine which is right? A misstatement of the law of the case invites litigation between mine-owners, and such a statement should not go unchallenged.

The law, as given by Martin, is certainly the best for the prospector and mine locator, as he is not then compelled to survey all conflicting claims to safeguard his locations.

ALBION S. HOWE.

[illegible]

Peon or Mexican Indian

[illegible] of Steel Cable Over a Mountain Trail," all of the men employed for packing the cable were Mexican Indians. I think it rather unfortunate that the article de- [illegible] not exist, nor has it existed for a long time in Mexico; and there is a growing sentiment objecting strongly to the use of the term as applied to Mexican laborers. CYRUS ROBINSON.

New York, Oct. 7, 1908.

[The word "peon" was used in the article because it is a short, convenient word in very general use and in good standing in the dictionary; also because the movement to brand it as a term of reproach had not reached this office. Seoane's Neuman & Barretti dictionary of the Spanish and English languages, edited by Mariano Velazquez De La Cadena and published by D. Appleton & Co., gives as English equivalents of "peon," "day-laborer," "pedestrian," "foot-soldier," and (Amer.) "Indian laborer hired by the day." The word did not originally, nor, as we understand it, does it now, convey the idea of bondage or serfdom.

In our own experience with Mexican laborers no sentiment against the use of the word has ever appeared. The men called themselves and one another "peon" freely. They seemed to consider the term honorable enough, and, we thought, were rather inclined to use "Indio," "Indito," and "Indigene," colloquial equivalents of our "Indian," in a contemptuous manner. The use of the word is no doubt largely a matter of locality. The Mexican laborer by his efficiency and all-round usefulness is earning the respect of the world for himself and any title he may happen to bear. If he objects to "peon" he certainly deserves to be called by another name.—EDITOR.]

Ore Sampling by Machine

As further evidence that mechanical sampling can be correct, despite the contention of John A. Church and others, I wish to call attention to the following results. This lot was run through the mill twice, the first crushing being to about 2 in., the pulps in both cases ground to 120 mesh:

	Ag. Oz.	Au. Oz.	SiO_2 Per Cent.	S Per Cent.	FeO Per Cent.
Lot No. 806......	0.8	0.74	89.4	3.0	5.2
Resample	0.8	0.73	89.0	3.2	5.4

While this ore is not particularly high-grade, it is a free gold ore, more or less spotty, and is more subject to variation in sampling than our usual run of ore.

E. P. MATHEWSON.

Anaconda, Mont., Oct. 8, 1908.

Iron and Steel in Sweden

Statistics prepared by Director Richard Akermann, of Stockholm, give the production of raw materials in Sweden for the full year as follows, in metric tons:

	1906.	1907.	Changes.	
Coal.	296,980	305,338	I.	8,358
Iron ore	4,502,597	4,480,070	D.	22,527

The production of pig iron and of wrought iron and steel ingots was as follows, also in metric tons:

	1906	1907.	Changes.	
Pig iron.........	604,789	615,778	I.	10,989
Charcoal blooms .	178,298	174,405	D.	3,893
Bessemer steel	84,633	77,036	D.	7,597
Open-hearth.....	311,435	341,893	I.	30,458
Crucible and blister...	1,979	1,703	D.	276
Total steel...........	398,047	420,632	I.	22,585

The production of finished iron and steel, as far as reported, was as follows:

	1906.	1907.	Changes.	
Blooms and billets. .	28,880	44,975	I.	16,095
Bars..........	206,124	198,533	D.	7,591
Nail and wire rods....	125,051	139,240	I.	14,189
Other shapes..........	11,965	15,025	I.	3,060
Plates..................	21,063	21,246	I.	183

The only decrease reported was in bars. The exports of pig iron and of merchant bars were, in metric tons:

	1906.	1907.	Changes.	
Pig iron........	112,200	129,800	I.	17,600
Iron and steel bars....	194,400	154,200	D.	40,200

The average number of furnaces in blast in 1907 was 130, against 128 in 1906, and the average daily production of pig iron per furnace was 16.91 metric tons in 1907, as compared with 16.28 tons in 1906. The average time that each furnace was active in 1907 was 280 days.

West Virginia Mine Regulations

The following circular letter has been issued to coal operators by the Department of Mines of West Virginia:

CIRCULAR

At a meeting of the entire inspection force, except District Inspector J. G. Boyd, held at the office of the chief of the Department of Mines on Sept. 29 and 30, 1908, it was deemed advisable that the department should issue a general circular letter containing a note of warning and caution concerning conditions of danger that may be brought about by reason of the changing of the conditions of the weather respecting the probability of mine explosions.

The inspection force is unanimous in its opinion that it is extremely important that every precaution should be exercised in removing dust and wetting down of dusty sections of the mines, especially at and near the working places where explosives are used.

With reference to solid shooting in mines, the inspectors are convinced that the section of the regulations of July 1, 1907, permitting the employment of shot inspectors should be rescinded, since such privilege has been uniformly abused and has not been complied with in any spirit of sincerity. In this regard it is important that those in charge of mines should bear in mind that the danger of solid shooting arises from the excessive use of explosives and improperly placed holes and they will be required to employ methods which will minimize this source of danger.

It is suggested, and it will be exacted by all inspectors, that all dry dust be removed from the workings of the mines, especially on all headings and rooms, and that the dry or dusty parts of the mine be kept wet by a systematic system of applying water.

The inspectors discourage the use of dynamite for blasting coal, and where used for rock work it should be used by skilled employees and at a time when all other employees are out of the mine. With reference to black powder, the inspectors are fully convinced that the limiting of the charge of the explosive, and properly mining the coal will minimize the probability of mine explosions.

Operators of mines are invited to confer with the district inspector relative to any of the provisions of this circular.

Dredging Troubles in California

SPECIAL CORRESPONDENCE

The trustees of the city of Sacramento are about to take steps to prevent the alleged pollution of the waters of the American river by the dredge companies operating at Folsom, not many miles away. A number of excited citizens, having seen muddy water coming down are anxious to make the dredgemen quit work. As a plain matter of fact, there is not a single dredge at Folsom working in the bed of the river, and there never has been. The dredges are operated on ground away from the river and its banks, and their tailings are, as usual, dumped in the pits dug by the machine and not allowed to escape into the river. Doubtless some muddy water does escape into the stream which eventually reaches the Sacramento river at Sacramento. But there has been no clear water in front of the latter city since the State was settled up by farmers, miners and other people, who contribute their quota toward discoloring the river water as in the case of all settled communities. The dredgemen do not permit their tailings to go into the river. The city trustees have appointed the mayor, city counsel and city engineer to investigate the subject with a view to bringing suit against the dredge companies in case it may be proved that they let their tailings go into the American. This will be hard to prove.

In this connection it may be noted that the Folsom dredgemen are having other troubles as well. It has been discovered that there has been a systematic scheme to rob the plates of the machines and that a total, said to be $30,000 or $40,000, has been stolen by employees. Some half-dozen of the suspected men have been arrested and held for trial. The men, through other parties, had the gold disposed of at the United States Mint, but they were being watched and finally caught. These men had easy access to the amalgamation plates used on the dredges.

New Publications

TABLES AND OTHER DATA FOR ENGINEERS AND BUSINESS MEN. Compiled by Charles E. Ferris. Pp. 249. 3x6-in.; leather, 50c. Knoxville, Tenn., 1908: University of Tennessee.

GENERAL INDEX TO REPORTS OF GEOLOGICAL SURVEY OF CANADA, 1885-1906. Compiled by F. J. Nicolas. Pp 1014. 6½x10 in., cloth. Ottawa, 1908: Government Printing Office.

RHODESIA CHAMBER OF MINES (INCORPORATED), BULAWAYO. Thirteenth Annual Report for the Year Ended March 31, 1908. Pp. 200. 8x10 in.; cloth. London, 1908: Darling & Son, Ltd.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. Vol. LXXVI, No. I. Edited by Bennett H. Brough. Pp. 493; illustrated. 5½x9 in.; cloth, $6. London, 1908: E. & F. N. Spon, Ltd.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. Vol. LXXVII, No. II. Edited by Bennett H. Brough. Pp. 287; illustrated. 5½x9 in.; cloth, $6. London, 1908: E. & F. N. Spon, Ltd.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES FOR BUYERS AND SELLERS, 1908. Seventeenth Annual Edition. Pp. 1240. 7½x10½ in.; cloth, $10. New York, 1908: Samuel E. Hendricks Company.

ROAD PRESERVATION AND DUST PREVENTION. By William Pierson Judson. Pp. 146; illustrated. 6x9 in.; cloth, $1.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

RAILWAY TRACK AND TRACK WORK. Third Edition. By E. E. Russell Tratman. Pp. 520; illustrated. 6x9 in.; cloth, $3.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES. Thirty-second Annual Report. W. S. Blatchley, State Geologist. Pp. 1258; illustrated. 6x9 in.; cloth. Indianapolis, Indiana, 1908: Department of Geology and Natural Resources.

THE PRINCIPLES AND PRACTICE OF SURVEYING. Vol. II. Higher Surveying. By Charles B. Breed and George L. Hosmer. Pp. 432; illustrated. 6x9 in.; cloth, $2.50. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

GENESIS OF ROCKS AND ORES. By Brenton Symons. Pp. 403; illustrated. 5x7½ in.; cloth, $3. London, 1908: The *Mining Journal*.

Contents: Sedimentation of rocks and ores. Metamorphism of strata. Segregation of metallic ores in veins.

THE COBALT-NICKEL ARSENIDES AND SILVER DEPOSITS OF TEMISKAMING. Third Edition. Report of the Bureau of Mines of Ontario, 1907, Vol. XVI, Part II. By Willet G. Miller. Pp 212; illustrated including 5 maps. 6½x9½ in.; paper. Toronto, Ontario, 1908: Bureau of Mines.

A POCKET HANDBOOK OF MINERALS. By G. Montague Butler. Pp. 298, illustrated. [illegible] in.; leather, $2. New York, 1908: John Wiley & Sons, London: Chapman & Hall, Ltd.

This book was designed to occupy the field midway between works on mineralogy and handbooks on the subject. Although of pocket size the work contains sufficient details to identify most of the minerals which mining men, students and collectors are apt to encounter. Emphasis is always placed upon certain characteristic physical features of minerals which are liable to be overlooked by the ordinary prospector. The book is illustrated by excellent half-tone reproductions of mineral specimens from all over the world.

COAL. By James Tonge. Pp. 275; illustrated, 5½x8½ in.; cloth, $2. New York, 1907: D. Van Nostrand Company.

Contents: History. Occurrence. Mode of formation of coal seams. Fossils of the coal measures. Botany of the coal-measure plants. Coalfields of the British Isles. Foreign coalfields. The classification of coals. The valuation of coal. Foreign coals and their values. Uses of coal. The production of heat from coal. Waste of coal. The preparation of coal for the market. Coaling stations of the world.

This book, by Mr. Tonge, although elementary in some details, is worthy the attention of students of coal mining. One of the most interesting chapters in the work is that dealing with "the preparation of coal for the market." Another chapter equally interesting treats of "the production of heat from coal." Included in this latter chapter are descriptions of the Lewis Thompson and the Parr calorimeters; sectional drawings showing the instruments in detail also accompany the subject matter. The most valuable illustrations, however, are the plates showing the many fossils and plants contained in the various seams.

THE GEOLOGY OF COAL AND COAL MINING. By Walcot Gibson. Pp. 341; illustrated. 5x7¼ in.; cloth, $2.50; New York, 1908: Longmans, Green & Company. London: Edward Arnold.

Contents: Varieties—chemical and physical characters. Coal as a rock. Formation and origin. Distribution. Fossils as zonal indices. Prospecting and boring. Study of an exposed coalfield. Study of a concealed coalfield. Coalfields of Great Britain, Southern Province. Coalfields of Great Britain. Midland Province. Coalfields of Great Britain. Northern Province, including Ireland. Coalfields of Continental Europe. North American coalfields. Coalfields of Africa, India, Australia, and South America. Coalfields of China, Central Asia, Japan, New Zealand and Dutch East Indies.

It is becoming more evident to those engaged in coal mining that a thorough understanding of the geology of the various coalfields is of vital importance in the economical development of the different beds. It has always been recognized in metal mining that the geology of the field is one of the first points to be definitely understood; in coal mining, however, such work has generally been thought unnecessary in the preliminary plans for the development of a coal property. This book, prepared by Mr. Gibson, is deserving of the closest perusal by all those who are concerned with the economic development of coal seams and the practical application of geology to this end. The diversity of opinion with reference to the correct correlation of the various coal beds one to another would be largely dispelled if the superintendent and other practical coal engineers had a better understanding of the nature and characteristic features of the different seams. One of the best chapters in the volume under consideration is that dealing with "fossils as zonal indices." Although a large part of the volume is taken up with a study of the coalfields of Great Britain and Continental Europe, the descriptions given will be of interest to American readers.

The Virginia Geological Survey

The Virginia Geological Survey, recently established by the General Assembly of Virginia, with headquarters at the University of Virginia, is under the direction of a commission composed of Governor Swanson (chairman), President Alderman, of the University of Virginia; President Barringer, of the Virginia Polytechnic Institute; Superintendent Nichols, of the Virginia Military Institute, and Hon. A. M. Bowman, of Salem. At a recent meeting of the commission Dr. Thomas L. Watson, professor of economic geology in the University of Virginia, was elected director of the survey. Dr. J. S. Grasty, of the Maryland Geological Survey, was appointed assistant geologist, and Wm. M. Thornton, Jr., of the University of Virginia, chemist.

Work is in progress on the geology of the coastal plain region, including the underground water resources; cement and cement materials; topography and geology of the Virginila copper district; geology [illegible] and ornamental stones. The studies of the coastal plain geology and topographic mapping of the Virginila district are in coöperation with the United States Geological Survey.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidabe. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

THE FLOTATION PROCESS LITIGATION

What is the present status of the litigation over the various patents pertaining to the flotation process of ore separation?

E. M. H.

A correspondent who is well posted in this subject sends us the following reply to the above inquiry:

Sulman & Picard vs. *Wolf, May,* 1905—This was an action by Sulman & Picard, inventors of an oil-gas flotation process against Wolf, inventor of an oil buoyancy flotation process, for fees claimed to be due from Wolf under an agreement in regard to professional work on Wolf's process. This case did not involve the validity of patents, nor the ownership of processes, but Justice Buckley, of the Chancery division of the English courts delivered an opinion in favor of the plaintiffs which contains an interesting discussion of the legal and technical merits of the various flotation processes.

British Ore Concentration Syndicate vs *Webster Ballot* et al., *Nov.,* 1907—This was a case in which the Elmore interests sought to recover damages from the defendants, who are also directors of Minerals Separation, Ltd., for an alleged nonfulfilment of contract. This action involved the ownership of the oil-gas flotation process, but had no direct bearing on the validity of patents. In the trial court the defendants (directors of Minerals Separation, Ltd.) won, but the British Ore Concentration Syndicate, Ltd. (the Elmore interests) appealed and the appeal court sent the case back to the lower court for retrial on the ground of insufficient evidence taken at the first hearing.

DeBavay vs. *McQuisten, Jan.,* 1907—McQuisten applied for a patent in Australia for a process which made use of surface tension of liquids in a revolving tube. DeBavay, inventor of the process of that name, opposed the granting of the patent unsuccessfully.

Elmore vs. *The Minerals Separation, Ltd., Dec.,* 1907—The Minerals Separation, Ltd., applied in Germany for a patent on its oil-gas flotation process, and the Elmore interests entered a strong opposition to the granting of the patent on the ground of lack of novelty and lack of ownership. The German patent office held that the idea sought to be patented was novel, and granted the Minerals Separation, Ltd., its patent with limitations. The Elmore interests appealed from this decision; the appeal is still unheard.

Potter vs. *The Broken Hill Proprietary Company, Ltd., Feb.,* 1907—This was an action brought by C. V. Potter, inventor of an acid-flotation process against the Proprietary company for infringement by the use of the Delprat process. Justice a'Beckett delivered a voluminous judgment in which he discussed the merits of the two processes and decided against Potter. Potter appealed to the High Court of Australia, and before the appeal was decided on the merits of the case a compromise was effected. By this compromise Potter granted to the Proprietary company the right to use free his process throughout Australia. The Proprietary company assigned to the Potter company all the Delprat patents in Australia and paid the Potter company £10,000 in cash. Each party paid its own costs.

British Ore Concentrating Syndicate, Ltd., and Stanley Elmore vs. *The Minerals Separation, Ltd., July,* 1908—This was a case brought in London by the Elmore interests asking for "an injunction restraining the defendants, their servants, agents, and workpeople from importing into, selling, offering for sale, supplying, and using in this realm, ores or mineral substances treated by any one of the processes described and claimed, respectively, in the specifications of letters patent numbered 21,948, of 1898, and 6519, of 1901, of which the plaintiffs are the registered legal owners." The case was heard by Justice Melville, of the High Court of Chancery, who, after an inquiry lasting seven days, pronounced judgment on the 18th of July in favor of the defendants (Mineral Separation, Ltd.). In the course of a lengthy judgment the judge made the following statements: "It seems to me, therefore, that on giving what seems to me a perfectly fair construction of Elmore's specification, that is, that the essence of his invention is the making use of the known law of selection of oil with a view to obtain the carrying up of the particles by the oil to the surface, is a different thing from making use of the same law for the purpose of greasing the particles in a way which does not affect their specific gravity, and then making what I think is an ingenious use of the law of surface tension by agitation and enabling the particles to be carried up by the operation of air bells. I come, therefore, to the conclusion that with regard to the 1898 patent there has been no infringement by what the defendants have been doing."

After referring to the 1901 patent the judge concluded as follows: "I think, therefore, in that case, whether you take it that the patent is confined to the 1898 patent, or whether you take it generally, the defendants have not infringed, or they have infringed a patent which has no validity, and consequently no relief can be granted against them. I think, therefore, that the action fails, and must be dismissed, with costs."

DOES ELECTRIC LIGHTING UNDERGROUND PROMOTE IDLENESS?

Some time ago I read in the JOURNAL a note to the effect that an experienced mining engineer had stated that electric lighting underground tended to decrease the efficiency of the miners. This was a statement that surprised me very much. I should like to obtain, if possible, an explanation of it.

A. D. C.

We addressed an inquiry to the engineer responsible for the statement referred to above and received the following reply: "My own experience has been that a large underground chamber brilliantly illuminated tends to promote sociability among men. In one case, at Globe, Ariz., I went down the shaft and walked quietly into a huge chamber we had, which was brilliantly illuminated. Seated on a large pile of broken ore, in a semicircle, were about 20 workmen, while perched on a boulder about 4 ft. higher up a man was reading the record of a prize fight by rounds. I entered the chamber unnoticed, and for some minutes was a member of the interested audience. However, when I joined in the applause, at the end of the eighth round, it seemed to take all the joy out of the occasion for the workmen. I only cite this as an instance of what is likely to happen wherever the men are able to distinguish clearly each other's features and to indulge in real sociability. Mind you, I do not consider that, in this case, laziness was the inciting cause for neglecting their work. If a man is lazy and simply wants to neglect his work, his opportunities in the dark are satisfactory; but workmen are gregarious animals, and the tendency toward visiting and social intercourse apparently is only developed when the illumination is sufficient to enable them to see the play of each other's features."

AMERICAN TARIFF ON METALS

What are the rates of duty on new and old metals imported into the United States?

I. S. R.

Pig iron, $4 per ton. Scrap iron, $4 per ton. Aluminum, 8c. per lb. Antimony, as regulus or metal, ¾c. per lb. Pig lead, including scrap, 2⅛c. per lb. Nickel, 6c. per lb. Quicksilver, 7c. per lb. Zinc in blocks or pigs, 1½c. per pound; in sheets, 2c. per pound; old and worn out, fit only to be remanufactured, 1c. per pound. Copper free.

LEAD ORE AND MOLYBDENUM ORE

Please inform me who are purchasers of lead ores; also of molybdenite.

C. M.

Lead ores are purchased by many smelting companies whose advertisements may be found in the JOURNAL. Molybdenite is purchased by the Primos Chemical Company, Primos, Delaware county, Penn., De Golia & Atkins, San Francisco, Cal., E. P. Earle, 31 Nassau St., New York, and Fried. Krupp, Essen, Germany.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of of their movements and appointments.

Harvey S. Brown is foreman of the Mushett lease at Goldfield, Nevada.

A. F. Kuehn left New York Oct. 10 for Chile, South America, on professional business.

S. F. Shaw will be in Bodie, Cal., during the remainder of October and the month of November

J. Philip Furbeck, mining engineer, of Chicago, Ill., is engaged in professional work at Benton, Wisconsin.

John Knox, chief mining captain of the Calumet & Hecla mine, has left for a visit to New York and Canadian points.

Allen H. Rogers, of New York, has left for Chile to examine mining property there. He will be absent until February next.

H. E. T. Haultain has been appointed associate professor of mining in the faculty of applied science of Toronto University.

A. D. Moffat, formerly superintendent of the Cactus mine, has been appointed manager of the Majestic Mines Company, in Beaver county, Utah.

Thomas H. Soddy has been appointed acting superintendent of motive power of the Calumet & Hecla mine, succeeding James D. Ramsay, resigned.

Cecil B. Smith has returned to Toronto from British Columbia, where he has been superintending the establishment of electric-power works at Nelson.

S. H. Worrel has resigned as manager of the Southern Mining Company, Urique, Chihuahua, Mexico, and will accept a position as instructor at the University of Texas at Austin, Texas.

James R. Thompson has resigned his position as manager of the Schlesinger mines on the Gogebic iron range, near Ironwood, Mich. Luther C. Brewer has been appointed manager in his place.

W. F. Hannes has resigned as superintendent of the smelter of the Mazapil Copper Company, at Saltillo, Mexico, and will move to the United States. Leslie C. Mott has been appointed his successor.

Cecil Pocock, formerly with the Santa Fe Gold and Copper Mining Company, has recently become general manager of the Montezuma Mines, Inc., with mines at Montezuma, Costa Rica, Central America

George D. Stonestreet, formerly inspector of mines in South Africa, will have charge of the San Carlos mine, Ures district, Sonora. The company's headquarters are at Hermosillo, Sonora, Mexico.

W. H. Aldridge, general manager of the Consolidated Mining and Smelting Company, [illegible] recently, [illegible] for the shipment of low-grade ores for treatment by the smelter at Trail, British Columbia.

[illegible] Transvaal, has been in the Lake Superior country, and recently gave a talk to the [illegible] Michigan College of Mines at Houghton, on mining practice on the Witwatersrand.

Cortlandt E. Palmer left New York Oct. 12 upon a tour of inspection of Pinguico, Peregrina, and Mexican Milling and Transportation Company properties at Guanajuato, Mexico, and of the Esperanza property at El Oro.

Theodore Douglas, president of the Douglas Copper Company, was married to Mrs. Amy Busby Lewis, at Greenwich, Conn., Oct. 7. After spending a few weeks in Massachusetts. Mr. and Mrs. Lewis will go to Fundicion, Sonora, Mexico.

A. N. Humphreys, Jr., who for the past year has been general superintendent of the three mines of the Bituminous Coal Company, at Coalville, Mont., has resigned his position with that company and gone to Philippi, W. Va., to develop a large tract of coal which he recently bought.

John Markle, the largest of the individual anthracite coal operators of Pennsylvania, who has been abroad for several months undergoing treatment by European oculists, has returned to his home in Hazleton, Penn. It is said that while the sight of one eye is practically gone, that of the other eye is much improved.

Obituary

Capt. John Addis died recently at Ipoh, Perak, Federated Malay States, aged 74 years. For many years he had been engaged in tin mining in the Malay peninsula; and he was the first one to introduce machinery in those mines. The first machine for washing tin alluvials was erected by him at the Tronoh mines. His name has long been a household word among the miners of Perak, and he had been interested in many mining concerns there conspicuous among them being the Tronoh mine. At the time of his decease he was largely interested in the Sungei Raia Tin Mining Company, of Melbourne, which company is erecting a large dredging plant on its property.

Societies and Technical Schools

Institute of Metals—The Interim Council of the Institute of Metals has appointed as permanent secretary G. Shaw Scott, who has a large scientific and practical knowledge of metals. The first general meeting of the institute will be held in Birmingham, England, Nov. 11. Papers or communications are expected from a [illegible]

Northern Colorado Coal Operators' Association—This association was organized at a recent meeting, at which all the operators in the district were represented. The association will represent the operators in the settlement of wage scales and of any disputes which may arise, besides devising methods of aiding the coal industry in the northern part of the State.

Leland Stanford University—A smelting plant of modern type, complete in all details but on a reduced scale, has been erected in the metallurgical department of Stanford University, Palo Alto, Cal., for the benefit of the students. An electric smelter of the type in use at the Pitt river iron mines has also been put in place so that experiments may also be made with it.

[illegible] The latest bulletin—No. 8—issued by this school at Rapid City, is a pamphlet of 56 pages on the cement resources of the Black Hills, including tests on cement made from Black Hills material. It is the joint work of C. C. O'Harra, M. F. Coolbaugh, M. A. Ehle, Jr., and Charles H. Fulton. It contains an account of the large supplies of cement material existing in the Black Hills, and is accompanied by maps and diagrams.

American Mining Congress, Utah Branch—The Utah branch of the American Mining Congress has been organized with D. C. Jackling, Samuel Newhouse, C. E. Loose, N. A. Dunyon, John Dern, E. A. Wall, James E. Talmage, David Keith and Duncan MacVichie as directors. An effort will be made to obtain the location of the national headquarters at Salt Lake and the construction of a mining temple building to cost about $1,000,000, for the headquarters.

Pan-American Scientific Congress—The first meeting will be held in Santiago, Chile, beginning Dec. 25 next. These congresses have heretofore been exclusively Latin-American. For the first time the United States has been invited to participate. Any papers prepared here for presentation to this congress will be taken charge of by Calvin W. Rice, secretary, American Society of Mechanical Engineers, 29 West Thirty-ninth street, New York City, and should be forwarded to him.

American Mining Congress—At the recent convention of mining men in Den- [illegible] measures for the organization of a Colorado branch of the American Mining Congress. This committee has been en- [illegible] sentative from each mining district in this State. A call has been issued for a meeting in the rooms of the American Mining Congress, at the Chamber of Commerce, Denver, on Oct. 14, and each mining company has been requested to appoint a mine operator to serve on the [illegible]

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and Goldfield

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 7—No rains having fallen, the scarcity of water still continues in the mining regions of the State. The company which provides water for the Grass Valley and Nevada City mines, does the same for properties is Placer county so that many mines in both counties will have to remain idle for a time, or at best work on half time. About the same condition or affairs exists in other parts of the State.

Now that the city trustees of Sacramento are investigating the dredgers at work on the banks of the American river near Folsom the board of health of the same place is also taking a hand. The health officers declare that the water coming down the American and emptying into the Sacramento river is much muddier than it should be and that if this continues additional filtration facilities will have to be provided by the city.

The accidental discovery of phenomenally rich gold-bearing ore at the head of Rush creek, near Silver Lake, about 30 miles from Bodie, Mono county, has started a stampede into that district. The strike is on the same mineral belt, and about equi-distant from the old May Lundy and Mammoth mines which yielded largely. The character of ore is also similar to that taken from these mines. The country is a wild and mountainous one where there is no chance of obtaining accommodations of any kind. There is, however, plenty of timber and water, and it will be a good place for a permanent camp. Much rich float has been found, but thus far the mines are confined to the original discoveries. Some hundreds of men have gone into the new district.

The Keystone mine, at Amador City, Amador county, one of the oldest, if not the oldest, quartz mine in the State, and for many years owned by the Macdonald Brothers, has been placed under bond to Philadelphia men. The mine has been operated continuously for more than 50 years. No very great depth has been attained. Most of the paying ore has come from above the 600-ft. level, although the shaft is more than 1500 ft. deep on the incline. It is only a few miles from the Kennedy, now the deepest developed gold mine in the State and one of the most profitable.

The recent strike in the Oro Belle mine, at Hart, San Bernardino county, is of great importance to that camp and seems to assure more permanency than had been expected. Heretofore the small rich shoots found have been lost at a depth of 50 to 100 ft., but the discovery of this orebody at more depth gives encouragement to others to sink deeper and find better ore.

The Fulton Iron Works, of this city, which has been actively conducting bussiness here for the past 50 years, has closed down and is to sell its plant and its extensive real-estate holdings on the northern water front. There are some debts, but the assets are considerably over them, so there will be some dividends to stockholders. Losses on the burning of a steamship under repair, damages by earthquake and fire, and loss of business have led the directors of the concern to give up further work. They used to employ 900 men, but of late have had only 150 employees.

Goldfield, Nevada

Oct. 7—Thomas G. Lockhair, chief owner of the famous Florence Goldfield Mining Company, was arrested this week, but upon his arrival at the court house he gave a check for $117,933.96 to the court, thus purging himself of contempt arising in his refusal to pay the sum as ordered. This sum, as has been already stated in this correspondence, represents money due the Little Florence Leasing Company from the sale of its ores which was withheld by the parent company for alleged breach of contract.

The reported suit by the minority stockholders against the management of the Florence Goldfield Mining Company and the application for a receiver are denied by Judge Lindley and officials of the company. There was a conference of the minority stockholders recently at which a request was framed addressed to the president of the Florence regarding the old and new leases on the company ground. These stockholders feel that the further extension of the leasing system by which the company receives only a 25-per cent. royalty is an injustice to them. Most of the leases on the Florence ground have proved bonanzas and have made many of the leasers wealthy. The fact remains that while the company itself has done no work underground, it has declared several dividends of 10c. per share; this money was derived entirely from royalties. This, although the company's mill, owing to extremely poor and faulty design, had to be partially torn down and entirely remodeled before it was completed.

The T. D. Murphy interests in the Combination Fraction mine have been acquired by Nixon & Wingfield. This stock, in addition to the Myers stock, which was acquired some time ago, as noted in this correspondence, gives Nixon & Wingfield considerably more than control in the company. The new owners deny that the Combination Fraction will be amalgamated with the Consolidated group, but state that they have purchased the stock for themselves solely as an investment.

It is authentically stated that early in October a gasolene motor car patterned after those in use in the Southern Pacific interburban traffic will be run between Blair and Goldfield via Tonopah. This will make travel more convenient between the Silver Peak district with the Pittsburg 100-stamp mill at Blair, Millers and its two big mills, Tonopah and Goldfield.

A suit for $2249 has been filed against the Mohawk Extension Leasing Syndicate by E. A. Rathburn for services as superintendent and for money advanced by him to the company.

F. W. Nash and C. J. Callahan have been arrested in Los Angeles on warrants charging them with issuing to the stockholders of the Gold Bullfrog Mining and Milling Company false reports regarding the physical condition of the property. The complaint states that Callahan as consulting engineer prepared a statement which reported the existence of a orebody high in grade and another independent vein of great promise, together with subordinate veins and oreshoots; all this the complaint alleges is a misrepresentation, and that Nash, as secretary of the company, signed and promulgated the report.

The Engineers lease has received a bill from the Western Ore Purchasing Company for damages caused by the head of a single-jack in an ore shipment from the lease which caused trouble in the company's crusher.

A merger of the strongest north-end Comstock mines is rumored including the Consolidated Virginia, Ophir, Mexican, Union and Sierra Nevada.

Salt Lake City

Oct. 10—Several members of the board of directors of the Majestic Mines Company have recently completed an examination of the properties belonging to the corporation in Beaver county. Subsequently they announced that the financial affairs of the Majestic company have been practically straightened out and that operations on a large scale would be resumed immediately. A. D. Moffat, formerly superintendent of the Cactus mine belonging to the Newhouse Mines and Smelters has been appointed manager of the Majestic company. At first mining will be confined to the Harrington & Hickory, a silver-lead mine. The Majestic company owns a smeltery near Milford; it is equipped with one lead stack and one copper furnace, but this smeltery would have to be overhauled extensively before it could run.

While the Utah Consolidated Mining Company has spent approximately $100,000 in the past two weeks in exercising options and making the initial payment on smoke easements covering nearly 30,000 acres of land in Tooele county, no other steps have been taken toward the erection of a copper smeltery at the site near the town of Tooele. Possibly something may yet happen to prevent the Utah Consolidated from carrying out its plans to build the plant, for a local official of the American Smelters Securities Company states that the taking-up of the Tooele options was not to be taken as an absolute certainty that negotiations for a 5-year contract with the Garfield Smelting Company had been entirely broken off. "Matters have only been delayed," he said. The Garfield company does not desire any more competition in this region if it can be avoided so it probably will try very hard to make it uneconomical for the Utah Consolidated to smelt its own ores. Conditions underground at the Highland Boy mine belonging to the Utah Consolidated Company are reported to be very satisfactory and developments during the present year are said to have been of a highly gratifying character. The Highland Boy Gold Mining Company, the predecessor of the present Utah Consolidated company, was organized a little more than 12 years ago and has the distinction of being the builder of the first copper smelter in Utah. Dividends amounting to $25.64 per share, or a total of $7,092,000, have been paid by the company.

While the official report of the Utah Copper Company for September has not been sent out, advance information indicates that approximately 4,500,000 lb. were produced, yielding a net profit of $225,000. The third quarterly report of the company will be mailed about Oct. 20.

The Wasatch Utah Mining Company has been organized to take over the properties of the Consolidated Jefferson Gold Mining Company operating in the Big Cottonwood district. Frank Rumel, of Salt Lake is secretary of the new corporation. The property consists of 24 patented claims.

The mines of the Consolidated Mercur Gold Mines Company are in much better condition than last year for development work has been very gratifying. During the year considerable work has been done toward the opening of ground heretofore ignored. It is expected that the company will return to a dividend basis before the end of the year.

Manager R. S. Oliver, of the Utah Apex Mining Company, recommends the erection of a 500-ton concentrating mill for the Utah Apex mine in Bingham, and the matter is now receiving attention [illegible] Forty tons of high-grade lead ore is shipped daily to the smeltery which brings a net profit of about $750 per carload.

The Yampa smeltery, in Bingham cañon, is treating about 800 tons of ore daily, which comes mostly from the Yampa mine, resulting in approximately 1,000,000 lb. of copper monthly at a cost of from 7 to 8c. per pound.

The Tintic Smelting Company has been compelled to suspend the operation of its smelter temporarily. In a letter addressed to shippers asking them to withhold their ore for the time being, the lack of sufficient electric power is assigned as the reason for the shutdown. Others declare that some metallurgical troubles have been experienced. The plant had been in operation about six weeks and it will be at least a month before the furnaces are blown in again. The mines of the Tintic district that hold contracts with the company, are the Lower Mammoth, Colorado Beck Tunnel Consolidated, Dragon Iron, Ajax and Iron Blossom.

The copper production of Utah in September fell slightly under 8,000,000 lb. From the Garfield smelter the output was 6,450,000 lb.; Yampa smelter, 1,080,000 lb., and from the Independent smelter at Ogden, 200,000 pounds.

The Ontario Silver Mining Company, at Park City, has won an important decision in the Federal Court. In the controversy, title to the water flowing from the drain tunnel adit was involved. The Wasatch Irrigation Company, and others set up the claim that the driving of the adit had lessened the supply from which the defendants had obtained water for irrigation purposes. Judge Marshall held, however, that no evidence was introduced to prove that such was the case and, therefore, entered a decree in favor of the plaintiff. The Ontario adit was constructed about 18 years ago.

Information has reached here to the effect that the Ohio Copper Company has placed the balance of its unissued bonds, and that the money derived therefrom is now available to complete the 2000-ton mill and equip the mine for production on the basis indicated. It is stated that $400,000 of the $1,000,000 issue have been taken by shareholders of the company. These bonds are convertible into stock at par, $10 per share.

A special meeting of shareholders of the Utah Development Company has been [illegible] the matter of disposing of the company's [illegible] Mining Company for $525,000, payment to [illegible] company.

Butte

Oct. 8—According to a recent report issued by the Butte Mining Stock Exchange, the sales of stock on the exchange for the past nine months aggre[illegible]

At a conference held in Helena last week between the coal miners and operators of Montana a wage scale for two years was agreed upon and signed. The trouble arose about an attempt on the part of the mine owners to reduce the scale of wages on an average of from 10 to 25c. per day. By the new agreement the present wage scale will continue and no reduction will be made, thus averting all possibility of a strike.

Under the agreement between the old Davis-Daly Estates Copper Company and the underwriters of the new Davis-Daly Company stock, those holding the stock of the old company and who failed to pay the 50c. assessment due Oct. 1, have forfeited their rights to the new stock and are only entitled to 50c. in liquidation of their old stock. Since the underwriters receive no commission for their services, their profits will depend upon the failure of old stockholders to take advantage of the offer to purchase the new stock.

Denver

Oct. 10—Two new and important strikes are reported in the Cripple Creek district, one on Gold hill and one on Tenderfoot hill.

The Vindicator Consolidated Gold Mining Company has declared a dividend of $45,000, payable Oct. 25. This brings the total amount paid to date to nearly $2,000,000. The Portland Gold Mining Company has declared the regular quarterly dividend of 4c. per share, amounting to $120,000, and making a total of $480,000 paid this year. The deep workings of this great gold mine are reported to be better than ever.

The output of Cripple Creek for September is given at 67,313 tons, with a gross value of $1,300,080.

The engineering enterprise known as the Central Colorado Power Company is offering $2.75 per day for common laborers, with no takers. Orders for men to supply the construction gangs of the Denver, Northwestern & Pacific, the Denver, Laramie & Northwestern, and the Western Pacific are hard to fill. There is a dearth of labor in this State rather than a dearth of employment.

According to Daniel Guggenheim during his recent visit, the zinc smelter of the American Smelting and Refining Com[illegible] the facilities for handling the ore from all parts of the country much improved; this being the first resumption on an increased [illegible]

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Cochise County

Copper Queen—The new underground electric-haulage system has been started, all the ore above the 600-ft. level being handled to the Sacramento shaft by motors and then hoisted, and the ore loaded into railroad cars by belt conveyers. The belt-conveyer system is running smoothly, handling 800 tons daily. In a short time practically the whole production will be handled at this shaft.

Superior & Pittsburg—A rich strike of high-grade oxidized ore has been made on the 1300-ft. level of the Hoatson shaft. The orebody has been cut for 100 ft. In a raise from the 1300- to the 1200-ft. level 35 ft. of good oxide ore was opened up. The shaft has been sunk to a depth of 1650 ft., which makes it the deepest in the camp. At present, a sump is being cut below the 15th level. The mine is looking extremely well, and more work is going on than at any time in the past. At the Junction, a number of rich but small orebodies have been encountered. The principal work at present is cutting a large pump station on the 1550-ft. level. Some ore is being shipped daily. The Cole shaft is producing steadily, its output being the third largest in the camp.

Graham County

Arizona Copper Company, Ltd.—The production for September was 1388 tons of copper.

California

Calaveras County

Hageman—This drift mine on the North fork of Calaveras river has been unwatered and will be bonded to Fox & Donner who are prospecting the Bay State ranch with a view to dredging it.

Petticoat—The cyanide plant at Railroad Flat has been removed to the Sheep Ranch mine where it will be used in working the tailings from the latter property.

El Dorado County

Copper Hill—The report that ore shipments had commenced from this mine at Latrobe, owned by W. F. Detert is incorrect. The mine is still being developed the shaft being down 700 feet.

Garden Valley Mining Company A gasolene engine is being put in to take the place of the present steam power and shaft sinking continues at this mine.

Douglas Mining Company—This company has been organized to work property in Bear Creek district east of Georgetown and a new mill is to be started after the rains come. The directors are T. H. Douglas, M. B. Potter and O. G. Hopkins, of Sacramento.

Inyo County

Four Metals Company—The new smelter of this company has commenced work on 2000 tons of ore and slag from the company's property at Cerro Gordo.

Mariposa County

Exchequer Mining Company—Dr. E. S. O'Brien, of Merced has been chosen secretary, and general manager of this company, Mr. Littlefield having resigned. The company is developing the old No. 5 mine near the Mount Gaines which they purchased some months ago. Machinery to be run by electric power is being installed.

Nevada County

Black Bear Mining Company—At this property, Grass Valley district, J. H. English manager, a new 10-stamp mill is to be erected as well as a new hoist. Air compressors and drills are also to be installed. As soon as the new machinery is placed shaft sinking will be resumed.

Riverside County

German-American Mining Company—This company, F. C. Longnecker manager, is working three of its mines, the Texas Chief, Lone Star and Apex. The mines are 30 miles north of Indio, just south of the San Bernardino county line. A new and shorter wagon road is being opened.

San Bernardino County

Fremont Milling and Development Company—This company, near Barstow, is preparing to put up a mill, recent developments having proved plenty of ore in sight.

Oro Belle—Hart and Hitt, while drifting on the main tunnel, have opened up 3 ft. of high-grade ore.

Shasta County

Mammoth Copper Company—This company, which has for some time been obtaining silicious ore from Salt Lake, has again agreed to treat 150 tons of ore daily from the Reid mine, at Whitehouse, or Old Diggings district.

Sierra County

Bonded—A San Francisco company has bonded 2½ miles of gravel ground on the east side of the Scales-Port Wine ridge, including the Hardscrabble, Poor Boy, Belle Union, Bon Ton and Monitor claims. The Port Wine lead is supposed to pass through them all. Compressors and machine drills will be used to bore a 3000-ft. tunnel.

Siskiyou County

California Consolidated Mining Company—This company, in Eddy gulch, owning the Mountain Laurel and Klamath mines, has the mines now in operation on a profitable basis. Concentrates are now being shipped.

Tuolumne County

Confidence—The shaft at this mine is being retimbered and electric power has been supplied to the hoist.

Dutch Mining and Milling Company—It is understood that the chief creditors of this company have secured an option on the property and expect to organize a company to work it.

Contention—This mine has been bonded and active operations will begin under superintendence of A. C. Morison.

North Star and Laura—W. G. Phillips has secured an option on these mines near Cherokee on the east belt, and will proceed to work them at once.

Colorado

Lake County—Leadville

Big Six—Drifting on the ore shoot, recently opened in this property, Breece Hill, is being carried north into Big Evans gulch. Development shows the presence of ore in pockets carrying gold, lead and silver. The lessees are shipping 60 tons per week.

Fanny Rawlins—An upraise has been started from the lower level on the orebody recently opened. The property, Breece Hill, is shipping 30 tons daily and some of the ore nets 8 oz. gold per ton.

Independence—A 6-ft. vein of ore was opened lately in a tunnel driven on the property, Twin Lakes; a streak, several inches wide, carries considerable free gold, this ore is being sacked. The balance of the vein matter is of medium grade which will stand shipping.

Emerald Group—A crosscut tunnel has been driven on this property, Delmonico gulch, during the summer and last week the vein was caught at a distance of 800 ft. from the portal; the breast of the tunnel is in ore and holds up to $75 per ton, an ounce in gold and the balance silver, lead and copper.

Iowa Gulch—Howard Collins, operating

the Anona group, has taken a lease on the Gypsy, adjoining, and will work both claims from the Anona. Shipments are going out from the Anona.

Iron Silver—The work of installing electric power in all of the principal shafts of this company, Iron Hill, is pushed and another month should see the work completed.

Yak Tunnel—The monthly output from this property is in the neighborhood of 10,000 tons, the bulk of which is sent to the mill. In addition to the regular shipments of ore the company is doing a great deal of development work on the trend of the tunnel. The breast of the tunnel is now well into Little Ellen hill and will reach Resurrection No. 2 shaft by the first of the year.

Dinero Tunnel—On account of the heavy flow of water from the breast no work has been done for the last 10 days; the bulk of the water comes from the old workings, and until they are drained the tunnel will not be driven ahead, or any exploration done in the orebody opened. The water is so heavily impregnated with sulphuric acid that it cannot be used in the boilers, so a pipe line will be run into the tunnel 2000 ft. to tap a natural spring of pure water that will be used for steaming and household purposes.

Manhattan—A tunnel is being driven on this property, Twin Lakes, and is in 250 ft., at which point a vein 14 ft. wide was encountered; a 5-ft. streak next to the hanging-wall is rich in gold. Work will be continued during the winter and the owners will probably erect a mill next spring to treat the part of the vein which is of low grade.

Bartlett Tunnel—This property is situated about a mile north of the Dinero, and is shipping steadily from the 2000-ft. mark; the ore is a sulphuret, running high in silver. Several veins have already been cut and will be developed during the winter. The Dinero vein trends to the north, and the Bartlett tunnel will be driven ahead to catch it.

Sunday Tunnel—Ground is being broken at the rate of 12 ft. every 24 hours, and by the beginning of the year it is expected that the Sunday vein will be cut. Before that time several veins will be caught and developed.

Favorite—The recent strike in this claim, South Evans gulch, has turned into a good body of ore 18 ft. high by 6 ft. wide, and shipments are being sent out regularly; the ore carries gold with a fair percentage of lead. To the north the Valley is shipping steadily and developing the ore horizon opened at the 650-ft. level.

Star of the West—This property, Iron hill, continues to ship a high-grade iron ore at the rate of 30 tons daily; development work is being pushed.

[illegible]—John G. Morgan, who owns a number of acres of ground adjoining the London, has started work and is sinking a new shaft on a promising vein.

Idaho

Shoshone County

Snowstorm—The company will pay a dividend of $45,000 on Oct. 20, 3c. a share the first dividend disbursed this year.

Bunker Hill & Sullivan—This company has declared its regular monthly dividend for September, a total of $75,000. This is the one hundred and thirty-third dividend, making a total for this year of $705,000, and a grand total disbursed by the present management of $10,515,000.

Federal Mining and Smelting—The company has started two suits in the Federal court against the Bunker Hill & Sullivan company to quiet title to orebodies within the plane of the end lines extending of the Overlap and the San Carlos lode claims. An accounting will be demanded for the ore already taken from the land in dispute. No restraining order has yet, or will be asked for. This is the commencement of a battle royal in the Cœur d'Alenes between these two companies.

Rex—This company will be allowed to ship ore from its property on Nine Mile. Its affairs have been tangled by litigation for some time past.

Sherlock Placer Claims—A deal for the purchase of these grounds located at the head of the St. Joe district is under way; a number of New York capitalists are endeavoring to close the matter up with the owner, Peter Sherlock, of Wallace.

Silver Cliff—At the annual meeting held in Wallace, the following officers and directors were chosen: President and manager, James D. Young; vice-president, A. Honeker; secretary-treasurer, Ed. C. Young; directors, Edward Godfred and Dr. J. A. McLaughlin. The affairs of the company are regarded as highly satisfactory. Work will be continued all winter.

Indiana

Greene County

Water is now being hauled from the Linton water works to the mines in the Linton district to feed mine boilers. In some instances water is hauled a distance of seven miles. There is not a mine belonging to the Vandalia Coal Company in this field that does not now depend absolutely on Linton city water to supply the boilers. The nearest mines have been connected by pipes, but to the more distant mines water is hauled in cars and a special train is kept busy supplying the mines.

Sullivan County

The mine belonging to the Carlisle Coal Mining Company caught fire Oct. 3 and has since been burning fiercely. The [illegible] full of [illegible] a number of miners are idle on account of the fire.

Kansas

Cherokee County—Galena

Murphy—O. W. Sparks and J. C. Moore have made a rich strike of ore in their [illegible] Murphy 40 acres.

Allen County—Iola

Lanyon—This company has announced that it will reopen eight blocks of its zinc smelter at Iola.

Michigan

Copper

Atlantic—A crosscut driven from the south drift at the 15th level of section 16 shaft has cut the lode, which has the same appearance as at the 12th and 13th levels; from this point of intersection drifting both north and south will be started and the lode at this depth fully exposed. The shaft is sinking close to the 18th level, and preparations are about completed to begin opening up for the lode at the 16th level. This property is gradually rounding into shape to enter the producing list.

Lake—Preparations are about completed to resume sinking below the second level, 300 ft. from the surface. The faces of the drift both north and south from the shaft at this point show the same characteristic mineralization. The high-duty hoisting engine, recently purchased from the Champion mine, has been delivered and the foundations have been started.

North Lake—This company has started to put down a sand pipe on the site of the first drill hole. The overburden at this point is estimated to be about 200 ft. thick. Operations for the present will be confined to diamond drilling, and two complete cross-sections of the tract are to be plotted.

Wyandot—Diamond drilling continues at this property, and the drill is nearing the approximated point of intersection of the lode. The crosscut from the 700-ft. level of the exploratory shaft is in about 250 ft., and has entered a softer formation; consequently, greater headway will now be made. This crosscut will have to be driven at least 800 ft. before it will encounter the lode.

Seneca—The new shaft is down more [illegible] being made. The surface equipment is [illegible] operations will not be interfered with.

King Phillip—A crosscut from the ninth level of No. 1 shaft has cut the lode and [illegible] At depth a more consistent showing is being made in the character of the formation [illegible] 400 ft., and a crosscut has been driven to the lode at the 4th level. The levels in [illegible] horizontal plane as the Winona, with which they will eventually connect.

Missouri

Zinc-lead District

Alladin—This mining company at Spring City made one of the richest strikes of jack made in the district for some time in driving an air drift. The first shot put in exposed the ore which assays about 64 per cent.

Boston-Aurora—This company has struck 20 ft. of rich jack at 72 ft. depth on its land at Aurora.

Duvall—Carlock, Williams & Hamby have leased 40 acres near Granby on the Duvall land on which they found a dump 20 years old containing 100 tons of rich jack. This was mined when prices were too low and transportation lacking.

Luke—W. J. Briggle has started sinkign a shaft on the Luke land west of Joplin in the sheet-ground district. The ore is found at the 180-ft. level and a 20-ft. face of ore averaging nearly 15 per cent. has been struck in a drill hole; 11 drill holes have been put down on the 20 acres.

Coöperation Mining Company—This company has filed papers of incorporation for $50,000. The stockholders are C. W. Munson, J. W. Boydfield and T. P. Burns, all of Joplin.

Cameron—This company has let the contract for a 250-ton mill on the Dr. Boyd land at Sarcoxie.

Granby—J. H. Yonkin has leased the old Hill Top 40 acres at Oronogo and is developing it.

Granby Mining and Smelting Company—This company is prospecting the James Trent land at Granby and has five drills at work.

Merry Widow—This company is drilling a 10-acre lease east of the Osyka, on Turkey creek, east of Joplin, and is reported to have struck good ore.

Montana

Butte District

Copper Eagle—While sinking the shaft at about the 350-ft. mark a 2-ft. vein of ore was encountered carrying 300 oz. silver and considerable gold. A drift is being run on the vein from the shaft. The same orebody was cut on the 250-ft. level. It is probable that sinking will continue for another 50 feet.

Tuolumne—The foundation for the new boiler plant has been completed. The new first-motion Nordberg hoist will probably not be installed until next spring. On the 1000-ft. level drifting is in progress.

Butte & Superior—The shaft has reached a depth of 1280 ft. It is stated that the shaft will be sunk to the 1600-ft. mark before any further cross-cutting is done. During the past week deeds have been filed for record transferring to the company portions of the Niagara, Laura and Enterprise lode claims.

North Butte Mountain—Work has been started on the contract for the sinking of a 500-ft. shaft. James E. Higgins, of Butte, is in charge.

Badger State—The shaft on this property of the Boston & Montana Company has reached a depth of over 600 ft. The North Butte company has drifted upon its Jessie vein practically to the end lines of the Jessie claim and it is thought that the Jessie vein will be found in the Badger State.

Fergus County

Barnes-King—The company's net earnings for the month of August were $7000.

Deer Lodge County

Gold Coin—Operations have been resumed on this property, which is situated 20 miles west of Anaconda. The mill is running at full capacity.

Theodosia—This claim has recently been purchased by Levi Davis. A winze has been started in the tunnel on the property and is now down 50 ft., at which point water has been encountered in sufficient volume to necessitate the installation of a pump.

Milwaukee Gold Extraction Company—Forty men are employed at the mill and in the mine where much development work is being carried on.

Jefferson County

Montana Consolidated—At the company's Comet mine, located in the Basin district, 60 men are employed. The shaft is down 1000 ft. Regular shipments are being made to the smelter at East Helena, and it is expected that by the end of the present month the mill on the property will be completed and the concentrates will also be shipped. The company owns the Hope, Gray Eagle, Deer Lodge, and Alta claims

Boston & Corbin—The company has decided to install a new first-motion hoist good for a depth of 2000 ft. Superintendent Emerson is securing estimates for an entire new surface plant.

Missoula County

Monitor—On the 400-ft. level of this property a large body of chalcopyrite ore has recently been discovered. Its extent has not as yet been determined.

Beaverhead County

New Departure Mining Company—The board of directors has recently made a report to the stockholders. The statement shows an outstanding indebtedness of $10,569. To meet this deficit two remedies are suggested—either the sale of treasury stock, or the levying of an assessment.

Nevada

Esmeralda County—Goldfield

Output—Production of the Goldfield mines for last week amounted to 2236 tons valued at $282,075, not including $16,000 from the Kinkead mill, obtained by re-treating concentrates from the Combination mill. The Combination mill treated 630 tons of ore from the Consolidated mines. The Nevada Goldfield Reduction Company treated: From the Combination Fraction, 243 tons; Consolidated Red Top, 99; Mohawk Jumbo, 26; Baby Florence, 19; Florence Annex, 6; Little Florence, 64; Black Butte Bonanza, 70; Begole Syndicate, 176 tons. The Western Ore Purchasing Company handled: From the Baby Florence, 47 tons; Consolidated Red Top, 126; Engineers Lease, 419; Mohawk Jumbo, 25; Florence Consolidated, 376; Kinkead concentrates, 12; dump ore, 4 tons.

Zinn Florence—The 126-ft. level is being pushed toward the Florence Consolidated oreshoot. The drift on the 180-ft. level is now within a few feet of the Baby Florence side-line.

Old Kaintuck Goldfield Mining Company—The shaft on the Economist claim, which is 200 ft. deep, is being retimbered preparatory to sinking the shaft to a depth of 400 feet.

St. Ives Leasing Company—The oreshoot on the 50-ft. level that was lost has been picked up about 50 ft. south of the old workings; high-grade ore is being sacked from this level.

Florence Consolidated—A large air compressor, machine drills, and an electric hoist are being installed. A spur from the Tonopah & Goldfield railroad is being built to the company's ore-bins. When these improvements are completed the present output, 50 to 75 tons a day, will be doubled.

Consolidated Jumbo—The shaft is now 275 ft. deep. The crosscut on the 250-ft. level has been driven 190 feet.

Mushett—On the 480-ft. level of this lease on the Miss Jessie claim of the Laguna a new shoot of rich ore has been found. The shoot has been followed for 30 ft.; the ore averages about $75 per ton.

Esmeralda County—Lida

Lida Queen—This property has been bonded to Philadelphia men who have installed a 10-stamp mill equipped with Wilfley tables and Frue vanners.

Esmeralda County—Hornsilver

Great Western Mining Company—Shipments to the Belmont mill at Millers have begun. Some ore has also been sent to a San Francisco laboratory for testing as the company is considering the erection of a mill. The ore developed in the mine is approaching the quantity justifying this expenditure, and the present expensive wagon and railroad haul make a mill a necessity.

Granite Mountain Mining Company—This company has the deepest workings of the four companies operating on the big dike about 3 miles from the Nevada Empress. The main vertical shaft is 500 ft. deep.

ESMERALDA COUNTY—RAWHIDE

Diamondfield-Jack-Davis Placer—Nine shafts have been sunk on the 500 acres of this company; the pay streak is 80 ft. wide and 4 ft. thick. The gravel stands well without timber and averages $7 per yard free gold in addition to the black sand concentrates, which amount to 60 lb. per yard; the black sand assays over $2500 per ton.

Rawhide Coalition—Hoisting plants are being installed at the Townsite and Hooligan leases on the Coalition property; hoists have been ordered for the Burns and Marigold leases. When these four are installed the Coalition company will have in operation on its property, 19 out of a total, in the district, of 40 hoists.

Rawhide Consolidated—A shipment, consisting of 30 tons, was made last week from the Big Four lease on Consolidated ground; the ore averaged $300 per ton. This ore came from the high-grade shoot recently found at the 100-ft. level.

HUMBOLDT COUNTY—NATIONAL

National is a new camp, which is attracting considerable attention among Nevada operators. It is located 60 miles north of Winnamucca, the nearest railroad point. The first discovery of ore was made Aug. 8; since then some remarkable surface showings have been found.

HUMBOLDT COUNTY—SEVEN TROUGHS

Mazuma Hills—At the mill the last clean-up representing a run of 13 days amounted to $15,000. The adit is now 700 ft. long.

LYON COUNTY—YERINGTON

Nevada Douglas—The drift on the 650-ft. level has broken into a fine body of copper sulphide. This is the same orebody which was developed for over 500 ft. on the 550-ft. level.

LYON COUNTY—BUCKSKIN

Kennedy Consolidated—This company has started operations with a crew of 30 men. The shaft, which is 120 ft. deep is being sunk rapidly. Only ore from development work is being taken out.

Albany Copper—Work has been resumed on the Albany after a long shutdown, and this low-grade copper deposit will be actively developed.

NYE COUNTY—TONOPAH

The Tonopah mines last week produced 5741 tons of ore having an estimated value (shipping ore calculated at $60 per ton and milling ore at $25 per ton) of $140,675. Tonopah Mining Company mined 3150 tons of ore; Belmont, 700; Montana Tonopah, 1001; Midway, 100; MacNamara, 350; West End, 150; Jim Butler, 200; Tonopah Extension, 90 tons.

Montana Tonopah—Last week the mill crushed 100 tons of ore; this is the largest weekly tonnage treated at this mill.

Tonopah Extension—Henry Krumb has submitted his report to the stockholders; it verified the reports of the company's president and general manager and is a vindication of the management.

Tonopah Mining Company—The Mizpah shaft was sunk 15 ft. during the week; no change has been noticed in the dacite formation.

Belmont—Big orebodies are being opened up below the 1000-ft. level, thus proving that the ore goes to great depth. One of these orebodies is north of the famous Mizpah fault, which is proof of the existence of ore in a section which had been supposed by some to be barren. This vein has already been opened up by the west drift for over 150 ft. on the north side of the Mizpah fault, and there is now exposed in the underhand stopes 4 ft. of the richest ore in the mine. A station is now being cut for a hoist. The winze on the main vein from the 1000-ft. level is approaching the point from which crosscutting will begin. This winze has been in ore for over 100 feet.

WHITE PINE COUNTY—WARD

Nevada United Mines—Eight 4-horse teams are hauling ore from Ward to Ely for shipment to the Salt Lake smelters. The ore comes from the 180-ft. level of the new shaft, and is a lead carbonate carrying 40 to 50 per cent. lead and about 6 oz. silver. The vein is 20 ft. wide; the ore is rich enough to ship without sorting.

New Mexico

GRANT COUNTY

Comanche—This company which went into bankruptcy a few weeks ago has paid almost all its debts.

Hachita District—There is considerable excitement due to the discovery of tellurium ores in paying quantities in this district. Three properties are now taking out shipping ore, and a townsite has been laid out by Camp & Ish, of Hachita.

Tyrone Copper Company—It is reported that on claim No. 2 in the town of Tyrone, good copper carbonate ore has been cut by the diamond drill at a depth of 185 feet.

Whiteside Exploration Company—At the Golden Link group of mines in Wilcox district, it is reported that rich gold ore has been discovered.

Pennsylvania

The commission to revise the mining laws of Pennsylvania has held its final session in Pittsburg. Manufacturers and those interested in mining machinery were heard at this session. The commission will present its report to the legislature, which meets next January.

ANTHRACITE COAL

United States Commissioner of Labor Charles P. Neill, has been appointed umpire to settle certain points of dispute between the Delaware & Hudson Company, and some of its employees, the Conciliation Board being deadlocked over the question at issue.

Philadelphia & Reading Coal and Iron Company—This company is installing rescue apparatus of the helmet type at all its collieries. The device is equipped with a tank of oxygen to supply the wearer for two hours. The directors of this company have abolished the office of first vice-president, held by the late Thomas M. Richards, and created the office of vice-president and general manager. W. J. Richards, who has been second vice-president, has been elected to this position.

BITUMINOUS COAL

Pittsburg-Buffalo Coal Company—This company is increasing its capacity and has plans for extensive additions to its plants. When its new town of Mariana is completed it will have one of the finest independent coal and coke plants in this section. Three shafts have been sunk and plans are ready for 1000 coke ovens. This is merely a start on what may prove to be one of the largest coal and coke plants in the vicinity of Pittsburg. The property of the company is situated in Washington and Greene counties on the verge of what is known as the Pittsburg district; it adjoins the great Vesta mine of the Jones & Laughlin Steel Company.

Philippine Islands

[illegible]

Benguet Consolidated Mining Company—In July this company produced 205 oz. gold, besides 366 lb. cyanide bullion, val- [illegible]

[illegible] *Dredging Company*—The company's return from its dredge at Paracale in July was 779 oz. gold.

CEBU

[illegible]—The [illegible], according to the *Far Eastern Review*, is making progress in developing its property on Cebu island, and the management expects to have an output of about 100 tons a day within six months. The coal is now being supplied to the vessels calling at Cebu. The railway connecting the mines with Danao, the terminal of the Philippine railway in Cebu is to be completed soon.

Tennessee

[illegible]

[illegible] miners is on at the Wooldridge company's coal mine at Wooldridge. The company refused to employ miners other than men who are tenants of its houses. The miners claim that this is a violation of the contract with the union. The company's proposal that the question be submitted to arbitration was refused by the miners' union. President Lewis will decide the dispute.

Wisconsin

PLATTEVILLE ZINC DISTRICT

Empire—The old mine is improving to the east, where the former management thought the ore pinched out. The mill is making 30 to 40 tons of concentrates daily and a second roaster is being installed. Its central electric power plant is proving a great coal saver. A dividend of $4 has just been declared on the old stock.

Mitchell Hollow—This mine is erecting a mill that is being moved from the adjoining lease of the Royal mine.

Carson—The mill has been completed and will start soon.

Platteville Separator Company—The company has completed its repairs and alterations, after a month's shutdown. It has been treating 60 tons a day, but expects to raise the capacity to 100 tons. It is now marketing iron pyrites as a by-product that assays 44 to 45 per cent. sulphur.

Sunset—This mine has been taken over and reorganized as the Union Zinc Company.

Calamesis—This mine is still sinking its shaft where the water is unusually heavy, requiring two 16-inch Cornish pumps and a 12-in. Cooke pump.

Forcite—The mine has been equipped with a pair of 16-in. lift pumps and has again begun shaft sinking.

Bureau Mining Company—The company is building a mill that formerly operated at the old Ida mine, at Benton.

Canada

ONTARIO-COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 3 were as follows: Coniagas, 63,400 lb.; Chambers-Ferland, 61,800; City of Cobalt, 191,600; Drummond, 60,000; La Rose, 253,390; McKinley-Darragh, 121,200; Nipissing, 176,900; O'Brien, 127,700; Silver Queen, 63,000; Townsite, 40,000; Temiskaming & Hudson Bay, 240,000. Total 1,398,990 pounds.

Chambers-Ferland—The new ore house for shaft No. 2 is nearly completed. A 5-drill air-compressor has been purchased from the O'Brien mine and it is expected that 13 drills will soon be in operation. More than 155 ft. of drifting has been done at the 100-ft. level of No. 1 shaft.

Cobalt Central—A contract has been let for 2000 ft. of diamond drilling.

Crown Reserve—The crosscut at the 100-ft. level has been driven for 80 ft. to the north; its course will be changed to the east and will run down the center of the lake in order to tap No. 7 and No. 9 veins from the Kerr Lake mine.

Little Nipissing—On Oct. 9 a promising 6-in. vein of solid smaltite was discovered on the corner of the property adjoining the Temiskaming & Hudson Bay and Right of Way locations.

Nancy Helen—A rich strike has been made at the 100-ft. level 160 ft. north of the main shaft, where the vein is 4½ in. wide and rich in native silver.

Nova Scotia—At the 140-ft. level of the main shaft a little way in the crosscut, a vein formerly encountered has widened from 3 to 6 in. to 2 ft. The ore is very rich. The company will shortly erect a concentrating mill with a capacity of 100 tons daily.

Coniagas—A nugget of almost pure silver, weighing about 100 lb., was taken out recently at the 75-ft. level.

Kerr Lake Mining Company—The annual report gives the output during the year at 1,473,712 oz. of silver produced from 528 tons of ore, of which the gross value is $787,554. The cost of production exclusive of the cost of surface plant, and including all the developments of the mine shows a total of $139,530, leaving a net profit of $648,023. The average gross value of ore per ton was $1491. The cost of producing an ounce of silver was 9½ cents.

Nipissing—A gang of 100 men has been trenching and new veins when discovered have been marked and left for future working. The company has more than 100 veins, but is operating only about half of them at present.

Peterson Lake—A force of 20 men is employed on surface and development work. Diamond drilling has disclosed a promising orebody.

Red Rock Mining Company—At a meeting held Sept. 28, it was decided to go into liquidation, the company having liabilities of $10,000 and no assets. The company is capitalized at $1,000,000, and the stock was all issued.

Right of Way—At the end of the drift at the 70-ft. level a 4-in. cross-vein has been struck which carries 4000 oz. silver to the ton.

Silver Queen—This mine is having the ore on its dump treated at the Muggley concentrator. At No. 3 shaft, 1000 ft. southwest of the main shaft, a 12-drill compressor and two 100-h.p. boilers have been installed.

University—In continuing the sinking of No. 3 shaft, which was down 22 ft. when operations were abandoned, two 2-in. stringers were found carrying 4054 oz. silver to the ton. They are in the conglomerate near a granite dike. Arrangements have been made with the Shamrock to supply power for working No. 3 shaft.

Victoria Mine—A valuable discovery was made recently in a shallow pit about 50 ft. from No. 3 shaft, where five calcite stringers were found running parallel, and ranging from 1½ to 2 in. wide. They all carry native silver.

Mexico

CHIHUAHUA

Bullion Shipments—Recent bullion shipments passing through the Chihuahua branch of the Banco Minero include the following: Dolores Mines Company, 92 bars gold-silver, valued at 160,550 pesos; Lluvio de Oro, 8 bars gold-silver, 16,000 pesos; Watterson, 11 bars, 25,000 pesos.

Parral Output—The production of the Parral camp for the week ending Oct. 3 was 8460 tons, of which 5460 tons were treated at local mills and the balance sent to outside smelters. Increased shipments will be recorded during the month from the Hinds Consolidated and Minas Tecolotes properties.

Rio Plata—This company recently sent out from its Santa Barbara mine in the Guazapares district two carlots of silver-carrying concentrates of a value of 71,642 pesos.

Oxnam Prospecting Company—Important development work is being prosecuted at this company's Guerra al Tirano mine in the western part of the State. Percy J. Holmes is in charge.

Greene Gold-Silver—Reports emanating from both New York and Mexico City indicate that a new holding company with adequate funds is in process of organization to take over the properties of this company, as well as of the Sierra Madre Land and Lumber Company at Madera. It seems assured that the Greene interests will not remain in control. The company with mines and reduction works at Ocampo and Concheño and the Sierra Madre Land and Lumber Company, owning immense timber tracts in this and adjoining States, and a 250,000 daily capacity sawmill at Madera are both heavily in debt, but it is conceded that they can be made profitable enterprises. The bankruptcy of these concerns has put a damper on mining in this State and has handicapped industrial and mercantile enterprises generally. The funds derived from the sale of merchandise and machinery for the payment of wages are in control of Governor Enrique Creel since the misappropriation on the part of the trustee was alleged. The wages of the Mexicans have been settled in full, but there are still large sums due Americans and other foreigners. Judge A. B. Fall is still acting as the personal representative of Col. W. C. Greene and as attorney for both companies in all transactions.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 16—There seems to be a better feeling in the coal trade in the West, though actual progress is slow. There is more inquiry for steam coal, and the domestic demand is increasing, in consequence of cooler weather. While there is no special incident in the trade, more confidence is expressed.

The long drought is being felt by the Ohio and Indiana mines, as well as in Pennsylvania. In Indiana, especially, the operation of mines has been interrupted by short supply of water. The river trade of the Pittsburg district is at a standstill, no shipments down the Ohio having been made for an unusually long period.

In the East the coal trade is quiet and without any special feature, though the Coastwise trade is showing an improvement. Anthracite production in September was better than in August, but is still below that of last year.

The miners of the anthracite region are holding a convention this week. It is probable that some decision will be made as to the demands to be made when the present working agreement expires.

The Pocahontas Coke Company, it is stated, has closed a contract for 150,000 tons of coke to be delivered to the Algoma Steel Company at Sault Ste. Marie, Ont. Deliveries will extend over a year or more.

The appeal in the Shaleen case to the United States Supreme Court has been decided by default, the appellant in the case not putting in an appearance. This leaves the Pennsylvania miners' certificate law in force, in accordance with the decision of the State Supreme Court.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 3, in short tons:

	1907	1908.	Changes
Anthracite......	4,296,066	3,826,497	D. 469,569
Bituminous.....	29,627,357	24,837,307	D. 4,790,050
Coke............	10,693,281	5,168,371	D. 5,524,910
Total..........	44,616,704	33,832,175	D. 10,784,529

The total decrease this year to date was 24.2 per cent.

Coal receipts at Boston, nine months ended Sept. 30, reported by Chamber of Commerce:

	1907	1908.	Changes
Anthracite ..	1,535,009	1,274,144	D. 260,865
Bituminous	2,446,340	2,425,336	D. 21,004
Total domestic.	3,981,349	3,699,480	D. 281,869
Foreign........... ..	403,458	289,850	D. 113,608
Total	4,384,807	3,989,330	D. 395,477

[illegible] Scotia, with a little from Great Britain.

Anthracite coal shipments in September were 5,211,047 long tons, being 611,953 tons more than in August, but 301,670 tons less than in September, 1907. For the nine months ended Sept. 30 the total shipments were, in long tons:

	[illegible]	[illegible]	[illegible]
Reading..........	10,308,070	8,827,388	D. 1,480,682
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] New York, Ontario & Western—increased their shipments this year; all the others show smaller tonnages than last year. The total decrease was 2,895,041 tons, or 5.8 per cent.

New York

ANTHRACITE

Oct. 14—Prepared sizes are active and in fair demand both in the all-rail and tidewater trades. Among the small steam sizes buckwheat No. 2 or rice is in better demand than the other sizes. Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

There seems to be a stronger demand in nearly all quarters except New York harbor. In the far East and along the Sound the demand has picked up and consumers are beginning to call for coal. In the interior, not reached directly by the main lines, an increased demand is also felt. In New York harbor there is little improvement and good grades of coal fetch $2.50@2.65; poorer qualities sell around $2.40. Transportation is good [illegible]

In the Coastwise vessel trade rates are [illegible] Rates for large vessels from Philadelphia are: Boston, Salem and Portland, [illegible] Bath, 60@65c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@$1; [illegible] Sound, 45@50c. per ton.

Birmingham

[illegible]

[illegible] are, however, a number of men waiting to [illegible] this State. The railroads are exerting [illegible] complaint of a car shortage.

During the past week foreign mining experts, under the guidance of J. A. Holmes, of the Federal Bureau of Mines and Mining were in the Birmingham district looking over the collieries in this section of the country.

Other visitors to this district during the past week were members of the American Institute of Mining Engineers who held their annual convention in Chattanooga, Tenn. These gentlemen looked through [illegible] and iron plants in the Birmingham district.

Chicago

[illegible] increasing sale, the average retailer and consumer having apparently decided that it is good policy to lay in an early stock. The movement of such coals is not large yet, however. Steam coals are still sluggish, though aided somewhat by the approach of winter conditions and by increasing railroad consumption. The market is [illegible] run-of-mine being the chief exception. Occasionally the market becomes overstocked with western coals, notably screenings, but this condition does not last long and there is no chronic depression [illegible] years.

[illegible] cause of the increase in demand for do[illegible]

[illegible]

[illegible]

Indianapolis

[illegible]

normal state were apparent during the past week. The railroads decreased the number of their idle coal cars by 50 per cent. and the growth of coal traffic has been perceptible. The operators say although orders are somewhat irregular, owing largely to varying weather conditions in different sections, nevertheless substantial progress has been made.

The Indiana Railroad Commission has been upheld by the court in its effort to inforce its joint rate order. The Southern Indiana and the Big Four railroads could not agree between themselves as to the division of joint rates. The result was that the Southern Indiana refused shipments of coal which were to be transferred to the Big Four road, and the latter refused to take shipments from the Southern Indiana. The Commission brought suit to compel the roads to accept shipments at the joint rates fixed by the commission and the court sustained the commission by issuing an order to compel the railroads to obey the orders.

Pittsburg

Oct. 13—Production in the Pittsburg district shows no increase and prices continue nominally on the basis of $1.15 a ton for mine-run coal at the mine. Slack seems to be a trifle firmer at 50c. a ton at mine. The Pittsburg-Buffalo Company, which until this season has been disposing of its Lake coal through the Pittsburg Coal Company, has entered into a long term contract with the M. A. Hanna Company for all of its surplus coal. It will go to the northwestern market.

Connellsville Coke—The coke trade is unchanged. A few new contracts are being taken occasionally, and prices remain practically the same on contract; furnace coke quoted at $1.65@1.85 and foundry at $2.10@2.25. Lower prices may be secured for prompt shipment. The *Courier* in its weekly report gives the production in both fields at 199,074 tons. Shipments amounted to 7680 cars as follows: To Pittsburg, 3188; to points west of Pittsburg, 4009; to points east of Connellsville, 483 cars.

Foreign Coal Trade

Nova Scotia Coal Shipments—Shipments from Nova Scotia mines, eight months ended Aug. 31, long tons:

Companies:	1907.	1908.	Changes
Dominion	2,110,222	2,251,846	I. 141,624
Novo Scotia Steel	404,877	424,644	I. 19,767
Acadia	202,045	213,948	I. 11,903
Cumberland	213,409	247,082	I. 33,673
Inverness	154,150	172,243	I. 18,093
Intercolonial	181,571	171,368	D. 10,203
Total	3,266,274	3,481,131	I. 214,857

All the companies but one show increases. The total gain was 6.6 per cent.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 3: Best Welsh steam, $3.78; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.30; seconds, $3.12; best small steam, $1.92; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 14—The market continues to be in great part a waiting one; neither buyers nor sellers are disposed to be active. This condition seems likely to prevail for at least a month yet. Buying of finished material is only fair, and is mainly in small lots for immediate necessities. The only department at all active is structural steel. Several good contracts have been taken for buildings, and others are under negotiation. From the quotations made by fabricating companies, it is evident that prices are being cut by the mills, though they deny that they are doing so. The railroads are still out of the market for rails and other work. Upon the whole, the market must be called a dull one.

In pig iron not much business has been done. There is some call for basic iron, but it is not urgent. In foundry iron the only people who have been buying more than small lots are the pipemakers, who seem to have considerable work on hand. Foundry stocks are generally light, but there is no disposition to increase them at present.

L. M. Bowers, it is reported from Denver, has been chosen treasurer of the Colorado Fuel and Iron Company; he also succeeds R. C. Clowry as a director of the company. The change is important, as Mr. Bowers is understood to represent the Rockefeller interest, while Mr. Clowry was a Gould representative.

Pig Iron Production—Reports from the furnaces on Oct. 1 show 188 coke and anthracite stacks in blast, having a total weekly capacity of 337,900 tons; an increase of 26,800 tons over Sept. 1. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the production of pig iron in the United States in September was approximately 1,435,000 tons; for the nine months ended Sept. 30 it was 10,951,000 long tons.

Baltimore

Oct. 12—Exports for the week included 895,300 lb. steel billets to Liverpool and 479,015 bales tin scrap to Rotterdam. The imports included 6100 tons manganese ore from India, and 5800 tons iron ore from Cuba.

Birmingham

Oct. 12—There appears to be just enough activity in the pig-iron market in the Southern territory to warrant a good feeling and confidence. There is very little buying being done by consumers outside of the home territory. Quotations hold strongly, the furnace companies not seeing any reasons why concessions should be made. The minimum price for pig iron quoted in this section is $12.50 per ton, No. 2 foundry, with $13 per ton as the maximum. The sales for delivery during the balance of the year take care of considerable of the probable make.

Alabama is given credit for 128,425 tons of pig for September. The largest previous month's production was in July when 124,870 tons were made. The output at the furnaces this month promises to be larger. One furnace had gone into blast already this month and two will start up this week.

A number of hands have been laid off at the steel plant at Ensley, of the Tennessee company. The official statement is made that the conditions are only temporary and have no significance whatsoever.

The rolling mills of the Tennessee company at Bessemer, near here, are again to resume operations this week. This will give employment to about 250 men. These mills have resumed operations and closed down again three times in the past two months.

Chicago

Oct. 12—Very little business is being done in the iron market, the attitude of melters and furnace agents alike being a waiting one. The uncertainty of political results is most commonly given as the cause for hesitancy, but in addition to this the revival of business is slow. Melters buy only as much iron as they can see a clear disposition of within the next 30 to 90 days; most orders, indeed, are confined to 1907 deliveries. Inquiries for deliveries next year are not numerous nor are they for large quantities. Under such conditions it is difficult to say at what price any good-sized order for future delivery could be placed. For hand-to-mouth business standard quotations are $13 Birmingham ($17.35 Chicago) for No. 2 Southern, and $16.50 for No. 2 Northern, but these are cut as much as 50c. on desirable orders. Such business as is being done is chiefly with Northern furnaces, whose increased output has made their iron promptly available.

Business in nearly every line of iron and steel products is holding its own, though the volume of trade is not large and orders for the future are scarce. Coke is firm at $4.90 for the best Connellsville, with the demand light but steady.

Cleveland

Oct. 12—Shipments of iron ore from the Lake Superior region for the season to Oct. 1 were as follows:

	1907.	1908.	Changes.
Escanaba	4,473,417	2,006,192	D. 2,467,225
Marquette	2,342,149	871,107	D. 1,471,042
Ashland	2,722,331	1,521,146	D. 1,201,185
Superior	5,571,918	2,264,443	D. 3,307,475
Duluth	9,406,283	6,201,121	D. 3,205,162
Two Harbors	6,043,108	3,766,951	D. 2,276,157
Total	30,559,206	16,630,960	D. 13,928,246

Total decrease this year was 45.6 per cent. The shipments in September were

4,646,024 tons. Notwithstanding the light shipments, the stock on lower Lake docks at the close of the season will be very large.

Philadelphia

Oct. 14—The pig-iron industry is in better shape than a month ago. So far as eastern Pennsylvania furnaces are concerned it is held down to a certain extent by Central Pennsylvania and by Virginia furnaces. The scramble for business continues. Buyers who are obliged to be particular as to brands are favoring Lehigh and Schuylkill furnaces. At present there is call for some of the cheaper makes. Most of those who use special brands are fairly well supplied for the rest of the year. The range of prices is wider than for months. Orders with one or two exceptions, are small. Forge iron is extremely dull. No. 2 is $16@17; forge, $16; basic about the same.

Steel Billets—Small orders came in this week at full prices and inquiries came to hand for large blocks of billets from buyers who are sounding the market with a view to 30-day options.

Bars—Everything drags, manufacturers are impatient. Buyers who ordinarily at this season order freely are taking hand-to-mouth lots. Best refined bars delivered are 1.50c.

Sheets—The week has developed an enlarging demand for both early and later delivery, but the orders are small. Sheets are going into consumption better than for months, but there is no present disposition to make contracts ahead.

Pipes and Tubes—There is a further moderate improvement in shop work.

Plates—A source of encouragement is the repairing activity recently stirred up. None of the orders placed last week were large. Local demand for small lots is better.

Structural Material—One feature this week is the appearance of orders to furnish material ordered months ago. The amounts are not large but the disposition to complete old contracts is encouraging. Considerably more activity prevails in structural plants.

Rails—Agents in South America are keeping in close touch with railroad prospects there and report favorably to Pennsylvania rail makers of large contracts.

Scrap—Dealers either have in stock or have control of large quantities of material which they are holding at prices which forbid more than hand-to-mouth purchases.

Pittsburg

Oct. 13—There are no signs of an early improvement in the iron and steel trade. A number of inquiries have been received for late delivery in several important lines, but these are merely for the purpose of getting options and may not result in business. Some orders have been received, particularly for structural material, but all are contingent on the result of the election. The only new business placed for any finished product is for small lots, and in most instances the prices must be shaded to get these little orders. There is no material change in new business and the mills in this district are running at about the same capacity as a week ago, the National Tube Company leading, its operations being around 70 per cent. The American Sheet and Tin Plate Company is not doing so well and the officials will not admit that its plants in both sheets and tinplate are running to more than 50 per cent. of capacity. The sheet mills, however, are doing a trifle better than the tinplate mills, and there is no reason to doubt that the company is maintaining its regular prices, the cutting of rates being done by the independent mills. Shading also is reported in plates and structural material; iron and steel bars are unchanged as prices are now at the bottom. This was shown at the bi-monthly average last month. While the "official" price of bars is uniform at 1.40c. the result of the examination of the sales sheets for two months indicated that 1.35c. is being done by the large producers. No particular significance is attached to the action of the Carnegie Steel Company in giving notice of a readjustment of wages at all of its plants on Jan. 1. This has been customary for both the company and employees, but often when the notice is given there is no change and at some times the readjustment meant a slight advance for the workmen.

Pig Iron—There really are no prices for pig iron and it is now classed as a "consumers' market." Producers and dealers are ready to sell Valley iron at almost any price, although quotations remain practically unchanged. The only important inquiry this week is from the Allegheny Steel Company and calls for 5000 tons of basic iron for delivery this year. It is believed someone will take the order at between $14 and $14.25, at furnace, possibly at the lower figure. The United Steel Company, Canton, Ohio, came into the market last week for 12,000 tons of basic iron for delivery during the first and second quarters of next year. Furnaces hesitate about quoting so far ahead. Some are inclined to quote $14.25 for first quarter on about 6000 tons, but do not care to take a chance on the larger tonnage. Of the 21 merchant furnaces in the two valleys 13 are in operation this week. Pig-iron prices are nominally as follows: Standard bessemer, $15; malleable bessemer, $14.50; basic, $14.25; No. 2 foundry, $14.50; gray forge, $13.50, all f.o.b. Valley furnaces. These prices, however, may be shaded.

Steel—There is a little inquiry for crude steel, but no sales of any consequence. Bessemer and open-hearth steel [illegible] Pittsburg. [illegible] prices remain on the basis of 1.60c., but some shading is done. Merchant steel bars remain at 1.40c.

Sheets—But little change outside of the cutting of black sheets about $1 a ton and galvanized $2 a ton. The regular price remains on a basis of 2.50c. for black and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese—There is but little doing and prices continue at around $45. Pittsburg.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the eight months ended Aug. 31, are valued by the Bureau of Statistics of the Department of Commerce and Labor at $129,400,247 in 1907, and $105,258,962 in 1908; a decrease of $24,141,285. Leading items of export in long tons:

	1907	1908	Changes
Pig iron	[illegible]	[illegible]	[illegible]
Billets, ingots & blooms	[illegible]	[illegible]	[illegible]
Bars	[illegible]	[illegible]	[illegible]
Rails	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Wire	[illegible]	[illegible]	[illegible]
Nails and spikes	[illegible]	[illegible]	[illegible]

The only increase this year was in billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the eight months ended Aug. 31, are valued at $28,795,578 in 1907, and $13,407,611 in 1908; a decrease of $15,387,967. Leading items of exports, long tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
Scrap	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Bars	[illegible]	[illegible]	[illegible]
Wire rods	[illegible]	[illegible]	[illegible]
Tinplates	[illegible]	[illegible]	[illegible]

The only increase shown here is that in tinplates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the eight months ended Aug. 31 are reported as follows, in long tons:

	1907	1908	Changes
Exports	[illegible]	[illegible]	[illegible]
Imports	[illegible]	[illegible]	[illegible]

Imports of manganese ore, 124,611 tons [illegible] 5356 tons.

Foreign Iron Trade

[illegible]—Exports of iron and steel and their products from Great Britain for the eight months ended Aug. 31 valued by Board of Trade returns as follows:

	1907	1908	Changes
Iron and steel	[illegible]	[illegible]	[illegible]
Machinery	[illegible]	[illegible]	[illegible]
New ships	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

Total quantities of iron and steel, 3,602,035 long tons in 1907, and 2,770,528 [illegible]

Imports of iron and steel, and of machinery into Great Britain for the eight months were:

	1907.	1908.	Changes.
Iron and steel.	£ 4,515,769	£ 4,877,406	I. £ 361,637
Machinery....	3,706,498	3,373,675	D. 332,823
Total....	£ 8,222,267	£ 8,251,081	I. £ 28,814

Total quantities of iron and steel, 580,071 tons in 1907, and 688,574 in 1908; increase 108,403 tons.

German Iron Production—The German Iron and Steel Union reports pig iron production in August at 935,445 tons, which is 75,325 tons less than in July. For the eight months ended Aug. 31 the total make was, in metric tons:

	1907.	1908.	Changes.
Foundry iron....	1,473,339	1,486,623	I. 13,284
Forge iron....	526,878	451,592	D. 75,286
Steel pig.....	676,627	632,989	D. 43,638
Bessemer pig.....	319,116	269.402	D. 49,714
Thomas(basic)pig	5,601,504	5,155,330	D. 446,174
Total...........	8,597,464	7,995,936	D. 601,528

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The total decrease this year was 7 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 14.

At all U. S. Ports in August and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1908..	$ 6,597,101	$ 4,257,255	Exp. $ 2,339,846
" 1907..	4,596,879	3,223,772	" 1,373,107
Year 1908..	64,960,348	33,614,330	" 31,346,018
" 1907..	48,375,977	28,103,201	" 20,272,776
Silver:			
Aug. 1908..	4,130,853	3,194,426	Exp. 936,427
" 1907..	6,748,085	4,882,622	" 1,865,463
Year 1908..	34,576,144	27,375,355	" 7,200,789
" 1907..	41,922,336	30,665,458	" 11,256,878

Exports of specie from New York week ended Oct. 10: Gold, none; silver, $876,222, to London and Paris. Imports: Gold, $128,421, chiefly from Cuba; silver, $96,400, from Mexico and Central America.

Specie holdings of the leading banks of the world, Oct. 10, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	....	....	$306,469,500
England..... ..	$184,690,015	....	184,690,015
France.........	651,275,820	$178,917,565	830,193,385
Germany.......	185,670,000	76,765,000	262,435,000
Spain...........	78,675,000	167,270,000	245,945,000
Netherlands....	38,849,000	20,106,000	58,955,000
Belgium........	20,640,000	10,320,000	30,960,000
Italy............	185,185,000	22,500,000	207,685,000
Russia..........	602,005,000	35,560,000	637,565,000
Aust.-Hungary.	243,075,000	64,080,000	307,155,000
Sweden.........	20,955,000	....	20,955,000
Norway	8,145,000	....	8,145,000
Switzerland ...	23,165,000	....	23,165,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Treasury estimate of amount and kinds of money in the United States on Oct. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury).	$ 185,680,399	$ 615,955,118
Gold certificates.........	36,378,105	805,667,764
Silver dollars............	201,835	75,084,147
Silver certificates........	12,364,058	475,843,942
Subsidiary silver...... .	21,746,013	124,024,077
Treasury notes of 1890...	16,191	4,750,809
U. S. notes....	5,490,551	341,190,465
Nat. bank notes.........	39,829,288	635,783,039
Total....................	$301,706,440	$3,078,299,361

Population on Oct. 1 estimated at 87,852,000; circulation per capita, $35.04. Total circulation Oct. 1 was $892,453 more than on Sept. 1; and $272,444,987 more than on Oct. 1 of last year.

Gold and silver movement in France, eight months ended Aug. 31:

	Imports.	Exports.	Excess.
Gold....	Fr.634,711,000	F.16,969,000	Imp. Fr.617,742,000
1907...	310,870,000	83,723,000	Imp. 227,147,000
Silver..	108,499,000	119,418,000	Exp. 10,919,000
1907...	118,582,000	121,659,000	Exp. 3,077,000

Silver Market

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver. New York Cents.	Silver. London, Pence.	Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
8	4 8650	51⅝	23 13/16	12	4.8650	51⅝	23 13/16
9	4.8700	51⅜	23 11/16	13	4.8650	51⅝	23 13/16
10	4.8675	51⅝	23 13/16	14	4.8650	51⅝	23 13/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has remained very steady, and without special feature, closing at 23 13/16d. bid in London.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 1:

	1907.	1908.	Changes.
India... ...	£9,116,254	£7,324,163	D. £1,792,091
China.......	......	516,400	I. 516,400
Straits......	625,950	112,385	D. 513,565
Total......	£9,742,204	£7,952,948	D. £1,789,256

Imports for the week were £7000 from Mexico and £139,000 from New York; £146,000 in all. Exports were £441,250 to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
8	13⅜ @13⅝	13⅛ @13⅜	59¼	29½	4.40 @4.45	4.75 @4.80	4 60 @4.65
9	13⅜ @13⅝	13⅛ @13⅜	59¼	29⅜	4.40 @4.45	4.75 @4.80	4.60 @4.65
10	13⅜ @13⅝	13⅛ @13⅜	....	29¼	4.40 @4.45	4.75 @4.80	4.60 @4.65
12	13⅜ @13⅝	13⅛ @13⅜	59¼	29¼	4.40 @4.45	4.77½ @4.82½	4.62½ @4.67½
13	13⅜ @13⅝	13⅛ @13⅜	59¼	29	4 35 @4 40	4.77½ @4.82½	4 62½ @4.67½
14	13⅜ @13⅝	13⅛ @13⅜	59¾	29⅛	4.35 @4.40	4.80 @4 85	4.65 @4.70

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market remains essentially unchanged, but while the optimistic feeling among the producers still exists, there appears to be more willingness to make concessions upon such important business as offers. Domestic manufacturers are getting more orders but they are still using supplies previously bought and have not yet come into the market in a general way. More or less the same conditions prevail in Europe, but some considerable quantities are reported to have been sold for export thither. During the week, Oct. 8-14, domestic business was done at about 13¼c., while sales for export have been made at prices netting about the same or a little less, with some tendency to shade prices further at the close. The market closes at 13⅜@13⅝c. for Lake and 13⅛@13⅜c. for electrolytic in ingots, cakes, and wire bars. The average for casting during the week has been 13@13⅛c.

The lowest bids for about 2,000,000 lb. of copper required by the U. S. Government, opened on Oct. 14, were 13⅝c. for Lake copper, and 13½c. for electrolytic, these prices being for the metal delivered at various navy yards throughout the country, and estimated to be equivalent to about 13½c., cash, New York for Lake and 13.3c. for electrolytic.

The London market for standard copper has been very dull, fluctuating within narrow limits. It closes at £59¾ for spot and £60⅝ for three months. Refined and manufactured sorts we quote: English tough, £63½; best selected, £62½@£63½; strong sheets, £74½@£75½.

The American Smelting and Refining Company is to sell the copper of the Nevada Consolidated and Cumberland-Ely companies under contract with those companies.

Exports of copper from New York and Philadelphia for the week were 5546 long tons. Our special correspondent states the exports from Baltimore for the week at 687 tons.

Manufactured Copper—Sheets, cold rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 14¾c. base carload lots at mill

Tin—The London market under heavy transactions suffered a decline, no doubt brought about by the closing out of a bull account. The contango between spot and three months tin is getting larger again, and stands now at almost £2. The close is cabled at £132⅛ for spot and £134 for three months.

Business in the domestic market was confined among dealers, who traded in fairly large quantities. The market closes at about 29⅛c. for spot, October and November deliveries.

Shipments of tin from the Straits in September are cabled as follows: United States, 545; Great Britain, 2765; European continent, 845; total, 4155 long tons, an increase of 250 tons over September of last year.

Visible stocks of tin Oct. 1, in long tons:

	In Store.	Afloat.	Total.
Great Britain	8,391	[illegible]	[illegible]
Holland	1,808	[illegible]	[illegible]
U. S., exc. Pacific ports	2,159	[illegible]	[illegible]
Total	12,358	[illegible]	[illegible]

The total was 852 tons more than on Sept. 1, and 5611 tons more than on Oct. 1 last year.

Arrivals of tin at Atlantic ports for the first half of October are reported at 1105 long tons.

Lead—The pressure to sell Missouri lead continues. The market has been weak and declining, and closes at 4.35@4.40, New York, and 4.20@4.25c. St. Louis.

The London market for Spanish lead is £13 6s. 3d., and for English lead £13 8s. 9d., the squeeze for spot lead reported last week having been relieved meanwhile.

Spelter—Consumption of this metal appears to be increasing, and more business was reported this week. The market closes strong at 4.80@4.85c., New York, and 4.65@4.70c., St. Louis.

The London market is unchanged at £19 12s. 6d. for good ordinaries, £19 17s. 6d. for specials.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is stronger both in New York and abroad. There are few offerings and cheap lots of the metal have disappeared. Quotations are 8¼@8½c. for Cookson's, 7⅞@8⅛ for Hallett's and 7½@7⅝c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Some foreign metal is reported as offered at lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is at $46 per flask for large lots; small orders depend on size and condition. San Francisco nominal, about $43 for domestic orders, and $41 for export. London price is at £8 10s. per flask, but £8 9s. is done with jobbers.

Platinum—While leading interests continue to ask $20 per oz. refined platinum is still offered at lower prices, and business can be done at $16@18 per oz. The market is inactive and uncertain, and dealers, hesitating to commit themselves, will accept the metal for sale only on commission.

Missouri Ore Market

Joplin, Mo., Oct. 10—The highest price paid for zinc ore was $39.50, on an assay base price of $37 per ton of 60-per cent. zinc. A $37.50 base price was made on three cars of 60-per cent. zinc. The greater bulk of sales were made on a $36.50 base, while considerable ore sold as low as $36 base. Zinc silicate sold on a base of $18 per ton of 40-per cent. zinc, the highest price being $24.50. The average price, all grades, was $33.26 per ton.

Lead sold as high as $55 per ton, though the ruling prices were $53 to $54 per ton. The average price, all grades, was $52.38. With the higher offering some of the producers who have been holding their lead ore for two or three weeks put it upon the market greatly enlarging the shipment of this mineral, especially in proportion to the reduced sales of zinc ore. Some producers declined the offerings on zinc ore, but the purchasing agents claim they secured all the ore wanted on the prices offered.

Following are the shipments of zinc and lead ore from the district for the week ended Oct. 10:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	[illegible]	[illegible]	[illegible]
Galena	[illegible]	124,770	14,807
Spurgeon	[illegible]	110,600	[illegible]
Granby	[illegible]	[illegible]	[illegible]
Alba-Neck	[illegible]	9,680	[illegible]
Badger	[illegible]		6,605
Quapaw	[illegible]		6,399
Miami	501,770		6,020
Aurora	[illegible]		5,863
Duenweg	[illegible]	113,380	[illegible]
Prosperity	116,820	80,320	4,152
Oronogo	[illegible]	4,210	3,625
Carthage	130,270		2,409
Zincite	132,970		2,325
Sarcoxie	[illegible]		[illegible]
Stott City	38,250		716
Totals	[illegible]	1,596,480	$198,770
41 weeks	391,611,180	59,526,000	[illegible]

Zinc value, the week, $156,944; 41 weeks, [illegible]
Lead value, the week, 41,826; 41 weeks, 1,644,878

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

Month.	Zinc Ore. Base Price. 1907	Zinc Ore. Base Price. 1908	Zinc Ore. All Ores. 1907	Zinc Ore. All Ores. 1908	Lead Ore. All Ores. 1907	Lead Ore. All Ores. 1908
January	[illegible]	[illegible]	$45.84	[illegible]	[illegible]	$46.88
February	48.30	[illegible]	47.11	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	[illegible]	54.59
October	41.75		[illegible]		[illegible]	
November	[illegible]		[illegible]		[illegible]	
December	31.50		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible]

Wisconsin Ore Market

[illegible] $37.50 was the highest price paid for zinc ore on a basis of $36.50@37 per ton of 60 per cent. zinc. One choice car of lead brought $55.50 per ton; the base price paid for 80 per cent. lead varied from $52.50 to $54 per ton.

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
Platteville	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
Mineral Point	41,000		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

In addition to the above there was shipped to the electrostatic separator, at Platteville, from Livingston, 58,000 lb.; from Benton, 235,732 lb.; from Days Siding, 183,000 lb.; from Linden, 113,550 lb.; from Potosi, 148,000 lb. Shipped to the Joplin Separator Works, at Galena, from Rewey, 48,000 lb.; from Benton, 85,400 lb. Shipped to the Enterprise roaster, at [illegible] zinc concentrates.

Chemicals

[illegible] market is quiet and business is not active. Prices, as a rule, are steady and buyers are holding off for the time being.

[illegible] and buyers seem to be waiting for some decided change in the metal situation. Prices are unchanged at $4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate—[illegible] firmer and higher prices prevail. There is considerable buying abroad, especially by Germans. Prices are 2.12½c. for spot and 2.15c. for the rest of 1908. For 1909 the quotations are 2.15@2.20c. Dealers are looking for higher prices.

Phosphates—Shipments of phosphate rock from Charleston, S. C., in September are reported by Paul C. Trenholm, as follows: Coastwise 1060 tons; by rail 5725; total, 6785 tons.

Mining Stocks

[illegible] market this week, based upon no special [illegible]

On the Curb business has been active, [illegible] time. Coppers were fairly active, Nevada Consolidated and Miami being the leaders.

Boston

[illegible]

of Arizona Commercial, Boston & Corbin and Old Dominion and the weakness of Utah Consolidated have been the special features in trading. Arizona Commercial touched $35, and the convertible bonds made a high record at $145. Profit-taking in the stock clipped off $2.50 of the price. Boston & Corbin rose $2.75 to $18.75 on speculative buying, although the price has not reacted much. Old Dominion rose $3.12½ to $46.12½ on favorable reports, holding most of the advance. The receipts sold for $1 on the Curb. Utah Consolidated sold off $3.50 to $39.50, with the close $40.50 tonight. The smelting controversy has brought rather free offerings of the stock. It is estimated that New York interests have reduced their stock holdings in this company very materially the past year. Franklin sold up $1 to $13. A special meeting of this company has been called for Nov. 16 when stockholders will be asked to consider an increase in the capital for the purpose of purchasing adjoining lands. Negotiations are said to be in progress for disposing of the old Franklin mine and mill site.

Amalgamated slid off $3.75 to $72.75, but has recovered the loss. Adventure is off $1.25 to $7.37½ on light offerings, Atlantic, $1.25 to $17. Copper Range has varied from $73 to $74.50, and North Butte went off $3.25 to $79.50, rallying to above $83.

On the Curb, Superior & Boston rose almost $2 to $10.50 on buying for Western account. The general offices of the Davis-Daly company have been removed from this city to New York.

STOCK QUOTATIONS

NEW YORK Oct. 13	
Name of Comp.	Clg.
Alaska Mine	7/16
Amalgamated	75¾
Anaconda	43¼
Balaklala	‡2 1/16
British Col. Cop.	6½
Butte & London	.....
Butte Coalition	25⅛
Colonial Silver	⅞
Cum. Ely Mining	7⅞
Davis Daly	2
Dominion Cop	1
Douglas Copper	2¾
El Rayo	4
Florence	3⅝
Foster Cobalt	.50
Furnace Creek	.14
Giroux	4⅛
Gold Hill	⅜
Goldfield Con.	5¾
Granby	100
Greene Gold	⅜
Greene G. & S	⅛
Greenw'r & D. Val.	‡ 75
Guanajuato	1⅝
Guggen. Exp.	170
Hanapah	.15
McKinley Dar.	.90
Micmac	2⅛
Mines Co. of Am.	1¼
Mitchell Mining	¼
Mont. Sho. C	⅞
Nev. Utah M. & S	3
Newhouse M. & S	5
Nipissing Mines	8½
Old Hundred	½
Silver Queen	1.18
Stewart	¾
Tennessee Cop'r.	41¼
Tri-Bullion	1⅛
Union Copper	⅝
Utah Apex	4½
Utah Copper	41½
Yukon Gold	4⅜

BOSTON Oct. 13	
Name of Comp.	Clg.
Adventure	7⅜
Allouez	37¼
Am. Zinc	23½
Arcadian	3½
Arizona Com	33¼
Atlantic	17
Bingham	‡ 30
Boston Con.	14
Calumet & Ariz.	116½
Calumet & Hecla	665
Centennial	35
Con. Mercur	.40
Copper Range	74½
Daly West	9¼
Franklin	12¾
Greene-Can.	10¼
Isle Royal	23½
La Salle	13¾
Mass	5½
Michigan	14
Mohawk	63
Nevada	16⅜
North Butte	82½
Old Colony	.60
Old Dominion	45¾
Osceola	118
Parrot	26
Quincy	93
Rhode Island	4
Santa Fe	1¾
Shannon	15½
Superior	26½
Tamarack	71
Trinity	17
United Cop., com.	‡10½
U. S. Oil	25¾
U. S. Smg. & Ref.	40
U.S.Sm. & Re., pd.	44½
Utah Con.	41½
Victoria	4½
Winona	5⅛
Wolverine	137
Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	27¾
Am. Smelt. & Ref	87
Am. Sm. & Ref., pf.	‡105
Bethlehem Steel	22⅞
Colo. Fuel & Iron	36
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	82⅞
National Lead, pf.	103
Pittsburg Coal	‡10½
Republic I. & S.	22¼
Republic I. & S., pf.	79¾
Sloss-Sheffield	63⅞
Standard Oil	626
U. S. Red. & Ref.	‡10
U. S. Steel	46¾
U. S. Steel, pf	109⅝
Va. Car. Chem	‡33

BOSTON CURB	
Ahmeek	119
Black Mt.	3½
East Butte	8¼
Hancock Con.	‡6
Keweenaw	‡3¾
Majestic	.69
Raven	.87
Shawmut	13
Superior & Pitts.	14⅛
Troy Man.	‡.30

ST. LOUIS Oct. 10		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.04	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	66.00	64.00
C.C. & C. pd.	75.00	74.00
Cent. Oil	105.00	100.00
Columbia	5.00	4.00
Con. Coal	22.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	12.00

LONDON Oct. 14	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 3
Esperanza	3 8 9
Tomboy	1 1 2
El Oro	1 5 0
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 14.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.23
Best & Belcher	.43
Caledonia	.16
Chollar	.22
Comstock	‡.24
Con. Cal. & Va.	.63
Crown Point	.27
Exchequer	.28
Gould & Curry	.19
Hale & Norcross	.51
Mexican	.66
Ophir	1.87
Overman	.20
Potosi	.19
Savage	.44
Sierra Nevada	.33
Union	.30
Utah	.05
Yellow Jacket	.49
TONOPAH STOCKS	
Belmont	1.16
Extension	.60
Golden Anchor	.01½
Jim Butler	.23
MacNamara	.52
Midway	.38
Montana	.90
North Star	.06
Tono'h Mine of N.	6.75
West End Con.	.52
GOLDFI'D STOCKS	
Adams	.03
Atlanta	.20
Booth	.40
Columbia Mt.	.21
Comb. Frac	1.22
Cracker Jack	.06
Dia'dfield B. B. C.	.15
Goldfield Belmont	.05
Goldfield Daisy	1.10
Great Bend	.36
Jumbo Extension	.32
Katherine	...
Kendall	.15
Lone Star	.08
May Queen	.06
Oro	.10
Red Hill	.23
Roanoke	...
Sandstorm	.18

Name of Comp.	Clg.
Silver Pick	.16
St. Ives	.25
Triangle	.03
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B	.04
Gibraltar	.03
Gold Bar	.03
Homestake King	.26
Montgomery Mt.	.06
Mont. Shoshone C.	.81¼
Original Bullfrog	.01
Tramp Cons.	.15
MANHAT'N STOCKS	
Manhattan Cons.	.05
Manhat'n Dexter	.03
Jumping Jack	.03
Stray Dog	.03
MISCELLANEOUS	
Golden Boulder	.05
Bonnie Clare	.05
Lee Gold Grotto	...
Nevada Hills	1.12½
Nevada Smelting	.87½
Pittsburgh S. Pk.	.93
Round Mt. Sphinx	.16

COLO. SPRINGS Oct. 10	
Name of Comp.	Clg.
Acacia	6⅜
Black Bell	....
C. C. Con.	3½
Dante	6½
Doctor Jack Pot.	7
Elkton	67
El Paso	40
Findlay	19
Gold Dollar	7¼
Gold Sovereign	3⅜
Isabella	26
Index	....
Jennie Sample	‡2⅜
Jerry Johnson	‡4
Mary McKinney	‡30
Pharmacist	3¼
Portland	1.01
Un. Gold Mines	‡4
Vindicator	83½
Work	7⅞

Assessments

Company.	Delinq.	Sale.	Amt.
Bald Eagle, Cal.	Sept. 25	Oct. 15	$0.10
Birchville, Cal.	Nov. 2	Nov. 20	0.03
Brunswick Con., Cal.	Oct. 20	Nov. 19	0.03
Bullion, Nev.	Oct. 29	Nov. 20	0.05
Caledonia, Nev.	Oct. 21	Nov. 11	0.05
California, Cal.	Oct. 17	Nov. 7	0.02
Colo. Hydraulic, Cal.	Sept. 23	Oct. 17	0.025
Con. Imperial, Nev.	Sept. 29	Oct. 22	0.01
Gould & Curry, Nev.	Oct. 7	Oct. 29	0.10
Highland, Utah	Oct. 23	Nov. 16	0.01
Lady Washington, Nev.	Oct. 26	Nov. 16	0.05
Little Chief, Utah	Oct. 7	Oct. 28	0.01
Massasoit, Utah	Oct. 17	Nov. 5	0.01
Nonpareil, Utah	Sept. 15	Oct. 15	0.01
Oro Cobre, Cal.	Oct. 3	Oct. 26	0.02
Overman, Nev.	Sept. 23	Oct. 14	0.05
Seg. Belcher	Nov. 7	Nov. 20	0.03
Sierra Nevada, Nev.	Oct. 14	Nov. 4	0.10
Wheeler, Utah	Oct. 5	Oct. 23	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	....	28.863	.....
November	58.677	....	27.154	.....
December	54.565	....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	.....	13.551	.....	60.717	......
November	13.391	......	13.870	....	61.226	....
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	....
May	43.149	30.015	November	30.833	....
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	.....	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	.....	5.280	.....	21.781	......
November	4.925	....	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, OCTOBER 24, 1908. NO. 17.

The Silver-Lead-Zinc Mines at Broken Hill

The Orebodies Are Large and Regular, but Mining Costs Are High Owing to Inefficient and Expensive Labor and Inadequate Supply

BY G. W. WILLIAMS*

The town and mines of Broken Hill are situated in the western part of New South Wales about 30 miles from the South Australia border. The town is connected by rail with Adelaide, the capital and chief port of South Australia, the distance being 330 miles. Discovered 22 years ago, the field has produced lead and silver bullion to the value of $325,000.000, while more than $60,000,000 has been paid in dividends. The lode is one of the largest and certainly the most consistent silver-lead lodes in the world. The metallurgical treatment, owing to the presence of zinc sulphide is of considerable complexity, while the labor supply is certainly the worst in Australia. Until recently the zinc, which averages 15 per cent., was regarded as an impurity, but of late years several processes have been introduced, which promise to give the zinc in the ores an even greater value than the lead.

BROKEN HILL, NEW SOUTH WALES, AUSTRALIA

The Broken Hill or Barrier mines are situated on a line of lode that runs in a general north-northwest-south-southwest direction for about 2½ miles. From south to north [illegible] upon the deposit are as follows: South Blocks; South; Block 10; Proprietary, embracing blocks 11, 12 and 13 in the center of the line of lode; Block 14; British; Junction; Junction North, and, at the north end of the field, the North mine.

Generally speaking, the mines at the southern and northern ends of the field have a quartz-calcite gangue, while the more centrally situated mines have more or less garnet-sandstone and rhodonite in the gangue. An exception to this is the Junction North where the rhodonite runs [illegible]. The presence of these minerals naturally enhances the difficulty of crushing and concentration.

The line of lode is continuous for 2¼ miles, but it varies considerably in width both laterally and vertically. The zone of carbonates extended down to about 250 ft. vertically, while from 250 to 400 ft. the ore was partially oxidized. Below this the solid sulphides come in and these have been proved down to 140 ft. All zinc has been leached out of the carbonate ores and these ores, which averaged 33 per cent. of lead and 20 to 30 oz. silver per ton, were smelted direct on the fields. Chloride and iodide of silver have been found, the former in very large quantities, while native silver and copper were characteristic of the richer portions of the carbonate zone. At present only a small amount of carbonates remain and the mines are all treating sulphide ores.

[illegible]

Considering the age of the field, but little development in depth has been accomplished. The deepest shaft, situated on the Proprietary mine on the center of the line of lode, is down only 1400 ft. [illegible] to the south, is down to 1200 ft.; the South mine has opened up the 970-ft. level while the North and Central mines are down about 1000 ft. The centrally situated mines attained their greatest width in the upper levels and the lode has narrowed considerably below the 600-ft. level. It is satisfactory to notice, however, that from that level down the orebody remains practically [illegible] 55 ft. of clean ore.

The mines on the southern and northern ends of the field, which originally worked very small lodes in the carbonate and sub-carbonate zones are all widening in depth. On the South mine in particular the orebody at the 425-ft. level was small in extent and averaged only 45 ft. in width. On the 750 level the length had more than doubled and the width increased to 150 ft. The 850 level averages 200 ft. in width of pay ore while on the 970 level the orebody, although somewhat irregular in width, is opening up remarkably well and promises to equal the 850 level in extent. The same is true, but on a smaller scale, of the British, the Junction North and North mines where every level is looking better than the one which preceded it.

---

*Mining engineer, Melbourne, Victoria, Australia.

The Proprietary attained its greatest width (300 ft.) in the carbonate zone, the immediately adjoining mines in the 500- to 600-ft. zones, while the northern and southern mines take the "bulge" at still greater depth. It is, therefore, reasonable to assume that, as in the centrally situated mines the "bulge" was succeeded by a uniform width of 55 ft., so the mines where the lowest level is now in the enlarged portion of the lodes will be succeeded by a uniform orebody in depth. At present none of these mines shows any signs of contraction in depth, but the lode at the 970 level in the South mine is certainly less regular in outline than it was on the 850 level.

It is much to be regretted that these mines have not been proved to greater depth. Kalgoorlie, six years younger than Broken Hill, is explored to 2300 ft. and the Rand, about the same age as the Barrier mines, to a depth of more than 4000 feet.

Despite the small depth to which the mines have been developed and the enormous tonnages extracted, the mine ore reserves are very large. The Proprietary and the South mines each show 3,500,000 tons, the Central has 3,000,000, while the other mines run from 500,000 to 1,000,000 tons each. All Broken Hill tonnages are based on the long (2240 lb.) ton and this ton will be used through this article.

Speaking generally, the ore assays 16 per cent. each of lead and of zinc, while the silver varies from 5 to 10 oz. per ton. The relative proportions of zinc and lead vary in the several mines. The ores tend to become harder in depth, for more rhodonite and garnet comes in on the lower levels, but the metallic contents remain unaltered except in the case of the silver which shows a slight increase in depth.

Mining Practice

In the earlier days all mining was accomplished either by open cut from the surface or by square-setting. The open-cut method, although suitable for a mine such as the Proprietary, where the widest portion of the ore lies comparatively close to the surface, was inapplicable to the adjoining mines where the ore in the upper portions of the mine was of small width or even altogether too small to pay for extraction. The open cut on the Proprietary extended to 270 ft. vertical depth. Expert timbermen were imported from America and square-setting was introduced at almost all the mines. The result was entirely disastrous. The vast stopes, often exceeding 250 ft. from wall to wall were worked out and in place of the ore there remained a skeleton of 10x10-in. Oregon-pine sets. These sets, while offering considerable resistance to direct pressure, crumpled up like a pack of cards when the pressure came diagonally. Diagonal stays were practically useless. A series of "creeps," involving the loss of enormous tonnages of ore, the destruction of shafts and the complete wrecking of two large concentrating mills, together with some loss of life, brought home to the companies concerned the imperative need for some more secure method. To-day forests of Oregon pine, crushed to match wood, are buried in the upper levels of the Barrier mines.

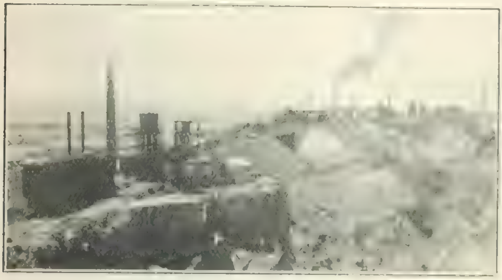
OPEN CUT, 270 FEET DEEP, BROKEN HILL PROPRIETARY MINE

At the present time square-setting is used only in the extraction of crushed ore from stopes which suffered during the "creeps," for taking up the floor of the level from the stope below, and in the few carbonate stopes which remain. In every case the sets are filled with waste as the work proceeds.

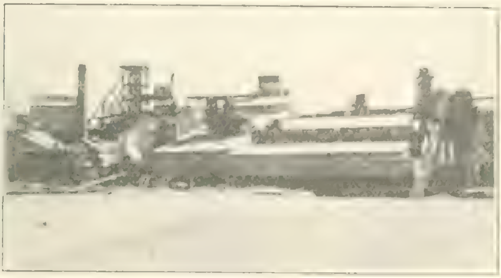
The mines which suffered most severely from the creeps were the Central, the Block 10 and the South mines. The boundary line of the first two mines ran diagonally across the lode at a point where the orebody attained a width of several hundred feet. The Central mine stoped its ore on the "block" system. Under this system the main drive is carried in the footwall and at intervals of 50 ft. crosscuts are put in through the orebody, thus dividing it into blocks 50 ft. wide and running from the foot to the hanging wall The alternate blocks were stoped out with square sets. In the old days the sets were not filled with waste but were left as an open framework. The adjoining Block 10 and South mines were working "on their

MILL, PROPRIETARY COMPANY

SOUTH MINE



BROKEN HILL PROPRIETARY MINE



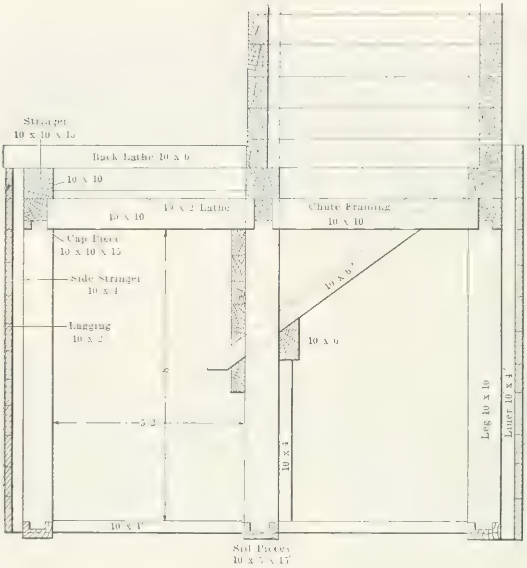
BLOCK 14 MINE

NORTH MINE

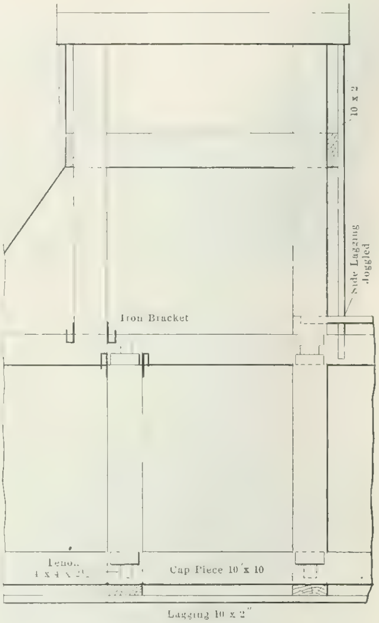
BRITISH MINE

WIDENING OUT INTO THE LODE

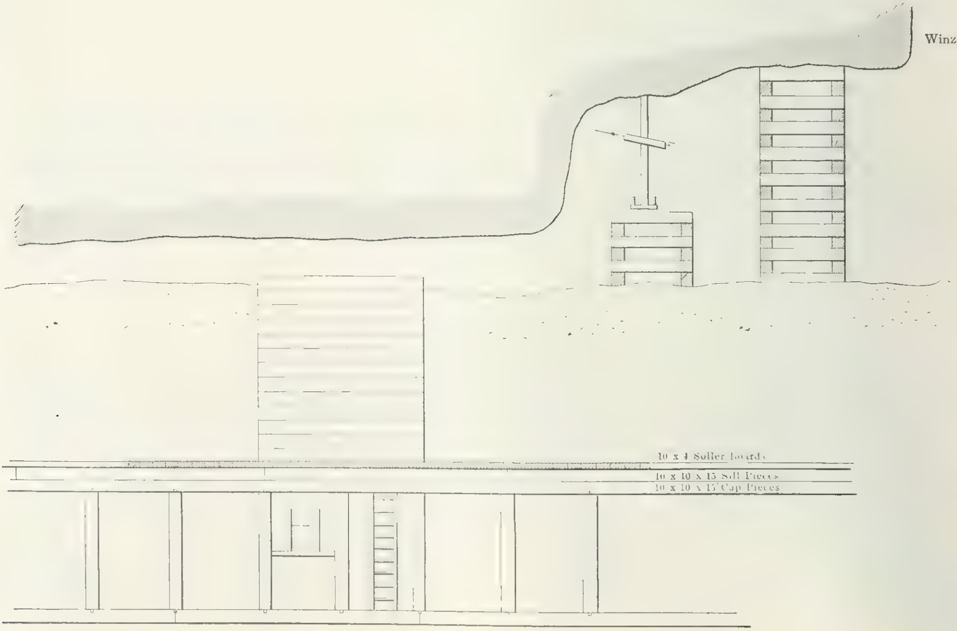
[illegible]



SECTION THROUGH DRIFT AND ORE CHUTE



FRAMING REINFORCED BY METAL BRACKETS



METHOD OF WORKING "OPEN STOPE"

own" following out the ordinary square-setting practice.

The net result of this independent work was that a serious creep set in which caused the loss of some millions of dollars. A creep which had been much more serious but for the support given by the "pillars" in the Central which although unable to prevent "creep" certainly minimized its effect. At present these three mines are removing the crushed ore from the region of the creep by means of square sets followed by careful filling, but in other parts of the mine the square sets have been abandoned in favor of the open stope method. On the Central mine the block system is still in vogue but it is materially modified. The blocks are extracted without square-setting, the roof being supported on bulks while the waste is kept well up to the face. After the alternate blocks are removed the pillars are removed in a similar manner, lagging being carried up to keep any loose waste in place. The method has little to recommend it and seems to involve some danger.

The bulk of the ore won in Broken Hill today is broken from stopes which are worked on what is locally called the "open stope" method. This method of stoping, which has proved both safe and economical in working is really an extension of the Kalgoorlie "flat back" system. The usual procedure is as follows: The main drive is carried along the approximate center line of the lode and crosscuts are put into the hanging and footwall at frequent intervals. Ore passes are placed along the main drive and in the crosscuts; the latter are necessary only when the width of the orebody exceeds 60 ft. As soon as the drive and the crosscut are timbered, the whole of the sill floor is stoped out to either wall, the face of the stope being supported on bulkheads of Oregon timber. The latter are built up of 5-ft. lengths of 10x10-in. pieces.

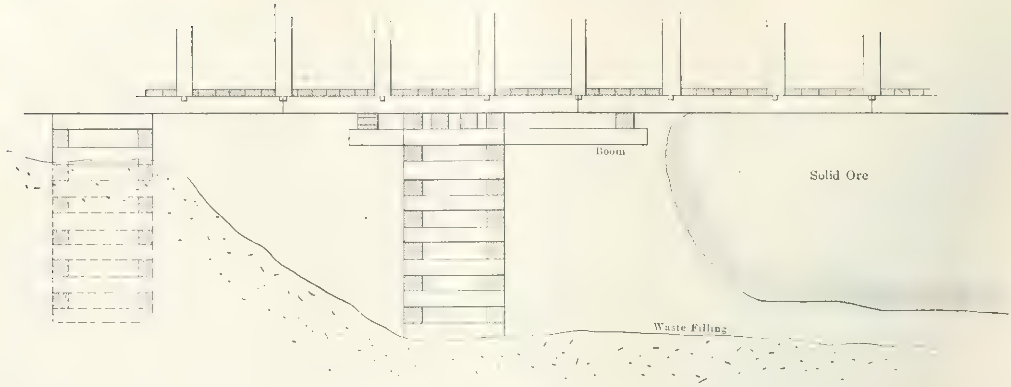
The compact sulphide ores stand well and accidents from falling ground are very rare. When the whole of the sill floor is stoped out waste is run down from the waste passes above and spread over the floor. Prior to running in waste the floor is boarded over with 4-in. Oregon planks. This is done, of course, to enable the stope from the level below to come up safely against the filling. When the sill floor is filled with waste a fresh stope is started off from the winzes, and this is carried right out, the face being supported on bulks. As this stope works ahead the fillers follow on and keep the waste well up to the face; all bulkheads are removed as the filling is brought forward.

The method of taking up the floor of the level above the stope varies somewhat in different mines. In most cases when the back of the stope approaches within 20 ft. of the level, the ore is rilled away from the winzes, the filling being kept close up to the face. In other cases the last cut off the stope is square-setted, while in many mines the form of the stope remains unaltered, but from the bulkheads booms are shoved forward which catch up the floor of the stope or level above and hold it until another bulk can be erected. These bulks in the last cut of the stope are usually left in position as they have to carry the whole of the sill floor timbering.

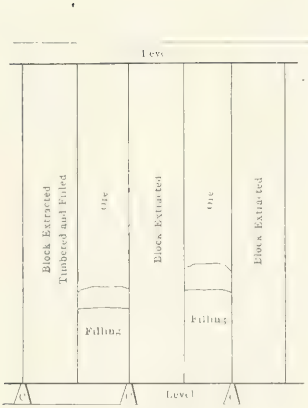
These open stopes are often of considerable extent. In the South mine the lode not infrequently exceeds 200 ft. in width and the breast of the stope is carried from wall to wall. The footwall is usually more or less vertical, but the hanging wall varies in pitch according to whether the lode is increasing or decreasing in width. It seems almost as if the carrying of these wide stopes might involve considerable danger to the mine; 200 ft. is a very considerable swing for any stope, no matter how solid the ore may be. As the stope works upward to the level above, the bridge of solid ore remaining will, despite the filling in the stope which takes time to settle, have to sustain a tremendous thrust. The Broken Hill ores give a remarkably good face, but from their nature (they contain about 35 per cent. of lead and zinc sulphides) they are incapable of withstanding any great crushing strain, as was abundantly demonstrated during the big creep on the Central mine. It would seem that a safer method would be to carry up the wide orebodies in sections of about 50 or 60 ft., starting from the footwall side. When any section has been stoped up to the level above the next section could be attacked, side boards being used to hold back the waste. In this manner all danger of collapse of the bridge of ore under the level would be avoided. This method has not the disadvantages of the block system in which the ore is taken out in 50-ft. blocks across the lode. A sill floor may be carried the whole length of the section and all crosscutting for ore passes avoided.

An indirect advantage lies in the fact that the stopes can be rilled and the cost

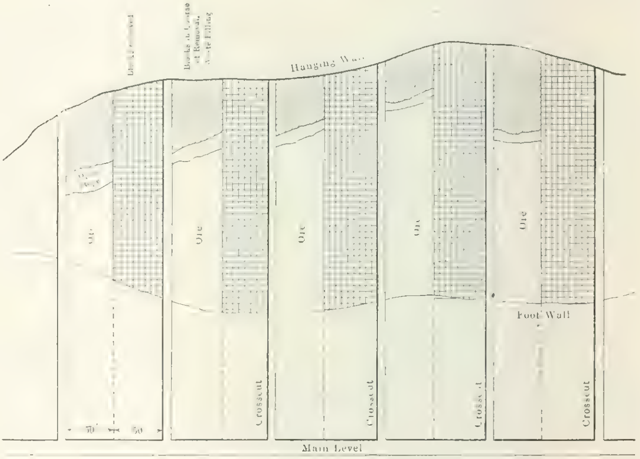
PORTION OF 725-FOOT LEVEL, SOUTH MINE, BROKEN HILL



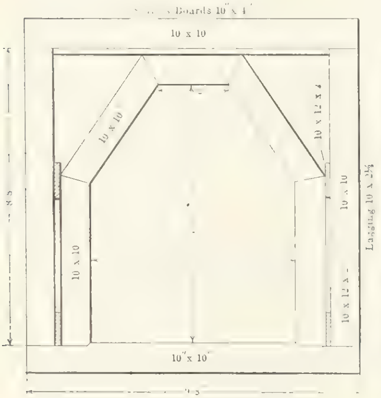
CATCHING UP FLOOR OF LEVEL WITH BULKHEADS AND BOOMS



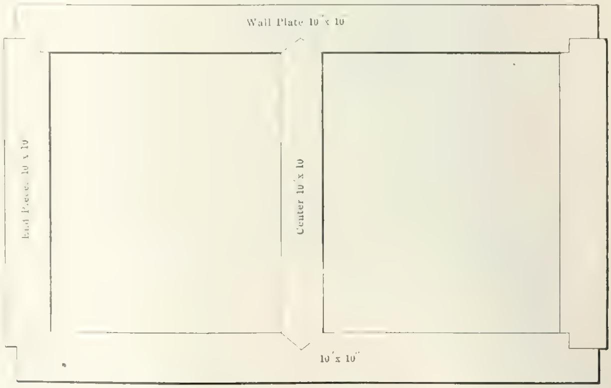
VERTICAL SECTIONS AT RIGHT ANGLES TO CROSSCUTS



IDEAL PLAN OF STOPES. BLOCK SYSTEM



MAIN LEVEL SETS, PROPRIETARY MINE

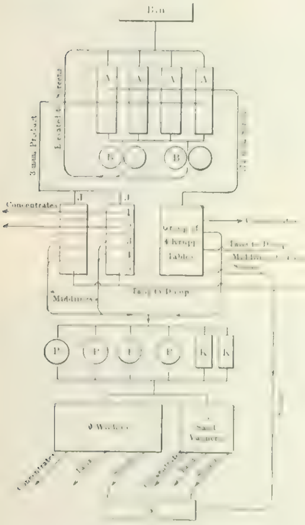


PLAN OF FRAMING CHUTE TIMBERS

of mucking thus reduced. The great disadvantage of the open-stope method in large stopes lies in the fact that all waste has to be trammed and shoveled from the pass to the face. This is no small item in a wide stope where costs of mucking run as high as 30c. per ton of ore. In regard to mucking the general practice is to carry the main pass in the footwall of the lode, and to tap this winze on each level by means of a short crosscut. From the chute the ore is trammed along the levels to the chutes leading to the stopes.

METHODS OF TIMBERING

There are in vogue three distinct methods of timbering the levels. The drive timber used in the British mine is shown in accompanying illustrations, which are from plans supplied by the manager, Mr. Sampson, who devised this method, which is generally in use, with slight individual modifications on the majority of the Broken Hill mines. The drive, which carries a double line for trucks is 5 ft. 2 in. wide by 8 ft. high within timbers. The sets are placed at intervals of 5 ft. between centers, and are composed of 10x10-in. Oregon timbers joggled into the cap pieces (10x10 in.x15 ft.), which run along the length of the drive. The struts are 10x10 in. On top of the cap pieces are laid other pieces of timber equal sized, and across these rest the roofing slabs of 10x6-in. Oregon timber. The sets stand on 15-ft. sill pieces running along the drive and the level, and the whole sill floor is laid with 10x4-in planks. The side slabs are not laid directly against the legs, but a 10x4-in. plank is interposed.

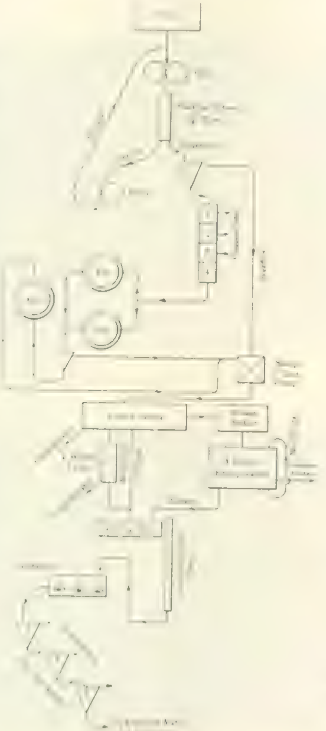


FLOW SHEET, CONCENTRATOR, JUNCTION NORTH SILVER MINE

A Three-deck oscillating screen. B [illegible]. J Jigs. P Pans. K Krupp ball mill. S Slime settlers.

The side laggings are 10x2-in. planks set closely together. The object of the side liner is to enable any laggings broken by lateral pressure to be replaced without moving or interfering with the main legs. The ore-passes and ladder-ways each measure 5x5 ft. in the clear, and are constructed of 10x10-in. timber. When an ore-pass wears out the ladder-way is changed over and the ladder-way used as an ore-pass.

Some mines line the passes with 10x15-in. hardwood timber obtained from West Australia or Tasmania.



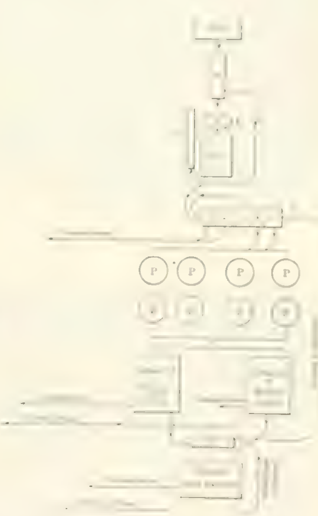
[illegible] HILL [illegible] MINE

The Proprietary mine employs plain "clap-me-down" sets stiffened with an inner bridgework. On the Junction North mine the method of laying out the level is quite different from that on any other mine. The sill floor is not carried out from the floor of the level, but the level, which is carried in the center of the lode, is cut just wide enough to carry the sets arranged for three sets of trucks. Empties go up the center and are filled from ore-passes placed at alternate sides of the level. The lode averages 60 ft. in width. The sill floor is laid down when the leading stope is taken off, and is then floored with 10x6-in. planks in the usual manner. The result is that a continuous pillar of ore is left on each side of the level, the pillars being removed as the stope from the level below comes up. The sets are plain 10x10-in. "clap-me-down" sets, i.e., the legs, sills and caps are not joggled or tenoned.

The removal of the pillars of ore alongside the level is accomplished not without difficulty. It is true that these pillars permit the use of a less solid type of drive timbering, but it seems not unlikely that the trouble is deferred, not overcome. As yet, none of these pillars has been removed as no stopes are yet worked up to the levels constructed in the manner described.

[illegible]

Almost all the ore [illegible]



[illegible] BROKEN HILL SOUTH

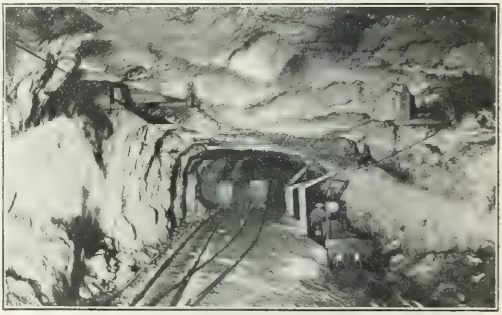
[illegible]

[illegible] to the shortage and general inefficiency of the labor supply, the contract rates rule very high. For breaking and delivering to the ore chutes the price averages 92c. per ton. At this rate the contracting parties have averaged $3.24 per shift for the past 12 months. Owing to the present drop in the price of lead and the consequent reduction of output, there is more labor available, and contract prices are falling somewhat. All contracts are paid for on the actual weight of ore delivered by each party at the pit mouth. Every truck as it leaves the cage is run over a [illegible] by an employee of the company and checked by a tally clerk appointed and paid by the men.

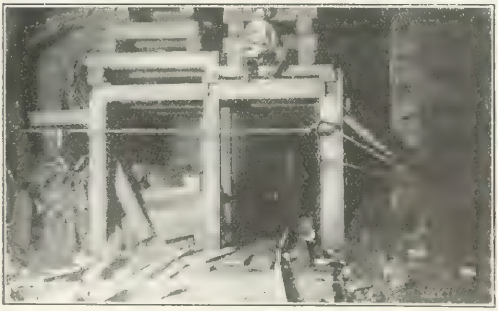
Each truck bears a tin label giving the number of the party of miners who have broken the ore. This method works admirably; no disputes are possible, for the men have their own representative present all the time. Moreover, the mine obtains an exact record of all ore raised. The ore drills somewhat hard, but it breaks well, and comparatively few holes will break a large tonnage. Exact figures as to the footage drilled per ton were not available. Neither underground nor on the surface do the Broken Hill mines keep costs with that care which is characteristic of the Kalgoorlie mines. It is difficult to obtain even the aggregate costs, while itemized costs for individual portions of the work are absolutely unobtainable.

Mining costs fluctuate considerably in inverse ratio to the demand for labor. Situated in the midst of an arid, treeless plain, the dirty, cheerless town has little to attract men to settle there permanently, so that when prices of metals rise and every mine is endeavoring to secure a maximum output, the demand for labor is out of all proportion to the supply, and as a natural consequence the costs go up rapidly. This was apparent during the recent boom in base metals. All over the Commonwealth there was a strong demand for men to open up new mines, or to reopen mines which only pay when lead and copper stand at a high price. The Barrier mines, normally employing from 7500 to 8000 men required fully 10,000 to cope with the demand for increased output, and as a result working costs increased by something like 40 per cent. A general increase in wages of 12.5 per cent. was granted, and this, together with the decreased efficiency due to the compulsory employment of anyone who called himself a miner, resulted in a surprising increase in the cost of mining and milling. At present mining costs vary between $2.88 and $3.24, or twice the cost of mining in Kalgoorlie where, if the ore is not quite so hard, the smaller extent of the orebodies greatly diminishes the tonnage broken per foot drilled. Of the mining cost about 70 per cent. represents labor.

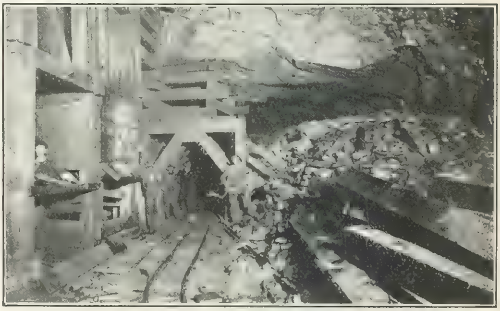
MUCKING



UNDERGROUND HAULAGE, PROPRIETARY MINE



CATCHING UP A STOPE



METHOD OF REINFORCING DRIFT TIMBERS, PROPRIETARY MINE

Underground mechanical transport of ore is unknown. The Proprietary did install electric traction, but it has been abandoned in favor of horses which are used in some numbers in that mine.

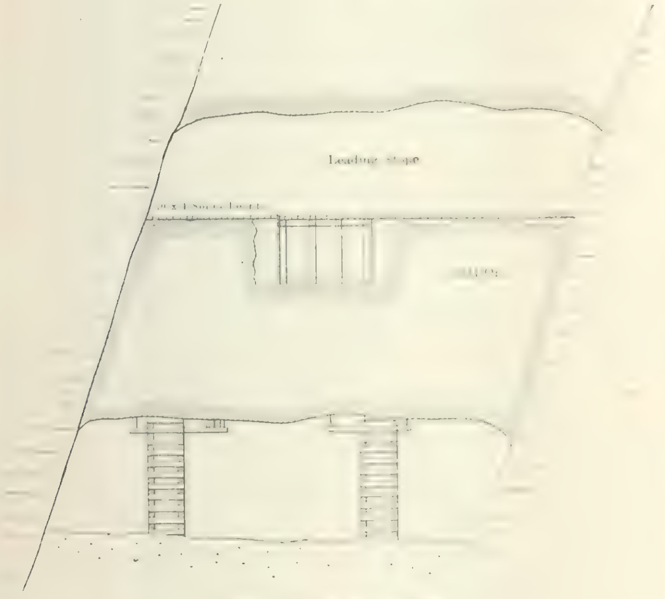
TRANSPORT AND HAULAGE OF BROKEN ORE

With the exception of the Proprietary mine, where horses are used on all main levels, all tramming is done by hand. Tramming, like mining, is all on contract, the price paid averaging 14c. per ton (2240 lb.). The trucks generally in use have a capacity of about 16 cwt. of ore. The larger mine shafts are provided with cages taking two trucks on one floor. Cages are used in all mines.

The shaft arrangements at the South mine deserve more than passing notice, for the arrangements at the various levels are singularly complete. The shaft is 12 ft. 10 in. by 9 ft. 6 in. within timbers. There are two compartments and the single-deck cages carry two trucks at a time. The shaft has a capacity of 10,000 tons per week. Signaling is by means of the return-bell electric system, and telephones, communicating with the central mine exchange, and thence to all parts of the mine and town exchange are placed at every level. The shaft chairs are actuated by levers which are in electrical connection with the engine house. At the side of the indicator cylinders are placed a row of little red lights, each light corresponding with the position of the levels on the cylinder. When any chair is thrown in gear the fact is signaled to the driver by the lighting up of one of these lamps. As the indicator pointer travels down the row of lamps it would require extraordinary carelessness on the part of the driver to overwind through the chairs. A small pilot lamp between the two rows of lights indicates any accidental break in the circuit.

The plats in this mine are constructed in such a manner that the full trucks running upon the cage discharge the empties which, running down a ramp over self-closing points and then up an incline are returned to the main line of empty trucks without any handling. At each plat a large and well lighted store is provided, as well as a magazine. A storeman is in charge of these supply depots and he is responsible for the issue and return of all store and equipment. Every tool is numbered, so that each party of contractors is held strictly responsible for all tools lost or broken.

Spares for drills and a small fitter's bench are provided at the depot. All plats and main crosscuts are lighted with electric light. This system of underground depots is also in use at the Proprietary. The close check which the mine is enabled to exercise in the matter of the issue and return of tools effect a saving considerably in excess of the cost of maintaining these underground storesmen.



[illegible]

FIRES

The great quantity of timber used underground, especially in the older workings renders these mines very liable to fire. Several disastrous fires have occurred, and at the present time a fire is burning in the Proprietary mine.

A serious fire which occurred some years ago in the mines on the northern end of the field was only extinguished after the four mines affected had been completed flooded. The present fire in the Proprietary is confined between water curtains. All drives passing through the affected portions have been closed and fresh drives have been carried in the footwall. The fire curtains maintain a wet zone, water being run from perforated launders placed across the lode and percolating vertically downward through the old stopes. At each end of the fire area there are two parallel "curtains" or launders. The fire appears to be quite under control and will die out slowly. Fans remove the air from all stopes and workings in the vicinity.

A new automatic inclined hoist installed at an iron blast-furnace plant in Germany [illegible] Sept. 26, 1908) picks up a loaded circular bucket having the same diameter as the hopper, places it accurately upon the furnace top and dumps the charge through a drop bottom. The advantages claimed for the device include, more uniform feed, and less fracture in the coke charge, the material remaining undisturbed in the bucket during the transfer from the stock-pile to the furnace hopper.

There were 1,062,000 lb. of bromine produced in the United States in 1907, valued at $138,060. This compares with 1,229,-[illegible]

Cadmium was manufactured in the United States for the first time in 1907.

Working Costs in the Transvaal

SPECIAL CORRESPONDENCE

A full report, just published, of the [illegible] tein Gold Mining Company, of the Transvaal, contains some interesting data given by the chairman, Samuel Evans, with regard to the working costs. Figures are given showing the beneficial effect of large plants. The average working cost of four of the larger mines with mills treating from 43,800 to 70,760 tons per month was for the month of July $2.58 per ton milled excluding development, or $3.38 including development charges. An analysis of returns from all the crushing mines of the Witwatersrand, with one or two minor exceptions, given below, demonstrates the advantage of working on a large scale.

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	14	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Development costs are omitted owing to the difficulty of bringing them to a fair basis for comparison. It must not be lost sight of in comparing working costs that depreciation of plant is generally not allowed for, and the amount properly chargeable on the extra additional plant required to gain reduced costs must cancel to some extent the advantages gained. A maximum output, provided regard is paid to keeping the grade of ore within the payable limit, is the right principle to aim for. Large outputs mean reduced working costs and increased pay ore, with the advantage of extracting the gold from the ground and making it productive earlier than when working on a small scale. Another point to be remembered in making comparisons of costs over several years is that conditions have changed; wages, for example, on an average are probably considerably less than they were a few years back, while stores, no doubt, show some reduction. The striking improvement shown by Mr. Evans between the working costs at the New Modderfontein between May, 1899, when the costs including development were $7.32 and July, 1908, when they were $4.70 per ton, is not entirely due to the increased scale of operations. To some extent the improvement has been gained by a general all-round economy in working.

[illegible]

(March 14, 1908, p. 175), plaster of paris may be used as a flux for melting scrap metals containing small amounts of iron. [illegible] is stirred. On cooling the plaster is re-[illegible] iron is thus removed and the flux, being neutral, does not attack the crucible.

Use of Basic Refractory Brick in Metallurgy

The Sources and Cost of Magnesite and Chromite and the Advantages and Disadvantages of Employing These Minerals for Furnace Linings

BY FRANCIS T. HAVARD*

There are few charges which figure so largely on the cost sheets of a smeltery employing reverberatory furnaces as those for the erection and the maintenance of brickwork. Even the blast-furnace superintendent deplores the cost of the quantity of lining which must be renewed on all occasions before he may recommence smelting with a furnace which has been blown down. It is therefore a feature worthy of note that, in many cases which have come before my notice metallurgists have not availed themselves of the full advantage of the improved kinds of refractory brick which have been placed on the market in recent years, nor developed other types of mortar and breast mass beyond the original popular mixtures.

Perhaps this unusual condition is sometimes due to the inclination of the superintendent to leave the question of the choice of the brick used in the hands of the master mason, who is responsible for the maintenance of the masonry. The mason approves and uses the best kinds of refractory acid bricks and highly aluminous silica bricks which have deservedly won their way to his heart. The most satisfactory results have, however, been obtained with the true basic magnesite and the neutral chromite brick. It is chiefly with the advantages which the use in general metallurgical practice of these two kinds of brick offers that my notes deal

REVERBERATORY COPPER FURNACES

The regular brick formerly in use in the reverberatory copper furnace was a highly aluminous firebrick with about 40 per cent. Al_2O_3 and about 45 per cent. SiO_2. For copper refining dinas, or a low aluminous silica brick, was chosen. This kind of brick, however, was rapidly eaten, particularly on the slag line; consequently it was found necessary to repair the furnace linings about once every week by a process called "claying."

This process consisted in throwing an aluminous sand against the corroded parts of the hot walls of the furnace in which the metal had been tapped as low as was safe. In the case of the reverberatory or smelting furnaces some matte was always retained in the furnace to keep the bottom hot. The sand thrown against the walls sweated and filled in the interstices. This work was and is a task which taxes heavily the physique of the men and the temper of the foremen; the shift which clays is fit for little other work.

By the use of magnesite instead of fireclay in the walls of the furnace this work of periodical claying is avoided; for the magnesite withstands the corrosive action of the slag, not, however, the abrasive action of a bath which is set in considerable motion by constant rabbling or blowing with air.

REVERBERATORY LEAD FURNACES

In lead work the superiority of the basic and neutral chromite lining is still more marked, for in this case the very refractory brick is required to withstand the corrosive action of the oxides of lead and antimony in the softening furnace and of bismuth oxide in the cupelling furnace.

In the case of the softening furnace either the lining of all the walls is made of magnesite or only that part on which the slag ebbs and flows.

In the cupelling furnace, and more particularly the litharge-producing furnace, walls as well as roof and bottom should be of magnesite or chromite brick. If the roof be made of firebrick it is apt to be attacked by the lead fume, and the drops of lead silicate which fall onto the bath hinder the flow, of a silver-free slag in the one case, and in the other of the pure litharge.

CUPELLING FURNACES

In American test hearths magnesite has replaced to a great extent other materials, such as marl and clay, cement and marl and boneash, of which hearths were formerly made. The magnesite is used in the form either of mass or of bricks.

The old type of round or elliptical German driving furnace with a hearth of marl is now being replaced by a standard-shaped oblong furnace with a lining of magnesite. Despite the most careful laying and heating cement hearths have not proved a success in driving furnaces; the cement would always crack and the broken pieces rise to the surface, destroying all chance of making silver-free slags and of successfully driving the charge to the "blicken" of the silver.

ANTIMONY REVERBERATORY FURNACES

In resisting the extremely corrosive slags produced in the reduction of antimony ores or oxides to metal, chromite lining has been proved superior to all other kinds. Since the oxides of lead, bismuth, antimony, arsenic and tin act as acids in attacking a basic lining it can be readily understood that a neutral material, which possesses the physical qualities of chromite, would be the most desirable material for refractory lining.

COPPER-BLAST FURNACES

In the construction of the copper-blast furnace, it is usual to make the walls above the jackets 13½ or 18 in. in thickness, of which the inside lining (a header and stretcher alternately) is of firebrick, while the other two-thirds of the walls is of ordinary red brick. For the lining of the walls of the crucible magnesite or chromite brick should be used.

If the settlers of the blast furnace have the form of a small movable forehearth, its floor and walls may be made of firebrick. In the case of the large stationary settlers used in both blast furnace and reverberatory practice, which are much less often put out of commission by reason of the freezing up of their contents than by the corrosive action on the lining, magnesite or chromite should be used on the walls and fireclay on the bottom.

In its quality of resisting corrosion, abrasion, and withstanding the effects of high and rapid changes of temperature chromite is superior to magnesite, and it would be preferred for almost all work were it not that the price of crude chromite ore is more than twice that of burnt magnesite.

Magnesite has the disagreeable quality of becoming soft at high temperatures, although it regains its hardness when cooled. For this reason it has been found advisable to surround magnesite-furnace linings with water jackets. Magnesite also requires much more delicate handling in laying than chromite.

All burnt magnesite should be stored in a dry place, and it should at all times be kept away from contact with water with which it forms a hydrate.

The bricks should either be laid dry or pointed with a mortar free from mechanically admixed water, such as a mixture of magnesite and tar. The percentage of tar, in this particular mortar, should be kept low; only enough should be present with the dry, fine magnesite to enable the mason to point with it; for the tar in the mortar which is exposed to the action of the heat of the furnace burns off and makes the mortar porous. But this will not result in any appreciable weakening of the wall provided too much tar be not used.

Another mortar used is a mixture of magnesite with magnesium chloride, a by-product from Stassfurt, yet another mixture contains magnesite and hydrochloric acid. I have obtained the best results with the first-named mixture.

---

*Metallurgical engineer, Helena, Mont.

Magnesite does not resist the abrasive action of a metal or slag bath which is poled or agitated by air. The hot, soft bricks peel, and the chips of magnesite make the surface of the bath or the slag viscid and difficult to work. Notwithstanding that magnesite expands considerably on heating, the use of expansion joints of wood between the bricks is deprecated; rather let the expansion and contraction of the furnace be met by the slackening and tightening the tie bars.

For breasts and bays of reverberatory furnaces and cupelling hearths magnesite is successfully used in the form either of blocks or of mass. Blocks of all sizes are made by factories on demand by hand pressing the once- or twice-burnt magnesite. These blocks are of the right degree of hardness and permit of cutting to keep the same level as the sinking bath. For breasts of mass a mixture of magnesite and litharge has been found successful in many cases, excelling the well known fireclay and marlclay breasts by reason of its firmness and durability after it has once been sweated by the heat of the furnace. This same mixture is more serviceable in replacing defective furnace floors and walls.

Before starting up a new reverberatory furnace it is advisable to sweat a thin layer of this material over the whole floor. I would here point out, too, that the loss of one or several bricks from the floor of a furnace is not sufficient cause for renewing the whole bottom. One should fit in new bricks as tightly as possible and shove down with a trowel between the bricks and in the interstices a mixture either of magnesite and tar, or magnesite and litharge. It will be found in most cases that the floor thus repaired will be perfectly tight after the furnace has been heated up.

In water-jacketed reverberatory furnaces, the magnesite lining will in the first month be eaten to within a couple of inches of the jacket, the progress of corrosion for the succeeding months being scarcely perceptible.

THE MAGNESITE INDUSTRY

It is only within comparatively recent years that magnesite has obtained a large market both as a source of carbonic-acid gas and as a refractory-furnace lining. The value of the pure deposits has become greatly enhanced as the demand in recent years correspondingly increased. Before the value of the mineral to the metallurgist had become fully realized, magnesite had been sought by makers of carbonic-acid gas. A large part of the mineral now used in furnace work is obtained in the form of burnt residues after the carbonic-acid gas has been won from the original carbonate. Magnesium carbonate is preferred to calcium carbonate as a source of carbonic dioxide on account not only of the larger quantity, but also of the greater purity of the carbonic acid produced from a ton of material and also by reason of the ready and good market obtained for the residue. Carbonate of magnesia is burned in a kiln with 10 per cent. coke in the same way as lime is burned. It yields 52 per cent. of carbon dioxide while limestone yields only 34 per cent.

SOURCES

The sources of magnesite are: In the United States, California, where considerable quantities are burned by raising to a white heat for 20 minutes in oil-fired reverberatory furnaces; Austria-Hungary; Germany; Greece; India, and South Africa. The two greatest producers of the crude magnesite are Styria, in Austria, and the island of Euboea, in Greece.

In Styria, the Veitscher Magnesitwerke Aktiengesellschaft, of Vienna, mines and burns the magnesite and produces a very fair brick in eager demand by steelmakers all over the world for linings in open-hearth furnaces. The growth of the Veitsch company has been remarkable; within the last five years it has more than doubled its output, and has made very large profits out of the Styrian magnesite, the mining of which it has developed on a very large scale along with its complete control of the local industry. In Hungary, a fair quality of magnesite is mined and worked by the Hungarian Magnesite Industry Company.

The purest magnesite comes from Greece. The product from this source contains in contra-distinction to the Austria-Hungarian mineral very little lime. Two companies, the Anglo-Greek Magnesite Company and the Society of Public Works, at Athens, are exploiting the deposits on the island of Euboea. The Greek magnesite is worked into bricks by various Dutch, German and English manufacturers; the German and Dutch brick is black and much softer and less refractory than one of the English varieties which has a grayish color.

In the United States the control of the manufacture of both magnesite and chrome brick is in the hands of the Harbison-Walker Refractories Company, of Pittsburg. The Kaliwerke, of Stassfurt, makes large quantities of chloride and sulphate of magnesia as end-products, for which they try to effect large sales. A company has also installed a factory in South Africa which produces carbon dioxide from magnesite. The value of burnt magnesite is from $7 to $8 per ton.

The accompanying tables show the production of magnesite in the years 1901 and 1905, and also analyses of some varieties of American magnesite and magnesia.

METRIC TONS PRODUCED

Year.	Austria-Hungary.	Germany.	Greece	India	[illegible]
1901	40,236	67,988	13,410		4,256
1905	92,359	58,578	[illegible]	2,096	3,567

ANALYSES OF MAGNESITE AND MAGNESIA

	1	2	3	4	5	6	7	8
SiO_2	0.10	0.5	1.1	3.3	[illegible]	[illegible]	[illegible] insol.	6.90
Fe_2O_3	0.23	0.30	0.47	7.25	6.02	0.08	15.1	[illegible]
Al_2O_3			0.76	0.84	1.18			
CaO	0.62	0.70		2.48	4.34	Trace		[illegible]
MgO	47.10	46.90	97.35	84.72	[illegible]	46.53	37.23	44.39
CO_2	51.98	51.6				51.25	40.98	50.06
Water			0.32	1.40	1.33	0.32		[illegible]

Nos. 1 and 2 [illegible] American Magnesite Co. [illegible] calcined; No. 6, Chiles Valley; No. 7, the same poor, not shipped; No. 8, Porte[illegible]

THE CHROMITE INDUSTRY

Even more remarkable than that of magnesite production and manufacture has been the growth of the industry of chromite, which, however, is more concerned with the manufacture of chrome salts and of ferro-chrome alloys than with the production of refractory brick. Crude chromite ore, suitable for furnace linings, is sold at the rate of $17 per ton. The chief source of chromite ores is New Caledonia, which produces the [illegible] grades, carrying from 30 to 57 per cent Cr_2O_3. That containing above 40 per cent. is shipped directly to Europe; that below 40 per cent. is subjected to dressing before it is shipped. Other large producers are Greece and Russia. Turkey has fallen from its former high estate of being one of the chief purveyors of chrome ore, probably on account of the difficult and expensive transport of ore to the coast.

The production of chromite ore in tons in 1896 and 1905 is shown in the accompanying table:

PRODUCTION OF CHROMITE ORE IN TONS

	1896.	1905
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	
[illegible]		[illegible]
[illegible]	1,600	15,000
[illegible]	16,018	51,000
[illegible]	1,031	
[illegible]	394	53
United States	793	122
[illegible]	[illegible]	[illegible]

Chromite ore in the United States is found principally in California.

Appended are analyses of samples of Turkish and New Caledonian ore:

ANALYSES OF CHROMITE ORES (PER CENT.)

	Turkish.	New Caledonian.
Cr_2O_3	51.70	55.70
FeO	14.20	16.60
Al_2O_3	14.10	16.20
MgO	14.30	9.80
SiO_2	3.50	0.25
CaO	1.70	0.25
MnO		0.20
P_2O_5		0.05
H_2O	0.30	1.05

It seems strange that neither magnesite nor chromite has been generally used as a basic lining in copper converters. It is quite possible that the reason for this has been the difficulty of securing a brick or a mass of sufficient tenacity to stand the physical action in the converter. Some of the mixtures of magnesite with certain alkali-metal salts have given such good results that it is quite probable that a satisfactory basic or neutral converter lining may yet become the vogue in metallurgical copper work.

Iron Ore Statistics of Iron County, Mich.

The report of William Carlson, inspector of mines for Iron county, Michigan, for the year ending Oct. 1, states that 2258 men were employed by the 40 mines operating in the county which produced 1,383,138 tons of iron ore. There were 11 fatal accidents during the year; nine of the victims were employed underground.

The report states the average number of men employed and the tonnages at the principal mines of the county. The average production per man for all producing mines was 613 tons. In the following table the statistics of production per man are given for those mines producing 100,000 tons or more.

PRODUCTION OF SIX IRON COUNTY MINES.

Mine.	Production Tons.	No. of Men Employed.	Production per Man.
Great Western	190,000	300	633
Tobin	185,000	200	925
Bristol	175,700	200	878
Baltic	136,800	181	755
Caspian	117,811	176	669
Dunn	100,000	85	1176

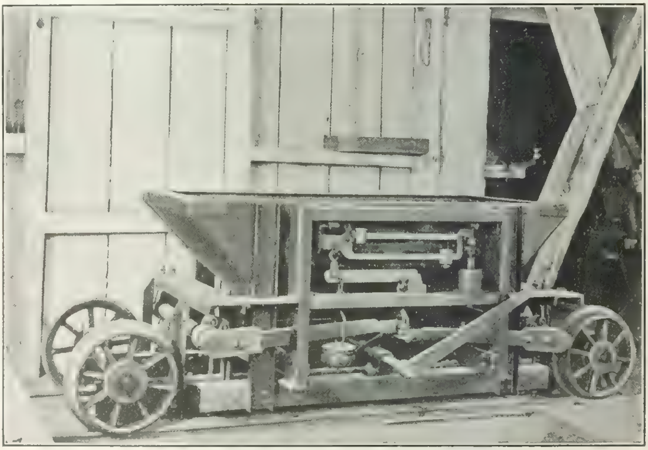
Assuming 300 working days in the year, the daily production per man at the Dunn mine was 3.92 tons; for the six mines enumerated, 2.64 tons; and for the 40 operating mines, 2.04 tons.

The ores from which the larger part of the world's supply of bismuth is derived are native bismuth and bismuth glance, the oxide and carbonate ranking next in importance.

Weighing Ore in Stamp Mills

By Frank A. Ross*

The stamp-mill of the Daly Reduction Company, Ltd., at Hedley, B. C., is, perhaps, the only large plant today in which the ore is weighed immediately behind the batteries. In this mill I determined to carry out certain ideas, long entertained, regarding the proper point at which scales should be located to obtain best results in all departments for the practice of not weighing at all, or of doing so between mine and mill, has many serious defects. It was first intended to install an automatic system, as is advisable wherever a continuous stream of any material is to be weighed, but the cost and time required for installing caused the use of a hopper-scales car running over a track laid upon the cam-shaft floor.



SCALES CAR USED AT MILL OF DALY REDUCTION COMPANY

The Weighing Car

This car, shown in the accompanying illustrations, has proved satisfactory. It runs easily upon roller-bearings, delivers a load of 2000 lb. and weighs accurately notwithstanding the jarring of the stamps, for its beam is dead-beat. New chutes were cut in the ore-bin above the regular ones and simple gate-mechanisms make loading easy and rapid. The car has two hopper-gates that work well and deliver the ore to the feeders through trap-doors in the cam-shaft floor.

Head-samples are taken by means of a hinged apron hung midway between the feeder-lip and the hopper of the mortar. Normally, this apron shoots the ore into the mortar, but when dropped at intervals it deflects the entire ore-stream into a sample-box. Each mortar is fitted with one of these aprons, and each apron is coupled by a rod to a shaft running the entire length of the mill and operated by a lever at one end thereof. At stated intervals the samples are taken simultaneously by throwing this lever and holding it down during 12 drops of the feed-stamp; the sample taken in 24 hours weighs about 2000 lb. This we find very satisfactory on an ore that varies greatly in its gold contents, and in which gold occurs along the cleavage planes of mispickel crystals, being the only valuable constituent of the ore except arsenic, which is saved but not at this plant.

Advantages of this System

The several advantages of any inexpensive system of weighing behind the batteries become evident upon brief consideration. When head-samples are taken at the feeders and the ore is weighed at any point between the mine and the breakers it is impossible to arrive at an accurate valuation of the ore being milled, for the ore that is weighed today will not reach the feeders until tomorrow, or the day after, or even next month, occording to the size of the battery bins. Therefore, any given sample fails to represent a known weight of ore, and all calculations regarding the value of the ore going to the stamps, the concentrators and the vats are mere guesswork.

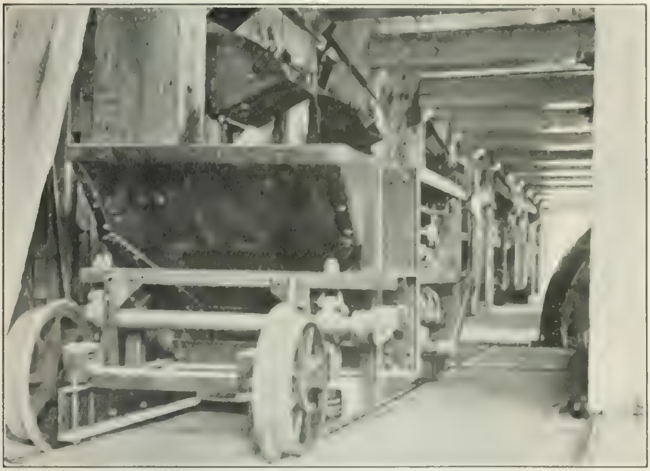
To be sure, in the case of a cyanide plant, following stamps or concentrators, this daily guess may, in the long run, hit sufficiently close to true weights to satisfy those that attach little importance to accuracy in accounting, but it remains guesswork at best—something that is never excusable. For instance, in our own case the calculated tonnage for June, 1908, came within 0.8 per cent. of the total shown by the new scales-car, or 28 tons short in 3837 tons actual weight. We do not yet know how far the law of compensation applies but, whether or not it will make up this difference in a year's run, there is profit and great satisfaction in being able to know at any given moment exactly what is being done.

---

*Managing director, Daly Reduction Company, Hedley, British Columbia.

Weighing before the feeders gives the mill foreman a constant check upon the performance of each battery, and enables a close study to be made of the causes influencing the duty per stamp. Daily tonnage curves show clearly the extreme sensitiveness of a battery to changes of screen, shoes, dies, water supply, rock, etc.

With an ore of extraordinary hardness and with cost of supplies high we have found it impracticable to use cast-iron dies, although they would increase our tonnage by wearing more evenly under steel shoes. We plane the special chrome-steel dies as soon as pitted, having found this by far the most economical thing to do. As soon as a pitted die is replaced by a planed one the tonnage curve jumps up sharply; but it falls just as readily when a new screen is put in or water fails, stamps grow light or dies become pitted.



SCALES-CAR USED AT MILL OF DALY REDUCTION COMPANY

The benefits of weighing behind the batteries do not end at the batteries; they extend to the concentrators and down to the cyanide vats, giving accurate data on the tonnage passed from one step in the process to another, as well as upon the performance of each unit in the system. Moreover, experimental tests under differing conditions are easily made at any time with single batteries without in any way interfering with the rest of the plant. This is a valuable feature where improvement is desired.

Any method of calculating tonnage from weights of wet samples taken from vats or slime-tanks is certain to be more or less misleading; therefore, this question of weighing behind the batteries deserves the careful consideration of all millmen, even if some may decry it as unnecessary. Since trying it in practice the writer is more than ever convinced that it is the only way, and that the benefits derived from such a system much more than counterbalance the slight extra cost of providing therefor, especially if the system be made as nearly automatic as possible.

Lead and Zinc Mining in Iowa

Special Correspondence

[illegible] the Dubuque district in Iowa has been in a quiescent condition during the present year. All of the large producing mines have been closed down and what work has been carried on has been by smaller operators and in a more or less desultory manner. Very little ore is being mined at present, and none is being shipped. The [illegible] and the only one having a concentrating plant—the Avenue Top Mining Company—is at present in the hands of a receiver, although this may not be a permanent state of affairs. The 50-ton Avenue Top concentrator was built last year when prices for zinc were high, and it did considerable work for a time. At present it is not in operation, and has only a few tons of concentrates—perhaps 100—in its bins.

The immediate cause for this state of affairs may be said to be the decline in the prices of lead and zinc accompanying the financial panic of last fall. Earlier in the season, when prices were high, the mining industry sprang into great activity. Every old prospect was worked and new ones were opened up in all of the districts. A larger amount of ore was raised than had been mined for a number of years previously. But accompanying this activity was a recklessness in the conduct of financial affairs and a laxity of business methods which were certain to lead to trouble. Hence when the money stringency affected prices the boom subsided and has not yet recovered. When or whether the recovery will be made and to what extent is at present largely a matter of speculation. The present prices, of $36 to $38 for 60-per cent. zinc ore and $60 to $61 for 80-per cent. lead, as quoted by the Wisconsin market reports, do not stimulate much activity.

There is another reason, though it is one which is at present of indeterminate value, and the importance of which can be understood only after trial and development. Many of the present mines are located upon properties which were opened and developed by the early operators after the crude fashion of those times. These early miners took out only the richest bodies of ore, worked only a very little below the water level and left extensive and thorough development to their successors. It has all along been the hope of the later workers that by means of modern methods of mine working and pumping, deeper bodies of productive ore might be reached than had been possible in the early days. It has been found feasible to remove economically some of the ore which had been rejected by the pioneers, but so far the rich bodies at depth have not materialized to the extent hoped for. If by reason of more complete knowledge of the field these large deposits shall be proved to exist, then Dubuque may see a renewal of its former activity as a mining center. Until this condition becomes a certainty, or prices advance to their former range, there is little encouragement in prospect for the immediate future.

A gas producer for the use of pulverized fuel [illegible] a receiver, circular in plan, lined with refractory material. Near the bottom and almost tangential to the circumference of the lining is inserted the discharge pipe of a fan blower by means of whch the pulverized fuel, together with the requisite quantity of air, is introduced. The producer is started by means of a wood fire and then by blowng in the coal dust by means of the fan. A very high temperature is produced which slags much of the ash which is withdrawn every six or eight hours, this being the only cleaning required. Owing to the high temperature the tar is converted into gas. The largest plant at present using the system yields 600 h.p. continuously from an inferior quality of coal.

According to an authority on silver cyanidation in Mexico the presence of manganese has, in itself, no hindering effect on the dissolving of silver in cyanide solutions provided the silver be present in some soluble form and the manganese present is a constituent of the ore separate and uncombined with the silver.

The Working Mines of Guanajuato

The Bonanza Mines on Veta Madre Are Being Reopened; Some Mines near La Luz and Some in the Sierra System Are Working

BY CLAUDE T. RICE

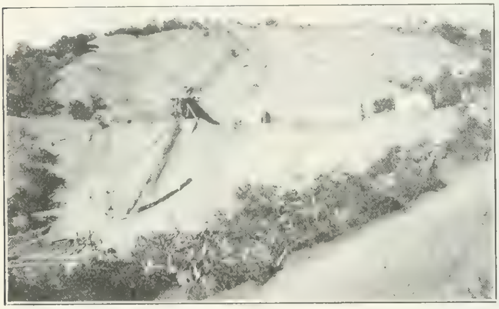
In a previous article[1] the Guanajuato district in Mexico was described, and its history and present conditions treated. That paper is now supplemented by an account of the principal mines of the district.

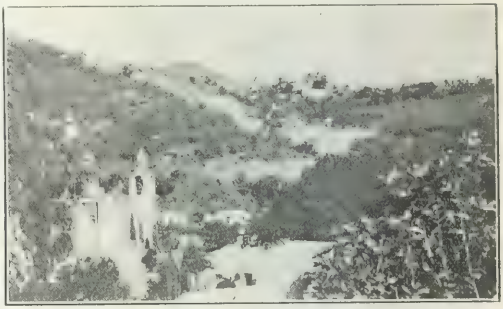
THE VETA MADRE MINES

In the Sirena mine the vein strikes north 70 deg. west and dips 47 deg. to the southeast. The ore occurs in chimneys and the ore-shoots vary from 40 to 150 ft. in width. The mine is worked through an adit from which underground shafts have been sunk on the vein. The Principe shaft is 800 ft. on the incline below the adit level. Above the adit old stopes are being worked. Below the adit level the mine is mainly virgin. In mining the ore no timber is used. Sometimes the ore is worked by underhand, but generally by overhand stoping. Gradually the mine is being put in shape to use the Alaska Treadwell method of ore-filled stopes. But as the dip of the vein is too low for the ore to run, several raises will be driven from crosscuts in the footwall from the different levels. These will be put in at such distances that little shoveling will be required to get the ore out of the stope. Rock-lined chutes will be used owing to the proficiency of the Mexicans in dry-walling. The level interval in the lower part of the mine will be 50 meters.

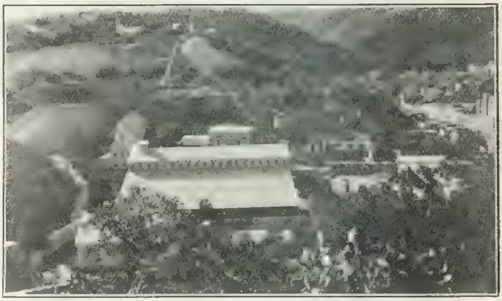
Most of the ore is mined on contract, the men paying for their own dynamite and fuse. The price paid for drilling and breaking varies between 0.60 and 1 peso per ton. Drilling when done with a machine is paid 15 centavos per meter. Several Murphy hammer drills are used. The men on large piston machines work on day's pay or on contract. Much of the drilling is done double-hand. A pair of miners will drill about 8 ft. in quartz in a 10-hour shift. Mining costs about $2.25 per ton; development, 50c. per ton. About 1000 men are employed underground at the Sirena mine.

The Guanajuato Mines and Reduction Company is at present concentrating its work on its Veta Madre mines, although it owns considerable ground in La Luz part of the district. The Cata mine has been unwatered; 150 tons of virgin ore and old fills are mined per day from it. The unwatering of the Rayas and Mellada mines has progressed so far that active work began underground at the San Miguel shaft Aug. 1. Work underground has been going on at the Tepeyac mine for some time so that in July the erection of an aërial tramway, having a capacity of 200 tons in 10 hours, to connect this mine with the Bustos mill was begun. Thus gradually the company is extending its work north along the veins toward the Valenciana. These old mines of the Reduction company were the most extensively worked in the district.


RAYAS DUMP


RAYAS DUMP

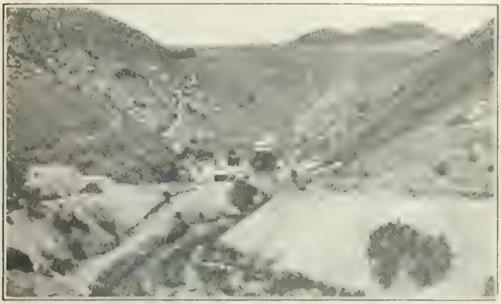
THE CATA MINE


CATA MINE; BUSTOS MILL

---

[1] ENGINEERING AND MINING JOURNAL, Oct. 3, 1908.

Some of the old shafts are [illegible] Valenciana shaft is 1800 ft. deep and 35 ft. diameter. It was completed before 1810. The Rayas-Mellada mine has several shafts; the largest is 39 ft. diameter and 1400 ft. deep. While very old, this shaft was found in perfect condition when the mine was unwatered as the upper part of it is lined with massive masonry. The pumping at the company's Veta Madre mines is to be concentrated at the Cata mine, where two Aldrich quintuplex pumps, having a combined capacity of 600 gal. per min. against a head of 1000 ft., are installed on the lower level. After the mines have been unwatered they will make only about 250 gal. per min. The Sirena mine



THE SIRENA MINE

[illegible]

PINGUICO MINE

[illegible]

makes only 45 gal. per min. About 700 men are employed underground at present, and 500 men on the dumps and at the mill and cyanide plant. Most of the ore comes from the Rayas dump where it is sorted on a traveling belt before being sent to the mill.

La Luz Mines

These mines were extensively worked years ago. Some work is being done on the San Cayetano adit, but the Guanajuato Amalgamated Gold Mines Company is doing the main work. Its mine, the Jesus Maria—years ago called the Jesus, Maria y José—has been opened to a depth of 320 m. Below the 265-m. level the mine is virgin; considerable ore is also left in the old workings in pillars, in *ramaléos,* and in the old filling. In the mine there are two veins the Plateros, having a strike north [illegible] and La Luz vein, having a strike north 12 deg. west and dip 60 deg. to west. These veins cross at the inclined shaft on the south which is to be the main working shaft. Most of the ore has been found north of the junction of the two veins. South of the junction only the Plateros vein has been worked. South of the junction extends a branch vein which is [illegible] sion of La Luz vein. This vein is being developed by the Montana & Mexican Min- [illegible] Jesus Maria shaft La Luz vein splits into two branches.

La Luz vein is 4.5 m. wide; the Plateros vein 3.5 m. wide, but sometimes these veins widen to 20 m. All the ore as yet developed along these veins is rich enough to mill. The rich ore occurs in two large [illegible] cross, the other, the San Brunos, to the south of that in the Plateros vein. Along these rich ore-shoots the hanging wall is shattered and the *ramaléos* occur; in these the ore carries mainly gold but some silver; the filling is mostly quartz and seldom calcite.

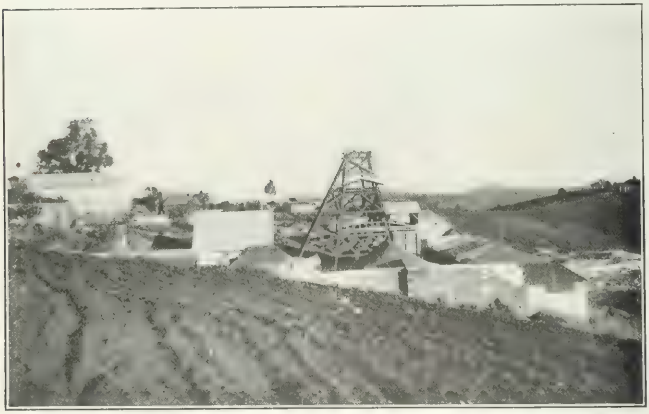
The walls in the upper part of the veins [illegible] a nearby laccolith. The lower part where the ore is found has agglomerate and schist walls. Sometimes this wall rock resembles diorite. In the granite the veins carry little ore. In the northern part of the mine the gangue is about equally quartz and calcite; in the southern part the calcite predominates, but silica increases with depth. The veins are faulted in several places, but never enough to cause them to be lost. The ore-shoots occur near where faults cut the veins. The dumps at this mine have been almost exhausted, and in the future most of the ore will have to come from the mine.

The drilling is done mainly by hand; two men drill 6 m. per day. They are [illegible] loading and blasting the holes, the company furnishing candles, powder, caps and fuse.

The Montana & Mexico Mining Company [illegible] tinuation of La Luz vein. It is working [illegible] m. deep; at each, a crosscut driven at the [illegible] vein in the Jesus Maria mine. At the [illegible] north and south from the crosscut. The vein where intersected is 12 m. wide. The shafts are still in granite. If this vein proves to be as rich in depth as La Luz vein, this will be one of the most important mineral developments in the Guanajuato district in recent years.

The Sierra System

The only vein of this system at present worked extensively is the Peregrina mine, where 500 tons of ore are being mined per day. The Peregrina mine belonging to the Guanajuato Development Company has been developed to a depth of 300 m. It is worked through two shafts, both having two compartments. There are three veins having a general strike of north 70 deg. west. The Guadalupe vein dips at a high angle to the west; the La Cruz dips to the south, and the San Pablo to the north. At a depth of 400 ft. the San Pablo and Guadalupe veins meet. Near the surface the wall rock is andesite, deeper rhyolite, and still deeper agglomerate. The gangue is mainly silicious with some calcite. The ore mineral is mainly argentite, as there is very little pyrite; where breccia occurs in the veins the pyrite fragments are banded. Considerable country rock is included in the vein. The ore occurs in shoots and lenses. The vein varies in width from 3 to 20 ft. The vein is stronger in the rhyolite than in the agglomerate.



JESUS MARIA MINE

Both overhand and underhand stoping are being used; principally overhand stoping with ore-filled stopes will be used in the future. Cleveland air-hammer drills have recently been introduced and these have decreased the cost of drilling. Little timber is used underground. The mill is treating about equal quantities of mill and dump ore, in all 500 tons per day. There are 400 men working underground.

The Pinguico mine, belonging to the Guanajuato Development Company, is opened to a depth of 225 m. below the Pinguico adit and the shaft is being sunk still deeper. The vein strikes north 30 to 35 deg. west, and dips 80 to 85 deg. to the east toward the Veta Madre. The vein varies from a few feet up to 30 ft. in width. The main ore-shoot is 600 ft. long and averages 16 ft. wide. The average width of the whole vein is probably 10 ft. About 250 tons of ore are being mined per day.

The neighboring Carmen mine is not producing. Near the Pinguico mine the Humboldt Mining Company is prospecting to find the northern extension of the Pinguico-Carmen vein. Ira C. Clokey is superintendent of the company. This company has sunk two shafts, one 600 ft. deep and the other 700 ft. deep, in July. From the shaft 600 ft. deep, a crosscut has been driven. In July the Pinguico vein had not been intersected, but a vein showing some low-grade ore is said to have been cut since then. Whether this is the Pinguico vein, which in its upper portion is low grade, is not known, for the Pinguico vein does not outcrop, being completely hidden to the north by the andesite capping. For a number of months Mr. Clokey averaged 6.1 m. per week in sinking these 5x7-ft. shafts; the greatest monthly average was 24 m. This is the fastest sinking done in the Guanajuato district. The shaft cost, excluding timbering, power, and superintendence, 48 pesos per meter.

Several small companies are working on veins in the hanging wall of the Veta Madre, and one or two are working on a small scale in the Sierra vein system.

Bismuth minerals, like those of lead, do not lend themselves to heap or kiln roasting; hence they are treated in reverberatory furnaces, the smelting being conducted either in crucibles or reverberatories.

The Dolcoath Tin Mine

Special Correspondence

The report of the Dolcoath Mine, Ltd., in Cornwall for the six months ending June 30, 1908, shows a considerable falling off of the profits from the previous half year, and the amount earned is not sufficient to justify the payment of a dividend. For the last half of 1907 the net profits were £16,755, while for the first half of 1908 they were £6293. The decrease is due partly to the fall in the price of tin and partly to increased working costs, which have gone up owing to a decrease in the tonnage treated, and to increased charges for rates, labor, coal and materials generally. The receipts per ton of ore amounted to $7.26, while the working costs were $6.17. The Lord's royalties amounted to $0.47 per ton, leaving a net profit per ton to the company of $0.62. The tons crushed during the six months were 48,849, yielding 40.38 lb. black tin per ton. The quantity of black tin sold was 88 tons which realized £71,768. The new vertical shaft (Williams) has been sunk 2019 ft. from surface, a progress of 61 ft. per month having been made. This is a circular shaft and is lined with 9-in. brickwork. A connection with the present workings will be made at a depth of 2940 ft., so that on June 30 there remained 921 ft. to sink, which will take at the present rate of sinking about 15 months. A small quantity of copper ore is being won from the upper levels, and the ore is being concentrated by the Elmore vacuum plant.

The high working costs at this mine are noticeable. They are in excess of any previous figures since the mine was worked on the limited liability system. For the six months ended Dec. 31, 1902, they averaged $4.49 per ton, the lowest figure reached. The turnover during that period was 52,295 tons as against 48,849 tons for the six months ended June 30, 1908, a decrease in tonage of only 3446 tons. Yet the costs have risen from £48,928 to £62,811, an increase of £13,883 or 28.4 per cent.

The report would be much improved if a statement were given showing the working costs distributed by departments. It is also desirable that information should be given as to the quantity and value of the ore reserves.

The total amount of capital invested in mining and smelting works in Mexico is more than $250,000,000 (A. F. J. Bordeaux, *Trans.* A. I. M. E. Sept. 1908) while the yearly metallic production is $160,000,000. There are in the republic more than 20,000 recorded mining properties.

Frequent cleaning of the main haulage drifts soon pays for itself by decreasing the number of cars upset.

Hahns Peak, Colorado

Special Correspondence

The name, Hahns Peak, has been given to a conical-shaped mountain of porphyry in Colorado, which rises through the sedimentaries to an elevation of 10,862 ft. The village of the same name, consisting of a dozen buildings, is about three miles south of the peak itself, and is the present county seat of Routt county. It is reached from Denver by the Moffat road as far as McCoy, 157 miles, and thence by stage via Steamboat Springs and up the valley of the Elk river, a distance of 95 miles.

The village itself is built upon placer ground, and the vast pits on the outskirts are evidence of the hydraulicking which has been done in the past. These bars were worked as long ago as 1870, the value of the gold produced being variously estimated at from $1,000,000 to $1,500,000. The gold was from 650 to 700 fine, and, as the then melter at the Denver mint informed me, a great deal of the gold was attached to fragments of porphyry. There seems to be little doubt that the derivation of the gold in the bars is due to the erosion of the peak itself, and it is apparent from the nature of the ground, and the comparatively small portion worked, that there must be a great number of good bars as yet untouched. These placers have been idle for some time, partly owing to dissension among the owners which prevented the granting of leases, and partly to the lack of dump ground, an obstacle which will eventually be overcome by the use of dredges. The railway will this year be within 30 miles of Hahns Peak, instead of 150 miles as formerly, and all these abandoned mining districts are taking on new life and will be worked again.

HAHNS PEAK, COLORADO

[illegible]

Workings in Hahns Peak

On the supposition that the gold in the bars came from lodes in the peak, numbers of tunnels were driven into it in the early days, but these have long since been abandoned, and the folly of driving long tunnels in the hope of striking a lode, or of intersecting a known lode which had not been proved from the surface first, has been amply exemplified here. One of these adits, which has been driven 800 ft. to intersect a small crevice which higher up on the mountain showed some free gold, intersecting a mineralized shear zone in the porphyry when about 200 ft. in. This has been drifted on from the tunnel about 50 ft., and shows from 2 to 14 in. of ore that can be hand-picked to run $150 to $200 per ton; it carries chiefly silver, ruby and brittle silver associated with iron pyrites. Outside of this streak is from 1 to 2 ft. of milling ore which may run about $10 or $12 per ton. A winze has been sunk 60 ft., and some drifting done from the bottom, showing the same ore. What is called a wall shows on the north side where the pay ore is found, with slickenside as usual in these shearage zones, but none could be seen on the other side, where in all probability the milling ore fades gradually into the country [illegible] is to be erected, which seems scarcely warranted at the present time. The fact of its being a shear zone or fault fissure, instead of a true fissure vein, does not necessarily detract from its potentialities, for the Gold Coin, in the Cripple Creek district, was a shear zone in the granite, outside the main gold-bearing breccia area, and produced gold to the value of more than six million dollars.

[illegible] Vicinity

A short distance south of these workings is another mine, which, however, has [illegible] long wagon haul killed the profits. This also is a shear zone, but the character of the ore in it differs entirely from the former. The ore is a bright galena, 200 tons of which are reported to have been shipped, a representative assay of the ore showing 52 oz. silver, 2 oz. gold, and 51 per cent. lead per ton. This mine is owned by business men in Steamboat Springs, who are preparing to open it up and work it vigorously.

A number of prospectors are now quartered at Columbine, a small settlement at the base of the peak, and inspired by the approach of the railway in the Yampa valley, are all digging and searching energetically.

Looking north from Hahns Peak may be seen Mount Bridger of the main continental divide, near the Grand Encampment copper district of Wyoming, about 36 miles distant as the crow flies.

The formation in this northwest corner of Colorado is in general sedimentary, the main uplifts which have broken through the strata being, (1) Pilot Knob, of the Elkhead mountains, 12 miles to the west, the basaltic lava from which has flowed over a portion of the formerly bituminous coal measures of the Yampa field and anthracized them; (2) Hahns Peak, a rhyolite porphyry; (3) about four miles southeast of Hahns Peak is Farwell mountain, 10,500 ft. high, which is chiefly granite and schists. Here about 40 mining claims have been located, the ore being copper, chiefly the blue and green carbonates, but no bodies of ore which will pay to extract have as yet been opened up.

Russian Tax on Gold

According to the London *Mining* [illegible] on gold will be decreased in order to promote private gold mining on lands belonging to his Majesty's Cabinet in the Altay and Nerchinsk districts Russia. The tax will not be calculated progressively any more, but will amount to only 5 per cent. per pood of placer gold extracted; the [illegible] gold will also be decreased. If improved methods of working be adopted this tax will be still more diminished; thus, for instance, if hydraulic methods or dredges be used, it is proposed to collect only 3 per cent. Moreover, it is intended to mine several heretofore prohibited localities along the Kondoma, Mrassa, and Lebed rivers, as soon as the present lessees—the Altay & South Altay Gold Mining Company—turns them over to the Cabinet.

Gayley Dry Air Blast at Warwick Furnace[*]

Results Obtained by Drying the Blast at a Merchant Furnace of Moderate Size. The Plant Used and the Savings Which Were Effected

BY EDWARD B. COOK[†]

The installation of the Gayley dry-air process appealed specially to the management of the Warwick Iron and Steel Company, for the reason that for 15 years records had been kept at the works of the company, showing the amount of water entering the furnace in the form of aqueous vapor, and careful observations had been made of its effect upon the working of the furnace. Some years had proved much worse in their effect than others, on account, not only of excessive moisture, but also of great variation in the moisture from day to day, and sometimes within a few hours. It had been found impossible to make a satisfactory percentage of high-silicon foundry-iron in summer, even on high fuel; and for some years the endeavor had been made so to arrange the sales that, during July and August, only a small percentage of the iron produced would be required to carry more than 2 per cent. of silicon. Our larger furnace, running on basic iron, year after year, produced in February a tonnage 20 per cent. higher than in August, on a much lower fuel-consumption, while, at the same time, the summer months were marked by messes, tuyeres closed by slips, and other irregularities, constituting serious additional business losses.

The Drying Plant

In the spring of 1906 it was decided to install a plant of sufficient capacity to treat 70,000 cu.ft. of air per min., an amount much larger than that treated at the Isabella plant, and sufficient for the maximum requirements of our No. 1 and No. 2 furnaces. The form in which Mr. Gayley's invention was applied at our works may be outlined as follows: Ammonia, liquefied by pressure, is allowed to expand in pipes inclosing smaller pipes which carry brine; and this brine, thus cooled to a point 0 deg. C., is conducted through a refrigerating chamber in coils of pipe, over which the air of the blast for the furnace passes, and upon which it deposits its moisture before entering the blowing engine.

The refrigerating part of our plant, which was furnished by the York Manufacturing Company, of York, Penn., comprises five vertical single acting compressors, each employing about 220 h.p. and having 175 tons refrigerating capacity. The object in having so many units is to guard against serious results from breakdowns, and also to have a more adaptable apparatus. Only in the summer months is the total capacity required. In winter one compressor will do the work for one furnace. An atmospheric condenser was installed above each compressor.

The brine coolers are of the double pipe class, with 3-in. outer pipes, in which the ammonia expands, and 2-in. inner pipes, through which the brine passes in the opposite direction. Through these coolers, and thence through the coils in the refrigerating chamber, the brine is forced by one of two flywheel pumps. The cold brine enters the coils at the top.

The refrigerating chamber contains 57 miles of 1¼-in. wrought iron pipe, divided into seven sections by partition walls and doors, so that one section can be washed free from frost without affecting the other sections or increasing the moisture in the treated air. A large Sturtevant fan was installed to furnish air to the refrigerating chamber, and maintain therein a pressure of about 1 oz. per square foot, in order to insure a proper distribution of the air rising through the coils, and also to overcome the friction in the pipes to the blowing engines, so that there should be no doubt as to the proper filling of the blowing tubs. It also guards against the entry of untreated air through possible leaks in the pipes. We have found, however, that the plant can be run for a short time without this fan.

Upon the assumption that 4.5 tons of air are required to make one ton of iron, the production of 720 tons of iron a day calls for the treatment every hour of 135 tons of air, moving at a rapid rate, and varying both in temperature and in contained moisture. We had our share of troubles at the beginning, but for several months past none has been experienced, and the dry-air plant is earning the reputation of being the only "sure thing" about the furnace.

Dry Blast on No. 2 Furnace

The first application of the dry blast was made on our No. 2 furnace, which was 100 ft. high by 22 ft. bosh and 15 ft. crucible and stock line. This furnace had been in blast for nearly three years and had made more than 500,000 tons of pig iron. Down to June, 1907, with the exception of the three summer months of each year, the fuel consumption had been kept low and the iron satisfactory.

Application of the Blast

The first application of the blast was made to No. 2 furnace in August, 1907, and was attended with many difficulties, owing to the fact that the application was made too suddenly; and that the furnace was not in good condition. Notwithstanding all the difficulties the furnace was kept running, and its work steadily improved until it was blown out on Dec. 27, on account of an accumulation of basic iron, due to the closing of steel works. There were short periods of good work, when the pressure stayed down and there were no stops, in which 515 tons a day were made on 2000 lb. of fuel per ton for several days in succession.

Figs. 1 and 2 show the condition of No. 2 when blown in and when blown out. In Fig. 2, the stock-line, 22 ft. 8 in. in diameter, is shown, with a large shelf below it, where the brick had stopped disintegrating on account of a change in quality. Farther down there was another shelf, made up of scaffold material. The scaffold did not fall until a week after the furnace had been cleaned out, and then filled the hearth 5 ft. above the tuyeres, so that it began to yield gas and had the appearance of being in blast again. We never imagined that the scaffold could be so high up, and consequently did not find it, since we did no drilling higher than 4 ft. above the mantel. Three times during the summer the furnace had been blown down to below the mantel.

The following is the record for the last six months of the blast. The increased percentage of basic iron and the lowering of fuel consumption, in a furnace without a stock-line, and with a large ring-scaffold, are remarkable:

RECORD OF FURNACE NO. 2.

1907.	Fuel per ton of iron.	Tons of iron per week.	Proportion of basic iron. Per Cent.	Average stoppages per week, in minutes.
July	2534	3025	89.2	194
August	2452	2649	69.0	528
September	2503	2638	78.2	441
October	2501	2927	82.2	336
November	2339	2735	80.4	336
December	2261	2880	88.5	319

No. 2 furnace has since been repaired, but up to the present time (August, 1908), trade conditions have not been such as to render it advisable to blow in. We have not, therefore, had the opportunity to test the virtues of the dry-air blast on the newly lined furnace.

Dry Blast on No. 1 Furnace

On Sept. 25, four of the compressors having been completed, the dry blast was put on No. 1 furnace. In three days the moisture per cubic foot of air was reduced from 6.5 grains to 1.50. There was the same evidence of greatly increased heat, shown by tuyeres, slag, and iron, as at No. 2 furnace.

---

[*] Abstract of paper read at Chattanooga meeting, American Institute of Mining Engineers, October, 1908.

[†] Furnace manager, Warwick Iron and Steel Company, Pottstown, Pennsylvania.

No. 1 had been in blast for 2½ years on high-silicon foundry iron. The settling for the first year had been entirely by 4-ft. jumps, and the fuel consumption had been consequently high, and the iron irregular in grade. After the first year, the three top rows of the total five rows of bosh-plates were pulled out of the furnace. This resulted in regular settling on foundry iron and lower fuel consumption.

In March, 1907, however, [illegible] was made to turn this furnace to the production of basic iron. It proved impracticable, because an arch formed on the step left by pulling out the plates. The furnace stuck fast for 24 hours and would not settle at all, so that it had to be put back on foundry iron. During the summer of 1907 its work became extremely bad, and the iron was irregular in grade.

Upon the application of dry blast in September, the furnace acted much as it had done in March, when the attempt was made to make basic iron. That is to say, the reduction of fuel (or, what is the same thing, the increase of burden) and the consequent lowering of the zone of fusion brought about a tendency to arch at the offset on the bosh.

The daily product increased about 10 per cent., and the quality of the iron improved. The fuel consumption had to be kept relatively high in order to run the furnace at all. It was blown out on Nov. 11, on account of our accumulation of foundry iron. The dry blast had been used for 45 days, hardly long enough to get significant results from an old furnace. Fig. 3 shows the original, and Fig. 4 the wear lines and the step on the bosh.

The effect of the dry blast on these two worn-out furnaces was a matter of great interest to the management. The first effect was to make them more troublesome, but this was explained by later experience as due to the too sudden application of the dry blast. The improvement in their work was slow by reason of the necessity of forming gradually somewhat different interior lines.

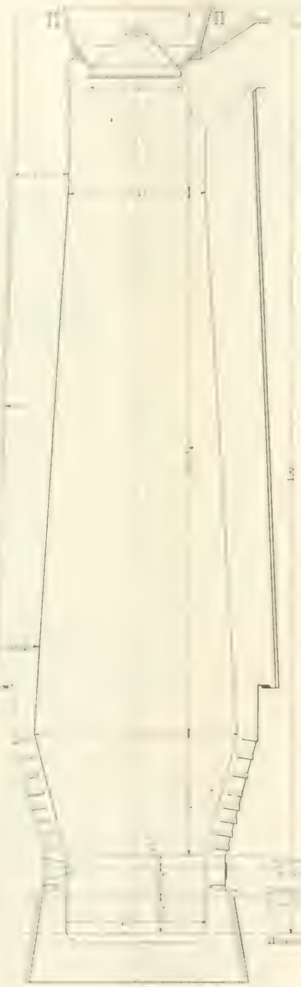
No. 2 was eventually properly burdened; but, in the light of recent experience, we are wondering whether No. 1 would have not done better had we had the courage to put on a heavy burden, in spite of the shelf on the bosh.

Dry Blast on No. 1 Furnace Relined

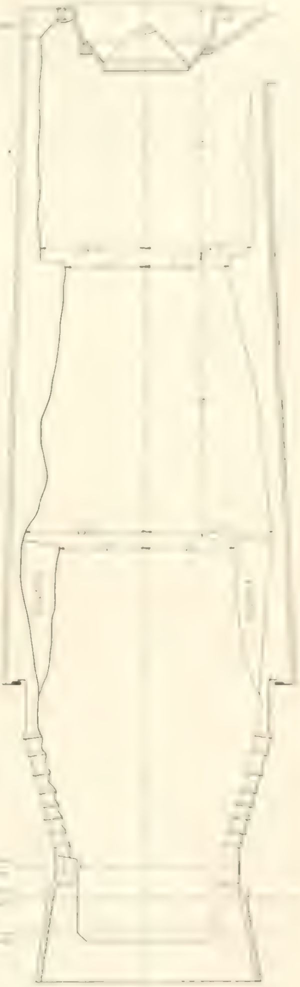
No. 1 furnace was relined, as shown in Fig. 5, there being practically no change in the lines, except that the crucible was made larger in diameter. The bosh is held by two rows of plates with a bosh-jacket above, on which there is 9 in. of brick. The idea is to avoid the cooling on the upper bosh (which seemed to cause the stock to settle irregularly during the previous blast), and still to be able to maintain the lines of the bosh, so that basic iron can be made if desired.

The furnace was lighted March 12, 1908. Ten days after the first iron was made the dry blast was applied. The moisture was lowered from 4.5 grains on March 24, [illegible] on March [illegible]. The [illegible]tions of the engine were reduced 10 per cent. at the same time and the burden was increased 5 per cent. The effect was immediate. At 9 a.m., when dry blast was applied, the silicon in the iron was 2 per cent. At 5 p.m. it was 2.75 per cent. Increased heat in the hearth was indicated by the appearance of tuyeres, slag and iron. In this case, as with No. 2, the dry blast was probably put on too suddenly, and there was trouble from the furnace sticking and settling irregularly.

Some difficulties were experienced, but they were overcome by increasing the burden. The furnace gradually improved its work, and has since in several different [illegible] less than 1900 lb. of fuel, which heats [illegible] per cent. magnetic concentrates, and only [illegible] silicon on less than 2200 lb. of fuel per



[illegible] NO. 2, BLOWN IN [illegible] 1904



[illegible]

ton, on the same mixture, but with 1000 deg. F. of blast temperature. The monthly records are as follows:

RECORD OF NO. 1 FURNACE.

1908	Product per week tons	Percentage of foundry iron	Yield of ore per cent	Blast temperature, degrees Fahr	Fuel per ton of iron pounds
April	1,392	3	57.5	882	2,061
May	1,532	21	56.7	920	2,059
June	1,451	77	57.1	968	2,131
July	1,501	32	57.4	907	2,006

Warwick is a merchant furnace, and the iron made must suit the order book. At the present time the changes of grade are consequently frequent, and the convenience of the furnace is not considered. We have no comparative records on basic iron, the nearest being the record of forge iron, 1898, when the ores were entirely different, and the blast temperatures much higher. This shows: Product per week, 1246 tons; yield of ore, 61.21 per cent.; heat of blast, 1234 deg. F.; fuel per ton of iron, 2378 lb. The best previous record of recent years on foundry iron is that of 1906, as follows: Product per week, 1016 tons; yield of ore, 57.3 per cent.; heat of blast, 1016 deg. F.; fuel per ton of iron, 2633 pounds.

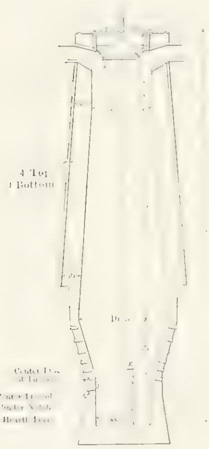


FIG. 3. FURNACE NO. I, BLOWN IN AUG. 3, 1905

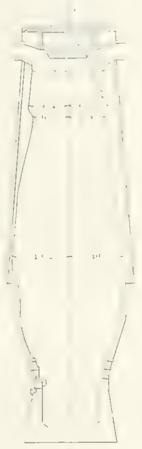


FIG. 4. FURNACE NO. I, BLOWN OUT NOV. 11, 1907

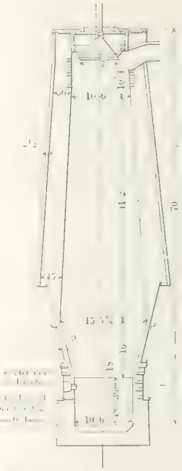


FIG. 5. FURNACE NO. I, RELINED

We feel that, at a moderate estimate, we are saving 400 lb. of fuel per ton of iron, and making 350 tons more iron a week, notwithstanding our lower blast temperature, and a much more refractory ore mixture. It is a remarkable fact that all the furnaces using dry blast are showing about the same percentage of saving of coke and increase of product as compared with their previous work.

The dry blast is by no means a cure-all. Although it greatly increases the regularity of the furnace, and enables it to be run closer, this very fact of doing away with the margin of safety and running on a small slag volume and a silicious slag, makes the furnace more sensitive to changes of coke and variations in the character of the ore mixture.

The blast pressure varies from 9 to 10 lb. per sq.in., according to variation in blast heat, and the use of three different kinds of coke. The dry-blast plant is about 150 ft. from the No. 1 blowing engine, and the pipe is not protected from the sun. The temperature of the air arriving at the engine varies about 15 deg. in summer, between day and night. This makes a difference of, roughly, 5 per cent. in the volume of air that the blowing engine delivers. The effect upon the furnace is to make it drive about 5 per cent. faster at night. On one or two occasions this faster driving has lowered the silicon in foundry iron; otherwise it has given no trouble. An attempt was made for a time to run the engine 5 per cent. faster on the day shift if the sun was shining, or 2.5 per cent. faster if the day was cloudy. But this was soon given up, as it was too complicated, like the changing of blast temperature to meet variations in humidity.

Uniformity in Grade of Iron

When the furnace is running on foundry iron, the product is wonderfully uniform in silicon and sulphur, as between one cast and another, or different portions of the same cast. On basic iron we can safely carry our silicon from 0.2 to 0.5 without fear; and the sulphur can be held more constant than in a furnace blown with natural air. On two occasions, through a desire to lower fuel consumption, the furnace has been overburdened, and hard iron and buckshot have resulted; but a small amount of extra coke and a reduction of burden to the proper amount have brought the furnace back on good iron immediately.

There are, of course, two ways of running a furnace: first, carefully, to make a regular grade of iron. Second, up to the limit, to make a large tonnage and reduce fuel consumption, without reference to maintaining a given grade of iron.

Running in the first way with the dry blast, it is possible, with ordinary care in keeping the stock regular, to make every cast of the grade desired. Running in the second way, some variation in silicon and sulphur occurs in the product of the dry blast, but not nearly so much as with natural air, irregular in moisture

The gas stays high in CO (up to 26 per cent.) on account of the use of 50 per cent. of magnetic ore. The temperature of escaping gases on a 70-ft. furnace averages 300 deg. F. on basic and 500 deg. F. on foundry iron.

On account of the irregular settling, the fine dust must necessarily be less; but our ore mixture has been so changed that it is difficult to make comparisons. We are inclined to think that it was a mistake to make the stock line so small in diameter, since, with the fine mixture now used, the amount of the flue dirt made is considerable. It varies from time to time, even on the same mixture. For several days the amount made is excessive, as if the furnace were channeled; then it decreases again.

Explanation of Dry Blast Results

Many furnace managers who have seen the Warwick dry-blast plant have asked how we explain the results obtained. The following hypothesis satisfies us and may be of interest to others:

Of all the heat value of coke that goes into a furnace, only about one-fourth is available for heating the hearth, about one-half is sensible heat in the gas, about one-quarter reduces the ore, some is required to carburize the iron. Now the hearth is the only limit, the only place where the ordinary furnace requires more heat. It was estimated for years that dry blast would save only 3 per cent. of coke, but the fact was neglected that this 3 per cent. of the total fuel would be saved to the hearth alone, and that this would amount to four times as much, that is, 12 per cent. of the heat of the hearth, and as the hearth is the only weak place, the efficiency of the furnace would be increased 12 per cent.

In this case, the dry blast decreases the duty of the hearth 12 per cent., and allows the resultant heat to be utilized upon increased quantities of iron and slag.

Further, this increased burden, together with regularity of heat supplied to hearth, enables the slag volume to be decreased and the slag made more acid. This again saves fuel. The increased product decreases the radiation per ton of iron, and makes another saving. This will vary with individual furnaces and will be particularly great on those that will stand more wind. The writer believes that a very close estimate can be made on the amount of saving dry blast will make on each furnace.

The temperature of a furnace is increased enormously when dry blast is applied, particularly if it is foolishly put on too fast, as on the No. 1 furnace, but the increased temperature is soon equalized with burden and more work and the temperature kept at the desired point as in any furnace.

Costs

Some estimate of the cost of operating the plant may be of interest. Based on a product of 720 tons a day, and running all the ammonia compressors, the labor cost is 2.5c. a ton. In the fall, winter and spring months it is 2c. a ton. The oil, waste, etc., should not exceed a maximum of 1.5c. a ton. Estimating on an excessive loss of ammonia (one-third of the entire contents of system yearly) the ammonia cost will be 1c. per ton. The brine cost is insignificant. We estimated that 10c. a ton would cover the cost of operation and maintenance; and we now feel that this will be more than ample.

Judging from the experience of general refrigerating machinery and plants, an annual depreciation charge of 5 per cent. will be sufficient.

No charge is made for steam; for, in our experience, the dry-blast plant has made no additional firing of coal necessary. The reduction in revolutions of the blowing engines spares enough power to run the refrigerating machinery, brine pump, and fan. Although the gas is leaner, and of lower temperature, so that it is not as good fuel, its flow is regular; and there is no sticking after casting, with loss of gas and consequent heavy firing.

Summary

The management of Warwick feels fully satisfied with its adoption of the dry blast. No explanation is needed to show its great value during this summer, of extremely high and irregular humidity, at a time when the iron market has been totally demoralized.

We are now installing new Roberts center-combustion-chamber stoves at No. 1 furnace, in order to obtain 1300 deg. to 1400 deg. F. of heat in the blast. It is a matter still open for discussion; but we feel that the dry blast will make possible the use of higher heats, and thereby indirectly lead to an additional saving in fuel.

In conclusion, attention is called to the fact that the efficiency of the dry blast has been demonstrated on a small furnace, and that the results warrant the statement that its application will be of particular value to small furnaces, as it gives them the efficiency, and somewhat of the production of iron, of the larger furnaces.

Colorado Fuel and Iron Company

This company owns iron and coal mines in Colorado, Utah and Wyoming; coke ovens, blast furnaces, steel works, rolling mills and other manufacturing plants. Its report is for the year ended June 30, 1908. At the end of the year the company had outstanding $34,235,500 common stock; $2,000,000 preferred stock; $19,945,000 mortgage bonds of various issues.

The income account for the year was as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total.	$22,099,880	$19,322,064	$2,777,816
Management.			224,449
[illegible]			[illegible]
Interest, etc.			327,127
[illegible]			[illegible]
[illegible]			[illegible]
[illegible]			[illegible]
[illegible]			[illegible]
[illegible]			[illegible]
[illegible]			[illegible]
[illegible]			[illegible]

The gross earnings, as compared with the previous year show a decrease of $1,692,419, or 7.1 per cent. Operating expenses decreased $1,611,806 and management $37,935, so that the decrease in net earnings was only $42,678, or 1.6 per cent. The report says: "The improvements referred to in the last annual report were completed early in the year, and the expenditures for maintenance at all of the properties have been on a liberal basis, with the result that their physical condition has been improved, and the company is now able to do a much larger business than ever before. It can safely be said, that, with a renewal of the demand for the company's products sufficient to permit of full operations, the gross earnings will exceed those in former times, and the ratio of net income to gross earnings will be increased."

The general profit and loss account was as follows:

[illegible]	[illegible]
[illegible]	[illegible]
Total	$308,572
[illegible]	[illegible]
[illegible]	398,307
[illegible]	[illegible]
Total debits	$1,538,504
[illegible]	[illegible]

The final result of the operations for the year was an increase of $152,308 in the debit balance of profit and loss.

The production statement is as follows for the year:

	[illegible]	[illegible]	[illegible]
Coal	4,844,461	4,276,095	D. 568,366
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Sales were 2,203,278 tons of coal, 145,463 tons of coke 37 tons iron ore and 388,499 tons iron and steel. The balance [illegible] pig, used at the company's plant for conversion into steel and finished products. Coal used in operating mines was 156,968 [illegible] tons to 1 of coke.

Transvaal Gold Statistics

Students of Transvaal mining statistics should always watch the figures of gold reserve. Most of the mines have now abandoned this system of equalizing the monthly returns, but there are some mines, the Eckstein group especially, which continue this absurd custom. In order to arrive at the true profit for the month it is necessary to add or subtract from the declared profit the difference between the gold reserve figures for that and the previous month. Some of the mines have during this year been building up handsome reserve balances under the name of gold reserves. The Robinson, for example, increased its gold reserve from 13,494 oz. in March to 19,524 oz. in August, equivalent to a sum in round figures of £25,000 in five months. This little sum is really profit, but is not declared as such.

The Ferreira is perhaps the worst offender in this direction. The reserve gold in March was 7180 oz. and in August 16,350 oz.; in other words a profit of £38,000 is returned as gold reserve and not as profit. This amount is more than the average monthly declared profit. Very few shareholders probably take note of the gold reserve, and are, consequently, misled as to the amount of the actual profit earned.

Another stumbling block to the statistician, although at present of minor importance, is the inclusion of gold from accumulation in the monthly returns. Gold won from old tailings heaps, or slimes, figures in the yield of the current ore milled. It is easy to see that a quite erroneous value of the grade of ore milled might be arrived at, if extras amounted to a considerable figure.

From what has been said it must be clear that Rand statistics require to be treated with caution. Two reforms seem specially needed, one, the abolition of the gold reserve account, and the other the declaration of profits more in harmony with the dividends.

In a method of preparing hydrogen on a large scale, described in the *Scientific American*, water gas, which consists of hydrogen and carbon monoxide, is passed over hot pulverized calcium carbide. The carbon monoxide combines with the carbide forming calcium carbonate and graphite leaving the hydrogen almost pure (97 per cent.)

The Problem of Treating Dust in Coal Mines*

Dust, as Such, Is Not Explosive. Preheating the Intake Air to Saturation by Exhaust Steam Is More Effective than Sprinkling

BY FRANK HAAS†

The subject of dust in coal mines, is one that has disturbed the keenest minds of engineers for a century or more, and it may be unnecessary to state that I do not assume to explain the problem fully, nor with complete satisfaction.

By dust, I take it, is meant such particles of coal as are transported from their original location by the air current. The sizes of the particles so affected will vary with the kind of coal and velocity of current. The term "dust" has in past literature had a loose definition, in fact a satisfactory one has not been discovered. No experiments, at least no results of experiments, are reported as to the size of particles which are maintained in suspension by air currents of certain velocities. The definition of dust, if it ever will be developed, will be flexible and will depend on various conditions, of which, velocity of air currents will be the most important. Recent French writers in conducting their experiments on dust have used the size that passes through a 200-mesh screen. In this country (probably merely as a starting point) a 100-mesh screen was adopted and in some cases an 80-mesh screen. By actual experiment it was determined that such coal which will pass through an 80-mesh and over a 100-mesh, is not maintained suspended in a velocity of 1200 ft. per minute, which is a comparatively high velocity when considering mine currents, and it would appear from this that our standard of 100 mesh is still too coarse.

However, this need not enter into the discussion, as we know that in case of an explosion there is no discrimination as to the size of the particles affected. In fact I am satisfied, in my own mind, that the bulk of the force of the Monongah explosion originated in the solid coal. From a strictly technical standpoint I would say that dust is not explosive, no more so than solid coal.

An Explosion is Rapid Combustion

An explosion is defined as rapid combustion. How rapid it does not state, but we know that it must be almost instantaneous. If it were possible to get ten parts of air by weight in immediate contact with one part of coal, an explosive mixture would be obtained. This, however, is impossible, as one volume of coal is equal to 1065 volumes of air. It would, therefore, require 10,650 volumes of air, each particle of which would have to be in intimate contact with one volume of coal. Furthermore, the temperature of volatilization of coal is less than that of ignition, therefore, coal dust would become coal gas and coke before the temperature, where explosion is possible, is reached. The argument then is this, that the explosions which are attributed to coal dust are really explosions of coal gas. This distinction, insofar as the results are concerned, is slight, but it is essential, nevertheless, for no investigation of dust can be successful without accounting for the volatile gases, and furthermore, there are other sources of coal gas, the solid coal, which might be overlooked if dust alone was considered the source of all the danger. With this explanation we can repeat that "dust as such" is not explosive.

All coals when exposed to a temperature of over 250 deg. F. will liberate gases, the amount so liberated will depend on the character of the coal, the temperature and the time of such exposure. If such temperatures should occur in a mine, combustible gases would be formed and the formation of explosive mixtures highly probable. It is not to be inferred, however, that gas or high volatile coals are the most dangerous. It is a question of how much coal is affected rather than the amount given off by each particle, and a very low volatile coal may give off some gas just as readily as a higher volatile one.

The Amount of Heat Given Off

Some time ago some experiments were made to determine the rate of burning and amount of heat given off in successive units of time, in which three kinds of coal were used: First, a highly volatile gas coal, containing some 35 per cent. of volatile matter; second, a semi-bituminous coal of about 20 per cent. volatile matter, and third, anthracite coal with about 3 per cent. of volatile matter. While the experiments were made in the furnace of a steam boiler for the purpose of purely practical results, and, therefore, lack the accuracy of laboratory determinations, they show the tendency, if not the exact measure of the reaction involved.

Among other data of interesting and useful application elsewhere, there were developed these facts pertaining to the subject in hand. The first 5 per cent. of the total volatile matter given off by anthracite coal had a heating value of 27,000 B.t.u. per lb. of volatile matter. For the semi-bituminous, this figure was 19,300 B.t.u., and the gas coal but 16,600 B.t.u. This would indicate that irrespective of other conditions, the first gases given off by anthracite are the most powerful explosively, and the general statement can be made that the lower the volatile matter in a coal, the higher the calorific power of the first gases given off. Following the curve farther, we find that at 23 per cent. of total volatile matter given off, the value of the gas of the anthracite and semi-bituminous are the same at 20,400 B.t.u., while the gas coal volatile was 16,600 B.t.u. At 38 per cent. of total volatile gas, the anthracite had dropped to that of the gas coal at 16,900. The semi-bituminous was not determined.

Dust Explosions In Anthracite Mines are Possible

These results will warrant the statement that if an equal quantity of gas is given off from these three kinds of coal in the first unit of time, the anthracite will, by far, produce the most violent explosion. Anthracite is not immune from dust explosion, and while the conditions are difficult and improbable, they are not impossible, and should ideal conditions for an explosion present themselves in an anthracite mine, we may prepare ourselves for the most violent explosion that has yet occurred.

The probability of favorable conditions is decidedly minute with anthracite, as compared with semi-bituminous or bituminous coals, and should dust explosions occur in the future, as they probably will, we will likely find them in coals of the bituminous or semi-bituminous class.

The composition of the gases given off is extremely variable and a discussion of all the different combinations that are possible would be an endless task and but little could be learned from it, but a single case can be taken and its physical and chemical features discussed, and for such an example we will take a gas which is the complete volatilization of a highly volatile coal.

The subject requests that reactions be given, but as there are problems of stochiometry involved, which are both laborious and uninteresting, the reactions which can be readily reproduced will be omitted.

The composition of such coal gas is approximately as follows:

---

*Paper read before the West Virginia Mining Association at Charleston, W. Va., Oct. 7, 1908.

†Assistant general manager, Fairmont Coal Company, Fairmont, W. Va.

	By Volume, Per Cent	By Weight, Per Cent
Illuminants, C_2H_4	2.8	6.1
Marsh gas, CH_4	25.1	[illegible]
Hydrogen, H	11.3	[illegible]
Carbon monoxide, CO	7.2	[illegible]
Carbon Dioxide, CO_2	2.8	7.7
Oxygen, O	0.4	[illegible]
Nitrogen, N	5.1	[illegible]
Moisture, H_2O	15.5	21.3

The first so-called illuminants (because of its high illuminating power) is mostly ethylene, a combustible gas of high heating power. Marsh gas which is the same as the principal gas of the miners' "firedamp" is also combustible. Hydrogen is a very light gas of high heating power; it combines with the oxygen of the air, forming water. Carbon monoxide, which is the miners' "whitedamp" is not only combustible, but highly poisonous when inhaled. Carbon dioxide or "blackdamp" is the result of the combination of carbon or such gases as contain this element; it is non-combustible. Oxygen and nitrogen are the two elements of the air. The water is the evaporated moisture of the coal, together with its combined water.

In some of the literature which has referred to gas given off by coal, it is stated that carbon monoxide is the principal gas so given off. This, I believe is in error, for at no time during the complete volatilization of coal, is carbon monoxide the principal ingredient of the gas mixture. A failure to find any considerable quantity of this gas after an explosion would by no means be evidence that the coal was not volatilized.

The illuminants, marsh gas, hydrogen gas and water vapor, would, in all probability form the bulk, if not all of the gases previous to their explosion. The combination of these gases is combustible, with a steady supply of air, and explosive within certain percentages in a mixture with air. For an explosion of maximum intensity, it requires by volume one part of gas to four and one-half parts of air.

THE MANIFESTATIONS OF FORCE

Under the conditions of perfect mixture and ignition, three manifestations of force are in evidence—a rise in temperature, an increase in pressure, and an expansion in volume. If there is no space for expansion and the volume remains constant, a temperature of about 4300 deg. F. would be theoretically reached, with a pressure approximating 134 lb. to the square inch. If, however, there is room to expand under atmospheric pressure, the volume would be increased to about nine times the original volume. These manifestations of force are all reciprocal, and none of the above theoretical figures is even approximated. The pressure depends on the temperature, the size of the area affected and the area of escape from the explosion center. The volume depends on the temperature and the quantity of gas exploded, while the temperature, which is really the initiative, is widely affected by the quality of the gas and quantity of air with which the gas is mixed. Radiation, conduction and convection, all antagonistic to temperature, tend toward a decided diminution from the maximum.

[illegible] 50 POUNDS

The maximum pressure of a theoretical mixture is alarmingly high; but with all these counteracting forces it is my opinion that 50 lb. to the square inch would cover the maximum pressure encountered in actual explosions, at least those which have come under my observations. While such a pressure is capable of enormous power, it is still within human control.

Air, as has been previously stated, is a necessary element for an explosion. Coal and coal dust are always in excess, and the amount of gas that could be given off is incalculable. The air, however, is limited, and the quantity is readily determined by a measurement of the volume of the mine from which coal has been displaced. From this it can readily be seen that the quantity of air, rather than the quantity of dust or coal, is really the measure of the magnitude of an explosion.

A COAL-GAS EXPLOSION CAN REGENERATE ITSELF

There is considerable difference in the physical results of an explosion from firedamp and from coal gas. Firedamp at its maximum will develop a theoretical temperature, practically the same as the gas coal; the difference between the two, however, is in the character of the products of combustion. The gases which result from the explosion of coal gas when cooled down to their original temperature and pressure occupy 10 per cent. less volume than the original explosive mixture, while from an explosion of firedamp they occupy 19 per cent. less than the original volume. This would explain, in part, the greater violence of so-called dust explosions and would also show that they would not be followed by a "back-lash" to the extent of a firedamp explosion.

Another important feature about a coal-gas explosion is that it is able to regenerate itself; that is, after an explosion has occurred, it can continue to volatilize gas and explode if it should come in contact with air. This could continue until the temperature was below the volatilization point, or until the mine was on fire. With a pure firedamp explosion this could not occur, for, after the gas is once exploded there is nothing further to feed it.

Coal dust has the property of absorbing and holding moisture when surrounded by favorable conditions in the atmosphere. A direct mixture of dust and water is very difficult and practically impossible. It appears that the time element has considerable to do with the absorption of water by dust, and moist atmosphere is necessary for it to retain the water so absorbed. A series of experiments was carried out to determine the amount of water which dust will absorb and retain. In normally dry atmosphere, the dust which was experimented on contained about 1.50 per cent. of water. In the return airway of a mine in which the air was held to its highest point of saturation, dust was collected from the side walls of the entry where it had lodged on the small projections of the solid coal. The results as obtained were extremely variable, running from 4 per cent. moisture as [illegible] with an average of 25 per cent. The atmospheric conditions surrounding each particle being practically the same there should be more uniformity in the results, if the water so determined was one of the physical properties of the dust. As this was not the case, however, it was concluded that the minimum was more nearly the absorptive power of the coal, while any additional water, over the minimum, was merely mechanically held in contact.

For all practical purposes it is immaterial whether the water is chemically or mechanically held; its effect is the same. The quantity is surprisingly large, and it is a most fortunate circumstance. If such conditions could be maintained uniformly throughout a mine, a formidable obstacle, if not preventive, is placed in the way of the possibility of volatilization and explosion of coal dust.

The difference in calorific intensity of the volatile gas of dry coal and that of wet dust (containing 25 per cent. of water) is insignificant from a practical viewpoint. It is in the quantity of heat necessary to volatize coal and to bring the gas to the ignition point that is the most important consideration. If we assume the average per cent. of moisture (25 per cent.) which we have determined, it would require two and one-half times as much heat to bring the wet coal and dust to the critical point as with dry dust. Considering the comparative infrequency of dust ignition, this additional obstacle can be accepted as of considerable magnitude. In addition to its effect as a preventive, the water so contained would have a marked effect on the force of the explosion as well as a cooling effect on conditions subsequent to the explosion, when danger from fire is always imminent.

[illegible]

It has been asserted by some few that a wet condition in a mine is a source of danger; that explosions are more liable to occur and that conditions for propaga- [illegible] Such a statement is incomprehensible to [illegible] chemistry that would substantiate it. Water either as liquid or vapor has the highest specific heat of any matter, either as liquid, solid or gas, which can occur in any considerable quantity in a mine, and it therefore requires more heat with a corresponding greater drop in temperature. The argument is evidently based on the decomposition of water vapor forming hydrogen and oxygen. That the decomposition of water vapor by heat and temperature is possible we do not deny, but it is not only heat and temperature, but also pressure which enters into the conditions. Under ordinary pressure the temperature necessary for such decomposition is high, and with 50 lb. to the square inch pressure, this temperature would have to be enormously increased, and in my opinion to an extent beyond practical possibility. I do not question the records of facts and observations which have led up to this opinion, but I do question the interpretations that have been put on these observations, and am of the opinion that other conditions, perhaps unnoted, occasioned such misinterpretations. Water has been, and always will be, the most efficient, and by far the most economical, material that can be introduced into a mine as a preventive of initial, as well as the propagation of an explosion.

Wetting Coal Dust by the Direct Application of Water Not Advisable

With no further thought on the subject the question would be simple indeed, but there are several physical properties and characteristics of coal dust that must be considered. The effect of a spring rain on a duck's back is proverbial. To make mud out of coal dust by the direct application of water is practically impossible. Coal when in a finely powdered form has some of the characteristics of oil, and it is probable that if the mineral ingredients were completely removed it would make a lubricant of some value.

Water by direct application is obstinately resisted by coal dust, yet we know that it has some absorptive power, and this leads one to suspect that the element of time and temperature as well as the manner of application play important parts in the operation. Water vapor has the property of greater penetration than the liquid, and it is in this form of water that practical results may be realized. A saturated atmosphere at a high temperature, and in constant contact would be the most efficient method. Saturation to a certain degree can be attained, but the temperature of a mine is fixed with but slight variation between the seasons of the year. A change in this temperature would be impractical and objectionable for various reasons. The best that can be done would be to maintain the uniform temperature of the mine and hold it to the highest point of saturation. This would fulfil the requirements for maximum absorption. The mines with which I am most familiar have a temperature of about 60 deg. F.; with a complete saturation, the mine air would contain nearly 10 gal. of water per 100,000 cu.ft. Complete saturation can hardly be attained by practice and 85 per cent. would probably be more nearly the best result that could be attained; this would mean about 8.8 gal. of water per 100,000 cubic feet.

As a cause of explosions, I have no faith in the theory of occluded gas, in the distant discharge of explosive mixtures by pressure, in the combustion of coal by friction or the unknown atmosphere generated by electric current. The causes of mine explosions, I believe, are well within the present knowledge of chemistry and physics, but it is the lamentable ignorance in the interpretation of the multitudinous and, therefore, complicated conditions which exist, each of which, simple of comprehension in itself, but enormously complicated in the aggregate, that has so far prevented a rational explanation of all.

It would be advisable then, to study more the conditions which are possible to occur, rather than to call on the mysterious or supernatural for new theories.

The Prevention of Dust Explosions

In proposing "efficient preventives," which the subject calls for, we confine ourselves strictly to coal dust. The first and by far the most effective is "keep the atmosphere of the mine saturated by whatever means practicable." Sprinkling in itself is not very effective, local and intermittent in application as it necessarily must be, it does not supply the moisture uniformly, nor in its most available form, yet it must be admitted in the absence of other methods it can be considered as a precautionary measure. The system of water sprays, which is elaborate and expensive, is probably more effective, but still falls short of complete success, unless the temperature of the mine is under control. A third method which has so far given much promise, is the preheating of intake air to saturation by exhaust steam. This method in its preliminary trials has given satisfactory results. A thorough study of the process is now under way, the results of which will appear in a subsequent paper on the "Control of Humidity of Mine Air."

Removal of dust should be carried out as thoroughly as practicable; so many considerations exist outside of danger, from a sanitary and economical standpoint that no argument is needed.

The suggestion recently made to abandon mining machines on account of the dust made is a statement based on lack of knowledge of conditions. The quantity of dust (as we understand the term) produced by puncher, chain and pick mining, has been investigated recently, and the conclusions reached were that the amount of dust produced was practically the same for all these methods of mining.

I do not believe any conditions which might arise from the presence of an electric current, by short circuit or otherwise, are capable of affecting dust to such an extent as to make an explosion possible. The volume of application of the temperature is too limited and the quantity of heat supplied insufficient.

Ventilation has no bearing on the question of danger from dust explosions, nor need safety lamps be considered in this connection. In fact the absolute preventive for a dust explosion is to prevent an initial explosion from some other source, for under no other circumstance can dust be considered dangerous.

Outside of the efforts of the individual operators, our hopes of safety lie in the mining laws and in the intelligent and faithful interpretations and enforcement of such laws by the district mine inspector.

Intelligent, honest, experienced and broad-minded men are needed, men fully appreciative of the authority vested in them and comprehensive of the responsibility that rests upon them. Compensations for such mine inspectors should be such as to attract the best men in the mining profession in the State.

The State should, through its department of mines, establish and maintain in each mining district instruments for recording the condition of the atmosphere; this would furnish the district mine inspector with facts instead of opinions as regards the atmosphere, and would enable him to caution the operators on short notice of any unusual or dangerous conditions. As an example it might be remarked here, that during four weeks in September, of the present year, such an unusual condition of circumstances existed. During this time the atmosphere was unusually dry, and it was estimated, from the records of recording instruments, that during this period the return airways carried out fully 20 per cent. more water than was furnished by the atmosphere in the intake, which in an ordinary sized mine would represent a loss of about 3000 gal. of water per day.

In the operation of a mine, the area under active development should be held to a minimum. I do not mean by this that the total acreage to be worked out by one opening should be limited, but that the working places should be contracted to within as small a space as possible.

We have sufficient evidence to believe that an explosion once started may spread to every nook and corner of the mine, and by minimizing the area, the chances for such local explosions are reduced, as well as the ultimate magnitude diminished. The panel system should be adopted throughout, abandoned panels which are not pillared (because of surface rights or other causes) should be closed by substantial brattices capable of withstanding the pressure of an explosion.

The present method of mine rating used by some railroads in which the number of working places is the principal factor should be condemned, as it encourages or even forces overdevelopment, which in my opinion, is a [illegible] practice.

A Central Power Plant for Anthracite Mines

Considerable attention is being directed to the great power plant which the Delaware, Lackawanna & Western Railroad Company has just completed near Scranton, Penn. The installation here established is the largest of its kind in the anthracite region. Five collieries are supplied with steam and 15 additional mines are furnished with electricity. The nearest of the collieries is only a few hundred feet from the plant; the most distant mine is three miles away.

Three hundred tons of coal are consumed under the boilers every 24 hours, and during one month 187,695,700 lb. of water were turned into steam. On a regular working day the boiler plant is run at a capacity of 10,000 h.p. The plant represents an investment of about $500,000 in all.

Because of the many mines dependent upon this central plant, it is absolutely necessary that no interruption occurs; for this reason, all the equipment, even to the pumps and the big fans for the forced draft, are supplied in duplicate. The water supply is brought down from West mountain nearby and flows into a reservoir that will hold 750,000 gal. Before the water reaches the boilers, it enters a preliminary heater and is raised to a temperature of 208 deg. After leaving this heater it is run through an "economizer," where it is further heated, keeping its liquid form owing to the artificial pressure to which it is subjected. By the time the water gets to the boilers, it is far above the normal boiling point; however, it is heated still further and turned into steam at 368 degrees.

AUTOMATIC ARRANGEMENT FOR FEEDING THE FIRES

The coal for the fire-boxes comes from the washeries in ordinary railroad cars. From these cars the fuel is dumped into a concrete pit from which it passes onto an endless rubber belt and is then conveyed up an incline and along an upper floor in the boiler house. Along the path of the belt is an arrangement known as the tripper which causes the coal to be emptied into a chute, which latter carries the coal down into the bunkers. The tripper moves slowly along the track made for it, at just the proper speed to load the bunkers, and when it gets to the end, starts back again. The belt handles 50 tons an hour. The bunkers have a capacity of 1000 tons.

[illegible]

All the ashes collected at the plant are put to use. They fall from the fire-boxes into a funnel which slopes at a grade of 3/8 in. to the foot. Water pumped from one of the nearby mines is brought into this tunnel and flushes the ashes into a bore hole which leads into the mine. It is estimated that about 50 tons of ashes are flushed into the workings from under the boilers every day.

[illegible]

The electric-power plant includes five 500 kw. Curtis turbines, with direct-connected alternators. The turbines run at 1800 r.p.m. and generate a current of 2300 volts. Running crosswise of the room toward one end is an Allis-Chalmers turbine, direct connected to a 2000-kw. Bullock generator. This represents the very latest development in turbines, having been in operation only a few weeks. It also runs at 1800 r.p.m., and generates a current of 2300 volts. Four of the Curtis turbines are equipped with Worthington jet condensers and one is equipped with a Worthington surface condenser. The Allis-Chalmers turbine is equipped with a jet condenser of another type. The water for all these comes from the mine, reaching the power house through a 24-in. concrete pipe. The plant has two traveling cranes with a carrying capacity of 10 tons each.

The current is sent through overhead wires; it lights the mines and breakers and runs all the electric locomotives in the neighboring mines. It also lights the passenger station in Scranton and the railroad shops there, this being the only respect in which the Keyser valley plant is devoted to other work than the mining of coal.

There is no wood used in the construction of the new plant. Everything is of reinforced concrete, iron or steel. The oil house is concrete as well as the wash house, where there are shower baths, lockers and tubs for the men. The incline for the rubber belt conveyers is supported by concrete columns. All the construction is [illegible]

Limit of Safety in Stored Coal

The coal department of the Arthur D. Little laboratory, Boston, has found instances where a small coal pile cooled down after being as hot as 165 deg. F. This was probably a rare occurrence as the temperature generally increases rapidly as the coal heats up above 150 deg., and there is no doubt but that when 212 deg. F. is reached the coal must be moved, or soon steps will have to be taken to cool it in order to prevent fire. Temperatures as high as 485 deg. F. have been observed, [illegible] the coal ignited [illegible] the air.

Coal Dust Experiments

Interesting experiments have been carried on for months past at the Altoft colliery, near Normanton, England. The tests have been conducted by the Mining Association of Great Britain with the object of studying the explosive character of coal dust and the mitigating influence of stone dust. In the evidence taken before the Royal Commission on Mines in the early part of the year, there had been a good deal said about the connection between coal dust and explosions, and also concerning the uncertainty that existed as to the part played by coal dust in past explosions.

The Mining Association of Great Britain raised about $50,000 from the collieries, contributions being levied on the basis of the coal raised, with a view to making practical experiments. These experiments were carried out with the object of inquiring into (1) the part played by coal dust in engendering and fostering explosions; (2) the means of preventing such explosions, and (3) the means of preventing the extension of such explosions.

The experiments were made in a wrought-iron tube 7 ft. 6 in. in diameter, built up of a number of boiler shells bolted together, having a total length of 1083 ft. The coal dust was laid on wooden ledges inside the tube and scattered by means of a cannon having a 4-oz. charge of blasting powder. The firing of the coal dust was effected by another cannon placed farther in the tube. The charge of this cannon was 16 oz. and the firing was supposed to represent a blown-out shot. The coal dust was obtained by grinding in a crusher so that 79 per cent. would pass through a screen having 40,000 apertures to the square inch.

Between May 6 and Aug. 14 of this year 26 experiments were made with only one failure. On Sept. 24 an experiment was conducted to decide if a barrier of stone dust would have the effect of limiting the area of an explosion. A zone of 367 ft. of coal dust was sandwiched in between two stone-dust zones of 210 ft. each. The experiment was entirely successful, no flame issuing from the end of the tube. On the following day an explosion of coal dust was made without the protection of a stone-dust zone and in this case a blinding flame issued about 90 ft. from the mouth of the gallery. The coal dust was distributed for a length of 250 ft. from the downcast end, the firing cannon being placed 90 ft. in the coal-dust zone. It will be some time before the data are worked up and a report issued. So far as the experiments have gone, it is safe to say that if stone-dust zones are established in dusty mines, the [illegible] much reduced.

Colliery Notes

Leather washers smeared with soap will not leak gasolene.

The factor of safety in colliery winding ropes should not be less than 10.

Manure is injurious to green concrete but does not affect well made concrete after it is set and hardened.

One investigator claims that a chain-mining machine using chisel-point bits will make more dust than a similar machine using pick-point bits.

One part of good portland cement thoroughly mixed with three parts of sand and six parts of broken stone makes good material for mine dams.

On main haulageways where electric cables are carried, the positive cable should be on one side and the negative on the other side of the roadway.

The advantages of the "rope over the car" system of endless-rope haulage are: (1) The rope is kept out of the water, thus lengthening its life; (2) less rope friction than where the rope runs under the cars.

Tamping cones made of hard burnt clay have proved themselves one of the most effective methods of preventing explosions. They take the place of coal dust or wet clay in the drill hole and prevent blowout shots on the solid.

The nut of a stag-bolt on a boiler can be protected from the intense heat by filling a tomato can half full of stiff asbestos putty and pushing it over the nut. The can will probably burn away but the asbestos will remain on the nut.

An accurate record should be kept of all explosives given to miners and only just enough to fire the allotted number of holes should be furnished each man. Miners should be required to take all explosives into the mine in tin boxes.

A few inches of tamping is as good as a foot for protecting dynamite and retaining the fuse. The use of more tamping consumes more time and increases the danger of missed holes by tending to conceal them if they are full to the collar.

When about to develop a new coal mine by shafting, ascertain, by means of the diamond drill, the lowest point of the coal basin and in what direction the strike runs; failure to determine these points often results in serious loss to mine operators.

The structure of coal plays a prominent part in determining what the crushing load will be when the direction of the force is not perpendicular to the bedding. Partings in coal tend to increase its strength, while cleats favor vertical splitting under compression.

Submarine coal can be successfully mined by the bord-and-pillar methods, and under certain conditions, all the coal can be won. At the Whitehaven collieries of Cumberland county, England, coal is being extracted at a distance of four miles from the shore. Falls, dislocations and anticlines are numerous.

Where a mining company handles its own timber from the woods to the mines, the saving in freight on pealed and seasoned timber is an important item, often reaching as high as 30 or 40 per cent. Such timber is also in better condition for its work in the mine and is in readiness for preservative treatment.

The sphere of usefulness of disengaging hooks is limited. They afford no protection to the descending cage and the protection afforded the ascending cage is limited to comparatively slow overwinds, since in case of quick overwinds the cage crashes into the frame which carries the detaching hook and smashes it.

When a squeeze is of considerable extent, draw all timber in abandoned places. Rush the drawing of back pillars. As a protection for the entry pillars, the roof over them may be broken by shots placed just inside the opening to abandoned rooms. Strengthen all doubtful places by additional timber-frames, cogs and posts.

An experienced mine superintendent states that wooden air bridges give better results than similar structures built of brick, stone, iron, or concrete, as they are less apt to be destroyed by explosions; wood is more yielding than any of the above named materials, and, when broken, wooden overcasts are more easily repaired.

The Transvaal Government is coöperating in the contest for a prize of £1000 offered by Mr. Reyersbach, on behalf of the Chamber of Mines, for the best drill produced by January 1, 1909. The Government proposes to offer an extra prize of money and to allow drills for competition to be imported free of customs duty and railway freight.

When handling coal and ashes it is well to make as much use as possible of gravity. Have the chutes, hoppers and slopes steep enough to prevent clogging of the material; 40 or 45 deg. is sufficient for coal while 50 deg. is necessary for ashes. Provide guards to keep the ashes away from the moving parts, as ash is destructive to machinery.

In case of mine accident do not remove the clothing by pulling over the head or injured limb, but cut it away until the injury is exposed. If the injured person vomits, do not raise him from a horizontal position, but turn face to one side. In case of burns do not give whisky, as it tends to bring the blood out to the surface and thus increase the pain.

With main and tail-rope haulage with its variable load, it is advisable under ordinary conditions to use a shunt-wound motor, or if the start is made under load, a few turns can be added to the windings. If a three-phase motor is used it should be so arranged as to start on no load and get up to normal load before the load is put on. This is usually done by clutches.

The importance of recapping winding rope at regular intervals cannot be too strongly emphasized, as the wires immediately above the capping, where the rope loses its flexibility as it enters the socket, are subject to a certain amount of rather severe bending and the rope strain near the capping is of a more trying character than the strain on other parts of the rope.

From 12 to 15 per cent. of the entire amount of fuel used by the Northern railway, of France, consists of briquets. They are used for starting the fires, raising steam and producing extra hot fires for quick runs. Each briquet weighs about 22 lb., is cubical in form and contains from 18 to 22 per cent. of volatile matter. The cost of this fuel ranges from $3 to $4.25 per metric ton of 2204 pounds.

In order to secure perfect stratification when washing coal, it is necessary that the raw material be fed evenly in thickness and that the rate of supply be constant, otherwise the aggregation is uneven and imperfect stratification takes place. Plunger systems of washing coal, with constant resistance under the bed, work best when there is a wide difference between the relative specific gravity of the coal and stone.

A large English colliery installed superheaters, with the result that the number of hoists were increased from 60 per hour to 70, giving an increased output of 400 tons a day. This was due to the superheated steam acting immediately on the pistons of the engines, and the cylinder being free from water, the full power was obtained at once and with a higher speed than when the water from the saturated steam flowed to the cylinders.

When installing an electric pump to deal with the water in dip workings, remember that the resistance must be as nearly uniform as possible. Three-throw pumps which give a fairly constant flow of water and are adapted to a uniform terming moment on their own driving shafts give good results. The speed of the driving motor must be necessarily high which necessitates the use of gearing. It is better to give the pump a short stroke.

A good system of firing where a mine is worked by the room-and-pillar system is to divide the mine into four sections, have the shot-firers work together and fire, for instance, the northeast quarter of the mine, then fire the southwest quarter; after this, return to the bottom of the air shaft and remain there for about 30 minutes, in order to give the parts of the mine fired time to cool off and the smoke clear away. The two remaining sections should then be fired. In this way the mine can be kept cool and free from explosive powder gases.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all news dealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, was 40,800 copies.

October 3	13,000
October 10	9,800
October 17	10,000
October 24	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
Coal Dust Explosions 819
Prime Western Spelter 820
The Anthracite Miners' Agreement 820
Dry Air Blast Results 820
*The Silver-Lead Zinc Mines of Broken Hill *G. W. Williams* 793
Working Costs in the Transvaal. *Special Correspondence* 801
Use of Basic Refractory Brick in Metallurgy *Francis T. Havard* 802
Iron Ore Statistics of Iron County, Mich. 804
*Weighing Ore in Stamp Mills *Frank A. Ross* 804
Lead and Zinc Mining in Iowa. *Special Correspondence* 805
*The Working Mines of Guanajuato *Claude T. Rice* 806
The Dolcoath Tin Mine *Special Correspondence* 808
*Hahns Peak, Colorado *Special Correspondence* 809
Russian Tax on Gold 809
*Gayley Dry Air Blast at Warwick Furnace *Edward B. Cook* 810
Colorado Fuel and Iron Company 813
Transvaal Gold Statistics *Special Correspondence* 813
The Problem of Treating Dust in Coal Mines *Frank Haas* 814
A Central Power Plant for Anthracite Mines. 817
Limit of Safety in Stored Coal 817
Coal Dust Experiments *Special Correspondence* 817
Colliery Notes 818
Correspondence:
Corrosion of Iron and Steel. *Henry M. Howe* 821
Rights of Junior Locators *A. H. Ricketts* 822
The Nomenclature of Zinc Ores *B. A. H.* 822
Mining Practice on the Rand. *F. M. Weston* 822
The New Ohio Law on Explosives 823
Detection of Mercury in Nitroglycerine Compounds 823
Effect of Compression on Burning of Fuse 823
Questions and Answers 824
Personals, Obituaries, Societies and Technical Schools 825
Special Correspondence 826
Mining News 828
Markets 833
*Illustrated.

Coal Dust Explosions

The paper on this subject read at a recent meeting of the West Virginia Mining Association, published elsewhere in this issue, is an important contribution to the literature of a danger which has excited more discussion among colliery engineers than almost any other. The practical experience and high scientific attainments of Mr. Haas will attract especial attention to his views, particularly inasmuch as they are at variance with many that have previously been expressed. Thus, Mr. Haas differs radically from many colliery engineers in his statement that as a cause of explosions he has no faith in the theory of occluded gas, in the discharge of explosive mixtures by pressure, in the combustion of coal by friction, or the unknown atmosphere generated by electric current. He asserts also that mining machines produce no more dust than pick mining, that the effect of a short circuit of electric current is too limited to cause an explosion, and that anthracite dust may cause a terrific explosion if conditions are favorable. These and many other statements will no doubt be hotly disputed.

Mr. Haas argues that coal dust is not directly explosive, inasmuch as one part of coal by weight requires more air than can come into intimate contact with the particles of coal. He does not deny the occurrence of coal-dust explosions, but considers the origin of the latter to be the ignition of carbureted gas distilled from the coal. At first sight this appears like splitting a hair, but the distinction has an important practical difference, as appears when Mr. Haas presents the statement that the absolute preventive for a dust explosion is the avoidance of an initial explosion from some other source, "for under no other circumstance can dust be considered dangerous." This is to say, a dust explosion may be produced by an initial explosion of gas, or by a blown-out shot, but not by a naked light or the arc of an electric short circuit.

It must be admitted that there is a good deal of evidence in support of this idea. In the elaborate experiments conducted by Professors Peckham and Peck nearly 30 years ago in connection with the flour-mill explosion at Minneapolis, Minn., it was found that a mixture of flour dust and air would not ignite explosively from glowing coal or sparks, but could easily be exploded by the injection of a live flame. However, Professors Peckham and Peck considered the careless use of lamps and lanterns to be a source of danger.

We think that many investigators of this subject have been mistaken in considering as coal dust what is not really so. In this country a starting point of experiments has been the fine coal which will pass through a 100-mesh screen. Mr. Haas expresses the opinion that this is too coarse, in which he is clearly correct. In metallurgy, nowadays, material is hardly considered as dust unless it will pass a 200-mesh screen. We understand that material from 100-mesh to 200-mesh in size is now actually being separated by means of pneumatic tables, while in the dust-collecting chambers of smelting works the reduction of velocity of the gas current to 4 ft. per second in order to settle the dust is not uncommon, and in some cases it has been caused to be so little as 1 ft. per second. Yet even the last extremely favorable condition will fail to settle all dust, some of the particles of which may be almost infinitesimally small. Some years ago, after the volcanic explosion of Krakatoa in the Pacific ocean, a cosmic dust circulated entirely around the world and was more than a year in settling, if our recollection be correct. One day this week the atmosphere of New York was smoky and murky from forest fires in the Adirondacks. In the preparation of his deflocculated graphite, E. G. Acheson reduces that form of solid carbon to a condition wherein it will not settle in water, being in what chemists call the colloidal form. Similarly, the water of muddy rivers, like the Mississippi, does not clear in their entire course of many hundreds of miles. Acheson considers that he subdivides his graphite to the molecular state. Without accepting that conclusion, it is to be admitted that solid carbon may occur in an extremely fine state of subdivision, and in that state it is conceivable that it may readily come in contact with sufficient air to explode directly.

Other points in Mr. Haas' paper are equally open to criticism. He does not give consideration to the injurious effect of water on the colliery roof, and does [illegible] that inasmuch as more men are killed by falls of roof than by explosions of all kinds, water cannot be used with impunity for laying dust. The statement that the maximum pressure of an explosion is about 50 lb. per square inch seems far too low. These and other points are open to serious discussion, which we hope will be entered into by colliery engineers. Our criticisms in the above respects are no disparagement of the practical value of Mr. Haas' contribution. The interests of coal mining would be promoted if there were more expressions of such thoughtful ideas, which would lead to expert discussions, eventually bringing out the truth.

Prime Western Spelter

A correspondent has requested us to define what is "prime Western" spelter, and what would be a good delivery of that class of spelter. Replying to this inquiry, we must say in the first place that there is no well established trade, much less official, definition; and consequently it is necessary to trace the history of the term. The term originated in the days when the smelters of Kansas and Missouri were producing a single grade of spelter from ore obtained from the Joplin district. This spelter contained about 0.8 to 1 per cent. of lead, 0.05 per cent. of iron and a small percentage of cadmium, usually undetermined. Later, the smelters adopted the practice of keeping separate the first draw of metal from the subsequent draws, and marketing it as "brass special," "extra select," or under other names, which may be generalized as "specials." The remaining draws continued to be called "prime Western."

The practical effect of this separation was to produce "specials" containing about 0.4 to 0.6 per cent. lead, and about 0.4 per cent. cadmium; and "prime Western," containing about 1 to 1.1 per cent. lead and 0.2 per cent. cadmium; in each case the percentage of iron remained about the same, viz, 0.02 to 0.05 per cent.

Later, most of the smelters entered upon the use of Colorado and other Western ore, some of them employing it exclusively. The spelter obtained from these ores was apt to be higher both in lead and in iron than that obtained from the Joplin ore, but it has continued to be marketed as "prime Western," although there has been from time to time some complaint respecting certain deliveries as such.

As a tentative definition for "prime Western" under present conditions we offer the following: Spelter produced from virgin ore by the retort process, containing not to exceed 1.1 per cent. of lead and not to exceed 0.08 per cent. of iron. This definition corresponds closely with the conditions which prevailed when the term "prime Western" originated, before special brands were made and before ore from west of the Rocky mountains was treated, and is sufficiently liberal to include the best of the metal made from the latter class of ore. Some of the spelter produced from Colorado ore is relatively high in lead—1.5 per cent. and occasionally more—the percentage of this impurity being governed largely by the temperature of distillation, but the lead content of such spelter can be reduced to 1 to 1.1 per cent. by a simple process of refining as practiced in Upper Silesia, and also in the United States.

Multiplicity in the grades of spelter, not to speak of the brands, is undesirable. Leaving out of consideration the superior grades of metal, made from peculiar and selected ores, which command a large premium, there exist at the present time among the Western smelters the following kinds of spelter:

1. Spelter made from Joplin ore, no separation of draws.

2. Spelter made from Joplin, and other ores in admixture, (*a*) with no separation of draws, and (*b*) sold separately according to draw, in some cases the first and second draws being united, while in other cases the three draws constitute distinct grades.

3. Spelter made exclusively from Rocky mountain ore, its composition varying according to the character of the ore and the method of smelting.

As above remarked, some of the spelter of the last class is of inferior quality and its delivery under the guise of "prime Western" is properly refused.

The Anthracite Miners' Agreement

Nearly six months before the expiration of their present agreement, the anthracite coal miners have formulated their demands for the new contract, which will not take effect till April of next year. The present agreement is practically that made by the Anthracite Coal Commission after the great strike of 1903; the movement made to secure changes in 1906 having failed, and ended in a continuation of the existing contract. The demands include briefly the full recognition of the union; the check-off—that is the deduction of union dues from the miners' pay; the payment for coal mined by weight instead of the carload; and the eight-hour day. No increase in the mining rate will be asked, but an advance will be demanded for the lower-priced laborers.

Not all of these demands will be accepted by the companies, and a prolonged controversy may be anticipated next spring if they are insisted on. It is perhaps well to have the demands formulated and known well in advance, though it is not likely that any answer will be made by the companies until the time comes to make the new contract.

Dry Air Blast Results

The paper on the use of the Gayley dry-air blast at Warwick furnace, given in another column, is of interest as showing the application of the drying plant at a merchant furnace of moderate size. There has been a general impression that it would pay to adopt this process only at large furnaces, or where several stacks are in use, as at steel plants where the make of pig iron is necessarily large and uniform quality is required. At Warwick furnace, however, where the iron made is sometimes basic pig, and at others different grades of foundry, as orders may be received, it has been found that considerable advantages resulted. Coke consumption was reduced, the output of iron increased, and the grade of iron was more nearly uniform. All of these results were secured at such moderate operating cost that the expenditure required to install the drying plant seems to have been fully justified.

The result of this working test, as it may be fairly called, is to increase largely the field of the dry-air blast in a practical way. Theoretically there was no doubt as to the gain with small as well as large plants. Practically it might have been—and was—argued that the saving on a small furnace, and especially a merchant furnace, would not warrant its introduction. This seems now to have been a mistaken conclusion.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Corrosion of Steel and Iron Tubing

In the *Iron Age,* of Sept. 17, p. 790, G. Schuhmann raises some points concerning a late paper by Professor Stoughton and myself on the corrosion of steel and iron tubing.

To our assertion that "nobody has a right to say either that defects which may in the past have lessened tube steel's resistance cannot be cured by skill and care, or, except on valid evidence, that they have not been cured," he replies, "It is an admitted fact that it is generally a very difficult matter to prove a negative." Negatives are often easy to prove. Mr. Schuhmann's letter proves that he was not dead when he wrote it. Every word he utters proves that he is not dumb. The fact that I have my cake proves that I have not eaten it. If the defects in steel have not been cured, that can be proved easily by showing that the best tube steel of the best makers habitually corrodes and pits worse than wrought iron under service tests.

He misleads his readers unwittingly by speaking of our evidence as "laboratory tests." In point of fact our conclusions were based in very large part on service tests, many of which were pushed to destruction. He explained to me privately that under "laboratory tests" he includes "all tests which deviate from average service conditions, that is, not only those that are made in the laboratory, but also all tests made under such extraordinary service as to push corrosion to an unusually early destruction of the metal, and that the proof of the slow actual average service is still lacking." With this explanation, and with his misapprehension in supposing that all the tests, which we reported, were under "extraordinary service," his words which I have just quoted are intelligible, but still likely to mislead. There are true service conditions of every degree of severity from that of carrying sulphuric-acid coal-mine water to that of carrying petroleum. For all I know there may be conditions under which either iron or steel would last indefinitely, indeed until worn through by the friction of the passing fluid. The iron tool found in the Pyramid of Kephron had resisted corrosion for forty centuries. What the true average degree of severity of all these conditions is would always be debatable, and would change from year to year. But to say that all service conditions more severe than that average, or more severe than the majority, are not service conditions at all, but are laboratory tests, seems to me at least to strain the meaning of these words in a misleading way. I believe that on reflection Mr. Schuhmann will admit this.

Now in point of fact, locomotive boiler tube service, which is certainly true service and in my opinion cannot fairly be called a "laboratory test," is sometimes favorable, but sometimes extremely severe, with every intermediate degree of severity. Our trials K and KK, I understand, were under normal service conditions in locomotive boiler tubes, and were pushed to destruction. The respective railroads made these in order to learn for their own information whether it was more profitable to use steel or iron, and not to uphold either. In K steel lasted better than iron, in KK no material dif- [illegible]

By this and other evidence we have shown that, in certain rather severe true service conditions pushed to destruction, and in others of very moderate severity, such as the hot-water system of Principal Thomson, not carried to destruction, but still to measurable pitting, some modern steel has lasted as well as wrought iron. I fancy that the impression which Mr. Schuhmann wanted to convey was that this sort of result is not conclusive proof that steel will last as long as iron under other service conditions which are so much less severe that iron lasts not two, but twenty years. In that I should agree with him fully. Proof of equality under one set of service conditions is no proof of equality under others; but then it certainly raises a very strong presumption against there being any great difference under those other conditions. Has Mr. Schuhmann given due weight to this presumption?

But under mild service conditions, too, steel has behaved admirably; for instance, in the great Rochester steel conduit, made about 13 years ago. Though laid in wet soil, many steel plates which had long lost their protective coating were uncorroded, and four-fifths of the plates were in good condition when examined lately. Thus in 1895 steelmakers already could make four-fifths of their steel so that it would not corrode under these trying conditions. The failure of certain steel plates in this conduit seems to me to mean simply that methods of manufacture and inspection had not been so perfected that every plate would be good, or that every bad plate [illegible]

[illegible] cannot be attained

He asks how it is that, if the difference of potential between cinder and iron in [illegible] the mechanical protective action of the cinder, yet cast iron corrodes less than steel? Whether such difference of potential shall or shall not outweigh mechanical protection depends on how great the difference of potential is and how effective the mechanical protection is. In one case the difference of potential may outweigh the mechanical protection, in another it may not. Actual experiment must decide in each case.

The difference of potential between the graphite and the cementite of cast iron on one hand and the iron itself on the other, is presumably very different from that between the cinder of wrought iron and the iron. Moreover, the difference between iron and any one mechanically protecting impurity, graphite or cinder, will differ greatly with the environment.

There may be conditions under which the difference of potential between cinders and iron is so slight that its effect is far outweighed by the mechanical protection of the cinder. In such cases wrought iron should have a material advantage, and might be much more resistant than even the best steel.

In point of fact, it is chiefly the continuity of the skin of cast iron which makes it resist corrosion. So far as I have seen, when the skin of cast iron is removed its resistance is not so much greater than that of wrought iron or steel. It is most misleading to speak of the cinder in wrought iron as the equivalent of the skin of cast iron, because that skin is continuous, whereas the cinder is wrought iron is very far from continuous, and exists chiefly in threads and rods. It is this discontinuity that lessens its protective action.

He asks why the present steel resists corrosion better than older steel. That is beside the mark. The makers are not called on to disclose to their competitors by what steps they have bettered their product. If they can prove that betterment, that should suffice. Personally I should be glad if they would disclose those steps, but such disclosure should not affect materially the effect of the direct evidence as to the present resistance of steel. Users wish to know whether steel actually is as resistant as wrought iron, rather than whether it ought to be, or why it ought to be.

[illegible]

that the burden of proof was on the steelmakers. Things have moved in those two years, and in them the steelmakers have actually furnished much proof. That they have furnished all the proof needed I have never suggested. They seem to have proved that they can make steel as resistant as wrought iron. It remains for them to prove that their processes and inspection are so perfected that they can do this every time.

HENRY M. HOWE.

Columbia University in the City
of New York, Sept. 25, 1908.

Rights of Junior Locators

Albion S. Howe, in the JOURNAL of Oct. 17, points out what appears to be a lack of harmony between my statements about the right of junior locators in the JOURNAL of Sept. 5, page 460, and the opinion on the same subject found in "Martin's Mining Law."

The law is correctly laid down in "Martin's Mining Law." It is not in conflict with the statement made by me in "Short Talks," and criticized by Mr. Howe. The doctrine is broadly stated by Mr. Martin, but a careful reading of the text does not support the theory that the overlapping locator secures the surface within the overlap. The case of Del Monte Company *vs.* Last Chance Company, 171 U. S., 55 (not cited on this point by Mr. Martin, but cited in the decision noted by him [Empire State Company *vs.* Bunker Hill Company, 131 Fed., 59]), is the leading one upon the point, and holds that "any of the lines of a junior lode location of a mining claim may be laid within, upon, or across the surface of a valid senior location *for the purpose of defining or securing to such junior location underground or extralateral rights* not in conflict with any rights of the senior location." * * * It matters not to the prior locator where the end lines of the junior location are laid. In the case of Davis *vs.* Shepherd, 31 Colo., 141, also cited by Mr. Martin, it is said: "Provided no forcible entry is made, a junior locator may project the end lines of his claim across the surface of a senior location *for the purpose of fixing extra lateral rights to so much of the vein as is subject to location.*"

That relocation is necessary to secure the territory within the overlap, is shown in Oscamp *vs.* Crystal River Company, 58 Fed., 293, in which the court said: "A failure to work a claim to the extent required by the statute simply entitles a third party to relocate it in the mode prescribed by existing laws. * * * If the statutes in that respect are not pursued, the status of all persons remain unaltered, barring the possible effect of limitations or laches, and if at any time the original owner re-enters and resumes work, the right of relocation is then lost." See also Omar *vs.* Soper, 11 Colo., 380; Johnson *vs.* Young, 18 Colo., 625.

Mr. Martin states (Section 197, page 152) *that the law does not tolerate a provisional location, the validity of which is to depend upon the future action of a prior locator.* Citing Lockhart *vs.* Farrell (Utah), 86 Pac., 1077, in which case it is said that "a location of a mining claim must be good when made, and each claimant must stand on his own location and can take only what it will give him under the law." And it is clear that the law only gives the junior locator the right of paralleling his end lines by the invasion of the territory of another.

Furthermore, Mr. Martin states (Section 198, page 153) "that property abandoned reverts to its original status as a part of the public domain." If so, it does not become the property of the overlapping locator.

A. H. RICKETTS.

San Francisco, Cal., Oct. 12, 1908.

The Nomenclature of Zinc Ores

My attention has been called to the following statement on page 267 of "Lead and Zinc in the United States," by W. R. Ingalls. "Deposits of smithsonite and hemimorphite classed together as silicate ore by the miners of the district occur at Aurora and Granby." Why is the silicate now called hemimorphite, when in the literature published in the past it is referred to as calamine? Dana gives the name calamine the preference. B. A. H.

Joplin, Mo., Oct. 1, 1908.

I wrote a paper entitled "The Nomenclature, of Zinc Ores" which was published in the Transactions of The American Institute of Mining Engineers for 1895. In that paper I called attention to the fact that the name "calamine" was used commercially and metallurgically to include all of the silicates and all of the carbonates of zinc and had been so used for upward of 100 years, the term being in use before it was known that there was any difference between the carbonates and the silicates; I called attention, moreover, to the fact that mineralogists had appropriated the name calamine for the designation of a mineral species, but that there was confusion in this respect among mineralogists, some using calamine as the name of the anhydrous carbonate and others using it for the hydrous silicate, the latter usage being that of Dana.

In order to obviate this confusion in nomenclature, I proposed that the hydrous silicate of zinc, called calamine by Dana, be renamed "hydrowillemite." This proposal did not draw out any particular discussion and I considered it to have failed of acceptance. Consequently I decided, inasmuch as the old confusion in nomenclature was vexatious and inexact, to adopt the second name given by Dana for the hydrous silicate of zinc, namely hemimorphite, and I used that term in my "Production and Properties of Zinc," published in 1901 and my "Metallurgy of Zinc and Cadmium" published in 1902.

All of this antedated the litigation which has been going on during the last three or four years as to the dutiability of certain ores of zinc, "calamine" being on the free list in the Dingley tariff. Of course, it was merely consistency on my part to continue to use the term "hemimorphite" in my recent work "Lead and Zinc in the United States." I have no doubt that my usage of that second name of Dana will constitute a precedent which will be generally followed because it is necessary in order to secure precision in language. If a metallurgist today speaks of calamine, I know what he means, because I know that he is referring to the carbonate and silicate ores of zinc in general as metallurgists have been doing for a century; but if a geologist or mineralogist speaks of calamine, I am bound to ask what he means. Of course, this in an indefiniteness which cannot long be permitted to exist . W. R. INGALLS.

New York, Oct. 6, 1908.

Mining Practice on the Rand

I should like to correct some slight errors in the article, "New Mining and Milling Practice on the Rand," which appeared in the JOURNAL of Aug. 15, 1908. My reference to the cumbersome and useless system of central administration referred to the abuse of this system which deprived mine managers of all initiation. Some groups retain the services of a general manager who is generally the most successful manager they have had, and who is able to check work and make fair comparisons of the work on different mines.

My remarks on the supply of drill steel should also be qualified by stating that in soft ground on the outcrop mine drills can be used twice, often to advantage; so the figures given were scarcely a shocking example. The "Murphy" drill is not at present at work on the Robinson mine. The drill referred to was the "Waugh," which has been working for several months on the Robinson Deep, putting in dry holes, "Cripple Creek style," with solid steel in the steeper stopes where the dip of reef is 35 deg. and more. Several machines for use with hollow steel and water injection are also at work and are stated to be giving most promising results. This drill is manufactured by the Denver Rock Drill and Machinery Company.

E. M. WESTON.

Brakpan, Transvaal, Sept. 18, 1908.

Cadmium forms alloys with many other metals and possesses the property of reducing the melting point.

The New Ohio Law on Explosives

George Harrison, chief inspector of mines, of Ohio, has issued the following circular relating to the law passed by the Ohio Legislature at its last session, which took effect Oct. 3. This law is as follows:

THE ACT

SECTION 1. Storing Blasting Powder or Other Explosives. No blasting powder or other explosives shall be stored in any coal mine, and all powder sold to miners by the keg shall be packed in kegs which have an opening at the edge 2 in. in circumference, and that can be conveniently opened, to avoid the dangerous use of picks to open the same; and no workman shall have at any one time more than one 25 lb. keg of black powder in the mine, nor more than 3 lb. of high explosives; and no explosive shall be taken into or out of any part of the mine in mine cars propelled by electric power; and no person shall keep blasting powder, or explosives, dangerously near the electric wire or power cable in any part of the mine where electric wires are in use.

(*a*) Boxing and Distance. Every person who has powder or other explosives in a mine, shall keep it or them in a wooden or metallic box or boxes, securely locked, and said boxes shall be kept at least 5 ft. from the track, and no two powder boxes shall be kept within 25 ft. of each other, nor shall black powder and high explosives be kept in the same box.

(*b*) Handling Explosives. Whenever a workman is about to open a box or keg containing powder or other explosives, and while handling the same, he shall place and keep his lamp at least 5 ft. distant from said explosive and in such position that the air current cannot convey sparks to it, and no person shall approach nearer than 5 ft. to any open box containing powder or other explosives with a lighted lamp, lighted pipe or other thing containing fire.

(*c*) Tamping. In the process of charging a hole, whenever in the opinion of the mining department this becomes necessary, the needle used in preparing a blast shall be made of copper and the tamping bar shall be tipped with at least 5 in. of copper. No coal dust nor any material that is inflammable, or that may create a spark, shall be used for tamping, and some soft material must always be placed next to the cartridge or explosive.

(*d*) Firing Shot. A miner who is about to fire a shot with a manufactured squib shall not shorten the match, saturate it with mineral oil nor ignite it except at the extreme end; he shall see that all persons are out of danger from the probable effects of such shot, and if it be a rib shot, he shall notify the person or persons working next to him on said rib before said shot, and shall take measures to prevent anyone approaching by shouting "fire" immediately before lighting the [illegible] shall return to a missed shot until five minutes have elapsed. And [illegible] nothing but a wooden tamper shall be used.

SECTION 2. Penalty. Any person violating any part of this act, shall be deemed guilty of a misdemeanor, and upon conviction be fined, not more than $100, nor less than $5, at the discretion of the court

[illegible]

It is not necessary to say that the above law covers a number of very important points, which, if reasonably observed, may result in preventing much loss of life and injury to persons in mines. It is no hardship to anyone, simply a little proper discipline and exercise of necessary care in handling explosives.

Clause (*c*) provides that: "Whenever in the opinion of the Mining Department this becomes necessary, the needle used in preparing a blast shall be made of copper, and the tamping bar shall be tipped with at least 5 in. of copper." The promoters of the law no doubt considered it essential that copper needles and tampers should be used as a safeguard against premature blasts, and loss of life or injury resulting to miners, and every inspector in the department is fully in accord with the law, hence this notice:

"That copper needles and copper tips on tamping bars must be provided without any unreasonable or unnecessary delay, and the use of all other materials as needles and tip ends of tamping bars dispensed with both by regular miners and by day men and any person or persons engaged in charging any hole, either in coal, rock, or any other material in any mine in the State except where the law requires that nothing but a wooden tamper be used to tamp dynamite charges."

Detection of Mercury in Nitroglycerin Compounds

Mercuric chloride, as is well known, has the effect of prolonging the "heat test" of nitroglycerin explosives, making the explosive appear purer than it really is. For a long time the small amount of mercuric chloride required to produce this effect made the quantitative determination of the mercury difficult. The following method is the one used by the inspector of explosives for West Australia to determine the amount of mercury in nitroglycerin compounds.

Two hundred grams of explosive are ground up with 400 grams french chalk; 250 c.c. water are added, and the whole allowed to stand for 24 hours. The solution is filtered; the filtrate is made slightly acid with H_2SO_4; then an electric current of 1.5 amperes is passed through the filtrate and the mercury deposited on a gold cathode, a platinum anode being used. [illegible] hours; then the cathode is detached, [illegible] carefully dried at a low temperature, and finally weighed, the increase in weight being taken as mercury. The cathode is cleaned by heating to redness.

QUALITATIVE TEST

The following qualitative test is used: Two hundred grains of explosive are ground up with French talc, and then placed in a large test tube, closed with a cork stopper from which is suspended a piece of silver foil. The test tube is then heated at 71 deg. C. for two hours. After cooling the silver foil is placed in a test tube and heated strongly, the upper part of the tube being kept cool so that any mercury present deposits in the upper part of the tube. The presence of mercury is detected by heating a small piece of iodide in the test tube, any mercury deposits turning red owing to the formation of mercuric iodide.

Effect of Compression on Burning of Fuse

In order to determine whether or not the quick burning of fuse is due to "burning through" of fuse so that the fire short-circuits in the hole, the inspector of explosives for West Australia made a series of experiments to determine this point. The inspector in reporting his experiments (report for 1907, Department of Mines, West Australia, p. 221), states that after testing many thousand samples of fuse in the course of 13 years he has never found a sample of fuse that "ran" (burned with extreme rapidity through its length).

In order to test the possibility that in coiling up the fuse and poking it into the hole (as is customary with some miners in order to avoid the tearing out of fuse by flying rock from other holes) the fuse may become cracked and broken at the sharp turns and so may "short-circuit," he either coiled or bent and tightly crushed 6 ft. of fuse into a galvanized-iron pipe having an inside diameter of 1⅛ in. and 12 in. long. At the same time the same length of fuse was burned unconfined, and the rate of burning of each sample was timed. Out of 287 fuses tested 107 showed a retardation, and only two an acceleration, and that very slight. In many cases the retardation in the rate of burning amounted to 20 per cent. This retardation is an additional reason why miners should not hasten back to holes which they suspect have missed fire.

[illegible] to silver imparts malleability and partially prevents blisters in the manufacture of silverware

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Separation of Chalcopyrite and Molybdenite

I would like some information with regard to the concentration of molybdenum sulphide. Our ores carry copper—5 to 15 per cent.— gold, silver and iron. The matrix is quartz and lime—gypsum and carbonates—all of which contain more or less molybdenite, some ores carrying as high as 14 per cent. On the Wilfley tables a small streak, ¼ in. to ⅜ in. wide, comes over and we find that the metal settles fairly well, its specific gravity being so much greater. In shoveling out the copper-iron concentrates a streak about ½ in. thick, mixed with some copper and iron, is always found on the bottom of the box; but it is so elusive and fine that I doubt whether the hydraulic classifier would give any result. What I would like to know is what is the lowest grade of known solvent of molybdenum which will not attack copper and iron. I would also like to know what is the lowest grade of concentrates salable, and what is the price. Any further information would be acceptable.
M. M. S.

Molybdenite is soluble in sulphuric acid. However, we do not believe that a chemical process on that basis could be worked out to solve the problem stated. The specific gravity of molybdenite is only 4.7 to 4.8, wherefore we do not see how our correspondent can be making any separation by washing on Wilfley tables. The problem is one that should be referred to a metallurgical engineer for experimental investigation. It is possible that some separation can be made by a magnetic, electrostatic or flotation process.

Molybdenite is commonly guaranteed to be 90 to 95 per cent. pure. As such, it is worth $400 to $450 per 2000 lb. Not being a staple product, the price is subject to wide fluctuation, and usually is a matter of negotiation between buyer and seller. The Primos Chemical Company, of Primos, Delaware county, Penn., and De Golia & Atkins, of San Francisco, Cal., are the principal dealers.

Quartz, Flint and Sand

Can you give me any information about the uses of silica sand and ground quartz in the clay industries of the United States? I am led to believe that there is a wide demand for these materials. What I want to know is: (1) What are the uses; (2) about what volume is used annually; (3) the present source of supply; (4) what constitutes a good sand; (5) about what is the value of the various grades per ton; (6) the suitability of the almost pure silica sand of the Woodbridge district in New Jersey for these purposes.
J. B. H.

Quartz and flint are extensively used in pottery manufacture, wherein they serve to diminish shrinkage in the body of the ware. Quartz is used also in the glaze. Sand and ground sandstone are, however, steadily gaining ground as a substitute for the more massive form of quartz in the pottery trade. Quartz of any variety, to be suitable for pottery use, must be free from iron; in general, there should be less than 0.5 per cent. of ferric oxide. Quartz, quartzite and silica sand are also used for the manufacture of silica brick. The largest uses for sand are for building purposes, for the manufacture of glass, for molding iron, and for the manufacture of sand-lime brick. The total production of sand for all of these purposes amounts to millions of tons per annum. For the manufacture of glass and silica brick freedom from iron is an essential requirement. Building sand must be clean and sharp. Molding sand varies from clay loam to a clean, sharp, coarse sand. The value of sand ranges from 8c. per ton for ordinary building sand to nearly $5 per ton for some of the finer grades of glass sand. Much depends, of course, upon the proximity to market. Silica sand is of very common occurrence. As to the suitability of the silica sand of the Woodbridge district, New Jersey, professional advice should be secured. We cannot undertake to answer such specific questions, requiring an examination for which we have not the time; nor is it our business.

The Cheapest Producer of Copper

Which company, operating in any part of the world, produces copper most cheaply?
W. K.

We do not know, and moreover we think that an answer to this inquiry would be of no value. The cost of producing copper in many cases is simply a matter of figuring. When ores contain gold and silver, the deduction of the value of those metals from the total cost of production causes the copper to be comparatively cheap. In this way the Utah Consolidated and North Butte companies are producers of very cheap copper. Both of them are surpassed by the Rio Tinto if the sulphur value of the latter's ore be deducted in the same way. Similarly, we venture to guess that the Orford Copper Company would be the cheapest producer of copper if the nickel value of its ore were deducted. However, the matter becomes rather absurd before that point is reached.

Chlorine Gas for Gold Chlorination

In looking through the volumes of the Journal, I find many articles on the use of chlorine gas for chlorination purposes, but I am unable to find recent articles giving data on the cost and actual method of production. Can you inform me where I can obtain such data and also how I can learn where the gas is used?
F. S. McG.

Chlorine gas for the chlorination of gold ore is usually produced in the barrel wherein the ore is treated by the action of sulphuric acid on bleaching powder, the charge of 15 lb. of bleach requiring 30 lb. of sulphuric acid and yielding about 5 lb. of chlorine, the cost of which is 75c. This is required per ton of ore in some cases. It has frequently been proposed to employ chlorine generated by the electrolytic decomposition of common salt, and it has been estimated that the chlorine required per ton of ore can be obtained in this way for 15c. against 75c. by the present process, but in spite of this estimated economy, the electro-chlorination process has not yet come into use.

The Market for Magnesium

Will you please inform me respecting metallic magnesium, its uses and the probable demand for the metal; also its approximate value. I am interested in a large deposit of magnesite of very high quality in British Columbia and am looking for a market for the various products that can be made from it.
M. P.

There are no available statistics as to the production of magnesium. However, it may be stated that the aggregate amount is very small, probably not more than 100 tons per annum. Magnesium finds its chief use in photography. An alloy of aluminum and magnesium, called magnalium, has recently been introduced, which promises to have considerable commercial value and perhaps will be the chief consumption of magnesium. The present price of magnesium is $1.25 per lb. At present it appears unlikely that this metal will ever attain the industrial importance that aluminum has, but progress in the arts and cheapening of cost of production often work wonders. But at the present time a deposit of magnesite is not considered valuable because magnesium can be produced from it. The chief use for magnesite is as a refractory material. The market for magnesite on the Pacific coast is limited. The product cannot be brought from there to the Atlantic coast in competition with the magnesite of Austria and Greece.

The United States imported 259,881 lb. of bismuth in 1907 against 254,733 lb. in 1906. The values were $325,015 and $318,452 respectively.

The production of borax in the United States is confined almost entirely to Inyo, San Bernardino and Ventura counties, California.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of of their movements and appointments.

H. W. Turner, of San Francisco, has been making examinations in the Coalinga oil district in California.

J. W. Mercer, of Denver, Colo., has been at Houghton, Mich., and is now on his way to South America.

H. W. Hardinge, of New York, has returned from Cobalt, where he has been engaged on professional work.

Richard A. Parker has removed his office as consulting mining engineer to 404 Colorado building, Denver, Colorado.

Walter Fitch, superintendent of the Calumet & Hecla mines, has tendered his resignation to take effect Nov. 1 next.

S. E. Bretherton, consulting mining and metallurgical engineer, has removed his office to 422 Montgomery street, San Francisco.

Lewis T. Wright, general manager of the Mountain Copper Company, is visiting mining and metallurgical districts in the East.

F. F. Sharpless, of New York, returned from the West Oct. 17 and on Oct. 21 sailed for London where he will be for about six weeks.

Walter S. Keith left Seattle, Wash., on Oct. 11 for Cooke City, Montana, to erect a 250-ton smelting plant for the New World Power and Reduction Company.

Etienne A. Ritter, of Colorado Springs, Colo., has been appointed consulting engineer of the Burleigh Mining and Milling Company operating at Silver Plume, Colorado.

Charles B. Strecker, president of the Commercial-Financial Association has been in the Lake Superior copper district looking over the various mining enterprises.

Richard S. McCaffrey has resigned as superintendent of the Tintic Smelting Company, in the Tintic district, Utah. He has been succeeded by G. C. Vivian, of Butte, Montana.

Dr. George F. Kunz and Charles Hugh Stevenson have just published a work called "The Book of the Pearl," in which no possible point of interest relating to pearls is left untouched. It is an elaborate work which surely will excite much interest.

W. B. Gohring has been made superintendent of mines of the Calumet & Arizona and the Superior & Pittsburg companies. The position has been created for Mr. Gohring, who will now be next in charge to Col. L. W. Powell, general manager of these companies.

Obituary

Captain John Wicks, a pioneer of the Lake Superior country, died at Iron Mountain, Mich., Oct. 12, aged 88 years. He was born in Cornwall, England, in 1820, and had been in Michigan since 1852, with the exception of four years, from 1866 to 1870, when he had charge of the Ophir Cañon mine in Nevada. He served as mining captain at a number of mines, including the old Minnesota, the Hamilton, the Kimberly, the Lake Antoine, the Millie and others. He had charge of the exploration work for the Menominee Iron Mining Company, which resulted in the discovery of the great Chapin mine. His last active work was at the Millie mine; in 1896 he retired on account of his advanced age.

William S. Tretheway, superintendent of the underground work on the Osceola and Kearsarge lodes for the Calumet and Hecla Mining Company was accidentally killed by a descending skip in No. 21 shaft of that property. He was born at Cambourne, Cornwall, England, and had been in the Lake Superior district since 1875. He had charge of sinking the Central company's vertical shaft and from there he went to the Atlantic. It was under his management that the first dividends from that mine were paid. From the Atlantic he entered the employ of the Calumet & Hecla and had charge of the reopening of the shafts on the Osceola lode.

Bennett H. Brough died at Middlesbrough, England, Oct. 3, after a short illness, aged 48 years. He had been connected with the Iron and Steel Institute for 24 years, having been associate editor of its *Transactions* from 1884 to 1893, and secretary from 1893 until his death. He was a well known figure in the mining world, having been an active member of many of the scientific societies of London. He was an associate of the Royal School of Mines, a fellow of the Geological Society, and of the Institute of Chemistry, and a member of several other kindred societies. In former years he had held the appointment of instructor in mine surveying at the Royal School of Mines. He was the author of many professional papers; perhaps his best known work was his "Textbook on Mine Surveying," first published in 1888, a book which has run into twelve editions. He served on the [illegible] School of Mines, the Cambourne Mining School and Glasgow University. He served on the mining and metallurgical committees of the British sections of the Paris Exhibition of 1889 and of the St Louis Exhibition of 1904. More recently he was secretary to the Iron and Steel Committee at the Franco-British Exhibition, and was instrumental in forming the important collective exhibit of the pig-iron industry.

Societies and Technical Schools

American Institute of Chemical Engineers—A circular from the secretary says that the first annual meeting of this institute will be held at Pittsburg, Penn., Dec. 28 and 29. It is essential that this meeting be well attended and that an excellent program be presented. Members are requested to notify the secretary as soon as possible in regard to any contribution which they can make to the meeting. The committee desires early notification regarding both classes of subjects in order to prepare the printed program. The committee also has in view the preparation of new features which will make the meeting of exceptional importance and interest. Early and hearty coöperation by all members, however, is imperative in order to assure success. The secretary is J. G. Olsen, whose address is at the Polytechnic Institute, Brooklyn, N. Y.

American Electrochemical Society—The next meeting of this society will be held in New York, Oct. 30 and 31. Headquarters will be at the Hotel Cumberland. The meetings will be held at the Chemists' Club, and in the Doremus lecture hall of the College of the City of New York. The annual dinner will be held on the evening of Oct. 30. The program includes a visit to the Balbach Smelting and Refining Works at Newark. The following papers are to be presented:

1. "The Use of a Mercury Cathode in the Determination of Metal." A. Harold Porter and Francis C. Frary.

2. "The Passivity of Nickel and Iron." E. P. Schoch.

3. "Equilibra in Standard Cells." G. A. Hulett.

4. "Chemical Energy." J. E. Mills.

5. "The Formation of Nitric Acid from Air by Means of Low-Voltage Direct Current." G. W. Morden.

6. "Electrolytic Corrosion of the Bottom of Oil Tanks." A. A. Knudson.

7. "The Corrosion of Underground Structures." Albert F. Ganz.

8. "The Function of Oxygen in the Corrosion of Metals." W. H. Walker.

9. "The Theory of Electrolytic Paints." W. D. Bancroft.

[illegible] of Electrolytic Corrosion." Maximilian [illegible]

11. "The Lash Steel Process and the Electric Furnace." F. A. J. Fitzgerald.

12. "Utilization of Power Stations for Electrochemical and Electrothermal Processes during Periods of Low Load." E. A. Sperry.

13. "Electrochemical Loads and the Central Station." John Meyer.

[illegible] Stray Currents." Clayton H. Sharp.

15. "The Latent Heat of Vaporization [illegible]

[illegible] Walls." Carl Hering.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and Goldfield

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 14—There are a few dredges working in Calaveras county, but until 1908 there was only one. The field in that county is somewhat limited in extent as far as known. This year, however, two or three new ones have been built and set at work. They are at Jenny Lind on the Calaveras river not far from the boundary of San Joaquin county. As there has been some little muddy water coming down the river the Chamber of Commerce of the City of Stockton, in San Joaquin county, following the example of the Sacramento county men, has appointed a committee to see how the dredging in Calaveras county may be controlled.

Up to the present time 11 men have been arrested and lodged in jail to be placed on trial for stealing amalgam from the dredges at Folsom. About $15,000 has already been traced to these men and it is expected that there has been $10,000 more taken.

The Gold Bar Dredging Company in Butte Creek cañon has been trying to mine its property with some kind of a steam shovel and the venture has been virtually given up. On behalf of the stockholders, however, the Black Sand Mining Company has taken hold of the property and promises, by saving more gold, to make the scheme a success. This latter company has put in a newly patented sluice.

New York men are running Keystone drills on ground on Butte creek, Butte county. Options have been taken on land along this creek from the Diamondville bridge down, so as to cover 500 acres of possible dredging land. Gravel has been found to the depth of 50 ft. and the drill will test the value before any steps are taken to build dredges.

Henry Spencer, of the Cascade Valley district, Butte county, is about to put in a new type of hydraulic gravel elevator in the gravels of that section. It is intended to work the machine on the second layer of gravel in the channel, first breaking the lava above it with powder.

The course of the old buried river with its channel of gold-bearing gravel from North San Juan, Nevada county, to Camptonville in Yuba county, has long been a matter of surmise among miners. The channel was first found at Smartsville and was followed and worked at Mooneys Flat, French Corral, Sweetland and North San Juan. Crossing the Middle Fork it was lost, and then found again at Camptonville, but the intervening portion, while long sought for, has only recently been found. Now the Sylvester Gravel Mining Company has found the rim of the channel in which the river originally flowed, while digging toward the center of the ridge from an old outbreak. The discovery is considered of great importance to that section and will incite others to prospect thereabouts in hope of again finding this channel which has proved rich in the portions where it has been mined.

Goldfield, Nevada

Oct. 14—An application for a receiver for the Mohawk Jumbo Lease Company has been filed in the district courts. Sensational charges are made against the management who are made defendents in the action personally, as well as officially. McMillan and Holleran, who own the controlling interest, are charged with fraudulently selling to the Mohawk Jumbo Lease Company, 300,000 shares of Mohawk Red Top Leasing stock at 15c. per share, which it is claimed was a grossly exorbitant price. The defendants' answer states that their employees, including their superintendent and shift-bosses, were taking stock in payment for their services, which should be sufficient proof of the value of the property as a leasing venture. They claim that the sale was made to perpetuate by means of the lease sold, which had then 10 months to run, the Mohawk Jumbo Lease Company, whose original lease was soon to expire. The payshoot within the Mohawk Jumbo lease was exhausted before the lease expired. The lease has some money in the treasury and its assets are being converted into money so as to pay a final dividend to the stockholders.

D. Mackenzie has returned from an extended trip East, and states that he will immediately resume work on his various properties and leases in this camp, all of which, except the Combination Extension, have been idle since their funds were tied up a year ago by the closing of the State Bank and Trust Company. The Jupiter, one of these properties, just before closing down installed a pumping plant which successfully handles a flow of 220,000 gal. per day. It was proposed to use this water for the city water supply, but during the idleness the Lida Water Company has completed its installation.

For the month of September, Goldfield produced 11,817 tons of ore valued at $871,275. The number of men on the payrolls of the mining companies is 2050, and the wages paid during the month amounted to $1,246,000. The mines of the Consolidated company are only producing sufficient ore to supply the Combination mill, and the Florence company, owning the second largest mine in the district, is not working any men underground on company account, as it is awaiting the completion of the mill before it resumes mining.

Thomas B. Rickey, formerly president of the different banks belonging to the State Bank and Trust Company throughout the State, has given himself into the custody of the sheriff and was locked up in the county jail. Rickey's downfall began with the financial distress of the Sullivan Trust Company two years ago. The latter starting with $3000 had $3,000,000 worth of assets, according to market quotations, in less than a year. The money stringency sent the Sullivan Trust Company to the wall; Rickey being more or less involved assumed all the obligations. His banks could not bear the load and they closed their doors a year ago. The receiver has just declared the first dividend of 5 per cent. Wildcatting in Nevada is about over, and a few more summary punishments would end it altogether.

The oilfields, 15 miles from Goldfield, are showing considerable activity. The Western Core Drilling Company has drilled to a depth of 600 ft., the limit of the machine, and will resume operations with a larger drill as soon as it arrives. Oil formation was encountered, and the prospects are encouraging.

Butte

Oct. 15—Last week a petition was filed in the United States District Court asking that the North Butte Extension Copper Company be declared bankrupt. The petitioning creditors are the Butte Machinery Company, Butte & London Copper Development Company and the Rocky Mountain Bell Telephone Company, representing claims aggregating $859.75. In the petition it is alleged that the company has allowed several of its creditors to obtain judgment by default for the purpose of giving certain creditors preference. At about the same time that the bankruptcy proceedings were instituted here the directors of the company held a meeting in New York City and appointed a committee for the purpose of reorganizing the company. The plan of reorganization, as outlined by a circular letter to the stockholders, contemplates the formation of a new company to be known as the North

Butte Extension Development Company with a capital stock of $1,500,000 with shares of the par value of $1 each. It is proposed to issue 1,000,000 shares of the new stock in exchange for the stock of the old company, each stockholder of the old company to have the privilege of exchanging his stock for a like number of shares in the new company upon payment of a 50c. assessment per share. The money thus raised will be used to pay off the indebtedness of the old company.

The Amalgamated company has declared a regular quarterly dividend of 50c. per share.

At the annual meeting of stockholders of the Butte-Radersburg Mining Company, held last week, the following were elected directors for the coming year: F. H. Symons, Charles D. Horton, E. R. Dornblut, E. E. German, M. J. Evans, M. Morley and L. E. Symons.

In the action of the Compagnie des Mines et Minerals, a Belgian corporation, against Sabastino Rodoni, brought in the local district court to quiet title to a portion of the Last Chance quartz lode claim, situated four miles southwest of Butte, the court directed a verdict for the plaintiff adjudging the company to be the owners of the claim in question.

Denver

Oct. 17—The fierce attack of the Denver *Post* on Simon Guggenheim who, it is asserted, purchased his seat in the United States Senate, and upon the smelting company with which he is connected, has caused no little excitement in mining circles, and while it is admitted that smelting charges have been reduced since the American Smelting and Refining Company practically absorbed all the smelting interests in this State, yet it is not believed that the mining companies are receiving proper treatment at the hands of the so-called "smelter trust." Before the amalgamation of the smelting interests, each separate works had to look out for its own ore supply, and to insure the smooth running of its furnaces, not only had to keep large stocks of ore on hand, but occasionally break into the market for certain desirable ores at prices that tickled the heart of the mine owner. Since the amalgamation, all this is a matter of bookkeeping, and the ore is diverted by the purchasing department to the particular plants where it is required. This, it will be readily seen, has immensely reduced the ore stocks necessary under the old system, and released a large amount of money formerly tied up in ore. In the next place, the American Smelting and Refining Company is believed to control the lead interests of the United States, and is able to fix the price of pig lead, although the experience of 1907 showed that it cannot do the latter when market conditions are adverse. However, these two points are looked upon as the direct result of consolidation of the smelter interests and trust manipulation, and to a considerable extent are believed to have reduced the price of smelting and given enormous benefit to the trust in marketing its lead at the highest prices. The mine owners believe they are entitled to a share of the profits obtained, and do not believe that they are receiving it.

The numerous advances made in smelting—mostly of a mechanical nature—have further cheapened materially the cost of smelting ore, and while the mine owners admit the smelting charges have been reduced, they do not believe they are receiving as low smelting charges as the present depressed condition of mining would warrant, taking also into consideration the enormous earnings of the smelter trust. This is the viewpoint from which the principal mine owners of Colorado look on the situation.

The various charges brought by the Denver *Post* regarding incorrect weighing and sampling, and enormous moisture deduction, are scarcely taken seriously by practical men, and the charge that there is no competition against the smelter trust, and that independent samplers have been abolished, is not quite true. The Ohio Smelter, at Salida, is an active and successful competitor for the Leadville ores and through the Southwest, while in the Cripple Creek district the competition of the big cyanide mill of the Golden Cycle Company with the trust's affiliated company, the United States Reduction and Refining Company, is a factor that cannot be lost sight of, more especially as the "mill trust," after cutting rates for about a year past, has found it necessary to restore them, which is, of course, temporarily a detriment to the mining interests of Cripple Creek, and the next move is looked forward to with extreme interest. It should be stated that the Cripple Creek mines have enjoyed the lowest treatment charges known during the past year, and it is generally believed that the $3.50 rate for freight and treatment on ores up to $8 per ton valuation does not cover expenses. This rate was some time ago advanced to $4 by the mill trust, and [illegible]

The foregoing outlines the situation as it is viewed by the practical and level-headed mining men of Colorado.

The effort by the same paper to show an alliance between the Federal Forestry Bureau and the smelting trust to block mining development in Colorado is absurd, simply because to curtail mining would kill the business of the latter. The chief forester means well, and is just [illegible] Japan did [illegible] years before Columbus sailed from Spain, and what Germany and France did 150 years ago, but in his zeal, and through the arrogant officiousness of some of the understrappers employed to carry out his policies, there can be no doubt that great injury has been done to the State in his withdrawal of 16,000,000 acres from the public domain in Colorado.

For instance, the paragraph in the "Use Book" that "the discovery of a mere trace of mineral is not sufficient to make a claim valid, unless both the character of the mineral and the manner of its occurrence are such as to warrant expenditure for development and reasonable expectation of a valuable discovery," is silly, for the reason that whether a claim will warrant expenditure or not can only be approximately determined by allowing the prospector first to do some work on his discovery, and he certainly will not do this unless he can stake it, do his assessment and record it. This results from the chief forester's ignorance of the subject he was handling, but he has shown his readiness to remedy this wrong by agreeing to meet a committee of mining men to discuss what reforms are necessary to right these evils.

Calumet, Michigan

Oct. 16—Forest fires have again broken out throughout the upper peninsula, and several of the outlying locations are in great danger.

Mine Inspector Dawe, in his annual report to the board of supervisors of Houghton county, states that for the year ended Sept. 30, 1908, there were 17,224 men employed in the mines and that there were 58 casualties.

Indianapolis

Oct. 20—A number of old coal mines have resumed operation and several new mines opened. The new mines of Massey, near Oakland City, which have been opened since the destruction of the old works by the flood last March, are now in operation. The mine and tipple are models of convenience in the coal industry, and the vein of coal which the mine opens is from 7 to 9 ft. thick. The mines are the property of the Peacock Coal and Mining Company, of Indianapolis; the principal stockholders are Fletcher Hines and T. C. Bugg. The coal which the works penetrate is of the peculiar formation known as a "lost" or "floating" vein. It covers a limited territory, and further than the established boundaries no trace of the coal can be found. The miners find many fossils in the coal, samples of which interest scientists.

The mine is of the slope variety and the tipple is reached by a long incline, up which the coal will be pulled by endless cables.

Much of the product of these mines will be shipped long distances to market, and the tipple is equipped with a box-car loader, the first to be installed in this field. A large number of men are also employed in constructing a railroad switch necessary to reach the mine.

The Brazil Factory Promoting Club has been organized at Brazil, which is in the heart of the block coalfield. The club will make an effort to add to the industries already established, the plan being to establish an immense power plant to generate and transmit electricity, the chief points being cheap fuel and excellent shipping facilities.

Thomas Bennett, a miner in mine No. 34, belonging to the Brazil Block Coal Company, was seriously and perhaps fatally injured while discharging a shot. It is reported that he used one of the large bits recently authorized by the legislature over the protest of the State mine inspector, who declared that such accidents had been reduced to the minimum by the enforced use of the smaller bit.

The Indiana Appellate Court has decided that a coal-mining company is under no general obligation to pay for medical treatment for an injured miner, except the immediate relief necessary to meet an emergency at the time the workman is injured. A superintendent of a mine has no authority to bind his company by employing a physician to attend an injured man other than for necessary and immediate relief.

Scranton, Penn.

Oct. 19—The convention of the anthracite district of the United Mine Workers was largely attended and more enthusiasm for the union was shown than has been evident for some time past. The current agreement does not expire until April 1, 1909, but the convention formulated the demands to be made in negotiating a new agreement. They are as follows:

"First, that an agreement shall be negotiated between the representatives of the miners and the operators of the Anthracite region, and all disputes arising under the contract shall be adjusted as provided for in said agreement.

"Second, we demand the complete recognition of the United Mine Workers of America as a party to negotiate a wage contract and that the United Mine Workers of America shall be recognized in our right to provide any method we may adopt for the collection of revenues for the organization.

"Third, that we demand an eight-hour day with no reduction of wages.

"Fourth, that all coal shall be mined and paid for by the ton of 2000 pounds.

"Fifth, that we demand a definite and more uniform scale of wages and prices for all classes of labor at all collieries in the anthracite region; and that all employees paid less than $1.50 per day shall receive a 10-per cent. advance; and all employees paid more than $1.50 and less than $2 a per day, shall receive a 5-per cent. advance.

"Sixth, that the system whereby a contract miner has more than one job, or employs more than two laborers, be abolished.

"Seventh, that the employers be required to issue uniform pay statements, designating the name of the company, the name of the employee, of the colliery where employed, the amount of wages, and the class of work performed.

"Eighth, that the contract shall be made for a period of one year."

The existing agreement is that made by the Anthracite Coal Commission after the strike of 1903. Not all of the demands made will be accepted by the companies, but they will not take any action at present.

The object in holding the convention and putting out these demands so far in advance was undoubtedly to revive interest in the union and to hold the miners together; also to bring back the numbers who have dropped out, as they are apt to do in quiet times. From this point of view the convention has been, so far, a success.

Toronto

Oct. 16—The Sturgeon lake gold region near Port Arthur, Ont., is attracting much attention. Peter King, the original discoverer of gold in this area who located the St. Anthony's Reef mine nine years ago has been prospecting there this season and recently brought to Port Arthur a number of rich samples of gold ore. He located three claims from which several sacks of ore have been taken which are said to be rich enough to ship direct to the smeltery. Other prospectors have located claims. Two of them have built a crude smelter and have produced gold bars valued at several thousand dollars. Many prospectors are going in including some who have been working in the Cobalt district; several parties have fitted out at Port Arthur and expect to remain in the field all winter.

London

Oct. 10—Much regret is expressed at the approaching retirement, owing to superannuation regulations, of Prof. William Gowland, from the chair of metallurgy at the Royal School of Mines. The salutary custom of enforcing the retirement of officials on reaching an age limit has its advantages, and the case of Professor Gowland is an instance. His successor has not yet been appointed. The position is one of much responsibility on account of the great importance of the metallurgical industries of Great Britain and her colonies. It is essential in order that these industries should hold their own in the struggle of nations, but that the men who direct them are men of the highest training. The Royal School of Mines is one of the principal recruiting grounds for metallurgical engineers and, therefore, the post of professor of metallurgy is one that should be filled by the best man that the country can give. Those who realize the great influence for good or evil that the position carries must naturally be anxious that a suitable man will be found.

The Iron and Steel Institute has been holding the annual meeting at Middlesborough, when papers on the iron and steel industry of the district, on the progress of electrical installations, on gas-producer practice and on the scientific control of fuel consumption were presented. The meetings were presided over by Sir Hugh Bell, president.

The ninth ordinary meeting of the Cobar Gold Mines, Ltd., with property in New South Wales, was held in London Sept. 30. Difficulties have been met with in finding a suitable process for the treatment of the ore which contains gold and copper. The Elmore oil process has been tried and abandoned, as the existing crushing machinery did not provide a suitable product. Experiments have also been made with the process belonging to the Minerals Separation Company; but, while the experiments are said to have been satisfactory, the directors have hesitated, after their experience with the Elmore plant, to install a working plant. The agents of the company have been examining the process used at Mount Morgan, which appears to them suitable for the Cobar ore, and further experiments on these lines are to be undertaken. The process consists of dry crushing, roasting and leaching. The directors express confidence in their mine, which, on Sept. 30, 1907, was reported to contain ore reserves of 141,053 tons containing 1909 tons copper and 74,651 oz. gold. With a faith that is commendable they stake their belief that the difficult problem of extracting the values at a profit will in time be solved by the ingenuity of scientific men. The company has £30,000 cash, and science, let us hope, will not disappoint them.

The San Francisco del Oro Mining Company, of Mexico, announces a scheme of reconstruction in order to raise further funds. It is proposed to form a new company with a nominal capital as before of £375,000 in £1 shares and to allot to the old shareholders 330,000 £1 shares, 15s. paid, for the same number of shares now issued in the old company. If these shares are applied for, the company will have £82,500 for working capital and 45,000 shares in reserve. The ill success of this company is attributed to difficulties connected with the treatment of the ore and the separation of the various minerals. The ore carries zinc, lead and silver and is similar to the Broken Hill ores of Australia, the treatment of which is being closely watched by the technical advisers of this company. In order to erect a plant capable of treating 200 to 300 tons a day a sum of £50,000 is considered necessary, while a further £10,000 is required to build a railway to the mine from Molino station.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Sylvanite—This new camp is situated about 12 miles from Hachita station on the El Paso & Southwestern in the Little Hachita mountains. Last February a small rush to these mountains was caused by the discovery of placer gold. The excitement died down, owing to the small returns of free gold, the difficulty of working, etc. The gold was associated with a mineral subsequently identified as sylvanite. This has renewed interest in these fields and prospectors are flocking to the new find. One shipment from the Neirhart claims of four cars had a reported value of $105 per ton. The Hachita mountains have a core of igneous rocks occasionally capped with limestone. The country is traversed by many porphyry dikes and the general appearance indicates mineralization.

Calumet & Arizona—The drift prospecting the rich strike on the 1300 level of the Hoatson is still in good ore, making 125 ft. of ore exposed. The pump station on the 1550 level Junction is nearly completed.

North Star Shaft—This shaft of the Warren Realty Company has a depth of 705 ft., 50 ft. having been made in September.

Anderson Apache—This mine in the Hachita mountains has made a shipment of 11 cars of ore valued at $500 each.

MARICOPA COUNTY

Climax—This company near Phœnix, has let a contract to drive 400 ft. in tunnel No. 5 to tap the Quartz Mountain vein at a depth of 500 ft. This tunnel is in 600 feet.

MOHAVE COUNTY

Tom Reed—This mine is making a monthly clean up of $75,000. A drift 240 ft. on the 250 level has had good ore all the way. At present, a 10-stamp mill will handle the output.

YUMA COUNTY

Clara Consolidated—This mine near Bouse, is pushing development. A drift from the bottom of the Signal shaft has 80 ft. of good ore. The company has in operation a second gasolene hoist and has also purchased a smelter consisting of one water-jacket blast furnace of 300 tons capacity and ironwork for one reverberatory furnace of 75 tons capacity.

California

[illegible] COUNTY

South Eureka—It is reported that this Sutter Creek property has a good body of pay ore and is in better condition than for a long time past.

BUTTE COUNTY

[illegible] Oroville, was at one time a large producer, but the vein pinched out and it has been idle some years. The lower workings are now being unwatered and the old tailings are being worked.

CALAVERAS COUNTY

La Franchie—At this mine near Glencoe, Jerome Burt and others are sinking the old shaft deeper, preparatory to crosscutting for a body of good ore known to exist.

[illegible]—A force of men has been put on the old works of this company putting the mine in shape to begin working when the water supply [illegible]

[illegible] COUNTY

Arkansaw—A new tunnel is being run at this mine so the ore may be taken to the mill by gravity instead of hoisting it out through the shaft. Crushing has been stopped until completion of the tunnel.

INYO COUNTY

[illegible] —Numbers of additional men are being put on at this mine at Tecopa and all the available teams are hauling ore to the railroad station. The main drift from the 600 of the Gunsight claim is in shipping [illegible] they are in 30-per cent. lead ore. There is some gold and silver in all this ore

[illegible] COUNTY

[illegible] ore, and the cyanide plant is nearing completion.

Empire—At this property a number of [illegible] water power.

[illegible] COUNTY

[illegible] Grass Valley mine, to start reopening it

[illegible] and buildings are being put up so that work may be carried on all winter.

Rose Hill—This old mine at Grass Valley, after an idleness of eight years, has been bonded by W. L. Hemmington and J. H. L. Green, who have started work on it, and will install a compressor and hoist.

PLACER COUNTY

Pine Avenue—This mine on the northern side of Shirt-tail cañon, has been bought from the Power estate by Harold Power, Jr. Two tunnels have been run for the gravel, one of which is 1600 feet long.

PLUMAS COUNTY

[illegible] 150-ft. level of this mine near Clio, high-grade copper ore is being taken out. This ore will be sacked and shipped to smelters in Shasta county.

SAN BERNARDINO COUNTY

Kewanee District—In this district there are now four companies developing their properties. The Chicho Mining Company of Los Angeles is the principal company and is taking out considerable $16 ore. The Morning Star has a wide gold-bearing [illegible]

SHASTA COUNTY

[illegible] being mined and shipped daily.

Sybil—At this mine, French Gulch, owned by G. A. Von Kruseze, the grade of ore being taken out is so high that it is being sacked and shipped to the smelter for reduction

[illegible] COUNTY

Alaska—At this mine, Pike City, a crosscut is being run from the bottom of [illegible] in the old shaft. This will result in draining [illegible]

TUOLUMNE COUNTY

[illegible] been supplied to the hoist.

Colorado

[illegible] COUNTY

[illegible] in the spring

Stratton—Work is progressing on this granite quarry at Salida. It is said that some good contracts for stone have been secured.

Lake County—Leadville

Big Six—In this mine, Breece hill, the lessees are driving the incline shaft toward Big Evans gulch, following a small body of ore that runs high in gold. From the present showing it is expected that the main ore horizon will be encountered shortly. The mine is shipping in the neighborhood of 75 tons per week.

Wolftone—The best of the heavy machinery at the Penrose shaft, Carbonate hill, operated recently by the Western Mining Company, is being hauled to the Wolftone. When it is installed considerable development work will be carried on.

San Juan County

Ore Shipments—Shipments from Silverton in September included 2200 tons concentrates and 1850 tons crude ore. The largest shipment of crude ore was 1075 tons from the San Antonio. Shippers of concentrates were the Hercules, 650 tons; Silver Lake, 600; Iowa, 325; Sunnyside, 250; Ross, 275; Old Hundred, 100 tons.

Bonanza Tunnel—Contracts have been let for the new mill, and materials are being delivered.

Gold King—At this mine, at Gladstone, 40 stamps are now at work.

Teller County—Cripple Creek

The United States Reduction and Refining Company has given notice of the following new rates on Cripple Creek ores, effective with bills of lading dated Oct. 16:

	Freight and Treatment.
Up to $8 value	$4.50
$8 to $10	5.25
½ oz. to ¾ oz	6.50
¾ oz. to 1 oz	6.75
1 oz. to 1¼ oz	7.25
1¼ oz. to 1½ oz	7.50
1½ oz. to 2 oz	8.50
2 oz. to 3 oz	9.25
3 oz. to 5 oz	9.75

	Delivered f.o.b. Cars Denver or Pueblo.
5 oz. to 7½ oz	$7.50
7½ to 10 oz	8.50
10 oz. to 12½ oz	9.50
12½ oz. to 15 oz	10.00
15 oz. to 20 oz	11.00

This is an increase of from $1 to $1.50 per ton. It is believed that the advance will reduce the shipments of low-grade and dump ores which have recently been large.

Idaho

Shoshone County

Golden Winnie Tungsten Mining and Milling Company—The control of this company has just passed into the hands of Arthur Amon, of Kennewick, Wash. E. M. Smith, who originally located the property in 1893, and who has been interested in it ever since that time, retains a large stock interest.

Murray Development Company—This company has been formed of Boston capitalists for the purpose of operating the Mother Lode group of 11 placer claims. This property is already equipped with a 10-stamp mill.

Big Murray Tunnel—A movement is on foot for driving of a 7000-ft. tunnel in this district on something like a coöperative plan. Such a tunnel could have a portal practically on the tracks of the Idaho Northern Railroad; running through the mountain in a straight line, it would tap the leads of the Bear Top, Chicago-London, Black Horse, Paragon, Jewell group, and Orofino mines, every one of which is waiting the completion of the Idaho Northern Railroad to commence shipments.

Orofino Company—About $80,000 worth of ore has been piled on the dump of this mine awaiting shipment on the completion of the Idaho-Northern Railroad. It is reported that a deal is pending for the sale of the property to a number of Eastern capitalists.

Chicago-London Company—Work in the face of this company's lower tunnel was resumed this week with a force of 10 men. Hand power will be used until power can be secured for the big 15-drill compressor owned jointly by this company and the Paragon company.

Indiana

Greene County

Johnson Brothers, owners of the Cherry Valley mine in the Jasonville district, which has been shut down since June, have resumed work, giving employment to 100 men. The Island Valley mine resumed operations Oct. 19, after having been shut down since April 1. This mine gives employment to 200 men.

Sullivan County

The mine near Carlisle belonging to the Carlisle Coal and Clay Company, which caught fire a week ago, is still burning. Although the fire is shut up in one entry, it is doing great damage. Workmen succeeded in closing the fire up, so that it will smother itself in a few days and the hoist may be started.

Vermillion County

At an average cost of $30 a day, each of the six coal mines in the Clinton field is using water bought from the Chicago and Eastern Railroad Company. Three of these mines belong to the Clinton Coal Company and three to the Deering Coal Company. The water purchased comes from the Wabash river, but is filtered through a tower tank before being shipped to the mines. This is the first instance of water being purchased by the mines of this district.

Louisiana

Oil production in September was 437,800 bbl., an increase of 10,200 bbl. over August. Rail and water shipments for the month were 463,158 bbl., showing a decrease of 25,358 bbl. in stocks. There were 18 new wells completed in September, of which 15 were producers. There were 42 wells drilling at the end of the month.

Michigan

Copper

Calumet & Hecla—This company has resumed operations at the White Pine property in Ontonagon county. Trenching will be extensively carried on in an attempt to disclose an amygdaloid ledge; drill cores, taken from this lode, were well charged with copper, and it is now planned to locate the outcrop.

Isle Royale—This company has started to sink a new shaft to open up the Baltic lode on its property. At the stamp mill a second head will soon be compounded and will go into regular service. At No. 4 shaft the new compressor will enhance progress at the shafts in the southern portion of the tract.

Keweenaw—Sinking has been resumed at the Medora shaft of this company. Prior to starting the mill run, sinking was discontinued at the 13th level, and all attention was given to the lateral openings in order to maintain a rock supply sufficient to keep the mill in continuous operation. The mill is now running only one shift per day, and most of the rock is coming from the lower openings from which better copper returns are being made. The Medora shaft will be sunk an additional 1000 ft. and the lode will be extensively opened up at that depth.

Wyndot—This company has encountered an amygdaloid lode well charged with copper in the crosscut, being driven from the 700-ft. level of its exploratory shaft. As this strike is a considerable distance from the approximated line of the Lake and Adventure lodes, its identification has not yet been established, nor has it been sufficiently opened up to ascertain its value.

Arnold—This company has a small force of men employed and is about meeting expenses in taking out mass and barrel copper.

Superior—Work of widening No. 1 shaft to two compartments is nearing completion, and when ready, shipments will begin to the Atlantic mill. The railroad into the property has been completed and the alterations to the mill finished. At the shaft a stock pile has accumulated, during development, sufficient to keep the mill running some time.

Ahmeek—This company is vigorously pushing work on the recently acquired mill site on the shore of Torch lake, and will have everything well in hand before the snow falls. Excavating on the site of the two new shafts is going forward favorably, and a depth of about 35 ft. in the pit has been obtained; the overburden at this point is about 70 ft. These shafts will start with a common collar and diverge. They will go down on the hangingwall side of the lode. The lode is expected to be cut at about 1250 ft. from surface.

Ojibway—No. 2 shaft has reached the second level, at a depth of 500 ft., and preparations are underway to begin crosscutting to the lode, a distance of approximately 90 ft. The lode opened from the first level, 250 ft. from surface was broken and shattered, but it is believed that this additional depth will be beyond the effect of surface influences and a more uniform formation will be opened up. The first level of No. 1 shaft will be established at 500 ft.; this shaft is down about 435 ft., and, like No. 2, is being put down in the footwall. In sinking this shaft a seam of calcite, well charged with copper, has appeared for a considerable distance. It is undoubtedly a stringer of the lode.

Tamarack—This company is installing a large fan at No. 4 shaft to aid in the ventilation of No. 3 shaft.

Montana

BUTTE DISTRICT

East Butte—The unwatering of the main shaft on the company's properties is nearly completed.

Sarsfield Claim—This claim lies east of Butte on the large north and south fault vein which has been opened up on the Bullwhacker and Bertha claims. A lease has been given to James McNabb and Ed. Schmitt. The shaft is now down to the 120-ft. mark and it is stated that the leasers will sink to a depth of 150 ft. where crosscuts will be run.

Davis Daly—Within the past week deeds have been filed for record conveying to the company portions of the Ramsdell, Silver King and Morning Sun lode claims.

Richmond Claims—A lease on the three claims, Nos. 1, 2 and 3, has been given by George L. Gotleib to Hugh Monroe and Harry Gorber. The lease is for a term of 18 months, with 15 per cent. royalties reserved; an option to purchase for the sum of $10,000 is given.

BEAVERHEAD COUNTY

Silver Fissure Mining Company—The company's smelter at Polaris was blown in last week and 30 additional men given employment. The smelter has a capacity of about 100 tons daily. Harry H. Armstead, Jr. is in charge of the property.

GRANITE COUNTY

Granite Bimetallic Company—The company's mine situated at Granite has resumed operations under the direction of general manager John R. Lucas. The work at present is chiefly repairing, but the number of men employed will be increased as rapidly as possible. A contract has been entered into with the American Smelting and Refining Company providing for the treatment of between 75 and [illegible] tons of ore daily at the smelting company's plant as East Helena. The mine has been shut down for the past six months.

Nevada

[illegible]

[illegible]—Operations have been temporarily suspended for reasons not given. A trial shipment of ore is ready to send to a testing plant in order to ascertain the best method adaptable to the treatment of the ore. It is reported that a 50-ton mill will be constructed soon.

Jack Pot Consolidated—This week 180 sacks of ore assaying $200 per ton was shipped to the smelters. It is stated that the 50-h.p. engine that has been on the property for some time, will be installed, and that a new and permanent working shaft will be sunk. Arrangements have been made for an ample water supply and a mill has been decided upon; construction to begin at an early date.

Wonder Queen—At the Flynn-Horgan lease on this property the shaft has been sunk 25 ft. and from it 50 sacks of high-grade ore has been obtained.

[illegible]

Rose Group—This group of claims has been sold to Kansas City men, who have made the first payment and will erect a mill within 90 days.

[illegible]

The production for the week amounted to 1958 tons valued at $154,425. The Combination mill treated 595 tons of ore from the Combination mine and the development work done in the Mohawk mine. The Western Ore Purchasing Company handled: From the Baby Florence, 48 tons; Florence Consolidated, 300; Engineers lease, 204; Consolidated Red Top, 123; Gem Florence, 11; Kendall lease, 7; Daisy, 39; St. Ives, 11 tons. The Nevada Goldfield Reduction Company treated: From the Combination Fraction, 130 tons; Begole Syndicate, 240; Baby Florence, 60; Florence Annex dump, 30; Eisen lease on Little Florence dump, 50; Great Bend, 120 tons.

St. Ives [illegible]—The lease has begun shipment from the vein on the 50-ft. level that was lost by the former leasers.

Mitchell Fairfield Lease—The shaft is now 500 ft. deep. The west crosscut on the 310-ft. level is 50 ft. long and the south crosscut 45 ft. long. On the 400-ft. level the west crosscut is [illegible] ft. long, and on the 500-ft. level the northwest workings are 95 ft. from the shaft.

[illegible]—Owing to a breakdown in the compressor plant the mine was shut down for four days last week; hence the small shipments. The timbering in the shaft is being repaired.

Goldfield Fissure—The whim on this property is to be replaced by a gasolene hoist and a headframe. In the crosscut on the 90-ft. level the quartz in the breast [illegible].

Red Hills Mining and Leasing Company—Last week fire destroyed the blacksmith shop, hoist house and practically ruined the hoist. The fire caused the cable to break just as the men were coming out from the ladderway, having been warned by a danger signal to come up. The buildings and hoist will be replaced immediately.

[illegible]

Dutch Flat Mining Company—A carload of pipe and supplies have arrived and are being delivered at the property. The trench for the pipe is being dug to the water supply two miles from the camp and will be completed by the time the pipe is ready.

[illegible]

Great Western—Returns from the last shipment of 28 tons showed the ore to average $68.30 per ton, all but $4.40 being silver. The ore was treated at Millers; freight and treatment charges amounted to $14 per ton.

[illegible]

[illegible] Work on the Fairview claim is being pushed with good results. The shaft is now more than 750 ft. deep; it will be continued to a depth of 1000 ft. A complete new pumping and hoisting plant, together with new surface equipments will be added.

[illegible]

[illegible] bonded by H. E. Taylor who will install machinery and begin development work.

[illegible]

Austin-Manhattan—Two big hoists are being installed on this property. Three shifts are at work in the adit, which is 6000 ft. long, and in the north crosscut, which is 2800 ft. long.

[illegible]

Knight-Merigan Option—A. G. Gutheil has taken up an option for the Knight-Merigan interests of Utah on 16 claims adjoining the McConnell and Yerington Consolidated properties. Extensive development is planned.

[illegible] of good copper ore has been developed on the 65-ft. level.

[illegible] pany has installed a 25-h.p. gasolene hoist and will sink their two-compartment shaft, at present 200 ft. deep, to water level, which it is expected will be found at a [illegible].

EUREKA COUNTY—EUREKA

Little Chief—The shaft-house and machinery were totally destroyed by fire this week. The loss is estimated at $20,000.

NYE COUNTY—TONOPAH

The production last week was 5513 tons valued at $140,975 as follows: Tonopah Extension, 90 tons; Tonopah Mining Company, 3150; Belmont, 750; Montana-Tonopah, 708; Midway, 100; MacNamara, 350; West End, 165; Jim Butler, 200 tons.

Mac Namara—Two sensational strikes were made last week. The first one was made in the raise from the west drift from the south crosscut at a point 260 ft. west of the shaft on the 200-ft. level, the orebody being 580 ft. southwest of the shaft. This raise intersected the ore at a point 52 ft. vertically above the level. The vein is 7 ft. wide, the whole width is good ore. This is the same vein which in the West End mine has been stoped for several months on the 150-ft. level. The second strike was made in the raise east of Apex raise No. 3, driven from the west drift on the 200-ft. level, and is fully 250 ft. northwest of the first strike. The vein contains 3 ft. of good milling ore.

Belmont—On the 1000-ft. level, the station on the vein found along the north or hanging wall of the Mizpah fault has been completed, and an air hoist installed. The winze on this new vein is already 30 ft. deep.

Montana-Tonopah — Preparations are being made to carry out the extensive development decided upon at the last annual meeting of the company. Drill holes will be put down from the 765-ft. level to determine the best place to sink the three-compartment winze which will be sunk through the dacite intrusion to prospect at depth the ground which has produced so well in the upper levels. One of the reasons that the contract was made for the treatment of ore from the MacNamara mine was to enable the mill to work at full capacity, for it is impossible to hoist the 1100 tons of ore per week necessary for the mill, and also to handle the waste which will come from this development.

Tonopah Mining Company—Development work done last week amounted to 349 ft. The Mizpah three-compartment shaft is 1243 ft. deep. No progress was made with the calyx drill hole. The ground has caved so badly in the hole that it was filled up with cement and then a hole has been drilled through it in order to save the hole and to get to solid ground.

West End—The extent of the new orebody on the 400-ft. level is still undetermined. Ore is exposed for 50 ft. the full hight of the stope, and for a length of 60 ft., with ore in the faces at both ends and in the roof.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain Combination—After extensive sampling and examining of that portion of the property exposed and developed by the hydraulic operations, the company has practically decided to work the entire property by means of steam shovels.

Round Mountain Reduction Company—The mill will be running soon. A new general manager has been appointed. Several changes in the plant have been made, and an effort is being made to secure a greater water supply.

NYE COUNTY—SKIDOO

Skidoo Mill—Gold bricks worth about $10,000 have just been forwarded to the mint via Rhyolite as a result of a 15-days' run at this mill. This is about the average for the past three months. The mill is treating 35 to 40 tons of ore per day.

WHITE PINE COUNTY

Nevada Consolidated Copper Company—The annual meeting of the stockholders will be held Nov. 4 at Portland, Maine.

North Carolina

CATAWBA COUNTY

Catawba Gold Mine—This mine has changed management and is now in charge of C. L. Constant, of 61 Beekman street, New York. He is making important improvements whereby the cost of mining and milling will be reduced to a minimum.

FRANKLIN COUNTY

Portis Gold Mine—This old mine has been put under the management of Capt. A. J. Overton, of Salisbury, N. C., who is installing two Eardman washers and other machinery.

LINCOLN COUNTY

Piedmont Tin Mining Company—This company, of which Prof. J. H. Furman, of Lincolnton, N. C., formerly of South Africa Gold Fields, Ltd., is manager, has just shipped five tons of concentrates to Hamburg, which, according to sampling of Ledoux & Co., went 72.60 per cent. tin.

MONTGOMERY COUNTY

Sam Christian Gold Mine—A nugget weighing 1¾ lb. was found by a Mr. Morgan recently.

YADKIN COUNTY

Gross & Dixon Gold Mine—This mine, owned by Hooper, Neb., men, has erected a complete five-stamp mill with 18-ft. tube mill and cyanide plant, built by the Allis-Chalmers Company, under the direction of Capt. C. E. Warren, of Chicago.

Oklahoma

The production of petroleum from the Oklahoma fields in September is reported at 3,619,124 bbl. Shipments were 3,365,831 bbl., leaving 253,293 bbl. to be added to stocks. The total stocks on Sept. 30 are estimated at 50,997,000 bbl. The number of wells completed in September was 290, of which 271 were oil producers, 3 gas producers and 16 dry. On Oct. 1 there were 204 new wells drilling.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for August and the two months of its fiscal year from July 1 to Aug. 31 is as follows:

	August.	Two Mos.
Earnings	$2,122,030	$4,076,794
Expenses	2,152,816	4,047,758
Net or deficit	Def. $30,797	$29,036

For the two months, as compared with 1907, there were decreases of $1,762,855 in earnings, and of $1,454,067 in expenses; leaving a loss of $308,788 in net earnings.

BITUMINOUS COAL

Dunlap-Connellsville Coke Company—This company now has the development of its mine well advanced, and the coke plant has been fired.

Echard Coal and Coke Company—This company has been obliged to close down its plant on account of short water supply. An artesian well is being bored.

New Connellsville Coal and Coke Company—This company has been organized, with $1,500,000 capital stock, by R. P. Burgan, George M. Hosack, J. H. Sanford and J. T. M. Stoneroad, who recently bought 2800 acres of coal land. The company will begin at once the work of developing the property. Coke ovens will be erected and a railroad connection established. A town will be built and will be named New Connellsville. The coal tract lies in Washington township, Greene county. The coal is of excellent coking quality and adjoins the coal recently bought by Julian Kennedy and others. It is adjacent to Ruff's Creek village.

South Dakota

CUSTER COUNTY

Saginaw—At the annual meeting held in Custer, I. W. Herber, of Custer, Louis Hahn, George Thompson, of Columbus, O., Ben Eilber, H. B. Wagg and Charles Ewing, of Wisconsin, were made directors. I. W. Herber is president and general manager, and B. Eilber vice-president.

LAWRENCE COUNTY

Gilt-Edge-Maid — Under the closer screening system the property is producing monthly a little over 4500 tons.

Imperial—With the addition of ore from the lower contact on quartzite the output is now 3500 tons of ore per month.

Golden Placer—Over 1500 tons per month of ore from the Kicking Horse mine is being handled; the bedrock ore will be tapped in Deadwood gulch this fall.

Golden Reward—The monthly production has reached 5000 tons. Miners are being shifted from the Harmony and Golden Wedge claims to the Tornado, which is to be reopened. The Alpha has a new orebody which is producing 50 tons per day.

Homestake—The company is now producing regularly 120,000 tons per month and is increasing the capacity of its slime plant and foundry.

Mogul—With the mill running nearly full capacity the company is treating monthly 10,600 tons of ore and is rebuilding the Horseshoe shaft.

Minnesota Mines Company—The present monthly tonnage of 2500 is to be doubled by the addition of machinery in the mill, including more crushers.

North Homestake—Improvements in the mill and mine have been completed and the monthly production is now 4000 tons.

Reliance—A new Huntington mill has brought the monthly capacity to 4000 tons, which will be increased this winter with a larger force of miners.

Wasp No. 2—Regular dividends are being declared on ore running less than $2 per ton gold and the output is 7000 tons per month.

PENNINGTON COUNTY

Balkan—The new five-stamp mill will go into commission this month and if satisfactory a larger plant will be erected.

Black Eagle—Joe Mitchell is working a new body of tripoli ore which he will prepare on the ground and then ship east. It is the only mine of this kind now being operated in the Hills.

North Star—Frank Coughran has put a 20-stamp mill on the property and is making a good extraction from the plates. He has an 8-ft. ledge of fair-grade gold ore.

Washington

CHELAN COUNTY

Holden Gold and Copper Company—A five-drill air compressor has been installed at the mine, near Lake Chelan. Two machine drills are now at work, one in each of the lower levels on the vein intersected several hundred feet from the portal. A lateral drift is to be driven in the footwall on both levels, and crosscuts will be driven at intervals of 100 ft. The vein is 40 ft. wide and carries ore assaying from 7 to 10 per cent. copper, $5 to $10 gold, and 2 oz. silver per ton. The stock is owned by J. P. Graves, of Spokane, and others from Spokane and Chelan men.

OKANOGAN COUNTY

The Favorite Gold and Copper Company—Two shifts are working in the adit, now 650 ft. long, on its property near Nighthawk. The adit will intersect the first lead-silver vein at a depth of 1200 ft. and at a distance of about 500 ft. from its mouth. Beyond the small lead-silver vein there is a larger one of the same ore and a 7-ft. vein of copper. Several open cuts and tunnels have been driven on the copper vein near the surface.

[illegible]

Beecher Gold Mining Company—Drifting from the different stations of the main shaft of the property, near Rock Cut, has begun; a small crew of men is working. A survey of the claims has been completed by L. W. James, of Spokane. R. M. McEntire is in charge of the work at the mine.

Canada

[illegible]

[illegible] for the week ending Oct. 10 were as follows: Cobalt Central, 40,500 lb.; Kerr Lake, 80,000; La Rose, 120,000; Nipissing, 260,200; O'Brien, 191,260; Temiskaming, 60,000; Temiskaming & Hudson Bay, 180,000; total 931,960 pounds.

[illegible] the company showed assets to Oct. 1 as $1,717,781 including estimated value of mine $1,500,000, ore not shipped $13,000 and ore shipped to smelters $69,850, with liabilities of $554,963.

Little Nipissing—At the annual meeting held Oct. 15 in Toronto, it was decided to increase the capitalization from $650,000 to $1,000,000, the stock being underwritten by the shareholders. Superintendent Madden reported that the recent valuable find on the J B 2 property of the company, was a vein 12 in. wide which when developed will be the means of proving the values of the other veins encountered. The additional capital secured will enable the company to prosecute active development work.

Trethewey—A calcite vein containing silver was encountered at a depth of 100 ft. at about 1300 ft. north of the main workings on the boundary between the Trethewey and Hudson Bay properties.

Mexico

[illegible]

The announcement, officially given out on Oct. 14, that the cabinet had decided to reject Article 144, of the proposed mining law, has been received with great satisfaction in mining circles. The clause, [illegible] it unlawful for foreign companies to acquire mines in Mexico. The chapter relating to the civil responsibilities of min[illegible]

CHIHUAHUA

[illegible]—This company has lately been organized with [illegible] operate extensively in the Candelaria district. New York capital is largely interested.

[illegible] property in the Parral camp has been increased since the return of Manager J. D. Barnes from an extended trip to the United States. J. Evans lately assumed the position of superintendent, succeeding Arthur Evans, who resigned to take charge of the mining operations of the Midland Mining Company in the Naica camp.

Guadalupe—In this gold district lying about 75 miles east of Chihuahua along the line of the Kansas City, Mexico & Orient road there are renewed activities resultant from the opening up of rich orebodies at a number of places within a radius of five miles of the famous Oaxaca mine. A number of new developments are recorded and the report is current that the Oaxaca, which has a production record of over 1,000,000 pesos, will be reopened.

[illegible] that this company in the Parral section is to build a branch line from its properties to Malina station on the Parral & Durango railway to facilitate the readier marketing of its increasing shipments.

[illegible]

Moctezuma—The second unit of the new concentrator has gone into operation and about 1200 tons per day, of which 950 tons is handled in the first unit, is now treated in the new plant beside 800 tons daily in the old mill. The plant, which was designed for a capacity of 1500 tons per 24 hours, will handle at least 2000 tons when in complete working order.

Promontorio—R. P. Travers passed through Nacozari en route to the mine accompanied by W. M. Cummings, of the Southwestern Development Company, of the Eppes Randolph interests by whom it is rumored that the mine is being taken over.

Caridad—Following a visit by S. T. Godbe to the properties of the Harris Copper Company, work has been started on the ground which is being opened by three adits drifting for the granite-porphyry contact. This work is under the supervision of W. P. Belding and about 30 men are now employed. Shipments of copper ore from this property will be commenced on completion of the trails to Calabazas.

[illegible] these mines of the Dawson Mining Company have been suspended during the in[illegible] plete cyanide plant for treating the tailings of the present amalgamation-concentration mill. It is expected that the treat[illegible] the first of the year, until which time work is confined to development.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 21—Coal trade in the West shows a slight improvement, and there seems to be a more hopeful disposition among operators. Sales of steam coal increase slowly, and a cold snap has brought up the domestic demand. The Lake trade is still quiet and the season seems likely to end more peacefully than is usually the case—that is, with out any rush at the end.

The Seaboard bituminous trade is slightly more active. New England is taking more coal especially in the sections served by water. The anthracite trade is dull and without change. The Coastwise trade is improving.

Testimony is still being taken in the government case against the anthracite coal companies; but nothing new has been brought out thus far.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 10, in short tons:

	1907.	1908.	Changes.
Anthracite......	4,427,580	3,921,674	D. 505,906
Bituminous	30,429,198	25,553,697	D. 4,875,501
Coke.............	10,964,547	5,302,856	D. 5,661,691
Total	45,821,325	34,778,227	D. 11,043,098

Total decrease this year to date was 24.1 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, eight months ended Aug. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio........	14,282,068	1,823,861	16,105,929
Buff., Roch. & Pitts.	3,477,598	223,484	3,701,082
Penn. lines, N. Y. C.	4,149,592	44,907	4,194,499
Pitts. & L. Erie.....	5,012,458	1,808,997	6,821,455
Norfolk & Western.	7,042,055	1,216,778	8,258,833
Total.....	33,963,771	5,118,027	39,081,798
Total, 1907.........	42,909,847	9,622,931	52,532,778

Decrease in coal, 8,946,076 tons; in coke, 4,504,904; total, 13,450,980 tons, or 25.6 per cent. In addition to the above, the Baltimore & Ohio carried 643,638 tons anthracite in 1907, and 485,177 in 1908; decrease, 158,461 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, eight months ended Aug. 31, short tons:

	1907.	1908.	Changes.
Hocking Valley......	2,569,057	1,853,956	D. 715,101
Toledo & Ohio Cent..	1,178,522	896,630	D. 281,892
Baltimore & Ohio....	1,486,006	903,357	D. 582,649
Wheeling & L. Erie..	2,290,975	1,732,632	D. 558,343
Cleve., Lorain & Wh.	1,914,996	1,568,090	D. 346,906
Zanesville & Western	1,071,431	742,411	D. 329,020
Toledo Div., Pen. Co.	1,563,345	981,681	D. 581,664
L.Erie,Alliance&Wh.	810,544	618,183	D. 192,361
Marietta, Col. & Clev.	18,626	29,449	I. 10,823
Total...............	12,903,502	9,326,389	D.3,577,113

The total decrease this year was 27.7 per cent. Only one small road showed an increase.

Coal and coke tonnage Chesapeake & Ohio railway, two months of fiscal year, July 1 to Aug. 31, short tons:

	Coal.	Coke.	Total.
New River	1,111,167	32,582	1,143,749
Kanawha.............	850,770	3,747	854,517
Kentucky.............	47,792	......	47,792
Connecting lines.....	28,338	10,997	39,335
Total.................	2,038,067	47,326	2,085,393
Total, 1907...........	1,985,805	81,502	2,067,307

Deliveries this year: Points west of mines, 1,072,367 tons coal and 27,782 coke; points east, 255,156 tons coal and 19,544 coke; tidewater, 708,741 tons coal; anthracite to line points, 1803 tons.

New York

ANTHRACITE

Oct. 21—Large operators report considerable activity in both prepared and small steam sizes. Wholesale dealers state that small sizes are not so active and that No. 1 buckwheat is especially dull. All-rail trade is not so brisk as that going to tidewater. Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

The moderate activity which has existed for the last two weeks continues at all points except New York harbor. The demand from shoal-water ports is fair although not especially noticeable. Business along the Sound has picked up and consumers are taking more coal than heretofore. New York harbor continues dull and prices remain unchanged at $2.50@2.65 for good grades of coal. Transportation is good.

In the Coastwise vessel trade rates continue firm and as a rule about 5c. higher than last week. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

Birmingham

Oct. 19—There is a steady increase still in the output at the coal mines in Alabama. The Tennessee company has removed the convict labor to the new shaft in the Pratt Mines division and has given Nos. 2 and 10 mines over to free labor. Coal washers are being added to this division and other preparations being made to get the largest possible output. There are yet a number of miners to be given employment in the mines. The indications point to an inclination on the part of the various companies which were involved in the strike to do the best they can for the men.

Coke production is improving right along. A good demand exists for coke.

Chicago

Oct. 19—Though warm weather at the end of the week has somewhat lessened the demand for domestic coals, there is a fair sale of Eastern and Western, with the market firm. Retailers and consumers in city and country continue to lay in stocks. Shippers are keeping away from the market a good deal of the coal that has made prices weak; the consequence is little coal requiring to be sold to meet demurrage charges. Eastern coals are better in tone, except smokeless run-of-mine, which is too plentiful. Western lump is strong, run-of-mine is a little dull, and screenings are variable.

Lump and egg from Illinois and Indiana mines sell for $1.85@2.50; run-of-mine for $1.75@2.15, and screenings for $1.20@1.50. Hocking Valley has no surplus, and is in good demand at $3.15. Pittsburg No. 8 brings steadily $2.75@2.85 for ¾-in. Youghiogheny moves on contracts at $3 for steam and $3.15 for ¾-in. gas. Smokeless is increasing in sales and brings $4.20@4.30 for Pocahontas and New River lump, with other lump selling at $4.05, and run-of-mine $2.90@3.45; there is much low-grade smokeless on the market.

Anthracite finds a fair sale, the distribution being general over Chicago territory and all sizes in good supply.

Cleveland

Oct. 20—It is estimated that the Lake coal trade will show a decrease of at least 1,500,000 tons from last year. Thus far there have been no signs of the rush of shipments which usually comes in the last month of the navigation season. Notwithstanding the comparatively light shipments, heavy stocks are still reported on docks at the upper Lake ports.

Indianapolis

Oct. 20—Coal-mine operators throughout the State feel a measure of satisfaction because the output of their mines during the past week was equal to the corresponding week a year ago. Such a comparison is indicative of that progress necessary to bring about normal conditions.

There has been a greater demand for steam and foundry coal, and judged from the current orders from mills and manufacturers it is apparent that business is improving.

Pittsburg

Oct. 20—There is no material change in the coal situation; mine-run is on the basis of $1.15 a ton at the mine. Only some large concerns, however, are holding to this price, others making sales at lower rates, the minimum this week being 90c. There is no regular price for slack, 40@50c. being nominal quotations. It is understood that M. A. Hanna & Co. have made additional contracts with independent interests for Lake coal.

Connellsville Coke—Production has fallen off, but shipments show a gain. Prices continue $1.65@1.85 for furnace and $2.10@2.25 for foundry. A number of sales have been reported under these prices, some foundry going as low as $1.90 and furnace at $1.40@1.50. The *Courier* gives production in both regions at 201,713 tons. Shipments 7707 cars as follows: To Pittsburg district, 3029; to points west of Pittsburg, 4236; to points east of Connellsville, 442 cars.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, nine months ended Sept. 30, long tons:

	1907.	1908.	Changes.	
Coal..	46,883,755	46,579,700	D.	304,055
Coke.....	656,198	817,082	I.	160,884
Briquets....	1,107,737	1,136,691	I.	28,954
Total exports	48,647,690	48,533,473	D.	114,217
Steamer coal......	13,884,782	14,490,794	I.	606,012
Total.. . .	62,532,472	63,024,267	I.	491,795

The larger exports this year were to France, 7,786,683 tons; Germany, 7,268,507; Italy, 9,443,000; Sweden, 3,080,440 tons.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 10: Best Welsh steam, $3.72; seconds, $3.48; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.92; seconds, $1.50. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 21—The iron and steel markets are still in a waiting condition. No one seems to be disposed to buy far ahead, and sellers are not pressing contracts which cannot be placed except at a cut in prices.

In foundry iron business continues to be in small lots for deliveries this quarter. There are inquiries for next year, but they are regarded as only feelers to test the market. Some furnaces which are short of orders have been cutting prices.

In finished material there have been some orders for railroad bridge work placed; otherwise the railroads are still out of the market. Some large building contracts are still hanging fire; quite a number of small ones have been placed, mostly at rather low figures.

There is a good deal of talk about export business. It is difficult to locate this business, as foreign contracts are generally kept quiet, for obvious reasons.

The board of directors chosen at the annual meeting of the Colorado Fuel and Iron Company this week shows that the control of the company has passed from the Gould to the Rockefeller interests. This confirms a belief that has been quite general. J. F. Welborn continues president, but L. M. Bowers, a Rockefeller representative, is now treasurer and D. C. Beaman secretary and general counsel.

Baltimore

Oct. 20—Imports of the week included 7250 tons manganese ore from India and 6000 tons from Brazil; 4950 tons iron ore from Cuba; 100 tons ferromanganese from Liverpool. Exports included 955,047 lb. tin scrap to Rotterdam; 1964 tons steel rails to Cuba.

Birmingham

Oct. 17—There has been but a little business booked lately by Alabama pig-iron manufacturers. The consumers are waiting until after the election. There is a steady inquiry, however, indicating that a large amount of iron is needed. There is also a good delivery of iron being made in this section, on orders placed some time ago. Very little business has been countermanded or ordered held for future instructions as to delivery. Quotations held [illegible] per ton, No. 2 foundry. While some inquiry continues to come in as to iron to be delivered next year there are no orders being placed worthy of mention. The make in this section has been increased by the blowing in of two furnaces. The rolling mills of the Tennessee company at Bessemer are again in operation. The car and foundry plant at Anniston is doing well again and the cast-iron pipe plants have recently received additional orders.

Chicago

Oct. 19—The iron and steel market continues dull, but with no signs of weakening. All interests, indeed, are awaiting the developments of the election. Inquiries are numerous and for increasing amounts, showing that the needs of business are large. The great majority of buyers, or would-be buyers, are confining their orders to this year's deliveries, as [illegible] 1909 deliveries it is not for large amounts.

These conditions make quotations apply only to the small business that is being [illegible] for speedy or delayed delivery, the price [illegible] would undoubtedly be shaded materially [illegible] vailing. At the standard quotations Northern iron obtains the preference of most buyers of quick-delivery lots. Lake Superior charcoal iron is steady at $19.50@20.

In iron and steel products there is no marked change. Coke is in better demand [illegible] Connellsville; Southern cokes, 15@25c. lower.

Philadelphia

Oct. 21—The orders for pig iron which have been quietly booked at eastern Pennsylvania furnaces, especially during the past few days have allayed much anxiety as to business and prices for the first quarter of next year. A few large consumers were taken by surprise this week when they learned of the withdrawal of certain options on next quarters' delivery. Those who order for next quarter will pay 25c. per ton more than they would have had to pay two or three weeks ago. Foundry iron is the subject of more inquiry than for some months. Basic pig is stronger than it has been. Forge is the weakest on the list.

Pittsburg

Oct. 20—There has been no improvement in demand for finished steel products, and the market remains very quiet. There has been some improvement in sentiment. The trade finds encouragement in recent railroad reports. There is some uneasiness as regards prices, since there is a little shading in several finished steel products and it may possibly be found necessary to reduce prices of certain products. These reports have already noted shading of $1 to $2 a ton in plates of $1 in black and $2 in galvanized sheets; tinplates are shaded 5 or 10c. a box. It is believed that in some cases where low prices have been made on fabricated steel contracts the fabricators have secured a concession on the shapes from the mills on account of the large tonnage involved.

Pig Iron—The Pittsburg Steel Company, which has been negotiating at intervals for a long time for a regular supply of basic pig iron for its new plant of eight 60-ton basic open-hearth furnaces, which was put in partial operation Aug. 1 last, has closed a contract with the Penn Iron and Coal Company for 6000 tons of basic pig a month for five years, commencing Nov. 1 next. The price is to be 7 per cent. above the current cost of production, although details are not available as to the method by which the cost of production is to be computed. The Penn company operates one blast furnace at Canal Dover, O., and is controlled by M. A. Hanna & Co., who are large ore [illegible] known. The contract disposes of more than half the output of the furnace. The Pittsburg Steel Company has just bought a block of 10,000 tons of basic pig from the Struthers Furnace Company, at $14, furnace, for delivery 500 tons a day, which will carry it until shipments commence on the Dover contract. Corrigan, McKinney & Co., a large ore interest, and operating Josephine Furnace, have sold in the past few days 2000 tons of forge at $13.75, furnace, and 3000 tons of No. 3 foundry at $14, furnace, both for delivery this year. The Allegheny Steel Company gets 5000 tons of basic iron for delivery this year at about $14, furnace. The iron for the United Steel Company, Canton, O., has not been closed. The market is quotable as follows, f.o.b. Valley furnaces: Bessemer, $15; basic, $14@14.25; malleable, $14.50; No. 3 foundry, $14.50; gray forge, $13.50@13.75.

Steel—Extremely quiet. Billets remain $25, Pittsburg. Tank plate is nominally 1.60c., but prices shaded $1 to $2 a ton. Merchant steel bars, 1.40c.

Steel—Unchanged. The regular figures are 2.50c. for black sheets and 3.55c. for galvanized, 28 gage, but black sheets are sometimes shaded $1, and galvanized $2 a ton.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 21.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1908..	$ 3,974,391	$ 4,695,894	Imp.$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 17: Gold, none; silver, $785,378, to Great Britain and France. Imports: Gold, $128,194; silver, $175,126, from Mexico and South America.

Foreign commerce of the United States, nine months ended Sept. 30, reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1907.	1908.
Exports.................	$1,331,588,696	$1,230,837,439
Imports............. ..	1,108,072,299	798,168,922
Excess, exports......	$ 223,516,397	$ 432,668,517
Add excess of exports, silver.........		8,055,905
Add excess of exports, gold..		30,580,564
Total export balance................		$ 471,304,886

The gold and silver movement in detail is given in the table at the head of this column.

Gold and silver movement in Great Britain nine months ended Sept. 30:

	Imports.	Exports.	Excess.
Gold..........	£35,626,226	£34,813,302	Imp. £ 812,924
Gold, 1907...	33,752,192	24,989,296	Imp. 8,762,896
Silver........	7,828,203	10,053,137	Exp. 2,224,934
Silver, 1907.	12,603,097	13,199,952	Exp. 596,855

Silver

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver. New York Cents.	Silver. London Pence.	Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
15	4.8655	51⅜	23¹¹⁄₁₆	19	4.8655	52	24
16	4.8660	51½	23¾	20	4.8650	51½	23¾
17	4.8660	51¼	23⅞	21	4.8655	51⅜	23¹¹⁄₁₆

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Owing to bear operations in India in futures, spot silver shows no tendency to advance; any small improvement in price being soon met by a pressure to sell. The bear commitment for futures is large, according to the best information.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 8:

	1907.	1908.	Changes.
India... ...	£9,702,354	£7,329,163	D. £2,373,191
China.......	......	516,400	I. 516,400
Straits......	625,950	112,385	D. 513,565
Total......	£10,328,304	£7,957,948	D. £2,370,356

Copper, Tin, Lead and Zinc

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
15	13½ @13⅝	13⅛ @13⅜	59½	29¼	4.32½ @4.37½	4.77½ @4.82½	4.62½ @4.67½
16	13½ @13⅝	13⅛ @13⅜	59¹¹⁄₁₆	29⅛	4.25 @4.30	4.77½ @4.82½	4.62½ @4.67½
17	13½ @13¾	13⅛ @13⅜	. . .	29⅛	4.25 @4.30	4.77½ @4.82½	4.62½ @4.67½
19	13½ @13¾	13⅛ @13⅜	59⁹⁄₁₆	29⅛	4.25 @4.30	4.77½ @4.82½	4.62½ @4.67½
20	13½ @13¾	13⅛ @13⅜	59⅜	29⅜	4.22½ @4.27½	4.77½ @4.82½	4.62½ @4.67½
21	13½ @13¾	13⅛ @13⅜	59¹⁵⁄₁₆	29⅝	4.20 @4.25	4.77½ @4.82½	4.62½ @4.67½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is still dull, although the week Oct. 15-21, shows somewhat more business than the previous week, both for domestic and foreign account. A noteworthy feature has been an increase in the difference between the prices for Lake and electrolytic copper. The floating supply of Lake has apparently been absorbed, and consumers requiring this grade have had to pay the prices asked by producers. Calumet & Hecla is understood to be still asking 14c. and is reported to have made some small sales at that price, which, of course, can have been only on orders for that particular brand of copper. The electrolytic situation is different, there being apparently plenty offered at previous prices. Offers at 13⅜c. and lower, net cash, New York, have failed to secure orders, the bulk of which appear to have been taken at about 13¼c., while orders for export have been accepted at somewhat lower prices. The market closes at 13½@13¾c. for Lake copper and 13⅛@13⅜ for electrolytic. The average for casting copper during the week has been 13@13⅛ cents.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c.. Wire, 14¾c. base, carload lots at mill.

The London market for standard copper has also been very dull, and fluctuated around £59 10s. for spot, £60 5s. for three months. On Wednesday there was more activity and the market closes at £59 18s. 9d. for spot, £60 15s. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 2000 tons.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£75 10s.

Tin—The London market, which had been barely steady throughout the larger part of the week, has developed a good deal of strength at the close, accompanied by large transactions. The close is cabled as firm at £134 5s. for spot, £135 17s. 6d. for three months.

The advance abroad has had an encouraging effect on home dealers and consumers, and especially among the latter more interest is shown in future deliveries. The domestic market at the close is quoted at about 29⅝c. per pound.

Lead—The market has had a further decline, and considerable lead is offered at the lower figures. Consumers appear to be well covered and are holding off. At the close the metal is quoted at 4.20@4.25, New York, and 4.05@4.10, St. Louis, and the market appears to be rather demoralized.

There was a flurry in the London market for Spanish lead, due to rumors of a strike having broken out at the Broken Hill Proprietary mines in Australia. These, however, proved to be unfounded. At the close Spanish lead is quoted at £13 6s. 3d., English lead at £13 8s. 9d. per ton.

Spelter—Transactions have taken place right along during the week, and in some cases slightly lower figures have been accepted. However, the position of the metal remains strong, as reports from manufacturing districts show that consumption is slowly improving, and on the other hand supplies of ore are not abundant. The market closes at 4.62½@4.67½c., St. Louis, 4.77½@4.82½c., New York.

The London market is unchanged at £19 12s. 6d. for good ordinaries, £19 17s. 6d. for specials.

The Bartlesville Zinc Company, at Bartlesville, Oklahoma, has resumed operations.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is quiet, both in New York and abroad. Prices are higher for forward than for early delivery. Quotations are 8⅛@8½c. for Cookson's, 7¾@8c. for Hallett's, and 7⅝@7¾c. for ordinary brands.

Aluminum—There has been a considerable reduction in prices. Base price of ingots is now 26c.; sheets, 35c. per pound.

Platinum—Business is reported to have been done recently at $18@20 for refined and $17.50 for scrap. This is considered low, and an advance is expected, as business has increased lately, especially with jewelers.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Nickel—Large lots, 40c., New York.

Quicksilver—New York price is $46 per flask of 75 lb. for large lots. San Francisco, $43@44 for domestic sales; $41@42 for export. London price is £8 10s. per flask, with £8 7s. 6d. done by jobbers.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, nine months ended Sept. 30, figures in long tons, except quicksilver, which is in pounds:

	Imports	Exports	Excess	
Copper	129,674	50,092	Imp.	[illegible]
Copper, 1907	85,161	51,489	Imp.	[illegible]
Tin	35,661	29,958	Imp.	[illegible]
Tin, 1907	33,046	28,455	Imp.	[illegible]
Lead	176,[illegible]	58,728	Imp.	[illegible]
Lead, 1907	145,181	34,320	Imp.	110,861
Spelter	79,135	6,173	Imp.	72,962
Spelter, 1907	80,099	[illegible]	Imp.	[illegible]
Quicksilver, lb.	3,130,466	1,295,071	Imp.	1,835,395
Quicksilver, '07	2,917,596	1,773,239	Imp.	1,144,357

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Tin-ore imports, 15,761 tons in 1907, and 19,298 in 1908. Imports of iron and copper pyrites, 576,586 tons in 1907, and 598,015 in 1908. Of the imports this year the United States furnished 5045 tons copper matte, 48,652 tons fine copper and 27,998 tons lead.

Zinc and Lead Ore Markets

[illegible] The highest price paid for zinc blende was $3[illegible], the [illegible] base ranging from $34 to $36.50 per ton of 60-per cent. zinc. The highest for zinc silicate was $25.50, on a base of $18 per ton of 40-per cent. zinc. The average price, all grades, was $32.98. The highest price paid for lead was $54, on settlements of the previous week's purchase, the price declining at the week-end to $51. Medium grades sold at $52. The average price, all grades, was $51.98 per ton.

Local papers reported that producers were holding both zinc and lead ore for better prices, but the increase in shipment does not bear out such an assertion. The stock of zinc in the bins which reached nearly 8000 tons at the close of last week, has been materially decreased by the heavy shipment this week, while the output is on the wane in the older camps.

[illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	3,308,420	996,120	$82,140
[illegible]	2,768,170	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	16,758
[illegible]	[illegible]	[illegible]	10,147
[illegible]	[illegible]	148,160	[illegible]
[illegible]	[illegible]		9,391
[illegible]	[illegible]		7,008
[illegible]	385,570	[illegible]	[illegible]
[illegible]	[illegible]	136,080	6,483
[illegible]	[illegible]	[illegible]	5,450
[illegible]	[illegible]	[illegible]	[illegible]
Carl Junction	199,590	15,220	[illegible]
[illegible]	[illegible]	31,650	1,928
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		1,556
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		1,478
[illegible]	64,410		1,030
[illegible]	[illegible]		918
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
42 weeks	402,152,330	61,826,730	$8,487,410
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

MONTHLY AVERAGE PRICES.

	[illegible]				LEAD ORE.	
[illegible]	[illegible]		[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
January	$46.90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	48.30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	52.47
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	56.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	46.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	

[illegible] Lead ore prices are the average for all [illegible]

Platteville, Wis., Oct. 17—This week $37 was the highest price paid for zinc ore on a basis of $36 per ton of 60 per cent. zinc. The base price paid for 80 per cent. lead ore was $52 per ton.

Shipments, week ended Oct. 17:

[illegible]	[illegible] ore, lb.	[illegible]	[illegible]
Platteville	911,030		[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] shipped to the Electrostatic Separator, from Benton, 298,510 lb.; from Linden, 63,170 lb.; from Potosi, 52,505 lb. Shipped to the Joplin Separator Works, at Galena, 53,700 lb. Shipped to the Enterprise roaster, at Platteville, from Strawbridge, [illegible]

Chemicals

[illegible] market has been quiet and trading has been light and for immediate needs. Prices have not changed and business seems to be waiting on the political situation.

Copper Sulphate—The market is quiet and unchanged. Quotations remain at $4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate of Soda—The market is firmer, but the demand is quiet. European dealers are buying heavily on the West Coast. Prices are 2.15c. for spot and for the remainder of 1908 and for 1909 the quotation is 2.17½c.

[illegible] port the exports of Sicilian sulphur as follows, seven months ended July 31, in tons of 1030 kg., as usual in the trade:

	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stocks, Aug. 1	533,022	542,641	I.	9,619

The Silician situation has been complicated by strikes among the miners, resulting in serious riots, which could only be subdued by a strong military force.

Mining Stocks

New York, Oct. 21—The general stock markets have shown some strength, as far as quotations are concerned. It is a traders' market, however, marked by moderate fluctuations, in which no definite tendency is apparent. There is an uncertainty which will probably continue until after election.

The Curb market has been fairly active, the copper stocks generally holding firm, or gaining slightly. The Nevada and Cobalt stocks were less firm, and less in demand.

One sale of Homestake, of South Dakota, was reported during the week, at $88 per share.

The directors of the Amalgamated Copper Company have declared a quarterly dividend of 0.5 per cent., the same as for the previous quarter. This was generally expected.

Boston.

[illegible] attention in this market the past week. [illegible] prevalent. The declaration of the regular quarterly dividend of 50c by the Amalgamated Company gave a slight stimulus to the market.

The so-called Amster stocks have been well bought, while Old Dominion and Superior Copper have had good sized bulges. Arizona Commercial rose $4.50 to $36.25, reacting but a small portion of the advance. Boston & Corbin has also been active, selling up $1.87½ to $19.37½. A bull pool has been at work in Old Dominion and the result was a $4.75 advance to $50.25, reaching to below $49. Superior Copper rose $3.62½ to $29.87½, reacting to $28. This company is expected to begin shipments to the mill in a few weeks. The Old Dominion has wiped out a floating indebtedness of $400,000 this year, and now has a working capital of over $800,000.

Copper Range has been steady around $72.50 and $73.50 and North Butte at from $81 to $83.37½. Amalgamated closed at its best tonight at $76.50. Brokers report that they are carrying but small lines of this stock. The 2,000,000 shares of Superior & Pittsburg Copper stock, of which 1,472,790 shares have been issued, have been placed on the unlisted department of the Stock Exchange. The price is about the same as when taken from the Curb.

Osceola has been firm at $116@119. The injunction against voting Calumet's holdings of this stock still holds and the adjourned annual meeting has been again adjourned.

Affairs have been quiet on the Curb. This institution has got to move its quarters and will take up its abode on Doane street a short distance from its present location on Exchange Place.

STOCK QUOTATIONS

NEW YORK Oct. 20

Name of Comp.	Clg.
Alaska Mine	7/16
Amalgamated	76⅝
Anaconda	44½
Balaklala	‡2 1/16
British Col. Cop.	6⅝
Butte & London	.....
Butte Coalition	24¼
Colonial Silver	¾
Cum. Ely Mining	7⅝
Davis Daly	3
Dominion Cop.	1
Douglas Copper	2¾
El Rayo	4¼
Florence	3 13/16
Foster Cobalt	.58
Furnace Creek	.16
Giroux	4
Gold Hill	7/16
Goldfield Con	5¾
Granby	100
Greene Gold	⅜
Greene G. & S	⅛
Greenw'r & D. Val.	‡ 75
Guanajuato	1⅝
Guggen. Exp.	172
Hanapah	.15
McKinley Dar.	.96
Micmac	2
Mines Co. of Am.	1 1/16
Mitchell Mining	⅛
Mont. Sho.C	⅞
Nev. Utah M. & S.	2 15/16
Newhouse M. & S	5
Nipissing Mines	9⅛
Old Hundred	½
Silver Queen	1.16
Stewart	11/16
Tennessee Cop'r.	46
Tri-Bullion	1
Union Copper	⅝
Utah Apex	5
Utah Copper	42
Yukon Gold	4½

BOSTON Oct. 20

Name of Comp.	Clg.
Adventure	7½
Allouez	36½
Am. Zinc	‡24¼
Arcadian	‡3½
Arizona Com	35
Atlantic	18⅞
Bingham	‡.30
Boston Con	13⅝
Calumet & Ariz.	117
Calumet & Hecla	665
Centennial	‡34½
Con. Mercur	.40
Copper Range	73½
Daly West	‡9⅛
Franklin	12¼
Greene—Can.	9⅞
Isle Royal	23⅛
La Salle	14
Mass	‡5¼
Michigan	13½
Mohawk	62½
Nevada	16⅝
North Butte	82½
Old Colony	‡.60
Old Dominion	49¼
Osceola	118
Parrot	27¾
Quincy	90
Rhode Island	‡4
Santa Fe	1¾
Shannon	15⅛
Superior	28
Tamarack	72
Trinity	17½
United Cop., com.	‡10⅝
U. S. Oil	25¼
U. S. Smg. & Ref.	39
U.S.Sm. & Re.,pd.	44¼
Utah Con	40½
Victoria	‡4
Winona	‡5⅜
Wolverine	‡140
Wyandotte	2⅜

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	‡27½
Am. Smelt. & Ref.	88¾
Am. Sm. & Ref., pf.	104½
Bethlehem Steel	21
Colo. Fuel & Iron	35¾
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	83
National Lead, pf.	‡103
Pittsburg Coal	‡10½
Republic I. & S.	‡22¼
Republic I. & S., pf.	79½
Sloss-Sheffield	63½
Standard Oil	625
U. S. Red. & Ref.	‡10
U. S. Steel	47⅛
U. S. Steel, pf	109⅝
Va. Car. Chem	31¾

BOSTON CURB

Ahmeek	120
Black Mt	3½
East Butte	8
Hancock Con	‡6½
Keweenaw	‡3¾
Majestic	.71
Raven	.87
Shawmut	.12
Superior & Pitts.	‡14
Troy Man	.25

ST. LOUIS Oct. 17

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.04	.03
Center Cr'k	1.80	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	76.00	74.00
Cent. Oil	110.00	100.00
Columbia	5.00	4.00
Con. Coal	21.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.20	.18
St. Joe.	15.00	13.00

LONDON Oct. 21

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 1 0
Camp Bird	0 13 9
Esperanza	3 6 3
Tomboy	1 1 2
El Oro	1 5 0
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 21.
Furnished by Weir Bros & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.24
Best & Belcher	.43
Caledonia	.18
Chollar	22
Comstock	‡.24
Con. Cal. & Va.	.59
Crown Point	.24
Exchequer	.35
Gould & Curry	.19
Hale & Norcross	.52
Mexican	.62
Ophir	1.80
Overman	.17
Potosi	.20
Savage	.39
Sierra Nevada	.33
Union	.28
Utah	.04
Yellow Jacket	.48
TONOPAH STOCKS	
Belmont	1.10
Extension	.57
Golden Anchor	.01
Jim Butler	.22
MacNamara	.53
Midway	.28
Montana	.80
North Star	.06
Tono'h Mine of N.	7.12½
West End Con	.53
GOLDFI'D STOCKS	
Adams	.03½
Atlanta	22
Booth	.38
Columbia Mt	.21
Comb. Frac	1.33
Cracker Jack	.06
Dia'dfield B. B. C.	.14½
Goldfield Belmont	.05
Goldfield Daisy	1.06
Great Bend	.35
Jumbo Extension	.32
Katherine	..
Kendall	.15
Lone Star	.08
May Queen	.06
Oro	.10
Red Hill	.23
Roanoke	..
Sandstorm	.21
Silver Pick	.15
St. Ives	.23
Triangle	.03
BULLFROG STOCKS	
Bullfrog Mining	.03
Bullfrog Nat. B	.04
Gibraltar	.03
Gold Bar	.03
Homestake King	.21
Montgomery Mt.	.05
Mont. Shoshone C.	.87½
Original Bullfrog	.01
Tramp Cons	.15
MANHAT'N STOCKS	
Manhattan Cons.	.05
Manhat'n Dexter	.03
Jumping Jack	.03
Stray Dog	.03
MISCELLANEOUS	
Golden Boulder	.05
Bonnie Clare	.07
Lee Gold Grotto	...
Nevada Hills	1.00
Nevada Smelting	.87½
Pittsburgh S. Pk.	.95
Round Mt. Sphinx	.16

COLO. SPRINGS Oct. 17

Name of Comp.	Clg.
Acacia	6½
Black Bell	....
C. C. Con	3½
Dante	‡6½
Doctor Jack Pot	7⅛
Elkton	65½
El Paso	44
Findlay	‡19
Gold Dollar	7⅛
Gold Sovereign	3⅛
Isabella	28½
Index	....
Jennie Sample	2½
Jerry Johnson	3⅞
Mary McKinney	30
Pharmacist	‡3¼
Portland	1.00
Un. Gold Mines	3⅞
Vindicator	83½
Work	10½

Assessments

Company.	Delinq.	Sale.	Amt.
American Fork Utah	Oct. 28	Nov. 25	$0.01
Birchville, Cal	Nov. 2	Nov. 20	0.03
Brookland, Utah	Oct. 24	Nov. 9	0.01
Brunswick Con., Cal	Oct. 20	Nov. 19	0.03
Bullion, Nev	Oct. 29	Nov. 20	0.05
Caledonia, Nev	Oct. 21	Nov. 11	0.05
California, Cal	Oct. 17	Nov. 7	0.02
Gould & Curry, Nev	Oct. 7	Oct. 29	0.10
Highland, Utah	Oct. 23	Nov. 16	0.01
Lady Washington, Nev	Oct. 26	Nov. 16	0.05
Massasoit, Utah	Oct. 17	Nov. 5	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
New Mercur, Utah	Oct. 19	Nov. 9	0.01
N. Y. Bonanza, Utah	Nov. 5	Nov. 25	0.02
Pittsburg Con., Utah	Oct. 12	Nov. 2	0.01
Seg. Belcher	Nov. 7	Nov. 20	0.03
Sierra Nevada, Nev	Oct. 14	Nov. 4	0.10
Uintah Treas., Utah	Nov. 2	Nov. 20	0.01
Utah United, Utah	Nov. 10	Nov. 27	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	......	28.863	......
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	......	13.551	......	60.717	....
November	13.391	.....	13.870	....	61.226	...
December	13.163	....	13.393	......	60.113	.....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	......
May	43.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	......	18.531	......
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	......	5.280	......	21.781	......
November	4.925	.....	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, OCTOBER 31, 1908. NO. 18.

Ore Dressing by Adhesion of Liquid Films

Principles of Elmore Process and Other Systems Based upon Surface Tension and the Property of Minerals to Attract or Repel Different Liquids

BY R. STÖREN*

The pioneers in the field of the so-called oil process for ore dressing seem to have thought that a special quality of oil was the beginning and end of the process; hence its name. The positive quality upon which this process rests is, however, a property of the mineral treated; in this respect the principle of the process is like all other principles of ore dressing. The oil is only a single one of the several factors which take part in the process, a part which, in the case of a couple of the minerals treated by the process, is even unnecessary. A. S. Elmore's apparatus marks the turning point in the history of the process under review, a process which depends upon the quality possessed by some minerals, when in a finely divided state, of adhering to liquid films, thus permitting the particles to be separated by flotation from other particles of the same or even lower specific gravity.

PROPERTIES OF LIQUID FILMS

It is well known that the condition of the molecules or particles along the surface of a liquid is different from that prevailing in the interior. In the surface layer the molecules, by reason of the freedom from molecular attraction on the free side, are held together more firmly, thus forming a thin membrane or film, known as the liquid film, which has a greater resistance to rupture than the liquid inside. A drop of liquid may be thought of as being inclosed in a thin membrane like the gas in a rubber balloon. The thin membrane or film-like rubber is elastic, and exerts a pressure on the inclosed liquid, a surface tension varying with the nature of the liquid.

The same is true in regard to the surface of a gas bubble surrounded by a liquid; the bubble's surface is in contact with the inclosing film, the inward tension of the film and the outward pressure of the gas being in equilibrium. If such a bubble, situated for example at the bottom of a glass of water, rises to the surface of the water, it will during its progress keep the same inclosing film of water, the identical molecules, as if it were a tiny balloon, held more firmly around the gas than the surrounding water.

[illegible] TENSION AND ADHESION

When a needle is placed gently upon the surface of water, it floats, although its specific gravity is many times that of water. If the needle is oiled slightly so that the water will not wet it, it will be easier to place the bit of steel upon the water without breaking the surface film. The needle is supported by the liquid film, which does not break because the oiled surface does not adhere to the water and thus does not break the continuity of the film. In the same way all small bodies having suitable surface properties will remain in contact with the film, and if the weight is not too great and the area sufficiently large, they will be supported by the film, either the layer of molecules stretched over the surface or that forming a bag around a gas bubble formed in the interior of the liquid.

If a little fine and dry chalcopyrite is poured on the surface of water, it will be observed that some of the particles remain floating upon the surface. This principle is employed in a machine recently described in the JOURNAL, and employed in the United States for concentrating chalcopyrite ore by constantly bringing the finely crushed material in contact with the free surface of water. Returning to the experiment it will be observed, that some pyrite particles which have fallen to the bottom and have, therefore, become wet, adhere to bubbles of air. If the pyrite particles are of suitable dimensions more of them, and perhaps nearly all, may be made to attach themselves to bubbles, by heating the water or diminishing the atmospheric pressure so as to cause a more copious evolution of bubbles; then by cautiously moving the liquid the agglomeration of bubbles and mineral particles may, if the combined weight be not too great, be made to rise to the surface.

In Norway experiments have been made in concentrating chalcopyrite and pyritiferous ore by means of the air bubbles developed in a column of water under partial vacuum without other aid. About 23 per cent. of the chalcopyrite has in this way been separated in the concentrate. Experiments made with other minerals prove that they do not all behave like chalcopyrite. The difference is very considerable, the form and luster of the surface being vital factors. Minerals such as graphite and molybdenite, which feel greasy to the touch and are thinly laminated, float upon water surfaces easily; others, such as quartz and granite do not float at all.

These peculiarities of minerals may conveniently be tested in a glass or beaker [illegible] a 40-mesh screen. By carefully heating [illegible] ant development of air bubbles is produced, and the mineral's ability to adhere to the bubbles and be brought to the surface will appear. Graphite and molybdenite are floated with great ease; chalcopyrite, pyrrhotite, and iron pyrite separate easily; bornite, zinc blende and mica fairly easily; less easily galena, hematite, magnetite and chalcocite; hornblende and feldspar with difficulty, and quartz and granite not at all.

[illegible]

To obtain suitable conditions for ore-dressing by means of the adhesion of pyrite particles to gas bubbles, it is evident [illegible] by means of, a liquid having better cohesion than water, at the same time having the property of wetting the valuable minerals and forming a stronger film round the gas bubbles. Such a liquid is oil. Particles of metallic minerals which are wetted by oil have no capacity of adhesion to gas bubbles in an oil medium, just as quartz particles immersed in water do not rise in water; but since oil repels water and cannot be mixed with it, oil has no surface attraction for bodies wet with water. This fact is an important factor in the process.

If a few cubic centimeters of thick oil [illegible] mesh screen, and the beaker is then well shaken, the chalcopyrite will be wet by the oil, and the particles will adhere to the oil foam or bubbles. On the other hand, the water-wet feldspar will not adhere to the [illegible] of the beaker will be wet with water or oil, according to which of the two liquids first touches the glass, for where the glass is not wet with water, the oil will adhere and where the glass is water-wet the oil will not adhere or wet it.

---

*Mining engineer, Hönefas, Norway.

The pyrite particles mostly adhere to the surface of the liquid film of oil. By agitating the mixture the oil may be thrown about in the water, separated into drops smaller and smaller in size, and finally converted into a foam consisting of air bubbles inclosed in films of oil, giving the particles of pyrite more opportunity to attach themselves to oil films and to be borne to the surface.

By heating the liquid to, say, 80 deg. C., chalcopyrite and feldspar may be completely separated provided that there are no particles containing both minerals. In the heated mixture bubbles become more plentiful; air bubbles with water films and others with oil films are mingled, the oil films bearing pyrite grains. These bubbles expand with the increase of heat, and the whole sponge-like mass rises to the surface. The water-wet particles of feldspar do not adhere to the films of either oil or water about the bubbles, and remain unaffected at the bottom of the beaker.

If mixed particles are present, i.e., true middlings, containing both minerals, the concentrates will carry some feldspar and the tailings some pyrite. In any ordinary crushed product there will also be more or less fine dust which, as slime, will neither sink nor rise in the water and will thus interfere with the process.

Chemical Conditions

The property possessed by pyrite and other minerals of being easily wet by oil and of adhering to liquid films is most apparent in particles having fresh lustrous or crystalline surfaces. When the surface of a pyrite particle becomes coated with a layer of oxide from long exposure to the air, its property of selective adhesion to liquid films is impaired or entirely lost. Tarnished particles may, however, be restored to their original activity by treatment with dilute acids which dissolve the layer of oxide. This effect of the acid is similar to that of a soldering fluid which cleans the iron plate so that the solder can come in actual contact with the surface.

In the operation of the flotation process the admixture of acid is beneficial only to a certain point. Too large a proportion of acid has a harmful influence upon the oil itself, destroying its capacity to foam. Thick oils resist this action of acids better than light oils.

A sulphide dissolved in nitric acid, sp. gr. 1.40, gives a mass of free sulphur, sp. gr. 2, which floats upon the surface of the liquid. Very dilute acids have not, of course, the same effect, but they do, however, have an important effect upon the surface of the pyrite particles. Sulphuric acid has an appreciable effect on pyrite coatings in dilutions as weak as 1 per cent. H_2SO_4 and less. This action of dilute sulphuric acid is intensified by heat. Violent boiling should be avoided.

When particles of hematite, taken from the surface of tarnished rock or ore, are placed in a beaker filled with dilute sulphuric acid, the acid attacks some of the particles, namely those that have weathered surfaces; small bubbles of air or steam in a nascent state are formed; these bubbles grow larger and finally masses of them with adhering mineral particles rise to the surface. This action is facilitated and hastened by heating the liquid or by diminishing the atmospheric pressure above it. On the other hand when particles taken from freshly fractured surfaces are put into the weak acid solution, little or no development of bubbles occurs at ordinary temperatures for the shining crystal planes are not easily attacked by dilute sulphuric acid.

Richards and Thoulet state that an addition of acid to a mixture of slime aids in obtaining a better and more rapid deposit of the material, and that the deposit is more rapid in a thick than in a thin mixture. This phenomenon may be explained as follows: The acid attacks the weathered surface of the minute pyrite particles and causes the evolution of gas bubbles; then the slime thus partially freed from the most plastic particles deposits more readily.

Very dilute acid probably has little chemical effect on pure crystalline pyrite minerals; at least it does not attack clean fracture planes of the copper sulphides, chalcocite, bornite and chalcopyrite. Nor does it attack galena, pyrrhotite, iron pyrite, magnetite, hematite and zinc blende.

The Elmore Process

Considering what has been said about the physical and chemical reactions which take place when oil and acid are applied to a mixture of fine-grained mineral and water, and the effect of agitation and warming upon this mass, it is plain that an ore-dressing apparatus for the use of the oil-acid process must have two chief parts, the mixer and the concentrator or separator, also that the separator must be a vertical cylindrical or conical tank, and that a slow movement of the mixture from below upward is the best arrangement. The fact that ores have very different properties, different degrees of fineness and dissemination of particles, different forms and dimensions of crystals, and different capacities for resisting surface weathering, make it practically impossible to devise a single system suitable for all classes of ore. A. S. Elmore's vacuum concentrator is capable of treating a fairly wide variety of poor ores, using variations within the limitations of the system.

The method of operating the Elmore apparatus is as follows: By reducing the atmospherical pressure in a conical tank, finely crushed ore, previously mixed with acid and oil and a minimum of warm water, is drawn into the apparatus together with additional water at ordinary temperatures. The air and gases, absorbed in the water, are set free by the partial vacuum and the rise in temperature, and the bubbles covered with films of oil or water rise, carrying with them the particles of metallic mineral to the surface. Thus the particles which have become wet with oil during the previous agitation in the mixing tank of the machine are separated from the gangue in the bottom of the cone, borne to the surface, and discharged as concentrates.

To obtain a more rapid and more complete separation, the mixture is stirred by means of a revolving rake at the bottom of the concentrator. This prevents the formation of an inactive zone about the center of the cone. The teeth of the rake also push the tailings outward toward the discharge openings of the machine. The methods of obtaining the vacuum, of feeding and of discharging pulp, have been described in a recent issue of the Journal. One of the advantages of the apparatus is that the process can easily be made continuous. The factors which may be varied to suit the peculiarities of the different ores to be dressed are: Fineness in crushing; the use of acid, or oil, or both, and the quantities added; the temperature of the mass in the mixer; the degree of vacuum; the water supply; the vertical and horizontal velocity; the circulation, etc.

In Norway and Sweden experiments with the process have been made chiefly with chalcopyrite and cupriferous iron pyrite, and with zinc blende. Installations of Elmore machines are in operation at Nautanen in Sweden, and in Sulitelma, Beitstaden, Lökken, Traag, and Hadeland in Norway.

Size of the Particles

The size of the particles is of great importance in the operation, for it greatly affects the results obtained. The fineness to which the ore should be crushed depends upon the size and distributing of the mineral particles, a maximum of purely metallic mineral particles being the aim, or rather a minimum of middlings containing both metallic and nonmetallic minerals in the same particle. There is a maximum and minimum size, between which ore is suitable for concentration by the oil-acid process. Classification may be advantageous, but it is not necessary except for removing the more plastic slime-forming material. The size of the particles ought not to exceed 20-mesh, or about 1 millimeter. Ten-mesh material has been tried, but particles of this size do not adhere readily to bubbles.

The water supply must be in proportion to the size of the ore. The larger the particles the more water must be used in the feed pipe, to increase the velocity and to prevent lodging; this also increases the velocity in the concentrator and aids in holding the material in suspension. [illegible] settling of the tailings against the rising current limits the supply and the [illegible] of the feed water.

The percentage of slime produced [illegible]termines the degree of crushing permissible. The surface of the slime particles is very great in proportion to the volume. The fine material is easily brought into suspension, and long remains in that state. Still finer slime has a plastic consistence, which has an important effect upon the working of the process. When the volume of the minute slime particles approaches zero, the area must also approach zero, and a body which has practically no surface cannot adhere to anything. The finest slime, therefore, cannot be enriched by means of the adhesion process. The addition of acid, as already explained, has some regulative effect; but the finest slime, chiefly the pyrite particles [illegible] with oil in the mixer, passes into the concentrator, and by means of its plastic consistence hinders separation in the central region of the cone. This fine plastic material should, therefore, be removed before the ore enters the [illegible] [illegible] material has been crushed.

The pyrite slime which carries gold and silver may contain a higher proportion of these metals than the original ore. Tests on [illegible] Norwegian ore gave the following results:

	Copper Per Cent.	Silver [illegible] per Ton	Gold [illegible] per Ton
Original ore	1.36	10	1
Slime	1.79	18	[illegible]

An explanation of this phenomenon may be found in the mode in which the precious metals occur in the pyrite, as microscopical particles [illegible] upon the surface of the crystals and between the [illegible] particles and the inclosing rock minerals. The statement made by certain [illegible] authorities that the precious metals [illegible] bound to the sulphides, cannot be accepted without question. During the crushing a relatively large proportion of the precious minerals will detach from the pyrite and, because of their [illegible]ness and high specific gravity, partly pass into the [illegible] and [illegible] into the [illegible]ings. The [illegible] bright surfaces, the so-called black gold, similar to [illegible] of gold [illegible].

The crystalline form of the minerals may play a rather important part in ore dressing [illegible] [illegible] may be [illegible] into two types: [illegible] numerous planes, such as prismatic and tabular crystals, and [illegible] forms, polyhedrons, etc. The form may be of considerable importance when the individual crystals are small enough to pass [illegible] screens, and [illegible] cleavage planes of such minerals as molybdenite and mica.

[illegible]

[illegible] first brought into practical prominence by the introduction of the Elmore vacuum concentrator, the vacuum chamber is not the chief feature of the apparatus; the mixer remains the fundamental factor in the process. Errors made in the mixer, in crushing, in the addition of acid and [illegible] trator. It would be quite as sensible to try to correct the mistake of feeding unclassified material to Wilfley tables by regulating the supply of water. It is, therefore, [illegible] to determine the properties of their constituent minerals, which may require more or less adjustment in the mixer to obtain the best possible result in the concentrator.

As stated before, the effect of the acid is chemical; it removes the weathered surface of the mineral. According to Elmore, mine water with acid reaction may be used instead of the dilute sulphuric acid. Ores with oxidized surfaces require more acid in the mixer than ores with fresh surfaces.

Ore from a Norwegian mine which had [illegible] come weathered, was treated with 0.45 per cent. raw petroleum and 0.[illegible] per cent. [illegible] paratus. The ore before treatment contained 1.15 per cent. copper and 6.8[illegible] per cent. sulphur. The extraction of copper was 56 per cent. and sulphur 46 per cent. The same ore crushed and screened through 35-mesh, and treated with the same quantity of acid and oil yielded an [illegible] per cent. sulphur. The better extraction was due to the fresh fracture planes produced during crushing.

A Swedish ore, also weathered, and containing 1.18 per cent. copper, 1.76 per cent. sulphur, and about 25 per cent. magnetite, after treatment with 0.8 per cent. Texas oil and 0.3 per cent. acid, yielded in the Elmore apparatus, an extraction of [illegible] cent. Fresh ore from the same mine, with the same percentage of minerals and mixed with the same quantities of oil and [illegible] copper and 25 per cent. sulphur.

Chalcopyrite resists surface oxidation better than iron pyrite; the latter requires more acid in the mixer, even when the surfaces are rather fresh. The presence of magnetite in large proportions causes low extraction of iron pyrite, for it neutralizes the acid leaving the particles of pyrite covered with a coating of amorphous oxide. In this case it is better to remove the magnetite by means of magnetic [illegible] process.

In the regular operation of the process it has been remarked that ores with pyrites oxidized on the surface are concen[illegible] ture of less oil than in the case of fresh pyrites. It may be said, that chalcopyrite is separated by means of oil; iron pyrite, by means of acid. It is important that the agitation in the mixer be not so vio[illegible] on the pyrite particles by the acid.

The treatment of bornite in the mixer should be similar to that outlined for pyrite ores. Bornite belongs to that class [illegible] air, are soon covered with a coating. A larger proportion of acid is required than for chalcopyrite and, as in the case of iron [illegible] water in the mixer, bornite ore should [illegible] but also rich tailings. This is, of course, due to the fact that the cleanest pyrite particles have better adhesion to the oil foam than the particles which contain [illegible] oil, some rock minerals, chiefly mica, enter the tailings as well as magnetite and hematite.

The use of warm water in the mixer aids the action of the acid; it also increases the tendency of oils to foam. Heating the water for the feed pipe of the concentrator outside the mixer is, however, not to be recommended, for heat causes the emission of more or less of the absorbed air, and this air furnishes bubbles required in the concentrator.

[illegible]

A Norwegian concentrating plant treat[illegible] bles from the carbonate in the ore, the [illegible] are briefly as follows. From an oil mixer [illegible] narrow cylindrical tank, having an over[illegible] rising, hot, 1-per cent. solution of sulphuric acid meets the descending pieces of limestone, and the bubbles of carbonic acid rise in the tank carrying the oil foam burdened with mineral particles. The con[illegible] while the tailings are removed at the bot[illegible] with the cleaning action of the acid. The plant is to be equipped for the Elmore process.

Attempts have been made to employ an apparatus operated by water pressure instead of by the partial vacuum used in the Elmore process. One inventor employs a high, narrow tank for vertical treatment of the mixture, but without arrangement for horizontal circulation at the bottom. Ore from the mixer and water are introduced through pipes, discharging somewhat above the overflow of the concentrator. In the absence of lateral agitation a neutral zone soon develops, and because of the short interval between the feed and the tailings discharge and the absence of gas bubbles the separation is not satisfactory. In an experimental plant in Sweden based on this principle, ore from the mixer is introduced into the concentrator by means of an injector, and the wide bottom of the conical concentrator is fitted with a rake.

Warming the water in the concentrator by means of double walls and currents of hot water or gases should be as effective for the development of air bubbles as the partial vacuum. The waste gases from a smelting plant might be used for this purpose in places where the concentration is carried on at the same plant. This plan would have the advantage that no high building for the vacuum pipes would be required, but the method has several disadvantages, which the Elmore system has successfully overcome.

The Elmore system has practically set aside the old laws of ore dressing. Like the Gröndal process for magnetic separation, it has revolutionized our ideas concerning the economical dressing of nonmagnetic mixed ores, a class of ores in which the earth's surface is very rich.

Overhand stoping is mainly used on the Rand, South Africa, but, owing to the low dip of the orebodies and the way of carrying the face of the stope, most of the holes drilled (probably 90 per cent.) are wet holes. This drilling of wet holes is due to several things: (1) The inability of the Kafir to drill an upper; (2) the effect of the dust upon the miner's health; (3) the dip of the reefs. The Rand is one of the few places where wet holes are drilled in overhand stopes.

The life of the Barry or "honeycomb" tube-mill liner used at the Waihi mill, New Zealand, is, according to the report for 1907 of the Waihi Gold Mines Company, from 12 to 15 months, and the cost for liners per ton milled is less than one-sixth of what it was when silex blocks were used.

In 1907, a little more than 10,000 lb. of metallic bismuth were produced, in the United States from Mexican ores. An electrolytic process was employed.

A Judicial Definition of "Lake Copper"

In his decision in the case of the Calumet & Hecla Mining Company against the Osceola Copper Mining Company, Judge Knappen, of the United States Circuit Court at Grand Rapids, Mich., summarizes as follows the facts developed in the testimony in regard to the different grades of Lake copper: "Lake copper differs from most other copper in that it is 'native' or usually 'free' and substantially pure, arsenic and other impurities being with rock where elsewhere united with the metal. Till recently practically all copper was furnace refined, and impurities were more readily removed from Lake copper and a better product was obtained. But by electrolysis practically absolute purity is now obtainable, and as a result much lake copper is now refined electrolytically. Calumet refines its highest grade mineral by furnace; other grades by treating a lower grade electrolytically and mixing it with another grade not electrolytically treated, thus diluting the percentage of impurities. Its copper, however treated, is entirely Lake copper and sold as 'Best Lake' copper (not electrolytic) and at one price. Osceola, Tamarack and Ahmeek mix their minerals with cathodes of Western copper produced by Boston & Montana, usually in equal proportions. The product is sold as 'Best Lake,' not as electrolytic, though but half Lake. Some other Lake coppers are likewise treated.

"Of 224,000,000 lb. of Lake copper Calumet's 95,000,000, Quincy's 16,000,000, Osceola's 18,500,000, Tamarack's 10,000,000 and Ahmeek's 3,500,000 are conceded 'Best Lake;' 24,000,000 lb. of seven other mines (including Centennial's 2,250,000 and Wolverine's 10,000,000) are capable of use for all purposes as Lake copper; and no reason appears why most of the remaining Lake product too arsenical for high furnace refinement cannot be electrolytically refined.

"There is no inherent chemical or physical difference between equally pure furnace refined and electrolytically refined copper, if the latter is subjected to the same final furnace process, as it usually is. Electrolytic is capable of use for any purpose for which best Lake is used. The ¼c. premium of the latter is probably due to the long existing good reputation of Lake. With electrolytic improvement this preference is diminishing. The Government originally specified Calumet alone for cartridges, but now indicates a willingness to take the best electrolytic. In the last five years Calumet has sold the Government only 1,000,000 lb. Attempts to raise the price of Lake as against electrolytic would be offset by larger use of electrolytic. If the distinction between Lake and electrolytic is as sharply identified as complainant claims, his marketing yearly 60,000,000 lb. as Lake, which is but half Lake, raises the question as to his right to relief against monopoly in Lake. But neither Lake nor 'Best Lake' is so far a distinct commodity as to make Calumet control of Osceola, Allouez and Centennial necessarily tend to restraint of trade or monopoly in Lake or 'Best Lake'; hence there is no violation of Federal laws."

Transvaal Mine Earnings and Dividends

Special Correspondence

In view of the great interest that is now being taken in the Transvaal goldfields it may be useful to point out that there is usually a wide margin between declared working profits and dividends. The difference is likely to be marked this year owing to the policy now widely adopted of increasing the plants out of revenue. The New Modderfontein company for example, is putting up 60 stamps at an estimated cost of £104,000, to come out of revenue. The payment of dividends is not to be interfered with, consequently the income of the company is really much larger than the dividend declaration would imply and when the plant is completed the shareholders may look forward to largely increased returns. The Nourse Mines directors, in the same way, are appropriating part of the profits for erection of additional machinery, and necessary expenditure will be met without interfering with the current rate of dividend. Thus the shareholders in some of the mines are providing out of profits capital for extensions and this method of finance accounts to some extent for the discrepancy between declared profits and dividends. On what this discrepancy is the returns for the six months January to June throw some light. The total working profits were £5,594,865 and the dividends during that period £3,949,968, or about 61 per cent. of the profits. The balance goes to capital account, interest and redemption of loans and debentures and to office expenditure outside Africa. According to Matson, "Mines of the Transvaal," (edit. 1908 p. 16) the working profits of the mines for 1907 were £9,727,000, while the dividends according to the Chamber of Mines were £7,131,612, leaving a difference of £2,595,388, or 26 per cent. of the so-called profits.

According to W. H. Gaze, a good tar varnish for coating wooden cyanide tanks is made by heating 80 lb. of tar in a water bath at 160 deg. F. until all water has been evaporated. Then add, with constant stirring, 80 lb. of hydraulic lime and apply hot. This varnish is acid resisting and flexible.

During 1907 the United States imported 9,922,870 lb. of white arsenic, valued at $553,440.

Turquoise Mining, Burro Mountains, New Mex.

Country Rock Is Granite and Turquoise Occurs between Well Defined Walls in a Zone of Alteration; Mining Is Conducted in Open Cuts

BY EDWARD R. ZALINSKI*

In a former paper published in *Economic Geology,* Vol. 2, No. 5, July-August, 1907, I described the Burro mountain turquoise deposits, principally from a geological and mineralogical standpoint. No mention was made of the mining operations. It is the purpose of the present article to give some notes on how turquoise is mined, including a review of the main geological features.

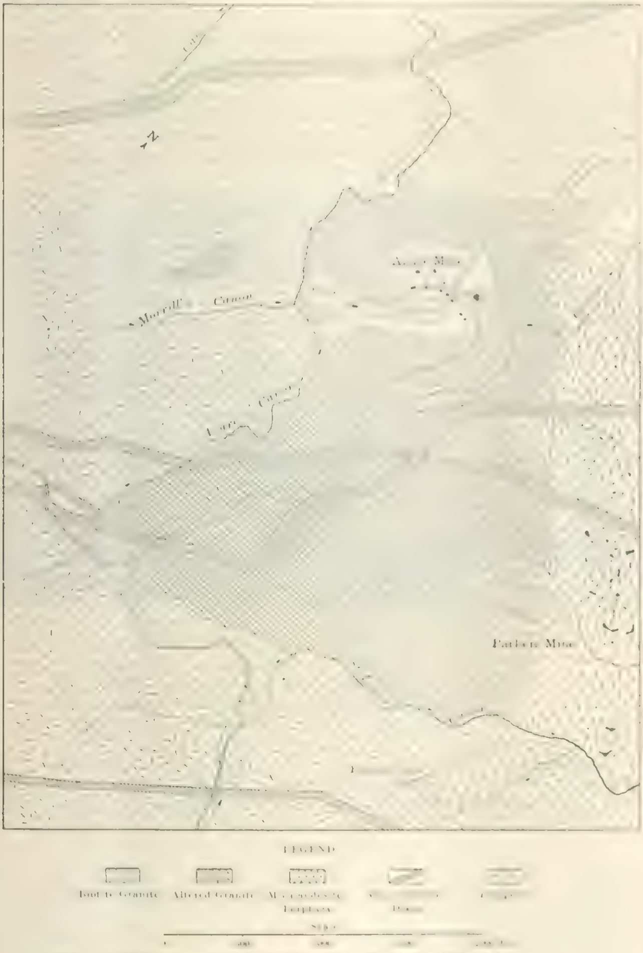


FIG. 1. GEOLOGIC MAP OF COUNTRY SURROUNDING AZURE MINE

These deposits have long been known and were worked by the early Spaniards and Indians. In recent years the mines of the Burro mountains, Grant county, New Mexico, have been the most active producers. The turquoise from here is of good color and quality and is highly

[illegible] United States, but most of the material [illegible] from New Mexico. Cerillos, southwest of Sante Fe, has furnished valuable gems. [illegible] placed the Persian and foreign turquoise used by the leading jewelers, and has established a reputation for holding its color.

Other localities in the United States where turquoise has been found are Turquoise mountain, Cochise county, and Mineral Park, Mohave county, Arizona; in southern Nevada, near Columbus; in Fresno county, California, and in Saguache county, Colorado. In New Mexico, besides Cerillos and the Burro mountains, turquoise is found at Hachita, Grant county, and in the Jarrilla mountains, Otero county. As at Cerillos, the Burro mountain turquoise was known and worked by the Indians; turquoise beads and ornaments are frequently found in their graves throughout this section. At Fort Bayard, near Silver City and on Bear creek, some interesting pendant-shaped turquoise ornaments were obtained.

DISCOVERY OF THE BURRO MOUNTAIN DEPOSIT

The modern discovery of turquoise in the Burro mountains is generally accredited to John E. Coleman and dates around 1875. While on a hunting trip he came across some old excavations which were partly filled and grown over with vegetation. Coleman made his locations and did his first assessment work in 1880. The first claim located was the Calliate and covered the largest prehistoric workings. Nicholas C. Rascome also located a number of claims in the neighborhood. It proved later the most productive ground; the Sante Fe and Gem claims, were not marked by prehistoric dumps. M. W. Porterfield bought Coleman's property and became interested with Rascome. They sold to C. Armeny, of New York, who, with others, organized the Azure Mining Company in 1891.

A large number of rude stone hammers, four to eight inches in diameter were found in the old excavations. The [illegible] evidently used without a handle. Traces [illegible] probable that heating and rapid cooling were used in the primitive mining.

[illegible]

[illegible] will be given here. The geology and occurrence, also some remarks on the possible genesis of the turquoise have been treated [illegible] article before referred to. The geologic map, Fig. 1, was published in this article and is reproduced by permission. This shows the Azure mine and surrounding workings, also the geology in the neighborhood of the turquoise deposits. The dikes, contacts, roads, etc., are plaintable locations.

---

*Mining engineer, Salt Lake City, Utah.

The turquoise deposits are situated 15 miles southwest of Silver City. The country rock in the neighborhood of the mines is biotite granite, into which has been intruded mica-andesite porphyry and later andesite dikes. Across the Mangus valley to the east are sedimentary rocks; lime, shale, sandstone and quartzite. Fossils found here in the lime and sandstone prove these beds to be of upper Cretaceous age. To the west lies the eruptive region in the neighborhood of Bullards peak.

The Burro mountains are largely granite, and on account of the main topograhic features are spoken of as the Big and Little Burros. The Little Burros rise gradually from the Mangus valley to an altitude of 6500 ft. The surface is rounded. Behind these as foothills the Big Burros reach an altitude of approximately 8000 ft. There are three main peaks with rugged slopes.

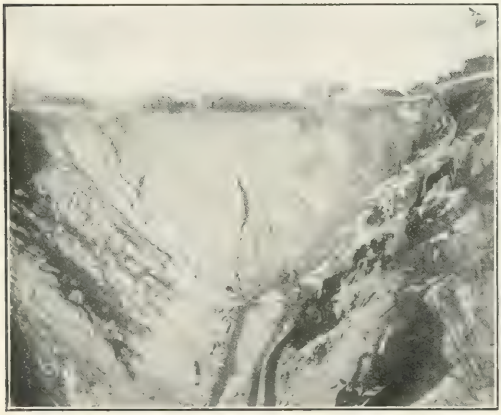


FIG. 2 OPEN CUT SHOWING FISSURING

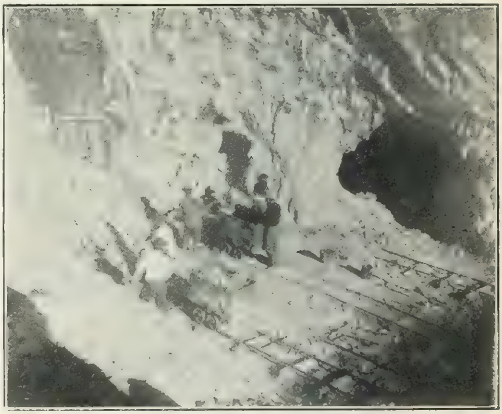


FIG. 3. LOADING TURQUOISE BEARING ROCK

It appears that the Burro mountain up lift took place after the Cretaceous and previous to the great volcanic activity of Tertiary times. A period of erosion was followed by the intrusion of andesite porphyry into the granite, and last of all andesite dikes which cut the porphyry and also the sedimentary rocks of the section. The last intrusions are doubtless of Tertiary age, and were accompanied by fracturing and mineralization. Copper occurs over an area three miles east and west by two miles north and south. The turquoise-bearing section is included in the northwest portion of this ground. Malachite and crysocolla are the principal copper minerals, but cuprite and chalcocite are found in the mines of the Burro Mountain Copper Company.

The Azure mining camp is situated in the Little Burros at an altitude of 6200 ft. For some distance surrounding the turquoise deposits the granite is much altered. The feldspar is kaolinized and biotitie has disappeared, while secondary quartz veinlets cut the rock in various directions. It is in this kaolinized area that turquoise is found. The magnetic variation on the Azure Mining Company's claims is 20 deg. 20 min. east. Directions referred to here are magnetic readings.

Turquoise occurs in a strong vein or fissured zone which strikes north 47 deg. east and dips 45 deg. south. It has a well defined foot- and hanging-wall, both of which show evidence of movement. The turquoise is found only between the well defined walls. Two sets of fissures cut this vein or sheared and altered zone. These strike in the same direction as the vein and one set dips 45 deg. south, parallel to the walls, while the other crosses the first set and dips to the north at a somewhat steeper angle. The fissuring can be seen in Fig. 2 and is of interest regarding the genesis of the turquoise. Two sets of fissures were noted in Dead Man's cañon, half a mile to the south.

Porphyry was intruded into the granite in the form of a stock or belt. Thin sections show this to belong to the mica-andesite series. The general direction of the contact near the Azure mine is northwest and southeast. The prehistoric workings on the Calliate claim lie in the granite near this contact, and Parker's turquoise mine is both in granite and porphyry. The porphyry crosses the St. Louis cañon and then strikes southeasterly to near the Chief, of the Burros copper mine, which lies in the porphyry several hundred feet from the granite. A fluorite vein, one to two feet wide can be traced for 200 ft. on the surface near this point. It is on the contact of granite and porphyry. Small amounts of turquoise are found through the altered granite, and some turquoise staining occurs in the porphyry, but it has not been found in paying quantities except in the well defined Azure vein.

Later andesite dikes cut the above mentioned rocks, and are roughly parallel to the Azure vein. It is difficult to say whether the dikes are normally mica-andesite or dacite. In places large phenocrysts of orthoclase occur and also quartz in dihexahedral crystals showing magmatic corrosion. The dikes are 40 to 90 ft. in width and stand nearly vertical. Some copper staining occurs along their walls, but no traces of turquoise were noted. Besides the Azure camp and Parker's mine, mentioned above, turquoise occurs at three other points in the Burros, and in the Cow Spring district a few miles to the southeast.

THE AZURE MINE

The Azure mine is worked on the largest scale of any of the turquoise properties. The vein is 40 to 60 ft. between walls and on account of the extreme kaolinization forms a saddle along the outcrop. The discovery was made in a small gulch leading into Azure cañon. Development proceeded through four adits driven northeasterly on the vein, and resulted in the production of turquoise equal to the best Persian gems. The turquoise was found in two forms, as vein turquoise filling cracks and fractures in the altered granite, and as nuggets or concretions imbedded in kaolin. It was mostly of a deep sky-blue color, and of a slightly translucent quality, being above 6 in hardness and making ideal gems.

In 1893 Feix Vogel, then superintendent, opened the famous Elizabeth pocket, which produced a large amount of high-grade turquoise. As much as 10 kg of the finest material was mined in one month. The Elizabeth pocket extended from the second level to the surface, 40 to 60 ft., and the same quality of turquoise was obtained for about 150 ft. along the vein, the distance between the walls at this point being 40 ft. This pocket was found at the southwest end of the open cut, shown in Fig. 1.

The character of the turquoise varies along the vein. Nearly all shades of blue and green are found, and these are the most common colors. The green is not used in jewelry. The best quality of nuggets are covered with a white skin or coating. The average vein turquoise is from ⅛ to ⅜ in. thick, and the nuggets ¼ to ¾ in. in diameter. An irregular shaped piece of greenish turquoise measured approximately 14x9x6 in. This was not of gem quality.

Chemically, turquoise is a complex hydrous phosphate of aluminum and copper. The following is an analysis by M. Carnot, of bright blue Burro mountain turquoise: H_2O, 18.24 per cent.; Al_2O_3, 34.32; P_2O_5, 28.29; CuO, 7.41; FeO, 0.91; CaO, 7.93; Insoluble, 2.73; total, 99.83 per cent.

MINING

At first all the turquoise was obtained from underground workings, but it was so thoroughly distributed at the Elizabeth pocket that an open cut was driven from the first level across the entire width of the vein. Connections were made with the second level 40 ft. below and much of the rock was handled by chutes and afterward passed through a sorting house on the second level dump. The coarse material and fines were separated by grizzlies and screens, and the turquoise picked out by hand. The open cut was afterward extended to the second level, and at the present time has been driven on the vein for a distance of over 600 ft. Some good turquoise was developed on the third level and sparingly on the fourth. On the latter level, however, the turquoise is associated with copper minerals, malachite, chrysolla and black oxide, and the best quality is scarce. So far all the finer grades of turquoise have been found practically 100 ft. or less beneath the surface.

The first work was done through four adits driven from the Azure cañon northeast on the vein. The cañon furnished good dumping ground and made hoisting equipment unnecessary. Later it was determined by the fourth level adit that the valuable turquoise did not extend to this depth. The levels are approximately 40 ft. apart. Most of the turquoise was obtained from the first and second levels, and as before mentioned, an open cut was driven on the vein from the second level.

Underground development is constantly kept in advance of the open-cut work and the character and quality of the turquoise determined, some lean portions of the vein being left standing where possible. The development work also is of use in removing the drift and weathered rock in the upper part of the vein. Chutes to the second-level tunnel provide for the removal of the dead rock at a minimum of time and cost. The chutes are connected with the first level, and the surface, and the dirt and rock are worked in through a large funnel-shaped opening of gradually increasing size, until good turquoise rock is encountered in the bottom part of the funnel, and everything has been removed from this point to the surface. [illegible] chutes can be seen in Fig. 3, to the left, in the face of the open cut. Fig. 3 also shows the turquoise-bearing rock being loaded into the cars. The buckets in the center are used to hold the turquoise. The pillar between the second-level tunnel and the small west crosscut in center furnished valuable material. An effort is made to keep the good turquoise-bearing rock separate from the dead rock, and the rock which carries green turquoise, though the latter is always sorted for possible blue.

After the surface rock has been removed the open cut is worked by benches. These vary from 8 to 12 ft. according to the character of the rock. In general a series of 10-ft. holes are drilled. These are sprung by ½ to 1½ sticks of powder, sometimes twice or three times, and 40 to 80 sticks of powder used in each hole; 35- and 40-per cent. dynamite is used. The charges are fired simultaneously by electricity, and are figured to barely remove and not throw the rock; little or no turquoise is destroyed. The benches are worked successively from the top of the cut to the second level. From the necessity of sorting over the rock as loaded on the cars, the progress is slow. The open cut at the top measures approximately 143 ft. across. The vein dips 45 deg. south and it is necessary to remove a portion of the hanging-wall. This ground is often dangerous. In past years a number of Mexicans have been killed by falling rock from this side.

The face of the cut is advanced along the vein from 50 to 80 ft. in a year. Four tracks are used. Before blasting these are covered with logs near the face. After a bench shot has been fired the tracks are cleared and the turquoise-bearing rock shoveled into cars. It is carefully looked over and the turquoise picked out and thrown into buckets.

As many as two tracks are worked at once. These are graded enough to allow the run from the face of the cut to the dumps to be made by gravity. The cars used are of 16 to 17 cu.ft. capacity. Coarse rock is broken by sledges or adobe shots. The latter consist of one-half to two sticks of powder laid on top of the [illegible] of mud. On the altered vein-rock this gives satisfactory results. Turquoise seldom occurs in these large blocks, and when it does the rock contains fissures and can usually be broken with a hammer. In loading the finer rock, care is taken to avoid loss of turquoise, and if this is plentiful the shoveling is slowly done and two men frequently watch each car, rake over the dirt and pick out the turquoise. In exceptionally good ground two or three buckets of rough turquoise have been obtained in one day. The daily output varies, but the average is considerably less than this.

SORTING

The sorting house on the second-level [illegible] more satisfactory to sort out the turquoise as the material was being loaded onto the cars. At the present time the sorting house is situated near the superintendent's house north of the open cut. On account of the many shades of turquoise and fine graduations in color, a uniform untinted light is desirable in sorting. The ceiling is covered with white cheese-cloth. Four windows with white shades throw a good light on the sorting tables which are covered with white oilcloth. The white reflected light enables the distinction of some of the shades of blue and green which under less favorable conditions would be hard to determine. Without practice it is difficult to distinguish between some of these shades.

The turquoise buckets are brought from the mine and their contents emptied into boxes, each of which has its date and number. Sorting is done on the oilcloth-covered tables, generally under the superintendent's direction. It is customary, in case of fine turquoise, for him to go over it roughly first, picking out the best material, before giving it to the Mexicans for further sorting. It might be mentioned here that Mexican human nature is the same as any other kind, and some turquoise finds its way to the Silver City [illegible] company's hands. However, most of this is taken from the mine and is unavoidable, though this practice is kept down to a minimum. No change rooms are required. It is but fair to say in referring to the sorting house, that Mexicans put on this [illegible] trouble has been experienced. I have left M[illegible] quality, for an hour at a time, and had no cause to regret my action.

The first-class turquoise is kept separate, and comprises nuggets and vein turquoise [illegible] quality. Second-class material is blue turquoise of any quality which will pass [illegible] and turquoise matrix, i.e., turquoise intimately mixed with silicious portions of the inclosing vein rock. All the green shades, and the soft, earthy classes or irregularly colored varieties are not shipped. The adhering vein rock, when not suitable for matrix, is removed on a small iron plate with a sorting hammer, or with special cutting pliers. Some turquoise is shipped without sorting, as it comes from the mine. In any case the final gradations as to quality and color are made in New York after the gem is cut and polished, and the sorting at the mine is done to take out undesirable material and facilitate handling. The percentage of the best turquoise to the amount mined is relatively small.

Equipment, Labor, Supplies, etc.

The nature of the work makes hand labor the best practice. A compressor and steam shovel would undoubtedly facilitate the amount of ground handled, but the greater part of the rock has to be thoroughly looked over, and loading into cars by hand, while slow, secures a satisfactory recovery of turquoise. Moreover, the mines are 15 miles from the nearest railroad, with some steep grades between, and neither fuel nor water is plentiful. Mexican labor is employed. From seven to twelve men are worked in the mine under a white foreman.

Good accommodations are made for the Mexicans, and they live with their families at the Azure camp. No water is to be obtained at the mine, and the company owns a well property below the camp in the Mangus valley. Water is pumped by a windmill and hauled to the mine in barrels; it contains no alkali. Mine supplies, also grain, groceries, etc., are brought by the company's team twice a month from Silver City. Frame and adobe houses are provided for the miners, and a nominal charge for water rent and team is made. Wages are $2 per day, which is higher than paid by other mines of the neighborhood. Blacksmiths get $2.50 per day and upward, and teamsters who live at the well, $65 per month.

The mine equipment is simple. Besides the sorting house, water house, office, miners' houses, etc., are a carpenter, machine and blacksmith shop on the second-level dump near the mouth of the cut.

Prospecting work with a diamond drill has been attempted at various times, and on one occasion turquoise was located. In general, however, it has been unsuccessful on account of the irregular distribution of turquoise even in the vein.

First-class turquoise is shipped in sealed cans; second-class in 150-lb. cases. Turquoise is commonly cut *en cabochon,* or elliptical with a convex surface. It is also cut *marquis,* or pointed at both ends. The price ranges from $6 to $25 per carat and higher, $15 per carat being an average price for turquoise of good quality and color. The standard shape is oval and of medium hight. The most popular size is from 5 to 10 mm. longest diameter, and gems of these dimensions weigh from ⅜ to 2½ carats. Turquoise brooches, etc., are often cut larger.

The Azure mine has probably produced more turquoise than any other single property. Stones to the value of several million dollars have been obtained. The demand for the turquoise of the best quality is constantly in excess of the supply.

Minerals at the Toronto Exhibition

Special Correspondence

The display of mineral products at the Canadian National Exhibition, which opened in Toronto, Ont., recently, is by far the most extensive and interesting ever shown in Ontario. The largest exhibit is that furnished by the Provincial Department of Mines in charge of Prof. Wm. Nicol, of which the most noteworthy feature is a nugget of native silver weighing 1600 lb. from the Crown Reserve mine at Cobalt, the silver content of which is estimated at $5000. Large collections of ore from other Cobalt mines are shown, including a slab of native silver about 4 ft. in length from the O'Brien, carrying about 90 per cent. silver; a silver nugget of 850 lb., and a specimen of a calcite vein from the same mine showing the mode of the occurrence of silver. There are four large masses of ore from La Rose, showing silver in association with calcite, niccolite, chloanthite and smaltite. The Coniagas is represented by a fine collection of ore and a silver bar 998.4 fine produced at the Thorold, Ont., smelter of the Coniagas Reduction Company; also specimens showing how the smelter has succeeded in saving the by-products in the form of pure commercial cobalt oxide and white arsenic. The progress of the smelting industry is also illustrated by six large silver bricks turned out by the smelter of the Deloro Mining and Reduction Company from ore from the O'Brien mine, and samples of the speiss produced after the extraction of the silver and the cobalt and nickel oxides yielded by the speiss. The Laurentian gold mine, Manitou Lake, Ont., contributes 60 oz. of gold nuggets, almost pure metal, valued at $4000. There is a full display of nickel products and copper-nickel ore from Sudbury, and iron ores from the Helen mine on the Michipicoten; from Bessemer, Hastings county; from Calabogie, Renfrew county; from Moose Mountain and other sources. The cement and oil industries are well represented.

The government of New Brunswick makes a comprehensive display of economic minerals in charge of Dr. L. W. Bailey, the exhibits being largely of a non-metallic character. The collection, however, includes a showing of iron and copper ores, manganese and gypsum. One of the most interesting features is a display of albertite from the neighborhood of Hillsboro, in Albert county, where it was at one time profitably worked and distilled for oil and gas.

The Province of Nova Scotia shows a collection comprising some rich samples of auriferous quartz from Montague, Halifax county; from the Eastwill and Withrow mines, South Unjacke; the Ophir mine at Brookfield, and the Gold River mine. A prominent feature of the display is an obelisk some 12 ft. high, supposed to represent the amount in bulk of all the gold produced in the Province to Sept. 30, 1905, amounting to 857,566 oz. extracted from 1,783,174 tons of quartz. Many samples of coal are also shown.

Specimens of asbestos are shown from King's mine, Thetford, the American Asbestos Company, Black Lake, the Dominion Asbestos Company, Black Lake, and other mines in Quebec.

Silver Cyaniding in Mexico

According to Prof. G. H. Stanley[1] the cyanide practice at the Hacienda de San Francisco, Pachuca, Mexico, is as follows: The treatment tanks are 10 ft. deep. After agitation for 24 hours, the charge is allowed to settle six hours. Then about 3 ft. of the solution is decanted off. It is filled up with fresh stock solution plus lime and lead acetate and agitated until mixed, then it is settled half an hour, and 18 in. in depth is decanted. Six other similar washes are given as well as two final washes with water, making nine decantations in all. Finally it is pumped to tall settlement tanks, where it remains as long as possible. The clear solution is then decanted, and the residue, running 70 per cent. moisture, is discharged. It is proposed to install filters with the view of saving time and recovering more dissolved silver and cyanide.

The mill work is as follows: Crushing is done in 0.025 per cent. K Cy solution with 1050-lb. stamps through slot screens equivalent to 50 mesh, the duty being 3.3 metric tons per 24 hours.

About 2½ per cent. by weight of concentrates are taken out of the pulp by Wilfley tables and Frue vanners. These concentrates carry about 50 per cent. of the silver in the ore.

The tailings are separated by classifiers into 45.8 per cent. sand, 51.7 per cent. of the dry weight of the ore of slime, and treated by percolation and agitation respectively. The sands get 14 days' treatment and the slimes are washed and dealt with as described above.

The weight of solution precipitated per ton of pulp treated and the strength of solution used are as follows: The sand treatment of 7 tons of 0.35 per cent. K Cy, 1.4 tons of 0.10 K Cy and, 0.7 ton of wash water; in slime treatment 6.4 tons of 0.10 per cent. K Cy. A recovery of 87 per cent. is made.

---

[1] *Journal*, Chem. Met. and Min. Soc., of South Africa, June, 1908, p. 385.

Construction of 100-ton Copper Smelting Plant

Furnace Capacity Depends Chiefly upon Quantity of Fluxes Required, Volume and Pressure of Blast and Fusibility of Charge

BY CHARLES C. CHRISTENSEN [*]

There are many mines for which [illegible] smelting plants, especially matte-smelting plants, are desired. It has seemed to me that a description of some of the essential features of such a smelting plant would be useful.

SIZE OF FURNACE AND CALCULATION OF POWER PLANT REQUIRED

The size of a blast furnace is determined by its internal area at the tuyere level. For rectangular furnaces the width should not exceed 54 in. Furnaces have been built as wide as 60 in., but the tuyere pipes, being water-jacketed, were then extended 6 in. into the furnace, making the actual width 48 in. No advantage was gained by this experiment except that the limit of width was discovered. For the length there seems to be no limit.

The capacity of a furnace depends to a great extent upon the quantity of fluxes necessary, the volume and pressure of the blast (the wider the furnace the higher the blast pressure) and the fusibility of the charge. The smaller size of rectangular furnaces will smelt approximately 3¼ to 3¾ tons of ore and fluxes per square foot of area at the tuyere level; in larger furnaces the capacity per square foot increases. Following this rule, a furnace for copper ores, having 100 tons capacity per 24 hours, with a width of 40 in., should be 96 in. long, giving an area at the tuyere line of 26.7 sq.ft. The cubic feet of blast required per minute is 260 × area, or square feet of smelting space, or in this case, 260 × 26.7 = 6942 cu.ft. The nearest blower on the market is one of 45 cu.ft. displacement per revolution and 175 r.p.m. = 7875 cu.ft. of blast per min. We may figure on 16 oz. or 1 lb. pressure for a furnace of this size, and 5 h.p. for each 1000 cu.ft. of blast needed, plus 10 per cent.

$$\frac{7875 \times 5}{1000} + 10 \text{ per cent} = 43.3 \text{ h.p.}$$

The horsepower could also be worked out as follows:

$$\frac{7875 \times 16\,(oz.) \times 0.003}{11} + 25 \text{ per cent.} = 42.05 \text{ h.p.}$$

To run this blower, then, use a 45-h.p. electric motor, making 650 r.p.m. The pulley should be 18x12 in., and the belt 11x5/16 inches.

Driving the blower direct from this motor the size of the blower pulley is found from the equation:

$$\frac{18}{x} \times 650 = 175$$

from which x is found to be 66.8 in. The pulley, then, should be 67x12 in. face. The belt speed will be

$$\frac{18 \times 3.14 \times 650}{12} = 3{,}061$$

ft. per min., or 51 ft. per sec. At this speed an 11-in., 5-ply belt will transmit: 3.43 (area of belt in square inches) ×

[illegible]

h.p.; hence, it is ample to run a blower at 16 oz. pressure.

For a suitable sampling plant the following machinery will be required: One 7x10 Blake crusher, 24x8½-in., tight and loose pulleys to run at 250 r.p.m.; for this 7 h.p. will be required; one pair of 24x8-in. belt rolls, pulleys 60x8½ in. and 30x8½ in., to run at 95 r.p.m., requiring 5 h.p.; one pair 12½x12-in. belt rolls, pulleys 36x8½ in., 150 r.p.m., 3 h.p. required; one sample grinder, 16x4½ in., tight and loose pulleys, 150 r.p.m., 3 h.p. required.

Allow 2 h.p. for shafting and use a 20-h.p. electric motor making 775 r.p.m., with 12x8-in. pulleys and 7-in. belt. The circumference of a 12-in. pulley =

$$1 \times 3.14 = 3.14$$

ft. At 775 r.p.m., this would give a speed of 775 × 3.14 = 2433 ft. per min. = 40.5 ft. per sec. The area of a 7-in., 4-ply belt would be

$$7 \times \tfrac{1}{4} = 1.75$$

sq. in.

$$1.75 \times 40.5 \times 0.3 = 21.26$$

h.p. The belt will transmit 21.26 h.p., and hence is ample to drive the sampling machinery. The sampling plant line-shaft, then, will run at 150 r.p.m., and will transmit 20 h.p. Diameter of shaft is

$$\sqrt{\frac{20}{150} \times 125} = 2.55$$

in. To be safe, make the shaft 2 11/16 in. diameter, in lengths to suit. Diameter of pulley on line shaft to receive power is found from the equation

$$\frac{12}{x} \times 775 = 150.$$

from which x = 62 in., face to be 8 in.

Diameter of pulley to drive 7x10 crusher is found from the equation:

$$\frac{24}{x} \times 250 = 150.$$

[illegible] straight face for tight and loose pulleys on crusher; 8-in., 4-ply belt to be used.

Diameter of pulleys to drive 24x8-in. rolls will be

$$\frac{60 \times 95}{150} = 38$$

in., face to be 8½ in.; and

[illegible]

in., face to be 8½ in.; 8-in., 4-ply belt to [illegible] 12½x12. in. rolls and sample grinder will be the same as on these machines, both running at the same speed as the line shaft, 150 r.p.m. The pulley to drive sample grinder, however, should have a 9-in. straight face for the tight and loose pulleys on that machine.

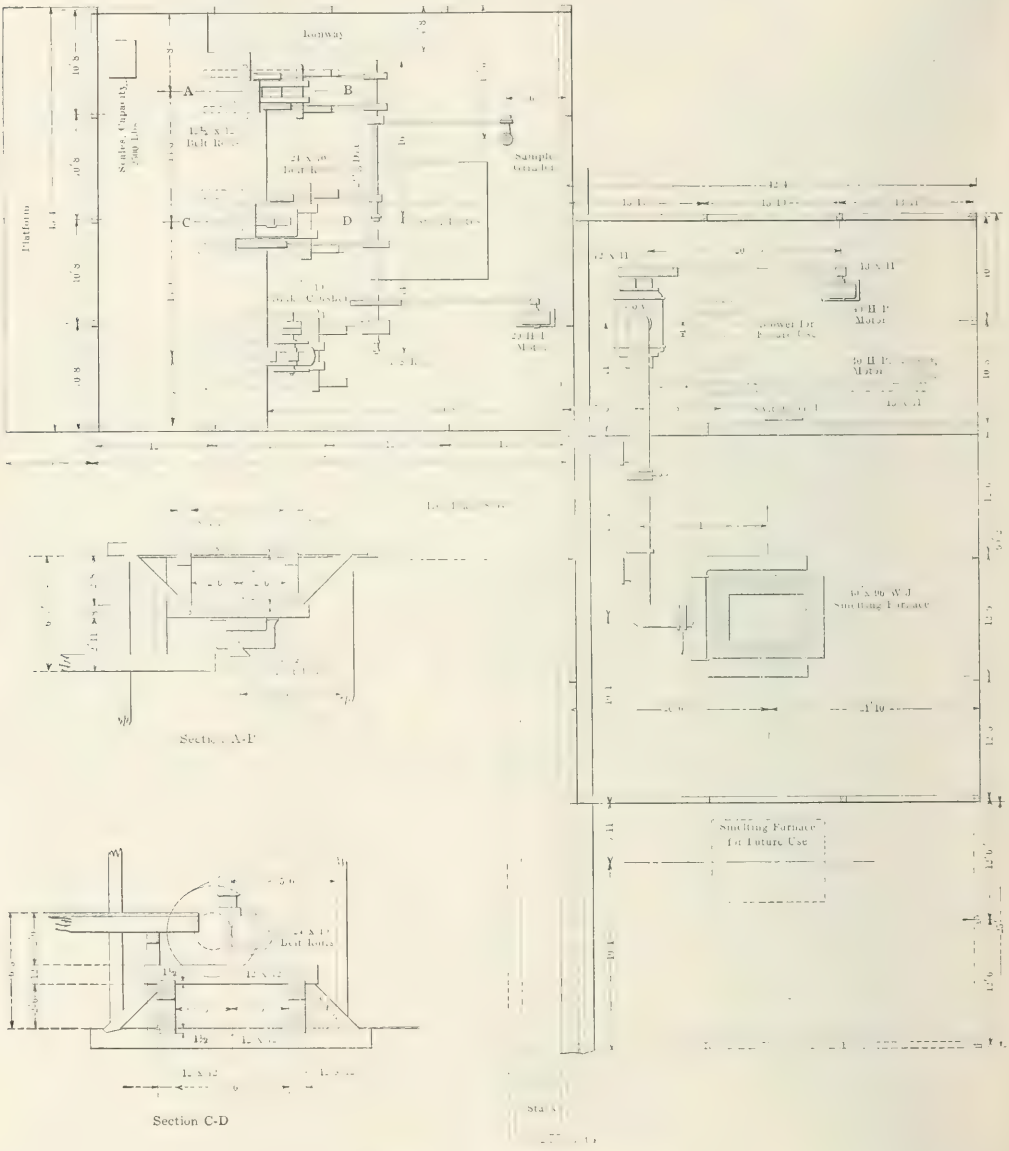
It is now desired to find the dimensions of the generator necessary to run the above mentioned electric motors, as well as one dynamo for one hundred 16-c.p. incandescent lights and four arc lights. Summing up, we have one electric motor delivering at the pulley 45 h.p., one delivering 20 h.p., and one dynamo for the incandescent lights and arc lights, representing 15 h.p., or a total of 80 h.p., to which add 15 per cent. for loss in motor and dynamo efficiency and 10 per cent. for loss in transmission. Say the generator is placed 1000 ft. distant in the water-wheel house; then a generator which will transmit 101 h.p.—say, 100 effective h.p.—is required. Allowing 15 per cent. for loss in generator and 3 per cent. for loss in transmitting power by belt from water-wheel to generator, and we have a total of 119 h.p. to be delivered by the water-wheel pulley.

Assuming that we have 200 ft. head in 650 ft. and 500 cu.ft. per min. of water available, we will use a single-nozzle water-wheel of 5 ft. diameter, delivering, with 200 ft. head and 412 cu.ft. of water per min., 132 h.p., figuring 80 per cent. efficiency for the water-wheel. The surface line is 650 ft., hence the pipe line will be that length, and figuring a 15-in. [illegible] feet. This will give about 125 effective h.p., with 408 cu.ft. of water per min., running the water-wheel about 214 revolutions per minute.

The pulley on the 100 h.p. generator is 20x16½ in., running 650 r.p.m., and hence will require a 60¾-in. diameter pulley on the water-wheel. The belt speed will be 20x3.14x650 = 3400 ft. per min., or 56.6 ft. per sec. Area of belt, 16 in. x 7-ply = 16x7/16 in. = 7 sq in. 7x56.6x0.3 = 118.86, or, say, 119 h.p., which is required to be transmitted to the generator.

---

[*] 1380 North Fairfield avenue, Chicago, Ill.


Runway
A
B
C
D
Platform
Scales, Capacity, 2500 Lbs.
Belt Rolls
Sample Grinder
Motor
Blower for Furnace Use
40"x 96" W.J. Smelting Furnace
Smelting Furnace for Future Use
Belt Rolls
Stairs

Section A-B

Section C-D

FIG. 1 ARRANGEMENT OF 100 TON SMELTING PLANT

The maximum pressure in the pipe line will be 193 ft. (head) x0.433 = 83.56 lb. per sq.in. Figuring a tensile strength of 60,000 lb. for steel plates, a factor of safety of 3¾, and for double-riveted lap joints 0.7 efficiency, the following equation will give the thickness of plate to be used in the pipe line:

$$\frac{7.5\ in.\ (radius) \times 83.56}{16,000 \times 0.7} = 0.056\ in$$

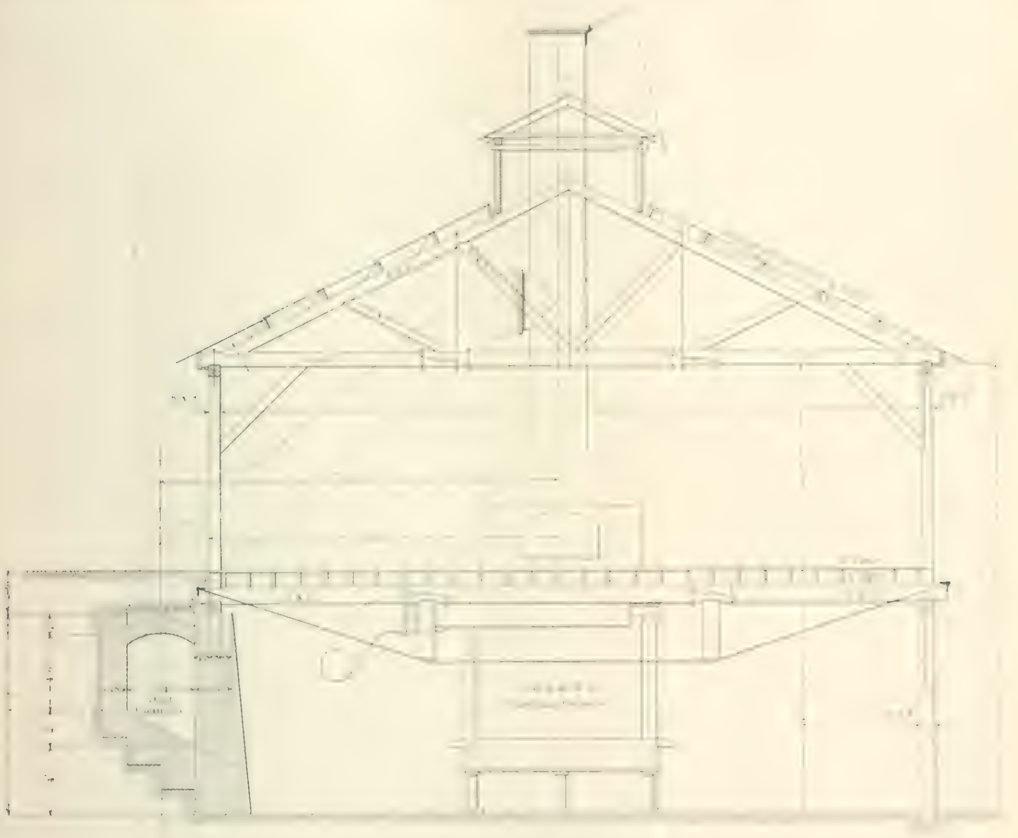
No. 16 steel plates, B.w.g., are 0.062 in. thick, and are the nearest to be had. It would be better to make the lower half of the pipe line of No. 14 steel and the upper half of No. 16 steel.

SPECIFICATIONS

The following are the specifications for a recently constructed plant of the character indicated:

Blast Furnace—All iron and steel work for one rectangular steel water-jacketed furnace, measuring 40x96 in. at the tuyere line for smelting copper ores, complete in details as follows: The curb to be built of steel plates, strongly braced with steel angles and provided with proper slag and copper spouts; curb to rest upon a heavy cast-iron bottom-plate, supported by six short cast-iron columns. Resting upon the curb will be the steel water-jackets, 6 ft. 6 in. high, with two side- and two end-jackets, leaving, when assembled, a smelting space of 40x96 in. at the tuyere level; the side jackets only to be boshed; the lower part of th[illegible] 18 in. from bottom, to be straight, the upper part departing from the vertical 8½ in. in 60 in.; both the end-jackets to be straight, 6 ft. 6 in. high, and to be provided at their lower ends with a semicircular cut-out of proper size to accommodate a tapping jacket. Two of these tapping jackets are required, one for each end of furnace to be furnished; all jackets to be of the best flange steel, the inside plate ⅜ in. and the outside plate 5/16 in. thick; all joints flanged, riveted and calked and the water-jackets to be tested to a few pounds water pressure before shipment, to see that they are perfectly water tight; all jackets to be provided with hand-holes, flanges for inlet and outlet water connections, all necessary binders and bolts and a complete set of piping, valves and fittings necessary for supplying cooling water and for conducting discharge water to pockets cast on the supporting columns of the furnace; each side jacket to have six tuyeres, each 4 in. diameter and each tuyere to be provided with an independent tuyere-box and connection to bustle-pipe. Bustle-pipe to be 16 in. diameter with an inlet of 24 in. diameter, made of No. 14 steel and supported from mantel-frame of the furnace.

Above the jackets, to support the upper ironwork, a mantle-frame, made of 7-in. I-beams, should be placed, consisting of three I-beams on sides and three on ends, connected by steel angles at corners, and provided with cast-iron spacers between [illegible] four cast-iron columns 11 ft. 4 in. high, 8 in. outside diameter, 1-in. metal, with 16-[illegible] cast on for receiving the discharge water. (Or instead of cast-iron columns, structural-steel columns, made up of Z-bars, [illegible] floor. Brickwork of shaft from deck-plate to charging floor to be provided [illegible] tending 4 ft. on each side of the furnace [illegible]



[illegible]

provided with a charging opening 4 ft. 6 in. wide by 2 ft. 4½ in. high; cover of hood to be made of steel, cone shaped, 3 ft. 2 in. high, and resting upon this will be a steel stack 40 in. diameter by 24 ft. 6 in. high, provided at top with a damper Brick stack casing to be made of 3/16-in. steel, hood and cover of No. 10 steel and stack of No. 12 steel.

The general dimensions of the furnace will be: size inside of jacket at tuyere level, 40x96 in.; floor-level to top of bottom-plate, 2 ft. 5 in.; floor-level to top of curb, 4 ft. 3 in.; hight of jackets, 6 ft. 6 in.; floor-level to charging-floor, 14 ft. 3 in.; floor-level to top of stack, 45 ft. 6 in. Furnace to be erected in the shops of the contractor and all parts properly marked and fitted into place, so that same may be easily assembled at destination. All drawings necessary for the erection of the furnace to be furnished by the contractor.

Blower—To be of the two-impeller type, belt driven; 45 cu.ft. displacement per revolution; 175 r.p.m.; 67x12-in. pulley; top discharge. One best brand rubber belt to drive blower to be furnished.

Blast Pipe—To be 24 in. diameter, tapering to 21 in. at blower end, made of No. 14 steel with flanges at both ends; bolts and gaskets for connections, and a relief valve.

Blast Gates—There will be furnished two blast gates, one at the furnace 24 in. diameter, and one at the blower 21 in. diameter; both to be of the standard cast-iron pattern.

Forehearth—One 36x48x24-in. rectangular cast-iron forehearth made of 1-in. well ribbed plates, mounted on four unflanged wheels and provided with cast-iron spouts.

Slag Pots—Twelve cast-iron standard pattern slag pots, 2 cu.ft. capacity complete with wheels provided with roller bearings. Wheels to have cast-iron rims and wrought-iron spokes.

Furnace Tools—Three steel charging barrows, each having a capacity of 10 cu.ft.; wheels provided with roller bearings; two 2-wheel coke charging barrows, complete with wheels fitted with roller bearings; six No. 7 steel wheelbarrows; two coke forks; four No. 2 scoop shovels; 12 long-handled square-point shovels; three sledges, 6, 8 and 10 lb. respectively with handles; 750 lb. of assorted sizes and lengths of furnace bars; one 6-beam charging scale. Twelve cast-iron dust-chamber doors and frames 24x24 in. to be furnished for dust chamber.

In addition to the above specified machinery, there is, of course, required crusher, rolls and grinder for the sampling mill, platform weighing scales, wheelbarrows and the usual tools, and the shafting, bearing and power-transmitting machinery.

In the case of the plant under consideration, the power was generated by a water-wheel driving a dynamo. That portion of the specifications applying to a particular case is omitted.

To the above specified machinery I should add: One steel water-tank about 10 ft. diameter by 8 ft. high, to be placed near the plant on level with top of the water-jackets. To take the water direct from the water-wheel pressure-pipe would not do, because modern furnace jackets are no longer provided with staybolts (which burn out and cause endless trouble). Consequently, they could not stand any pressure. They are simply tested to 3 or 4 lb. pressure before shipment to see that they are water tight. I should further specify: One set of blacksmith's tools; one set of machinist's tools; one set of pipefitter's tools; one set of carpenter's tools; repair parts for six months for the crusher, rolls and sample grinder; extra lamps and repair parts for the electric lighting plant; extra jackets, spouts and tuyere parts for the furnace; pipes and pipe fittings, duplicate valves of all sizes used in and around the plant; assay outfit; drawing tools; office furniture, fixtures and telephones.

The cost of such a smelting plant would be approximately $40,000, which amount would cover the machinery as specified, freight to smelter site, excavation, wooden buildings erected, installation of the machinery, tools and supplies. With steel buildings the cost would run up to about $48,000. The approximate shipping weight of the machinery is 90 tons.

California Petroleum Notes

Special Correspondence

The petroleum interests of California are on the increase as far as production and importance are concerned. No new fields of importance have lately been opened, but development on the older fields has been carried on actively, with the result of increased production. Oklahoma now holds first place in oil yield, but California is the second largest producer among the States. The wells of this State are now producing about 112,000 bbl. daily, and this amount is steadily increasing. Prospecting in new fields is going on, and some of these may be brought to a productive stage and probably will. All through the Salinas valley and over into Fresno county, more or less well boring is going on, though this is not a proven field. Much of this work is being done by the Standard Oil Company, which has bought up the mineral rights on the ranches in that region.

Some 33 of the 58 companies listed on the California Stock and Oil Exchange in this city are now paying dividends, the total being about $300,000 per month. The increase in the price of oil is making money for companies which were hard put to it for a long time. The "wild-catting" has about ceased in California, hundreds of useless concerns having gone out of business. Of course, there are numbers of companies still in the prospective stage, but the Californians are learning more about the oil business than they knew a few years ago, and are not investing in every advertising company which comes along. More and more land is monthly being bought up by the larger companies, all of which are extending their operations.

The Union Oil Company, one of the largest in the State, has bought the old Thomas Bell ranch near Los Alamos, in Santa Barbara county, paying $500,000 for it. Although purchased only last May, the wells since developed have brought the ranch up in value so that it is considered worth at least $4,000,000. The late Thomas Bell, who long owned this ranch, was an extensive investor in California and Nevada gold and silver mines, but never suspected the presence of oil on his ranch property.

Iron Ore Statistics of Dickinson County, Mich.

The annual report of Inspector Trestrail contains statistics of the mines in the most important county of the Menominee range. There were 2445 men employed—1602 underground and 843 on surface—and only four fatal and six non-fatal accidents occurred. The production of the 13 operating mines amounting to 1,617,824 tons. The production per man at the principal mines was as follows:

Mine	Production Tons.	No. of Men.	Tons Produced Per Man.
Chapin	514,193	555	926
Pewabic	398.784	438	910
Aragon	269.400	284	948
East Vulcan	159,614	450	355
East Central Vul.	82,703	200	414
Munroe	30.400	57	533
Calumet	27,644	47	588

Assuming 300 working days per year the daily production per man at the Aragon was 3.16 tons; at the seven mines enumerated, 2.43 tons; and at the 22 mines in the county, 2.21 tons.

Gold in Madagascar

A British consular report gives the gold production of Madagascar at 73,097 oz. in 1905, 64,844 oz. in 1906, and 72,100 oz. in 1907. Practically all of this is obtained from alluvial or placer workings. About 30 per cent. comes from the district of Diego-Suarez in the northern part of the island, where rich placer deposits were found by two French prospectors, MM. Grignon and Mortages, three years ago. The Government charges a royalty of 7 per cent. on all gold mined.

Short Talks on Mining Law—XII

By A. H. Ricketts*

A lien signifies a string, tie or claim, which one person has upon the property of another, as security for the payment of some debt or charge or the performance of some act, and may be said to be divided into two classes, namely: Statutory liens and equitable liens. The term "lien" includes mortgages, judgments, mechanics' liens, etc. It is created by contract, as by a mortgage or may be imposed by law without the consent of the owner of the property upon which it rests, as by proceedings under the Mechanics' Lien law, or by a judgment for the payment for a debt, or it may exist between members of a mining partnership for debt due to others or for money advanced by one of the members to the partnership. No lien which has attached in any way whatever to any mining property is impaired by the issuance of a patent therefor. But the lien may be waived by an express or implied agreement between the parties or the right of lien may be lost by failure to assert it or by lapse of time, or possibly be inoperative because subsequent to a prior recorded mortgage, unless by local statute the lien is made superior thereto.

What is termed a mechanics lien is the creature of a local statute, which should be consulted and strictly followed. It is intended to secure the unpaid wages of those doing manual labor in or upon a mining claim, as a miner, surface workman, or a person employed in a mill as an amalgamator; or a custodian, overseer or mining superintendent, doing some manual labor upon the property; but not to a superintendent, general agent, or general manager, geologist and mining expert doing no manual labor upon the claim. The courts are not in accord as to whether a teamster hauling rock from the claim is entitled to a lien for such services. This law also extends to the "material man," that is one who furnishes materials actually used in the improvement, alteration or repair of a mine or mill. The work must be done by the laborer or the articles be furnished by the material man under a contract, express or implied, with one in lawful possession of the property as the owner, agent, receiver, lessee, or bondee thereof. It is usually provided by law that property worked by another than the owner is subject to lien unless the latter posts a written notice in a conspicuous place or places thereon, stating such fact, and that he will not be responsible for debts contracted by such other person. It does not follow that work done upon a "mine" is work done within the purview of the law giving the right of lien upon a "mining claim." For example, land held under a Spanish or Mexican grant, or an agricultural patent, is not a "mining claim" within the meaning of the lien law giving such right.

A fixture may be an article which was a chattel, and which is physically annexed or affixed to a mining claim so as to become a part of the realty, and, therefore, immovable, or it may be a thing which can thereafter be severed from the claim, or a thing which is used in the working or development of the property, but not as a fact annexed thereto as a mining car, or a "giant." For the purpose of a lien, work done on tools or machinery is work done upon the claim.

EMINENT DOMAIN

Eminent domain is the power to take private property for public use on compensation made in the manner provided by law. The term "public use," as used in the law of eminent domain, means one which concerns the whole community and implies a possession, occupation and enjoyment by the public at large or by public agencies. The power to exercise the right of eminent domain can be conferred upon a corporation or an individual acting in his own interest and for purposes of private gain only by virtue of a constitutional provision of a State or Territory, as the Federal Government does not represent general sovereignty of eminent domain within a State or Territory. In the absence of such provision specially authorizing the condemnation of property by a miner, a local legislature has no power to authorize the taking of private property to be used by another for mining purposes; for example, for the purpose of building a flume on the lands of another to carry off the tailings from his mine, or to enable him to deposit the tailings on such land, or to enable the owner of a mining claim to obtain water for his own use in working such claim, though the intention may also be to supply water to others for mining and irrigation purposes, nor to obtain a right of way through a mining claim for the private use of another mineowner in working his mine. But when mining is expressly declared by constitutional provision to be a public use, as in Nevada a statute authorizing the taking of land by a mining company for its own purposes, is a taking for a public use.

THE STATUTE OF LIMITATIONS

The mining act provides that when mining claims have been held and worked for a period equal to the time prescribed by the statute of limitations for mining claims of the State or Territory where the case may be situated, evidence of such possession and working for such period shall be sufficient to establish a right to a patent thereto, under the act, in the absence of any adverse claim. In other words, under the provisions of the act proof of possession for the statutory [illegible] claim, is to be taken by the land department as equivalent to an establishment in detail of all the facts necessary to constitute a valid location. The local statute thus becomes the foundation upon which actively to assert a right and is not limited, as in other cases, to be used as a defense against an adversary's attack.

A patent issued by the United States is not subject to attack by the Government after the expiration of six years from its date. The time for the commencement of actions between individuals in regard to mining claims is controlled by the local statute of limitations.

[illegible]

As a mining claim is real estate, the rules of pleading and evidence relating thereto are applicable to it with such modifications as the peculiar nature of the property, the provisions of the mining act or local statute may require.

Actions in relation to mining claims may be confined to the court or to the land department, or may engage the attention of both tribunals, or may pass from a State court to a United States court by removal, or from a State supreme court to the United States Supreme Court, on writ of error, or pass from the land department to either a State or Federal court on questions of law. This complexity of procedure does not create a conflict of judicial authority. The courts alone determine questions concerning locations and possession of a mining claim while there are some questions affecting such a property, which are wholly within the jurisdiction of the land department, for example, the character of the land, or the party entitled to purchase it from the Government. The functions of the land department are mostly administrative and only incidentally judicial. The courts take judicial notice of its rules and regulations regulating the sale and exchange of the public lands, but the courts are not necessarily controlled thereby, but may set aside, reverse, or annul the same when it appears they are in excess of the jurisdiction of the land department, or are arbitrary, unjust, or an invasion of public rights, or reverse its decisions upon the law as contrary thereto. While a contest is pending in that department a court will not ordinarily proceed with a case involving the property. It should dismiss the action, or stay proceedings until the matter before the department has been finally determined by it.

Actions in relation to mining claims may be brought either in a Federal or a State court, or be removed from the latter to the former court, subject to remand if it appear that it was improperly removed thereto. The mere fact that the action is authorized by an act of congress does not vest jurisdiction in a United States court. The presumption always is that a Federal [illegible] case. Jurisdiction cannot be conferred by consent and the court may at any time dismiss or remand a case on its own motion, for want of jurisdiction.

---

*Member of the San Francisco bar, San Francisco, Cal

If the action is brought in a State or territorial court, it is subject to the local statutory provisions and practice prevailing therein. An action at law pending in a Federal court is also subject to such provisions and practice, but a suit in equity therein is conducted under the equity rules promulgated by the Supreme Court of the United States and the practice of the High Court of Chancery, of England. There can be no union of a legal and equitable action in a Federal court.

In a way, there are two distinct classes of cases affecting mining claims, viz:

(1) An action brought in a court of competent jurisdiction to determine the right of possession to a mining claim, that is, a right to a patent therefor, pursuant to the terms of the mining act and in which it may appear that neither party is entitled to a judgment. If neither party is entitled to relief, the jury or court shall so find, or a nonsuit may be entered, or the action may be dismissed, without verdict or decision, or the case may be remanded for a new trial with leave to amend. This proceeding does not affect the possessory right of either party to the ground in dispute. It simply prevents either party from proceeding to patent. The gist of such an action is that each party may prove his right against his adversary as well as against the United States, and neither party can depend on the weakness of the title of the other. This action arises out of proceedings in the land office, has its inception therein, and is a continuation thereof, and may be in the form of an action in ejectment, or a suit to quiet title, and is generically termed an "adverse claim suit." The pleadings of each party should set forth the facts upon which he relies to show that his is the better right as each party is plaintiff or actor therein. In addition to the usual allegations in the pleadings, in, say, a State court, there should be an allegation of citizenship, or its equivalent, the acts constituting the location, a description of the several properties involved in the controversy showing their relative position, as well as the area in conflict. Also a statement showing when the "adverse claim" was filed, and that the action was commenced within the statutory period of 30 days after such filing, which latter should be within the 60-day period of newspaper publication of notice of the intention to apply for a patent. This, although the court has really nothing to do with the proceedings in the land office, and has no power to determine as to the regularity or irregularity, sufficiency or insufficiency thereof, as the courts determine the "right of possession" as if no contests had been initiated in the local land office. If the action is commenced in, or removed to a Federal court, the jurisdictional facts must be alleged in the initial pleadings if an original proceeding in the Federal court, or in the petition for removal if the case is sought to be removed thereto. The jurisdictional facts may be said to be the existence of diverse citizenship, or of a Federal question, and that the value of the property, that is, that part of it in dispute exceeds the value of $2000, exclusive of interest and costs. The judgment on the merits is conclusive upon the Government as to the rights of the respective parties to the litigation, although it still remains with the land department to determine the right to the patent, that is, whether there has been a compliance of the provisions of the mining act, because the judgment establishes merely the right of possession and it remains for that tribunal to determine all other questions touching the right of patent.

The "adverse claim" suit must not only be based upon an adverse claim, for if there is no adverse claim there can be no adverse-claim suit, but must be commenced without regard to any judgment previously obtained or pending litigation, else the rights obtained or sought under such judgment or litigation will be lost, as the mining act expressly declares that if no adverse claim is filed, it must be conclusively presumed that none exists and that the applicant is entitled to a patent. Of course, a prior judgment may be made the basis of the "adverse claim." Furthermore, the suit must be prosecuted with reasonable diligence to final judgment, or the suit be subject to dismissal. "Reasonable diligence" is a question of fact. The filing of the adverse claim and the commencement of the adverse-claim suit may be waived by the parties in interest and the applicant for patent contract to convey after such patent issues.

(2) The other class of actions relating to mining claims excepting cases involving the law of the apex, may broadly be said to be in the nature of such cases as affect real estate generally, and are to determine the right of the parties between themselves without regard to the acquisition of patent by either of them. Judgment therein is available in patent proceedings only when made the subject of adverse claim proceedings therein, unless the judgment is in favor of the applicant for patent. Also to cases concerning rights under a patent already issued, as where the patentee has acquired the legal title affected with fraud, or a trust in relation to it, in which case he is regarded in equity as the trustee of the true owner. In such cases it must appear that the plaintiff is so connected with the legal title as to have a right to its control. In the second class of cases it is not generally necessary to aver the citizenship of the plaintiff.

Oil Wells in Chihuahua, Mexico

C. M. Leonard, vice-consul, reports as follows regarding the oil wells in the Mexican State of Chihuahua:

For several years persistent reports of the existence of oil in the eastern part of the State of Chihuahua have been current. For the last three years an American company has been carrying on operations with a great deal of secrecy, but it is learned on good authority that it is sinking three wells, varying in depth at the present time from 1400 to 3285 ft. In one well oil-sand to a depth or thickness of 40 ft. has been encountered; in the second it is reported three strata of oil-sands have been cut, and in the third the oil-sand strata is said to be 120 ft thick. Oil has been found twice in the latter

Adjacent to the lands mentioned the governor of Chihuahua, Enrique C. Creel, owns large tracts of oil lands. Mr. Creel states that he has received very favorable reports from engineers who have examined his property, showing that the existence of oil is strongly indicated. He has given options on these lands to an American, and drilling is expected to begin soon.

Following is an analysis of a sample of oil obtained from this field: Naphtha and light oil, 14.38 per cent.; kerosene light (flash point 110), 31.05; kerosene heavy (flash point 128), 22.06; lubricating oil, 20; paraffin, 10; total, 97.49 per cent.

The oil discovered is a fine paraffin base, said to be equal to the best Pennsylvania oil. The oil-sand resembles that known in Pennsylvania as Bradford chocolate sand. The lands upon which this oil is found are on the line of the Kansas City, Mexico & Orient Railroad, now under construction, and the line will reach the oilfields within 12 months.

The government of the State of Chihuahua has offered $5000 gold for the first oil well brought in producing a minimum of 60 barrels of oil per day. The benefit to the State of Chihuahua, and in fact to all northern Mexico, should oil be found to exist in commercial quantities, is incalculable.

The platinum output of Columbia is second only to that of Russia (H. G. Granger, *Trans.* A. I. M. E., Sept., 1908). This precious metal, washed from the gravels of the Choco, is always found mixed with gold, sometimes one or the other metal greatly predominating. Although platinum occurs to a small extent in other parts of the Choco, its main sources are the Platina and Condoto rivers, with a few tributaries, and some of the streams running into the Cajon, all being tributary to the San Juan river. The metal is also obtained from the Agua Clara river and certain sections of the Berbera river, both of which flow into the Atrato, and from the Certegui, which is the main affluent to the Quito river.

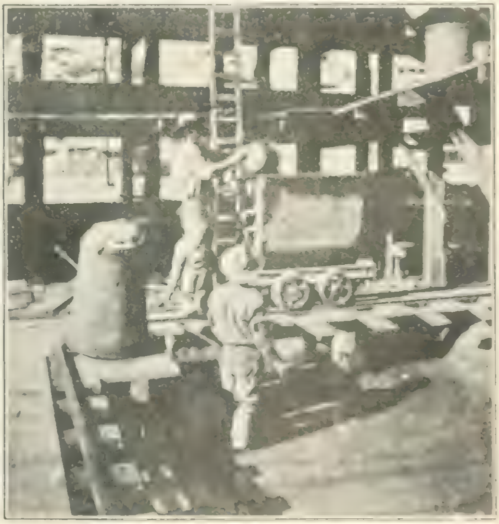
A Copper Precipitating Plant

By H. W. Chittenden*

VIEW OF INTERIOR OF COPPER QUEEN [illegible]

[illegible]

A MONTH'S [illegible]



[illegible]

One of the most successful plants in the United States for the recovery of copper from mine waters has been in operation for the last two years at the mines of the Copper Queen Consolidated Mining Company, Bisbee, Arizona. In the older mines belonging to the company, the Czar and Holbrook, where the ore-zone extends from the surface to a depth [illegible] highly oxidized and the mine water contains considerable copper. At the deeper mines, the Gardner, belonging to the Copper Queen, and the Irish Mag, belonging [illegible] ft. below the surface, the mine water con[illegible] pany, where the orebodies are much deeper and more widely scattered, the copper in the water is almost negligible. The [illegible] the Czar and Holbrook. The water at the Holbrook is pumped from the 500 to [illegible] shaft, where it is raised to the surface [illegible] itating plant.

[illegible]

---

*Box 72, Cananea, Sonora, Mexico.

outside dimensions of which are 78x108 ft. The troughs, which are made of 2-in. planks, are of rectangular cross-section, 3 ft. wide by 20 in. deep. In the troughs, at intervals of 2½ ft., are 2x4-in. cross-pieces raised 2 in. above the bottom; lengthwise on these cross-pieces are laid four 1x4-in. boards. This arrangement leaves a place for the copper to deposit until washed down into the settling tanks. In each tier there are two sets of troughs set side by side. These join together at each corner so that all the water can be made to flow through one, while the other is being cleaned. The troughs are supported by 8x8-in. posts and 6x8-in. stringers. The tiers are 6 ft. apart vertically, making the total hight of the structure about 30 ft. The slope of the troughs is from ¼ to 2 in. per 12 ft., increasing gradually through the successive tiers.

The water enters at one corner of the upper tier, and flows through the two troughs around the rectangle to the corner where it entered. At this point the water passes down a slide and flows in a similar manner through the successive tiers, until at the end of the last tier it flows into a flume. This flume takes the water to settling tanks, 17x9x9 ft. deep, a few hundred yards below the plant. These last tanks catch a small amount of the finest particles of copper and slime suspended in the water coming from the main plant. The total average length that the water flows in the troughs is about 1650 ft.

The precipitation is effected by means of tin cans which loosely fill the troughs of all the tiers. Scrap iron is used to a small extent, but the results are much less satisfactory than with the cans, principally because of the greater surface exposed by the cans. The reactions which take place in the precipitation are well known, and can be represented by the following simple equation: $CuSO_4+Fe=FeSO_4+Cu$. The resulting product is a thick yellow material containing in addition to copper, the replaced iron, some little silica, unconsumed fragments of cans, etc.

In the three upper tiers the clean-ups are made every second day, but less frequently in the lower two tiers, owing to the smaller amount of copper precipitated. While collecting the copper the flow of water is shut off from one trough at a time. This trough is then drained and the cans washed thoroughly with water from a hose under pressure. The water containing the copper product is run into settling tanks where in about two hours the metal settles sufficiently so that the water can be siphoned off. After these clean-ups, occurring every other day, more cans are added as required. Once a month each trough is emptied and a thorough clean-up made. The troughs are then refilled with a new supply of cans.

The clean-up settling tanks, of which there are four placed in the interior of the rectangle, are 25x40x2 ft. deep. Once a month these tanks are cleaned out; the wet mud is bailed up in buckets, emptied into a car and dumped into a drying tank, where it remains for about one month before being shoveled up and loaded into the railroad cars, to be taken to the smelter at Douglas. There are two of these drying tanks 18x25x2 ft. deep.

The cans which are collected in Bisbee are contracted for at a nominal price per ton. Mexican labor is used entirely, the amount required being very small, as only two men are working steadily. For cleaning out the settling tanks, three extra men are required four or five days a month. The precipitate handled by these three men is loaded, when dry, by five others into a railroad car, holding 45 tons, in one day. The product when shipped contains about 40 per cent. moisture; the dried samples assay 35 per cent. copper; 6, silica; 17, iron; 13, aluminum; and 1.5 per cent. sulphur.

The saving in this plant is high, at present averaging more than 90 per cent. of the copper in the water. This high extraction is obtained when the flow of water is low, and it is possible that it is obtained at the expense of excessive iron consumption. When the flow of water is greater, the extraction is somewhat less.

Slime Settlement

In discussing the methods of slime settlement, H. L. Sulman stated[1] that he has experimented extensively with apparatus for continuous slime settlement with satisfactory results. Suppose a vertical glass cylinder is filled with a homogenous slime pulp mixture, one in which the slime particles are uniformly suspended through the liquid and where no settlement has commenced. When settlement begins, each particle subsides at the same rate, be it at the top or bottom of the cylinder. After a short time, a thin layer of clear water appears at the top, and a thin layer of fine sediment at the bottom. This means that in the same unit of time every particle has fallen an equal amount; each particle originally in the narrow zones or layers (of a thickness equal to the clear layer of liquid produced) with which the column might hypothetically be divided, has fallen through into the zone immediately beneath. The last zone, having no further space to subside into, deposits its particles on the bottom of the cylinder as sediment.

If a series of shelves had been interposed in the cylinder between each such zone it is obvious that in the same time complete clarification of the liquor would have been effected, because all the particles in that time would have settled upon the intervening shelves.

This is the principle of the Howatson filter, which is used for the deposition of the highly-divided precipitate obtained by neutralizing calcium bicarbonate with milk of lime, which requires a considerable time for ordinary settlement. The liquor containing fine suspended sediment is distributed under a head, over the bottom of a rectangular tank. It is caused to rise upward through a series of closely-spaced partition slots, which are made of slate or other smooth material placed at an angle of about 60 deg. from the vertical. In passing up the narrow flattened columns between the slots at greatly diminished velocity due to the increased area of the total ascending column, the solid particles settle on the slots. The apparatus thus practically becomes a series of shallow continuously-acting deposition zones, the liquor above the plates passing off absolutely clear.

Not only do the particles readily and completely deposit, but, the slots being fixed at a greater inclination than the sliding angle, the settled slimes slide downward constantly. They become agglomerated and, although falling into turbid liquor beneath the slots, do not break up, but sink heavily into the hopper-shaped bottom of the tank, whence they are intermittently removed.

Settlement further depends upon the actual mass of the particle, upon its specific gravity, upon the ratio of its surface to its mass; also upon the friction between the surface of the particle and the liquid, which is variable both in regard to the nature of the surface and that of the liquid wetting it.

Very small quantities of soluble material produce physical results in regard to immersed particles out of all relation to the alteration in density due therefrom, sometimes even in a contrary direction.

Some time ago Sulman measured the contact angles which various liquids formed with given solids, and found that a rise in temperature modified the angles quite out of proportion to the slight change in density due to heat. He consequently believes that heat is a factor which produces results that are inexplicable by alteration in density only.

A small fraction of, say, one per cent. of sulphuric acid makes a great difference when added to water in which the various oil separations of mineral particles are effected. This amount of acid does not sensibly affect the density of the solution. It, however, makes all the difference between success and failure.

Again, small quantities of ammonium chloride and other ammonium salts have been shown to exert marked coagulation effects on many of the precipitates obtained in the laboratory. In using ordinary waters containing from 20 to 40 grains of calcium bicarbonate per gal., or mine waters of sensible acidity, marked effects not necessarily following in extent or direction, the small differences due to density, may be produced. Small amounts of dissolved salts, also, exercise pronounced effects upon suspended particles.

---

[1] Bulletin No. 42, Inst. Min. and Met.

The Present Position of Cobalt, Ontario

This Famous Camp Has Increased Canada's Annual Silver Production from Three Million to Nearly Thirteen Million Ounces in Four Years

BY HAROLD P. DAVIS[*]

Until recently little underground exploration work has been attempted at Cobalt. The discovery at depth of many rich "blind" veins notably in the Temiskaming mine where orebodies of great richness have been found at the [illegible] level, offers encouragment for the expenditure of a portion of the earnings in underground prospecting. It has been demonstrated in this camp that where a vein depreciates in value, or even pinches out entirely at a moderate depth there may be found within a few feet a blind vein of equal or greater richness. It has also been shown that veins which carry only little silver or none at all on the surface often develop into rich oreshoots at depth.

Within the last year the proved area of enrichment has been extended. The discouraging features which undoubtedly exist in some of the mines are more than overbalanced by the greatly improved conditions in others. The outlook on the [illegible] Steam plants have been installed at 92 properties, 57 of which have also installed [illegible] still unsatisfactory, are steadily improving.

[illegible]

Until late in 1906 little attempt was made at any of the mines of Cobalt to operate economically, the problem of treating the low-grade ore and the wall rock, [illegible] for shipment being almost neglected. Three mines, the Buffalo, Coniagas and Cobalt Central, now have concentrating plants in fairly successful operation. The Muggley concentrator, a custom mill, is handling ore from a number of mines. The mill at the McKinley-Darragh mine is being enlarged and a 10-stamp mill at the King Edward is well under way. The silver content of the ore extracted varies from less than 100 oz. to 7000 or 8000 oz. or more per ton.

Until 1907 practically all the ore from Cobalt went to smelteries in the United States. Since January, 1907, the output was divided as follows:

A large percentage of the ore shipped to the United States went to the American Smelting and Refining Company's plant at Perth Amboy. The ore shipped to Canadian smelteries went to the Canadian Copper Company, at Copper Cliff. The former company paid nothing for the cobalt content, the latter paid on the basis [illegible] cent., [illegible] Neither company paid for the arsenic content. The ore shipped to England was purchased for the cobalt content only, no payment being made for the silver.

NIPISSING MINE

[illegible]

LA ROSE MINE

[illegible]

Ten shippers were added to the list in 1907, and in the first six months of 1908 six more—the Little Nipissing, Cobalt Lake, Provincial, Silver Cliff, Crown Reserve, and [illegible] Since the first of the year the ore has been sent to a larger number of smelteries, and slightly better terms are being obtained. The following companies have received shipments of ore this year: Canadian Copper Company, Copper Cliff, Ont.; Clifton Sand, Gravel Construction Company, Thorold, Ont.; Consolidated Mining and Smelting Company, Trail, B. C.; Deloro Mining and Reduction Company, Deloro, Ont.; American Smelting and Refining Company, Perth Amboy, N. J., and Denver, Colo.; United States Metals Refining Company, Chrome, N. J.; Anglo-French Nickel Company, Swansea, Wales; R. C. Farrell & Co., Glasgow, Scotland; Beer Sondheimer & Co., Hamburg, Germany.

---

[*] Cobalt, Ontario, Canada.

During the first three months of 1908, according to the Bureau of Mines, there were shipped 4402 tons of ore containing 3,673,047 oz. silver, valued at $1,938,841. The total ore shipments for the half-year amounted to 9144 tons, including concentrates.

The decrease in value per ton during 1907 is accounted for by the larger percentage of low-grade ore shipped; the increase in 1908 by a small quantity of concentrates. In 1907 Cobalt produced 10,023,311 oz. of silver, which constitutes more than 5 per cent. of the world's production; this places Canada fourth in the list of silver-producing countries.

SHIPMENTS AND DIVIDENDS PAID TO JULY 1, 1908.

Mine.	Capital.	Par Value.	Tons Shipped to July 1.	Paid in Dividends.
1. Buffalo	$1,000,000	$1 00	2,781	$216,000
2. City of Cobalt	500,000	1.00	338	
3. Cobalt Central	5,000,000	1.00	201	
4. Cobalt Silver Queen	1,500,000	1.00	984	195,000
5. Cobalt Lake	5,000,000	1.00	124	
6. Colonial	6,000,000	5 00	55	
7. Cobalt Townsite	1,500,000	1 00	185	
8. Crown Reserve	2,000,000	1.00	49	70,000
9. Coniagas	4,000,000	5 00	3,218	680,000
10. Drummond	Close Corporation		506	Amount not stated
11. Foster	1,000,000	1.00	602	45,779
12. Green Meehan	1,500,000	1.00	135	
13. Kerr Lake	3,000,000	5 00	809	660,000
14. King Edward	6,000,000	5 00	246 (a)	
15. Little Nipissing	1,000,000	1 00	20 (b)	
16. McKinley Darragh	2,500,000	1 00	2,106	298,017
17. Nancy-Helen	500,000	1.00	100	
18. Nipissing	6,000,000	5 00	6,282	2,080,000 (c)
19. Nova Scotia	2,000,000	1.00	446	
20. O'Brien	Close corporation		3,163	250,000 (d)
21. Provincial	Government mine		76	
22. Red Rock	1,000,000	1 00	46	
23. Right-of-way	500,000	1 00	355	105,000
24. Silver Cliff	650,000	1 00	27	
25. Silver Leaf	5,000,000	1.00	154	
26. Temiskaming	2,500,000	1 00	517	75,000
27. T. & H. B.	7,850	1 00	346	777,150
28. Trethewey	1,000,000	1 00	1,902	110,000
29. LaRose, now included in LaRose Consolidated Mines Co.	7,500,000	5 00	6,062	1,066,904 (d)
Other mines			528	
Paid in royalties to T. & N. O. Ry. and Province of Ontario				300,000
Total			32,363	$6,950,765

(a) Consolidation of the King Cobalt mine and 80 per cent. of the stock of the Watts mine. Ore was shipped from the Watts.
(b) From Peterson Lake lease of Little Nipissing.
(c) $400,000 of this total was paid to original owners.
(d) Paid to owners.

DISTRIBUTION OF COBALT ORE SHIPMENTS.

Location of Smelteries	Year 1907.		Jan.-June, 1908.	
	Tons.	Per Cent.	Tons.	Per Cent.
United States	12,099	81.47	6416	70 73
Canada	2,585	17.40	2564	27.45
Great Britain	167	1 13	133	1 53
Germany			31	0.29
Total	14,851	100 00	9144	100 00

STATISTICS OF PRODUCTION.

Year.	No. of Shippers.	Tons.	Gross Value.	Value per Ton.	Percentage Increase in Tonnage.
1904	5	191.55	$ 136,217	$862	
1905	17	2,336 01	1,485,570	636	1,210
1906	19	5,836 59	3,573,908	613	150
1907	29	14,851 34	6,155,391	415	154
Total to Jan. 31		23,215 49	$11,351,086	$631 34	
First quarter, 1908		4,402.65	1,938,841	440 45	
Second quarter, 1908		4,741.35	2,200,000	Estimated	
Total to July 1, 1908		32,359.49	$15,489,927		

Eichhorn Trigonometric Slide Rule

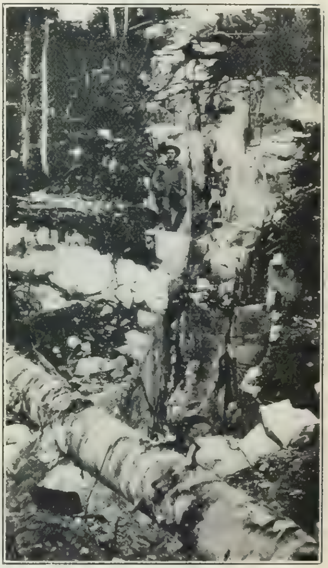
M. J. Eichhorn, Chicago, Ill., has devised a new slide rule intended especially for the solution of triangles.

The face of the Eichhorn slide rule is especially arranged to solve the general trigonometric equation for the third side of a triangle, the other two sides and the included angle being given. This relation is expressed by the familiar equation

$$C^2 = A^2 + B^2 - 2\,A\,B\,cos.\,c$$

If in this equation we make

$$2\,A\,B\,cos.\,c = X^2$$



A TYPICAL CALCITE VEIN AT COBALT

the equation will read

$$C^2 = A^2 + B^2 - X^2,$$

which is in a quadratic form and is solved directly by the upper scale on the rule and the upper scale on the slide; both of these scales are graduated to the functions of the square. The scale on the slide has its zero at the center and is graduated alike in both directions.

For convenience in the case of right-angled triangles the back of the slide is provided with the usual scale of logarithmic tangents from 6 to 45 deg. A scale of equal parts enables the user to read the values of the squares, the trigonometric functions or the logarithms as desired.

The mineral colemanite is the most important source of California borax.

Mine Signaling by Compressed Air

The pneumatic system of signaling of the Westinghouse Air Brake Company, which has been in use for many years on passenger trains, has been introduced at various mines in different parts of the country to replace the pull-bell or electric systems. In the Westinghouse apparatus there is only one moving part, i.e., the small lever of the "discharge valve." Another advantage is the fact that the signal sender has always the means of knowing whether the signal has been delivered to the engineer. Changes of temperature, likely to occur from change of air currents, do not affect the working of the system. If any accident should injure the signal pipe, or any other parts of the apparatus which would allow a part of the air to escape, a warning would at once be automatically given to the engineer. In the matter of cost for maintenance, the compressed-air system also has advantages. This system has been in operation for several years in some of the prominent mines of this country, and during that time has required almost no repairs whatever.

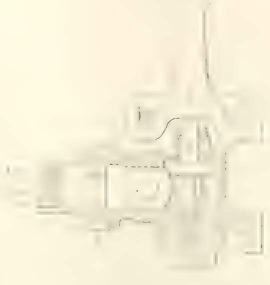
The accompanying diagram shows in a general way the simplicity of arrangement of the apparatus. The system is practically the same as that used by express trains with slight modifications in installation A small, shrill whistle in the engine room is the sounding device which conveys to the engineer the signal sent from the mine workings. Where signals controlling more than one hoisting shaft are received, the whistle is tuned or chimed differently from the others.

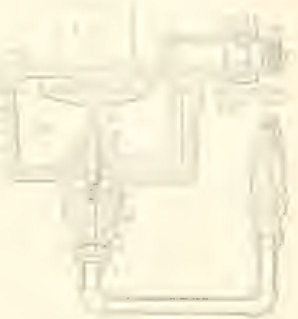
A signal valve is placed near the whistle and connected by piping with the source of supply for compressed air, and also to the various workings and levels of the mine. This pipe is called the "signal pipe," and is usually ½ or ¾ in. in diameter. The signal valve causes the whistle to sound whenever reduction in air pressure occurs in the signal pipe. A reducing valve is inserted in the supply to the signal pipe so as to reduce the pressure carried in the compressed-air mains of the mine to that required by the signal system, which is usually 40 pounds.

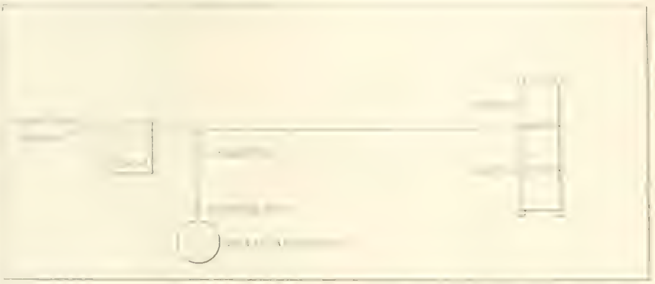
A discharge valve is inserted in the signal pipe at a point close to each signal station. A moderately light cord is attached to the lever of the discharge valve. Each pull of the cord opens a valve, permitting a small quantity of air to escape. This reduction of pressure travels rapidly through the pipe to the signal valve, causing it to sound the whistle. The escape of air from the discharge valve is easily heard by the signal sender.

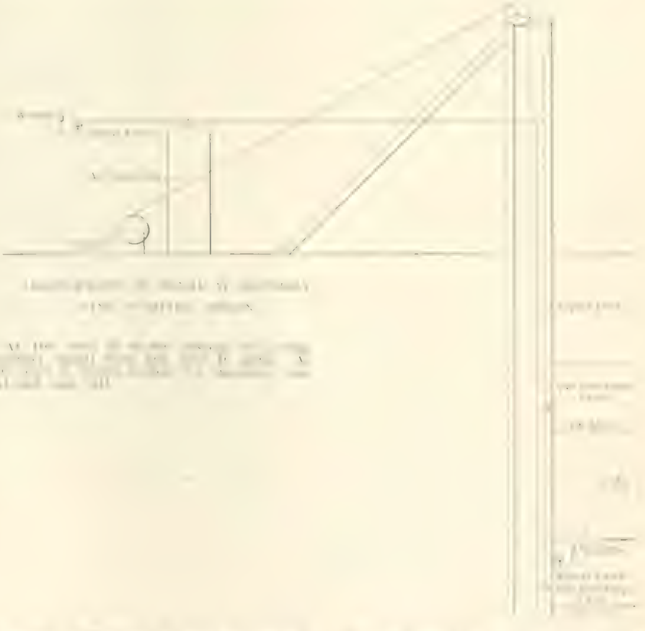
By this means signals may be given to the engineer from any station or signaling point in the mine by a quick, sharp [illegible]

[illegible] the discharge valve. Signal blasts may confuse the engineer.









[illegible]

Fighting an Underground Fire with Oxygen Breathing Apparatus

By F. W. Gray

The Engineering and Mining Journal of Oct. 12, 1907, page 695, contained a brief account of the rescue station of the Dominion Coal Company, at Glace Bay, Cape Breton. A successful demonstration of the usefulness of such a station has recently taken place. A fire broke out in No. 1 mine of the Nova Scotia Steel and Coal Company, at Sydney Mines on Sept. 9. It originated from a blown-out shot in a partly driven room off the back deep. This room is situated about 2¼ miles from the shaft, near the barrier of the Nova Scotia company's submarine areas under the waters of Sydney harbor. Owing to the inadequate supply of water, the fire, which on the morning of Sept. 10, seemed to be under control, gained on the parties who were endeavoring to extinguish it, and commenced to creep up the back deep. At this juncture the assistance of the Glace Bay rescue station was asked. The message was received at Glace Bay at 8 p.m., and about 11 p.m. a party of 24 trained men equipped with 10 Draeger apparatus, electric hand lamps, and sufficient oxygen and potash reserves to last for 12 hours' use of each apparatus, left for Sydney Mines.

The Rescue Station Called Into Service

The journey from Glace Bay to Sydney Mines is partly by tram line, partly by water, and partly by rail, and occupied somewhat over two hours. It was not until 5 a.m., Sept. 11, that the seat of the fire was reached. The apparatus was all taken down the mine and a base was established not more than 50 ft. from the burning room. The fire was attacked by relays of three men at a time. Other men were detailed to brattice and timber. The combating of the fire was directed by N. MacKenzie, one of the district superintendents of the Dominion Coal Company.

Method of Attack

The superintendent of the rescue station remained at the base of operations and fitted his men with their apparatus as required. The fire by this time had jumped the back deep and had extended along the room on the opposite side. The entrance to this room was blocked by a heavy fall, on the other side of which the fire was burning fiercely. It was necessary to mount this fall in order to bring the hose to bear on the flames. The heat was intense, and none of the men was able to withstand it for a period longer than 10 minutes. As they retreated, their places were taken by others. The instructor relieved the retiring parties of their apparatus and put it upon the fresh relay. He states that the metal parts of the apparatus became so hot that his hands were burned in handling them. It was found necessary to provide the apparatus men with oilskins to protect them from the scalding of the steam.

The fire fighters were greatly hampered by the feeble water supply. For some 500 ft. the water was carried in an ordinary fire hose, which was unable to withstand the head of pressure and was constantly breaking and interrupting the supply. By working steadily, however, it was found possible to drive back the fire, and by 3 p.m. it had been confined to the room where it had originally started on the other side of the back deep. A wooden dam, backed with clay, was constructed across the mouth of the room, and it was slowly flooded. This work was done by the workmen of the Nova Scotia company after the Glace Bay men had left the mine, which they did as soon as the fire was seen to be under control and capable of being easily confined by the dam.

Exacting Conditions Successfully Met

When all the circumstances are considered, the achievement of the Glace Bay corps is a remarkable one. It was the first time they had been called upon to use the apparatus under the actual conditions of an underground fire; they had had no sleep the previous night, and had taken no refreshment beyond coffee and biscuits for over 12 hours, and they worked for over eight hours under the most exacting conditions imaginable. Had they been able to tackle the fire within a reasonably short time after it had originated, their task would have been much easier; but under the conditions above described, the work was most serious in its aspect.

The results accomplished are practical proof of the utility of oxygen breathing apparatus in fighting fires or in dealing with any conditions underground where the presence of smoke or noxious gases precludes the ordinary methods. Previous to the arrival of the Draeger equipment, three men had been carried out of the mine insensible, and the fumes and smoke would very quickly have killed any person who had endeavored to penetrate them unprotected. Apart from severe muscular pains superinduced by the extraordinary exertions the men of the Glace Bay corps had made, they suffered no other ill effects. Their confidence in the apparatus is now unbounded, and it is realized that the original cost of the station and its equipment, and the trouble of training has already been amply justified by the results.

Some of the causes which contributed to the success of the Dominion Coal Company's men in this instance may be emphasized. Each of the 24 men was an experienced pitman, several of them having had considerable previous experience in fighting underground fires. They had all trained conscientiously in the smoke practice chamber, and were physically fit. The instructor remained at the base of supplies, and allowed no man to go into the danger zone before he had made sure that his apparatus was all working properly. This was all the instructor did, and all that he is supposed to do. The actual direction of the fire fighting was under an experienced official, and every man was working to orders, so that no confusion ensued.

---

*Mining engineer, Glace Bay, Nova Scotia.

Value of Flue Gas Analysis

In a recent boiler-plant test made by the coal department of the Arthur D. Little laboratory, Boston, the loss due to unburned gases from a thick, uneven fire was illustrated by an interesting occurrence in connection with the flue-gas analyses. The test showed the following relative conditions:

	1	2
Sample of gas taken...	5:00 p.m.	5:30 p.m.
Carbon dioxide CO_2, per ct.	11.3	14.3
Oxygen O_2 per cent.........	6.5	5.5
Carbon monoxide CO per ct.	2.4	0.0
Nitrogen N_2 per cent........	79.8	80.2
Air excess per cent..........	45.0	36.0
Temperature flue gas, deg. F.........................	45.0	700.0
Heat loss due to CO, per ct.	9.7	......
Heat loss due to increased temperature of flue gas, per cent................. .	......	4.3

The first analysis shows a considerable amount of CO to be present. Before taking the next sample the CO started to burn through the passes of a 600-h.p. Aultman & Taylor boiler and the CO was being entirely consumed. The flue temperature rose 155 deg. on account of the burning of the CO through the passes of the boiler instead of in the furnace. There was no combustion chamber and the fire was so thick that it came close to the bottom row of tubes.

A number of facts can be drawn from this instance:

1. Had the boiler been set with an ample combustion chamber, all gases would have been burned before coming in contact with the heating surface, resulting in a gas analysis like No. 2, but with a temperature corresponding to No. 1.

2. The fire should not be carried so thick that CO will be formed, as it is very difficult to burn it all in a boiler furnace when once formed and the loss due to small percentages of CO is very great.

3. The determination of CO_2 alone is not sufficient to determine whether the boiler is being properly fired. In the case of No. 1 sample, a CO_2 indicator should have shown 11.3 per cent. CO_2, which would ordinarily have been considered good, but there would have been no indication that CO was present, while the loss due to it was as great as if the CO_2 had been only 7.5 per cent. with no CO.

Underground Haulage in Coal Mines

Where there was one electric locomotive in the anthracite coal mines of Pennsylvania a decade ago, there are a dozen now; the hundreds of feet of trolley wire have grown into thousands. Millions of dollars have been spent upon the electric locomotives, the power houses and the strengthening of tracks necessary to the improved system. The network of tracks in the anthracite mines has spread until the underground mileage is almost as great as the mileage of the so-called "anthracite roads" on the surface.

Some 17,000 horses and mules are still employed in and around the anthracite mines, but in many cases the distance has disqualified mulepower. Compressed air locomotives, though used in considerable number, have proved less economical than electric locomotives, and their use is not apt to be extended. There are few steam locomotives in the mines, and there will be still fewer in the future. Combustion in any form is not desirable in coal mines, on account of the risk of gas explosions.

Within three years, 1903 to 1906, the number of electric locomotives in the anthracite mines—this does not include those at the top of the shafts—grew from 84 to 205. There were only 41 locomotives operated by steam in 1906 as against 49 in 1903, a decrease of 16 per cent. Compressed-air locomotives increased from 67 to 104 in the three years.

Four Kinds of Motive Power

There are four separate and distinct kinds of motive power, exclusive of rope haulage for steep slopes, used in the mines: mules, steam, compressed air, and electricity. In the volume of work done, mules, at this time, remain far in the lead. Steam is going backward. Compressed air is about stationary, probably destined to lose its importance in the future. Electricity is the coming factor, and will make headway steadily.

Managers of anthracite-coal-mining companies say that the mules will never be eliminated altogether. There will always be certain kinds of work which can be done more satisfactorily and more economically by animal muscle than by any form of mechanical power. In the gangways producing small quantities of coal the installation of electricity would be impracticable and wasteful.

Every one of the several kinds of motive power has greatly increased in expense in recent years. A mine mule that cost $125 in 1897 cost $240 in 1907. The rise in the prices of materials ran up the cost of installing mechanical appliances. The lengthening of the gangways and the exhaustion of the more accessible seams of coal, however, have been the greatest factors, for they have caused a direct increase in the amount of hauling to be done. It is certain that transportation in the mines will be more and more costly as [illegible]

Stables are fitted up underground, and [illegible] down into a mine he usually goes to spend the rest of his life there. He has to be well taken care of if [illegible] the work properly. In the newer mines he has stables of concrete (except the floors, which must not be hard for his feet), lighted by electricity, with perfect drainage and ventilation. Sanitary conditions are better in a mine stable than in the average stable above ground.

The cost of maintaining one mule one day comes to about 80c. The expense of feeding has gone up 35 per cent. in the last five years. The statistics of several anthracite mines show that a mule consumes in a day 10.61 lb. of hay and 9.37 lb. of corn and oats. This is one of the costs that continues during the suspension of work as at other times, for the mule must eat whether the coal is being mined or [illegible]

[illegible] Air for Hauling

When it became advisable to substitute mechanical power for mules, compressed-air locomotives were adopted because they were secure against fire or explosions of gas. Furthermore, they were low and could get through gangways which were not high enough even for mules. Comparatively simple in their working, they did not require much training in operating them. [illegible] air is very large. The air is compressed, first, to 800 or 900 lb. per square inch, and is transferred from the pipes to the locomotive at, say, 125 lb. The waste, in manufacturing unused power, is enormous.

The distance which an air locomotive can travel without replenishing depends upon the capacity of the tanks. A mile and half is a long journey for a single charge. Smaller locomotives cannot go more than half a mile. The compressor in the power house above ground has to be going all the time. The tanks have a capacity of from 40 to more than 200 cu.ft., [illegible] to the type of locomotive. [illegible] 50,000 [illegible] It is [illegible] mines, principally, that compressed air is superior to other forms of power. It is absolutely safe so far as fire is concerned. Hence the air locomotive will always find [illegible]

[illegible]

The first electric mine locomotive was built in 188[illegible] [illegible] startling innovation, and general doubt as to its usefulness was expressed. In appearance it was very unlike the one of today. Among other things, its hight was too great for the low gangways found in many mines.

In the early nineties came the "terrapin back," more nearly approaching the squat [illegible] one motor and the axles were coupled together by connecting rods. Then came the locomotive with two motors, the axles being driven independently. In general character this is the locomotive of the present day.

Electricity demands a much firmer and stronger track than does the mule. Manufacturers of electric locomotives invariably urge the adoption of heavier rails. "For animal and rope hauling," says one, the prevailing light rails are satisfactory; but for the locomotion of traction haulage the rails should be much heavier, in fact, the heavier the better." With the miles of track that have to be laid, this means great expense. For a 10-ton locomotive, a rail weighing 25 lb. to the yard is prescribed as a minimum, but a 45-lb rail is recommended.

[illegible]

Electric traction introduces new engineering tasks in the matter of grades. The capabilities of a locomotive are the same at all times, and grades have to be reduced accordingly. It is the adverse grades that determine the size of a locomotive in any particular mine. Though they can climb a 12-per cent., or even a 15-per cent. grade, with heavy rails, the locomotive cannot be called upon to perform economically, on long runs, against grades of more than 3 per cent. Consequently, there has had to be a great deal of work toward leveling the floors in the gangways.

In a mine gangway, the location of the trolley wire is not as simple a matter as it is on the streets and on country roads, for space is limited. The wire must be installed in such a manner that it will cause the least possible interference with free passage of men and animals.

A mine-haulage system should have a regular schedule, just like a street railway or a subway. If one locomotive is going from the shaft with a train of "empties" while another goes toward it with a loaded train, it means a saving in the size of generator and engine. Keeping such schedules involves employing well paid men, who are capable of running things smoothly and avoiding the confusion which means loss of time and money.

[illegible] larger percentage of moisture than do mine samples, though the gain is slight. High-moisture-content bituminous coals show less moisture in car samples than in mine samples; the loss is about 1.5 per cent. Car samples of small-moisture-content semi-bituminous and bituminous coals gain about 1.5 per cent. in moisture.

Sulphur has its own heating value equal [illegible] coal it replaces.

The Prevention of Mine Explosions*

Precautions as to the Handling and Use of Explosives, Wetting the Dust and the Employment of Electricity in Underground Operations

REPORT OF FOREIGN EXPERTS

The Geological Survey issued on Oct. 22 a report on the prevention of mine explosions, submitted by three foreign experts, Victor Watteyne, inspector-general of mines, Belgium; Carl Meissner, Germany; and Arthur Desborough, H. M. inspector of explosives, England. These engineers have been in the United States for six weeks, coming at the invitation of the United States Government to assist the Federal authorities in beginning the investigations authorized at the last session of Congress. The report was presented to Secretary Garfield, who transmitted it to President Roosevelt, stating that the report with its recommendations will be of the highest importance in aiding Congress and the different State governments in providing legislation to insure more efficient and careful operation of coal mines, by the adoption of mining methods and safety appliances that will materially aid in preventing such terrible losses of life as have occurred through mine explosions in recent years. The President ordered its immediate publication and distribution among the coal-mine operators and miners of the country.

Report

In response to your request that we coöperate with the United States Geological Survey in the inauguration of its investigations looking to the prevention of mine explosions, and that we submit for the consideration of those connected with the coal-mining industry in the United States such recommendations as experience in our own countries and observation among American coal mines indicates may be useful in providing for greater safety, we beg to submit the recommendations given below.

Since coming to the United States, we have given careful attention to and approve the investigations in relation to this subject begun by the Geological Survey. We have visited typical mines in the more important coalfields of the United States, and have discussed the mining problems with many coal operators, miners, and State inspectors.

To be effective, investigations for the benefit of mining must be continuous. The opening up of new mines, the deepening of old mines, the meeting with new conditions, the changing of explosives, and the inauguration of new processes and methods will call for continuous investigations, to be followed by continuous educational work.

Our investigations and recommendations relate primarily to questions of safety in mining; but in this connection we have been greatly impressed with another closely associated phase of the industry, viz., the large and permanent loss of coal in mining operations in many portions of the United States. This is a serious, permanent, and national loss. It seems to be a natural outcome of the ease with which coal has been mined in the United States and the enormously rapid growth of the industry.

The active competition among the operators and the constant resulting effort to produce cheaper coal has often naturally led to the mining of only that part of the coal which could be brought to the surface most easily and cheaply, leaving underground, in such condition as to be permanently lost, a considerable percentage of the total possible product. Certainly much of this loss can be prevented through the introduction of more efficient mining methods, such as the longwall system, more or less modified, and the flushing method.

In the preparation of these recommendations we have recognized fully the great differences between the mining conditions in Europe and those in America, where the industry has developed so rapidly that thorough organization has not yet been possible; where a large percentage of the men entering the mine are unfamiliar either with mining methods or the English language; and where the price of coal at the mine is less than half that in Europe. Nevertheless, we believe that these recommendations will be found useful in the further development of the American coal-mining industry for safety and efficiency. The cordial reception everywhere accorded us leads us to believe that these recommendations will be received by the operators and miners in the same spirit of good will as that in which they have been prepared. But the success of this movement for greater safety and efficiency will depend upon the hearty and patient coöperation of the operators and the miners, working together for the accomplishment of this purpose.

Recommendations

A. Selecting the Explosives to be Used

(1) We recommend that the Government of the United States examine the explosives now and hereafter used in mining, with a view to eliminating the more dangerous explosives and to improving and standardizing such explosives as may be considered most suitable for such use, these to be designated by the Government "permissible explosives."

The term "permissible explosives" is suggested for the reason that no explosives are entirely safe, and all of them develop flame when ignited; and we advise, therefore, against the use in the United States of the terms "safety explosives" or "flameless explosives," as these terms may be misunderstood and this misunderstanding may endanger life.

(2) We recommend that the operators and miners of coal use only such explosives as are included in a list of "permissible explosives," when the same has been published by the Government, in all mines where there is risk of igniting either dust or gas, selecting that one which their own experience indicates can be used to the best advantage under local conditions.

(3) We also recommend that investigations be conducted to determine the amount of charge of such "permissible explosives" which may be used to the best advantage under different conditions with a view to reducing danger to the minimum.

B. Carrying the Explosives into the Mines

(1) All explosives should be made into cartridges and placed in closed receptacles before being carried into the mine, and the quantity carried into the mine during one day by any miner should be limited as nearly as practicable to the quantity needed by him for use during that day. Handling loose explosives and making them into cartridges by an open light in the mine should be prevented.

(2) Detonators or caps should be handled with great care, and should be carried only by a limited number of responsible persons.

C. Use of Explosives in the Mine

(1) Shooting in or off the solid should not be practiced.

(2) The depth of the shot hole should be less by at least 6 in. than the depth of the cutting or mining. The use of very deep shot holes should be avoided as unnecessarily dangerous.

(3) The overcharging of shots (the use of a larger charge than is required to do the work satisfactorily) should also be avoided as unnecessary and dangerous. The proper standardization of explosives used in coal mining will greatly facilitate the carrying out of this recommendation.

(4) Shots should never be tamped with fine coal or material containing coal. Clay

---

*United States Geological Survey Press Bulletin.

or other suitable material should be supplied and used for this purpose.

(5) The firing of two or more shots in one working place, except simultaneously by electricity, should not be allowed until a sufficient interval has elapsed between the firings to permit an examination of the working place, in order to see whether any cause of danger has arisen.

(6) Before a shot is fired the fine coal should be removed from the working place, as far as practicable, and the coal dust on the floor, sides and roof, for a distance of at least 20 yards from the place where the shot is to be fired, should be thoroughly wet, unless it has been demonstrated that the dust in the mine is not inflammable.

(7) If gas is known to occur in the mine, no shot should be fired until, in addition to the watering, an examination made immediately preceding the time for firing, by a competent person, using a lamp which will easily detect 2 per cent. of gas, has shown the absence of that amount of gas from all spaces within 20 yards of the point where the shot is to be fired.

(8) Believing that such will be one of the greatest advances which can be made in safeguarding the lives of the miners, we recommend the adoption of a system of electric shot firing, in all mines where practicable, by which all shots in the mine, or in each ventilation district of the mine, may be fired simultaneously, at a time when all miners and other employees are out of the mine.

D. KEEPING THE MINE ROADWAYS CLEAN

(1) The roadways of the mines should be kept as free as possible from loose coal which may be ground into dust, and of rubbish in which such dust may accumulate, in order to facilitate the removal and wetting of the dust.

E. WETTING THE COAL DUST

(1) In all coal mines where explosives are used it is desirable, and in all mines containing gas it is highly important, that the dust on the walls, timbers, and floors of the working places and roadways should be kept continually wet prior to and during the work in the mine. If, however, conditions of roof or lack of water render this general watering impracticable, at least the dust within 20 yd. of each shot should be wet before each firing, and other precautions against explosions should be practiced with unusual care.

It is our opinion that a system of watering which occasionally sprinkles the floor only and leaves dry the dust on the walls and timbers of the roadways is useless and is also dangerous in that it may generate an unwarranted feeling of security against an explosion.

F. SPECIAL PRECAUTIONS FOR MINES CONTAINING GAS

(1) In any mine where as much as 2 per cent. of gas can be detected by [illegible] lamps of an approved type should be used so long as such condition exists or is likely to recur.

All safety lamps should be maintained in good condition, cleaned, filled, kept in a special room at the surface, and carefully examined both when delivered to the miner and when returned by him at the close of each day's work. A defective safety lamp is dangerous because of the false feeling of security it engenders.

In the filling of lamps with benzine, or other low-flash oils, which should always be done at the surface, special precautions against fire or explosions should be taken.

G. USE OF ELECTRICITY

(1) Electricity in mining operations offers so many advantages, and has been so generally adopted, that no reasonable objection can be made to its use under proper restrictions. The electrical equipment, however, should be installed, maintained, and operated with great care, and so safeguarded as to minimize danger from fire or shock. The fact that the effectiveness of some insulating materials is soon destroyed in most mines should not be lost sight of.

We recommend the following precautions: For distribution underground the voltage should not exceed 650 direct current, or 500 alternating current; these voltages being intended for transmission to machinery operating at 500 volts direct current and 440 volts alternating current, respectively. Even lower voltages are preferable. The trolley wires should be installed in such manner as to render shocks least likely; that is, placed either high enough to be beyond easy reach, or at one side of the track and properly protected.

Where current at a potential of more than 650 volts is employed for transmission underground, it should be transmitted by means of a completely insulated cable; and where a lead or armored covering is used, such covering should be grounded.

In all mines having electric installation special precautions should be taken against the setting on fire of coal or timber. Inclosed fuses or cutouts are recommended, and each branch heading should be so arranged that the current may be cut off when necessary.

No live electric wire should be permitted in that part of any mine in which gas is found to the amount of 2 per cent.

In all mines producing gas in dangerous quantities, as indicated by a safety lamp which will detect 2 per cent. of gas, the working places should be examined for gas by a qualified man, using such a lamp, immediately before any electric machine is taken or operated there.

H. PRECAUTIONS AGAINST MISCELLANEOUS ACCIDENTS

(1) In all new construction, shaft lining and super-structures about the entrance of the shaft (or slopes or drifts) should be built as far as practicable of noncombustible materials.

About the entrances to mines every possible precaution should be taken to prevent fires, or the injury of the equipment for ventilation and haulage. Ventilating fans should be placed at one side of the mine opening, and hinged doors or light timbering should render easy the escape of the explosive force in direct line of the shaft or slope.

Proper precautions should be taken for immediately preventing the entrance into the mine of heat and gases and for facilitating the escape of the men in case of surface or shaft fires.

(2) The surface equipment for handling the coal should be so arranged as to prevent coal dust from entering the mine shaft.

(3) In all new mines, and in all old mines as far as practicable, suitable man roads should be provided for the men separate from the main haulage roads.

(4) In connection with the system of ventilation it is recommended that in the more frequented roads connecting the intake with the return-air courses, two doors be provided, these doors to be placed at such a distance apart that while one is open the other is closed.

(5) In view of the large number of accidents from falls of coal or roof, under the existing practice with single props, more attention should be given to the introduction in mines where the roof is bad of better systems of timbering, such as have been long in use with economy and safety in many well managed mines.

(6) In undercutting coal by hand, the premature fall of the coal should be prevented by sprags or other suitable supports.

(7) We believe that the difficulties and dangers encountered in the working of coal seams which are thick and steeply pitching, or of which the coal is highly inflammable in character or subject to firing from spontaneous combustion, and in mines where the subsidence of the surface must be avoided, may be successfully and economically overcome in many cases through the adoption of the flushing system of mining—that is, the filling with sand or other similar materials of [illegible] This system originated in the United States and is now successfully practiced in portions of Germany, Austria, Belgium, and France.

[illegible]

W[illegible] the fact that thorough discipline about the mine is absolutely essential to safety, and that thorough discipline can be brought about only through the hearty cooperation of the operators, the miners, and the State.

[illegible]

responsibility for safety in the mine should primarily rest with some person, such as the manager or superintendent, clothed with full authority; and that such person can greatly facilitate the attainment of safety through the employment of a sufficient number of foremen, and also of one or more inspectors whose special duty it shall be to see that the regulations are strictly enforced.

(3) The State cannot exercise too much care concerning the experience, technical training, and selection of its inspectors. Their positions should be made independent of all considerations other than that of efficiency; and their continuance in the service should be coexistent with good behavior and proper discharge of official duty.

J Training for Mine Foremen, Inspectors, etc.

We are of the opinion that the cause of both safety and efficiency in coal mining in the United States would be greatly aided through the establishment and maintenance in the different coal regions of special schools for the training of fire bosses, mine foremen, superintendents, and inspectors. The instruction in such schools should be practical rather than theoretical.

The work of these schools would supplement most effectively that of the colleges already established in many parts of the country for the more thorough training of mining engineers.

Of the more than 100 supposedly noncoking coals from the Mississippi valley and Eastern States, tested by the Geological Survey, all except six were found capable, under careful handling, of making coke fit for foundry use. Of the 37 Rocky mountain region coals tested, all but three were good coke producers.

In Europe coal is being mined at a depth of 3773 feet.

Temperature of Coal Piles

The old method of determining the temperature of a coal pile by driving pipes and hanging thermometers in them has been greatly improved by means of a special coal augur designed and used by the coal department of the Arthur D. Little laboratory, Boston. It is similar in form to that used in the mines, but is provided with a means of inserting a small maximum thermometer near the point. Extensions, 4 ft. in length, for convenience in carrying, may be attached to the augur so that the thermometer can be readily inserted into any depth in a pile. The point of the augur can be driven 20 ft. in 3 to 5 min. About 10 min. is required for the thermometer to attain the temperature of the surrounding coal. Temperatures taken in this manner are much more accurate than those obtained by hanging a thermometer down a pipe where there is more or less circulation of air, making it impossible to locate the hottest spot. Temperatures obtained by means of the augur have been found to be 40 deg. F. higher than by the pipe method.

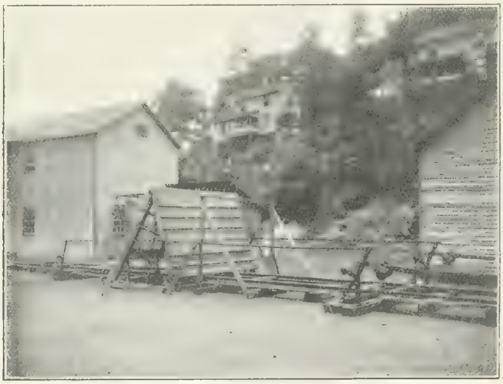


FIG. 1. SHOWING POCAHONTAS AUTOMATIC MINE DOOR WHEN CLOSED

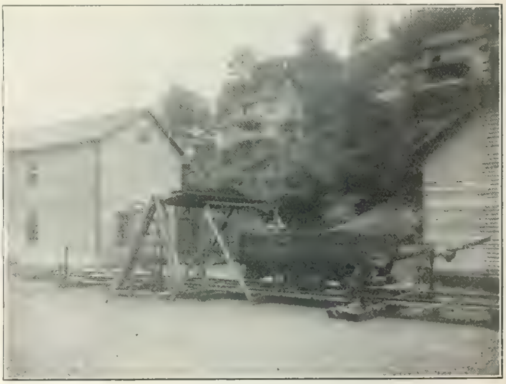


FIG. 2. SHOWS THE DOOR OPEN AND MINE CAR ABOUT TO PASS THROUGH

The Pocahontas Automatic Mine Door

By Audley H. Stow*

This device seems to have aroused considerable local interest, and promises to be of material assistance in simplifying the problem of reliable methods for ventilation. The illustrations shown include framing which could not well be avoided on the outside, with a full sized working model. As seen in operation on the inside, there are but two inclined timbers on either side. The levers shown are essential, but may be placed well out of the way.

The action of the door is the result of the vertical movement of the rail itself, the weight of the car, loaded or empty, or of mule, acting as the motive power. The weight of the track and ties is balanced by a movable cast-iron slide which can be adjusted with exactness. The only contingency which may result in the failure of the door to operate, is dirt under the ties, which trouble can be quickly remedied.

Construction of the Door

The door proper consists of canvas attached to strips of wood, a light wooden bar forming the bottom, so that a trip of cars should readily go through the door without serious damage to even the motorman, much less the motor. The ties are floored over in order that the weight of a mule will open the door, which may also be readily raised with one hand; on being released the door closes itself.

The inclined timbers on which the canvas attached to cleats, slides up and down, are boxed in against the entry ribs. With the track filled in level with the top of the rail, as usual with the common door, there should be practically no leakage. A movable section of trolley wire is ingeniously arranged so that it is in position when the motor reaches the door. The two lever stands, one on either side, are placed at such a distance that the door may be approached at considerable speed without any fear as to the certainty of its action, and without unnecessary loss of air.

R. S. Ord, vice-president and general manager of the Elkhorn Coal and Coke Company, has control of the Pocahontas automatic mine door. Trial orders have been given by the Empire Coal and Coke Company and by James Ellwood Jones, general manager of the Pocahontas Consolidated Collieries Company, for two each. The Mill Creek Coal and Coke Company and the Big Sandy Coal and Coke Company have also given orders.

---

*Mining engineer, Switchback, W. Va.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C. Eng.
Cable Address "Engminjour, N. Y."

Subscription payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for September, 1908, *was* 40,800 *copies.*

October 3	13,000
October 10	9,800
October 17	10,000
October 24	10,000
October 31	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
The Consumption of Lead in the United States in 1907 863
A Tale of Woe 863
The Steel Corporation Statement 864
The Report of the Coal Commission 864
Iron Ore and Pig 865
Ore Dressing by Adhesion to Liquid Films .... *R. Stören* 839
A Judicial Definition of "Lake Copper" 842
Transvaal Mine Earnings and Dividends *Special Correspondence* 842
*Turquoise Mining, Burro Mountains, New Mexico *Edward R. Zalinski* 843
Minerals at the Toronto Exhibition *Special Correspondence* 846
Silver Cyaniding in Mexico 846
*Construction of 100-ton Copper Smelting Plant .... *Charles C. Christensen* 847
California Petroleum Notes *Special Correspondence* 850
Iron Ore Statistics of Dickinson County, Mich 850
Gold in Madagascar 850
Short Talks on Mining Law XII. *A. H. Ricketts* 851
Oil Wells in Chihuahua, Mexico 852
*A Copper Precipitating Plant. *H. W. Chittenden* 853
Slime Settlement 853
*The Present Position of Cobalt, Ontario .... *Harold P. Davis* 855
Eichhorn Trigonometric Slide Rule 856
*Mine Signaling by Compressed Air .. 857
Fighting an Underground Fire with Oxygen Breathing Apparatus. *J. W. Graves* 858
Value of Flue Gas Analysis 858
Underground Haulage in Coal Mines.... 859
The Prevention of Mine Explosions *Report of Foreign Experts* 861
Temperature of Coal Piles.......... 862
*The Pocahontas Automatic Mine Door. *Dudley H. Stone* 863
Correspondence
Misleading Estimates *George Otis Smith and M. C. Leighton* 865
Duties of the Mining Engineer. *John F. Reed* 866
*Laboratory Burner for Volatile Fuel *R. Stören* 867
*Machine for Charging Copper Melting Furnace 867
The North Broken Hill Mining Company. *Special Correspondence* 867
Philadelphia & Reading Coal and Iron Company 868
Electric Power for Transvaal Mines *Special Correspondence* 868
Sault Ste. Marie Coal Traffic 868
Personals, Obituaries, Societies and Technical Schools 869
New Publications 870
Notes from Tonopah, Nevada *Special Correspondence* 871
Power Company Litigation in California. *Special Correspondence* 873
Indian Gold Production 873
*Illustrated

The Consumption of Lead in the United States in 1907

We have collected statistics of the consumption of lead in the United States in 1907 according to the purpose for which used, this being the first time that this investigation has been made. Although the returns received from the consumers are incomplete, nevertheless they represent so large a part of the total that they throw [illegible] light [illegible] important industry.

The total consumption of lead in 1907, [illegible] Vol. XVI., was 330,738 tons, which figure was determined by difference in the usual way. Unfortunately there is some uncertainty respecting this, owing to the failure of one of the large refiners to report its stock on hand at the end of the year. The total stock of domestic lead was estimated at 50,000 tons. The reports of the consumers indicate that this estimate was too low, but being unable to correct it, we shall continue to [illegible]

The reports that we have received from [illegible] divided as follows: For white lead and oxides, 113,372 tons; for pipe, 33,127 tons; for sheet, 16,345 tons; for shot, 23,232 tons; for other purposes, 99,044 tons. The reports from the corroders were nearly complete. Estimating that the unreported [illegible] ratio as reported in the cases of all the uses other than white lead and oxides, we obtain the following classification of the [illegible] 1907:

Purpose	Tons	Per cent
White lead and oxides	[illegible]	[illegible]
Pipe	[illegible]	12.40
Sheet	[illegible]	[illegible]
Shot	[illegible]	[illegible]
Other purposes	[illegible]	[illegible]
Total	[illegible]	[illegible]

The striking feature of the above figures is the immense quantity of lead used for "other purposes," which makes it interesting to mention their nature. First in importance appears to be the manufacture of solder, babbitt metal, type metal, and other alloys. However, the lead consumed for covering electrical cables is but little inferior in amount. A large tonnage is used for jointing cast-iron pipe. [illegible] manufacture [illegible] steel, i.e., making terne plate. It is also surprising to find how much lead is bought by the manufacturers of brass, who introduce a small amount of lead in certain grades of that alloy. Even some of the galvanizers appear as purchasers of lead. There is a considerable consumption for minor purposes, such as car seals, as yacht ballast, and weights of various kinds, the manufacture of plumbers' articles [illegible] Finally, a good deal of pig lead is bought by municipal water works for jointing cast-iron pipes, which is a form of consumption that it is difficult to report statistically.

A Tale of Woe

Revision of the tariff is going to be the the great topic at the forthcoming session of Congress. The Committee on Ways and Means is actively devoting its attention to the matter, and already there is a marshalling of the clans that want special tariffs reduced, raised, or left unchanged. The hearings are to come off in short order, and the plan of the committee is to introduce the new bill immediately after the assembling of Congress and pass it in about three months.

In this connection a tale of woe that comes from Washington in recent press despatches excites commiseration. It appears, as is gravely stated, that the efforts to secure data as to cost of production abroad with the view of using them in the preparation of the new tariff have practically broken down. The consuls were directed to investigate this important subject and special agents were sent abroad to study it. But, alas! the consuls now assert positively that the manufacturers to whom they have applied will not give the information desired, but on the contrary "have become more guarded as attempts to get the details have been more and more insistently made." So, the unhappy consuls have been unable to secure "material that is worth anything in response to the elaborate list of questions that was prepared for them by the Congressional people, assisted by domestic manufacturers, which was sent out by the State department."

How misguided are these foreign manufacturers! Obviously, the gentlemanly thing for them to do was to invite the [illegible] spection of their works and account books, so that the new American tariff could be designed to exclude their goods which heretofore have been allowed to slip in through loop-holes left ignorantly in the schedules. Is there any American manufacturer who would not welcome the visitor to his works and lay before him all the details of manufacture? Of course not. The bureaucracy at Washington in conducting its census and other investigations knows how easy it is to obtain from our courteous manufacturers frank statements as to their cost of production. Why, then, should these benighted foreigners be less responsive?

But we easily find the explanation when we read further in the press despatches that some are inclined to blame certain consuls who "went about their work with a brass band." For example, one exuberant and intelligent representative of our consular service circularized the manufacturers of his district, stating that the information was wanted for tariff revision purposes, and that by furnishing it they would be rendering aid to Congress. Some other wise heads hit upon the same scintillating scheme. When their superiors at Washington learned of this, they regarded it distinctly as a *faux pas*, but of course it was no such thing. Indeed, we fancy that good jobs as members of the detective police, or investigators on the staffs of the audit companies will be awaiting these gentlemen at home. Strange to say, the net result of their honest inquiries was to arouse fear in the minds of the producers abroad who have contracted the reprehensible habit of competing with American manufacturers in this market, or who feel American competition in their own markets. Some of the consuls admit that they are not sufficiently trained from a technical standpoint to be able to handle such an inquiry, involving as it does facts of an extremely complicated character. To them we bow and beg them to receive the assurances of our distinguished consideration. We always admire the modest man who confesses that he is not an expert in all things and refrains from entering fields whereof he knows not the paths.

But if the poor consuls have failed, what of the special agents from whom great things were expected? It appears now, sad to relate, that there is very little prospect of realization from them. Their work has been conscientious, it is said, and they have passed a pleasant summer abroad, but their accomplichment will not meet the need of the situation, which is an adjustment of our tariff to the difference between domestic and foreign cost. There are some who have been skeptical about this all along, but anyway, what does it matter? If Congress has no data as to foreign costs, there will be no need to pretend that the new tariff rates have been computed to conform to them.

The Steel Corporation Statement

The report of the United States Steel Corporation for the September quarter shows a moderate improvement in business as compared with the June quarter, and a considerable one over the first quarter of the current year. This applies to the net earnings after deducting operating expenses; as the gross receipts are not given, it is not possible to compare the total amount of business done. From the net earnings, however, it is evident that the estimates made heretofore that the company's plants have been operating during the quarter at 60 to 65 per cent. of last year's capacity are not far out of the way. The quantity of unfilled orders on the books on Sept. 30 was 106,000 tons greater than on June 30; on the other hand it was less than at the beginning of the year. The figures for Jan. 1, however, undoubtedly included many yearly contracts on which deliveries were indefinitely suspended.

The earnings for the quarter were sufficient to pay all charges and the usual dividends, and to leave a surplus of $5,152,000, or nearly $5,000,000 more than in the previous quarter. There were, however, no special appropriations for new construction and improvements this year; in the September quarter of 1907 the sum of $16,000,000 was laid aside for those purposes.

One thing is evident from the statement. The Steel Corporation has passed the low point of depression, without curtailing its dividends, though it has been necessary to suspend large appropriations for new work.

The general conclusion from the report is that there has been a gradual but slow improvement in business from the low point reached at the opening of the year. Perhaps this advance might have been greater if the Corporation had made more concessions, and had not allowed independent concerns to secure the larger share of current business.

The Report of the Coal Commission

The commission of foreign colliery experts who came to this country at the invitation of the Government to assist the Geological Survey in studying and ameliorating the dangers in our methods of coal mining has made its report, which, under orders of the President, has been published immediately. This extraordinary promptness is commendable, both as a mark of attention to the distinguished engineers—M. Watteyne, Herr Meissner and Captain Desborough—who constituted the commission, and for putting directly the results of their investigation before the coal-mining industry. We make haste to say that the report is a good one, and the members of the commission are to be congratulated upon their facility in obtaining an accurate understanding of American mining conditions and their terseness in formulating a series of thoroughly sound and admirable recommendations.

The precautions that are advised are well considered and are above criticism. Indeed, the majority of the measures suggested have been advocated in the advanced mining practice in this country for many years and have been urged repeatedly in the JOURNAL, both editorially and by contributors. It is to be hoped that the positive expression of views of these eminent experts from Belgium, Germany and Great Britain, which have the indorsement of the United States Government, will be effective in introducing much needed improvements of methods in many mining districts where the advice of engineers has heretofore been ignored. Yet, while we agree with Secretary Garfield that the report will be of the highest importance in aiding Congress and the various State Governments in providing proper legislation, we find it difficult to foresee what Congress can do outside of Alaska, Arizona and New Mexico; and the legislatures of the States have always shown themselves regretably obstinate in enacting adequate legislation of this kind.

Insofar as our unsolved problems of coal mining are concerned the report of the commission leaves us where we were before. As to minimizing the danger of dust explosions, we are all aware that water should be used, but how best to use it is a question that still confronts us. Perhaps the idea of Mr. Haas to [illegible] the intake air by exhaust steam, is the [illegible] suggestion that has yet been made; perhaps not; in this as in many other problems colliery engineers are still at sea. Similarly as to explosives, we do not yet know what is the best to use under our conditions, but neither the manufacturers nor the consumers are idle in this matter. The tests now being conducted by them will undoubtedly result in the production of a safer explosive.

With respect to many of the suggestions made by the commission, especially those pertaining to timbering, the employment of the flushing system of filling and other methods for increasing the extraction of coal, the great difficulty is that American operators at present are compelled to put their coal on board railway cars at their mines at a cost of only 50 to 60c. per ton, while in Europe the value of coal is many times as much. This feature of American mining practice pertains to the question to which we have frequently called attention, namely, the interest upon, and redemption of, capital account, which may make it more profitable to waste a large part of our resources than attempt to make a high utilization of them. The question that interests our colliery operators, just like other producers, is maximum profit, not merely the maximum percentage of extraction. The answer to this question is found always in the consensus of commercial experience, which generally is on the right road, although progress may be improved by engineering advice.

Iron Ore and Pig

Some recent transactions in the pig iron market, which have attracted much attention because they were practically the only large continuing contracts made for several months, are also notable as showing the important changes which have taken place in the methods of iron manufacture and marketing. It is not so many years since the iron mine, the blast furnace and the steel works were three distinct commercial units; the furnaceman buying his ore from the miner and in turn selling his pig iron to the steel maker. Now all the larger steel companies own not only their blast furnaces, but also their iron mines. The cost of iron ore delivered to the furnace and that of the pig iron made are matters of account only, the final profit having to be reckoned only [illegible] various forms.

[illegible] imposes a serious disadvantage on the surviving merchant furnaces which have to buy their ore; and in fact makes their absorption by larger companies only a question of time and opportunity. The merchant furnace in the Central West making foundry or basic pig, from Lake ore largely, must pay this season an average of about $3.88 per ton for its ore at a Lake Erie port, plus the freight from that port to the furnace. It must compete with companies which get their ore at the actual cost of mining and transportation, an advantage of at least 75c. to $1 per ton; and this is a serious matter in a time of small demand and consequent low prices.

The United States Steel Corporation, for instance, owns not only the mines from which its ore is taken and the railroads which deliver it at the upper Lake ports; it owns also the steamships which bring the ore to Lake Erie and the railroad which carries it from Ashtabula to Pittsburg. All of these agencies can be operated at actual cost, reducing to a minimum the cost of the ore as delivered at furnace. At the same time, owing to its extensive ownership of mines, it is in its power to determine the price which the merchant furnace must pay for its ore. It is only fair to say that so far this power has been exercised with discretion and some degree of liberality. Nevertheless it is a power which could be used to force a number of furnaces out of business.

In the transactions referred to above one furnace was able to underbid its competitors because its owners were also miners and shippers of Lake ore, and the contract price could be based upon actual cost, with a moderate profit on the whole transaction, of which the mining of the ore was an integral part. A year or more ago, when the Steel Corporation and some other companies found it desirable to buy pig iron outside, these transactions were, in most cases, based on the supply of ore by the buyers; so that the blast furnace really received only a fee or commission for turning the ore into pig. All these conditions make the future of the merchant furnace a doubtful one, and presage many changes in ownership.

Rejection of Article 144

[illegible] article, which has been the subject of so much discussion, read as follows:

"Foreign corporate bodies are incapable of denouncing and acquiring henceforth by any process either mining properties, or liens thereon within the territory of the Mexican Republic."

This article having been rejected, foreign companies will be permitted in the future, as in the past, to acquire and operate properties subject to the same laws under which they have heretofore conducted business, which has led, as is well known, to the prosperity of the Mexican republic. Although the opponents of this article learned to appreciate, after the explanation and full discussion which it received, that after all it was not so bad as appeared at first sight; nevertheless, the decision of the Government has been hailed with rejoicing. We said in the early days of this controversy that the whole matter could be safely left to the wise decision of President Diaz and his advisers, which opinion has been borne out by the outcome.

A NOTEWORTHY EVENT of last week was the reduction in the price of aluminum to 26c. per lb., which causes this metal now to be available at less than the price for tin, weight for weight, while bulk for bulk aluminum is, of course, much cheaper. This marks a further step in [illegible] ing one of the common commercial metals; although the recent reduction has doubtless been inspired by slackness in demand, the downward steps in this metal are unlikely to be retraced, in view of the approaching expiry of the patent monopoly, and we may yet see aluminum sell at a price approximating the price for copper, weight for weight. In fact that condition already exists in Europe, where [illegible]

[illegible] trade in times of depression at home, in order to keep iron and steel works busy. This does not take account of the fact that depression in trade is apt to extend all over the commercial world.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Misleading Estimates

In an editorial in the JOURNAL of Oct. 10, an inquiry is made as to the legality of expenditure by the Geological Survey, "upon the investigation of engineering problems like the development of water power, when the mining industry is loudly demanding its attention to important problems of economic geology."

Permit me to bring to your attention the fact that for 20 years the appropriations for the Geological Survey have contained specific items, and that the director of the survey would be legally culpable should he authorize expenditures for any purposes other than those specified in the wording of the current appropriation act. The accounting officers of the treasury very properly see to it that all administrative officers direct governmental expenditures in accordance with law rather than in response to "loud demands." The Survey policy is to have its administration accord strictly with Congressional enactments, and however much more urgent the need may seem for work along other lines the appropriation for water resources investigations will be devoted to that purpose and to no other.

In the particular case cited in this editorial, the appropriation involved was even more specific than is usually the case, the item being one passed by Congress on March 4, 1907, in connection with the agricultural appropriation bill as follows:

"*Survey of and Report on Appalachian and White Mountain Watersheds*—To enable the Secretary of Agriculture to examine, survey and ascertain the natural conditions of the watersheds at and near the sources of the various rivers having their sources in the Southern Appalachian Mountains and the White Mountains, and to report to Congress the area and natural conditions of said watersheds, the price at which the same can be purchased by the Government and the advisability of the Government's purchasing and setting apart the same as national forest reserves for the purpose of conserving and regulating the water supply and flow of said streams in the interest of agriculture, water-power and navigation. * * *"

Because of its identification with stream-flow investigations and its facilities for stream gaging the Geological Survey was requested by the Secretary of Agriculture to undertake this study of the water resources of the Southern Appalachian mountains. The expenses of the special field investigations upon which was based the report entitled, "The Relation of the Southern Appalachian Mountains to Inland Water Navigation," and which was published by the Department of Agriculture, were met by an allotment from this appropriation.

I trust that this explanation is sufficient to indicate wherein the editorial on "Misleading Estimates" is itself misleading, and that the mining industry needs no special assurance that not a dollar has been diverted from any Survey appropriation that could legally be devoted to the study of ore deposits, or other problems of economic geology.

GEORGE OTIS SMITH,
Director.

Washington, D. C., Oct. 20, 1908.

My attention has been called to the editorial entitled "Misleading Estimates," in the JOURNAL of Oct. 10. While I would like very much to take up with you a discussion of the estimates, I have not the time, and it is probable that you have not to spare in your JOURNAL the space which would be required to treat the subject in a worthy manner. My present purpose is to answer your inquiry as to the guise of legality under which the Geological Survey spends its money in the investigation of water resources.

In the bill making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1909, you will find under the caption "United States Geological Survey," the following:

"For gaging the streams and determining the water supply of the United States and for the investigation of underground currents and artesian wells and the preparation of reports upon the best methods of utilizing the water resources, $100,000."

I assume that you will be very glad to have your attention called to the specific authority granted by Congress for this work.

M. C. LEIGHTON,
Chief Hydrographer.

Washington, Oct. 10, 1908.

[Our inquiry implied an ignorance that did not exist. The point is that the organic law of the Geological Survey did not contemplate that it was to engage in extraneous investigations. Probably at the instigation of someone in the Survey, Congress lately authorized the Survey to engage in this investigation of water supply, but previously for many years the Survey frittered away time, attention and money upon water resources without any authority other than that water is a mineral.

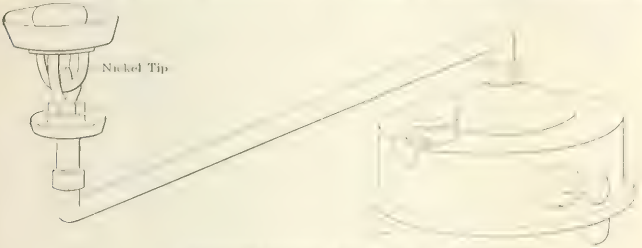
It is these foreign investigations, many of them of no particular value, many of them unauthoritative in character and many of them concerning subjects that the people can and ought to do for themselves, that play mischief with the real work of the Geological Survey. In the past the function of the director has been chiefly to win appropriations from Congress, while enthusiasts interested in magnifying their own work have teased and obtained appropriations for work that is not at all geological. What the Geological Survey needs if it is to live up to the high mark of its past history is the following: (1) A recognition by Congress that will insure to it an adequate annual appropriation, without the exercise of any effort on the part of the director or anyone else. (2) The unhampered attention of the director to the technical administration of the organization. And (3) the lopping off of all the excrescences like the water-resources branch, the technologic branch, etc., and confinement of the work of the Geological Survey to problems directly connected with the geology of the United States, and especially the economic geology.—EDITOR.]

Duties of the Mining Engineer

When has an examining engineer properly discharged his obligations to his client, and what constitutes a proper examination of ore deposits? I have in mind an eminent engineer, who having been engaged to report on certain mines, completed his examination in two days and a night and reported adversely to his principals. He made his examination without consulting anyone in the localtiy, and arrived at a conclusion which is diametrically opposed to that of other engineers who had seen the property and had formed their opinions only after weighing the testimony of a local engineer and conducting their examinations with the aid of the information given.

Some years ago I was called upon to make an examination of certain copper deposits. Time was a matter of great consideration just then, and the hurried superficial examination which I made led me to an adverse decision. Afterward, circumstances brought me into intimate contact with these same deposits for a considerable length of time. I became more closely acquainted with the deposits, my previous views began to change and finally I came to have a high opinion of their value. The reason for this change was the fact that a thorough investigation had brought out a great many features that did not present themselves at first sight. My first impression was entirely wrong. I am now disposed to look with suspicion on any report made without an exhaustive and detailed study. This sort of study requires time; my client had not been properly served in my first report, notwithstanding the fact that the examination was made in a conscientious way. I hurried the matter at his own request.

The question naturally arises: Is an engineer doing either himself or his client justice by accepting a commission, the time given being inadequate for a thorough study of the property? It is to be confessed that nine out of ten reports are made after a hurried examination many of them in one day or less. Such reports are totally devoid of value. John Hays Hammond, in his address before the A. I. M. E. at Chattanooga, remarked that the expert ought to consult the local engineer who, through years of contact, is familiar with conditions and historical facts which may be of inestimable value to the expert in his efforts to reach proper deductions. Experts should learn that they are not disgracing themselves by counseling with local engineers or, in fact, with anyone in the locality who may, by years of intimate contact, have gained valuable knowledge of the properties under examination.



LABORATORY BURNER WITH FUEL TANK

JOHN T. REID.

Lovelock, Nev., Oct. 19, 1908.

Laboratory Burner for Volatile Fuel

By R. Storen*

A new combination burner has been developed in the laboratory of the Nautanen Kopparfält. The burner, which is shown in the accompanying sketch, produces a flame near the surface of the table and has a tank for benzine sufficiently removed to prevent heating of the explosive liquid. More or less trouble with other burners led to the trial of the Swedish silent-burning "Fotogen Primus" with the reservoir arrangement shown in the sketch. The separation of the burner from the fuel reservoir was effected by means of a copper pipe hard-soldered or screwed to the burner. The brass burner is rather quickly affected by the heat especially when used constantly under an iron plate. Nickel parts should be more durable.

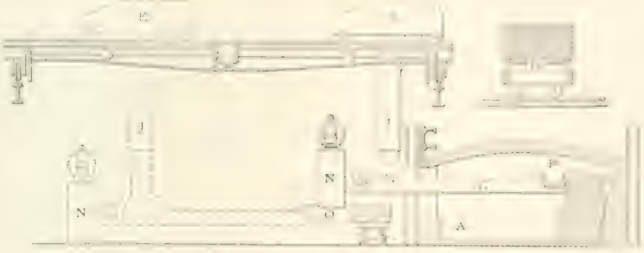
Machine for Charging Copper Melting Furnaces

In the accompanying illustration is shown partly in section and partly in side elevation a machine recently patented by H. A. Prosser, of Salt Lake City, and [illegible] copper plates or pigs into a reverberatory furnace. It may also be employed for a variety of other uses.

In the illustration *A* is a reverberatory furnace with wide doorways between narrow posts. A track along the front of the furnace carries cars bearing the material to be charged preferably in loads of convenient size to be handled by the charging apparatus. The charging machine is provided with a long horizontal arm *G* to introduce the material well into the back of the furnace. This arm is suspended from the trolley *K* by means of a post *H* telescoping into the leg *J*, so arranged that the arm may be drawn back and lowered beneath the load and then raised, moved backward or forward, and thrust into the furnace.

The load is picked up upon a flat fork *O* which is inserted below the pile of material blocked up on the car for this purpose. The arm is then lifted, thrust into the furnace and moved to the desired place, when the pusher *P* pushes the load off the flat fork, the arm being withdrawn at the same time. The machine is operated from the car *N* by means of electric switches, or other controlling mechanism.

The design of the lifting fork and the pusher is such that the operator can pile the successive charges accurately, filling the furnace to the roof with a minimum of lost space between the sheets.



MACHINE FOR CHARGING COPPER MELTING FURNACES

The North Broken Hill Mining Company

Special Correspondence

The North Broken Hill Mining Company is one of the group of mines at Broken Hill, New South Wales. The report for the six months ended June 30, 1908, is regarded by the directors as satisfactory. At the deepest level worked, 950 ft., the ore is above the average grade of the ore milled during the last six months. The mill treated 65,633 tons of crude ore averaging 15.92 per cent. lead, 13.69 per cent. zinc and 6.49 oz. silver per ton. The yield of concentrates was 11,062 tons, the recovery of lead being 75.07 per cent., of zinc, 7.78 per cent. and of silver 53.63 per cent. Working costs, including mining, milling and development, were $3.98 per ton of ore treated, equivalent to $23.60 per ton of concentrates. The ore reserves are estimated at 1,000,000 tons.

The zinkiferous tailings are sold to the De-Bavay Treatment Company. These tailings contain 4.16 per cent. lead, 18.91 per cent. zinc and 3.67 oz. silver per ton.

Two dividends of 1s. each amounting together to £14,000 were paid during the half year. On working account there was a profit of £32,407. Out of this the dividends have been paid, while management and general expenses absorbed £1884, royalty £200; contingency account £3000, mine and mill plant and new shaft £12,619; the balance being carried forward to next account. The capital of the company is [illegible]

---

*Mining engineer, Hönefas, Norway.

Philadelphia & Reading Coal and Iron Company

This company owns a large coal estate in the anthracite region, on which it operates numerous collieries. It is a subsidiary of the Reading company, which also owns the Philadelphia & Reading Railroad Company. The report is for the year ended June 30, 1908. The capital account shows $8,000,000 stock; $1,230,000 bonds; and $75,241,270 due the Reading Company for advances made from time to time.

The anthracite coal statement for the year is as follows, in long tons:

	1906–07.	1907–08.	Changes.
Coal mined...	10,034,713	10,218,392	I. 183,679
Coal bought...	1,107,848	1,083,682	D. 24,166
Total	11,142,561	11,302,074	I. 159,513
Coal sold	11,492,512	10,992,976	D. 499,536
Inc. or dec in stock..	D. 349,951	I. 309,098	

The total production of anthracite by the company and its tenants from lands owned, leased and controlled by the company was 11,655,101 tons in 1906-7, and 11,914,154 tons in 1907-8; an increase of 259,053 tons, or 2.2 per cent. The cost of coal mined and purchased during the year was 1.5c. per ton less than for the previous year, and the price realized on all sizes was 2.2c. per ton higher, making a total increase in the net amount realized of 3.7c. per ton.

The income account for the year is as follows, averages being calculated on the tons of coal sold:

	Amount	Per Ton
Gross earnings	$38,014,421	$3 46
Coal added to stock	1 200,927	0 11
Total earnings............	$39,215,348	$3 57
Mining and purchase of coal.	$22,996,197	$2.09
Transportation of coal......	10,652,083	0.97
Selling and general expenses..	1,974,697	0.18
Total expenses...........	$35,622,977	$3.24
Net earnings.............	$3,592,371	$0 33
Depletion of coal lands fund..	$514,350	$0.05
Colliery improvements......	1,286,011	0.12
Interest on Reading Co loans.	1,584,485	0.14
Total charges.............	$3,384,846	$0.31
Surplus for the year	$207,525	$0 02

Gross earnings include $36,669,481 for anthracite coal sold; $859,012 bituminous coal sold; $485,928 coal and other rents. Mining coal includes $19,026,334 mining and repairs at collieries: $2,497,487 anthracite bought; $804,654 bituminous coal bought; $667,722 royalty on leased collieries. The apparent profit on bituminous coal handled was $55,358. Coal added to stock is credited at $3.88 per ton.

Depletion of coal lands fund at the close of the year—including interest and the contribution for 1907-8—amounted to $2,083,187. This sum is accounted for as follows: Invested in coal lands and permanent improvements, $580,254; invested in securities, $1,083,094; cash on hand, $419,839. The contribution to this fund is 5c. per ton mined.

The total expenses last year were made up as follows: Cost of coal at mines, 64.6 per cent.; transportation, 29.9; selling and general 5.5 per cent. The total working expenses were 90.8 per cent. of gross earnings.

As compared with the previous year the gross receipts showed a decrease of $733,149; while the expenses decreased $970,964; leaving a net gain of $237,815. The small decrease—4.3 per cent.—in sales of anthracite illustrates the stability of that product in a year of general business depression.

The statement of the Philadelphia & Reading Railroad gives the following figures for coal traffic:

	1906 7.	1907–8.	Changes.
Anthracite....	13,223,780	13,537,464	I. 313,684
Bituminous....	11,190,250	10,816,439	D. 373,811
Total tons moved.....	24,414,030	24,353,903	D. 60,127
Ton-miles.....	2,709,745,000	2,776,062,000	I. 66,317,000
Av. haul, miles	111	114	I. 3
Earnings from coal..........	$18,730,190	$18,577,272	D. $152,918
Earn. per ton-mile..........	0.691c.	0 669c.	D. 0.022c.

The average haul is increased and the rate per ton-mile decreased by the large quantity of bituminous coal carried. The average rate per ton mile on all freight—including merchandise—was 0.946c. in 1907, and 0.954c. in 1908. The Coal and Iron Company furnished 84.2 per cent. of the anthracite carried last year.

Electric Power for Transvaal Mines

SPECIAL CORRESPONDENCE

The Victoria Falls Power Company, Ltd., a company formed in October, 1906, with somewhat of a misleading name, has issued its first report, covering the period from the incorporation of the company to Dec. 31, 1907. The name is misleading because the electric power is produced from steam plants situated on the Rand, many hundred miles away from the Zambesi falls. It is true that the company has acquired the right to develop 250,000 h.p. from the falls and to transmit it to the Rand, but this undertaking, about the commercial success of which there has been unfavorable criticism, seems unlikely to take practical shape for some time to come, if it ever does. At all events the report does not say much about this part of the scheme, confining itself to a statement that the directors and engineers paid a visit to the falls in 1907 and made an inspection of the sites for the future water-power stations and canal. The company purchased the 3550-h.p. electric station of the Rand Central Electric Works, situated at Brakpan at the eastern end of the Rand, and has added a new 8000-h.p. station. The company also acquired the 5000-h.p. plant of the General Electric Power Company at Germiston. A new power station of 10,000 h.p. is being erected at the Simmer Pan, which is expected to be completed early next year. The new Brakpan station is now running. The erection of a new power station at Vereeniging on the Vaal river is also contemplated. The company has entered into a number of contracts to supply electric power to mines and municipalities. No profit and loss account is given, as the work of the company has so far been chiefly construction; but a revenue and expenditure account is included in the balance sheet, showing a balance of £49,482 of revenue over expenditure. Deducting interest on debentures and London general expenditure, a surplus of £36,685 is shown which is carried forward to the 1908 accounts. The issued capital is £1,808,000, divided into 1,000,000 ordinary shares and 808,000 6-per cent. preference shares. There is also a 5-per cent. debenture issue of £800,000. To pay interest on the preference shares and the debentures an amount of £88,800 is required, and if 5 per cent. on the ordinary shares is added, the company's earnings must show a net surplus of £138,800.

As the policy of purchasing power from a power company is at present popular with some of the Witwatersrand mines, relieving them of the necessity of providing their own plant, the company may be able to carry on a profitable business in spite of the heavy capitalization.

At present it has the supply of electrical power to itself, but there are rumors that a rival power company may shortly be started in the Transvaal.

Sault Ste. Marie Canal Traffic

The freight traffic through the Sault Ste. Marie canals this season shows a decrease of 36.5 per cent., chiefly owing to the light ore and coal shipments. The total freight passing the canals for the season up to Oct. 1 was, in short tons:

	1907.	1908.	Changes.
East-bound. . . .	32,556,664	18,884,150	D. 13,672,514
West-bound	9,502,430	7,841,112	D. 1,661,318
Total............	42,059,094	26,725,262	D. 15,334,832

The total number of vessel passages this year was 10,567, showing an average cargo of 2529 tons. The mineral freights included in the total were as follows, in short tons, except salt, which is in barrels:

	1907.	1908.	Changes.
Coal..................	8,588,910	7,113,709	D. 1,475,201
Iron ore...........	28,883,106	16,127,105	D. 12,756,001
Pig and manuf. iron	230,551	191,885	D. 38,666
Copper...............	52,689	64,841	I. 12,152
Building stone... .	748	1,019	I. 271
Salt, bbl............	337,367	406,504	I. 69,137

Iron ore was 60.3 per cent. of the total tonnage this year, and coal 26.6; against 68.9 and 20.4 per cent., respectively, last season.

During 1907 the United States produced 97,776 long tons of bauxite, as compared with 78,331 tons in 1906.

Personal

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Ayer Stradley is now manager of the Black Beauty mine at Wall street, Colorado.

Henry L. Lefevre has been in the Coeur d'Alenes, Idaho, examining the Golden Chest mine.

Robert T. Hill left on Oct. [illegible] for [illegible], Nev., where he will be for several weeks.

J. F. Lane, of Goldfield, Nev., has bonded a mine at Nevada City, Cal., and will reopen it.

Thomas L. Wood, of Boulder, Colo., is now manager of the Camp Albion mine at Arapahoe Peak.

L. B. Queensburgh Tulloch, of Kingston, Jamaica, mining geologist, is visiting the United States.

George J. Bancroft has removed his office as consulting engineer to the McPhee building, Denver, Colorado.

Floyd, Harman, formerly of the Temiskaming, has been appointed superintendent of the Cochrane mine at Cobalt, Ontario.

John D. Judson has opened an office as consulting mining and metallurgical engineer in the Mills building, 35 Wall street, New York.

W. S. Weymouth who has been operating mining properties in California has become manager of the Nemcha mine near Central City, Colorado.

W. H. Paul manager of the Dolores Mining Company, Dolores, Mexico, has been making a visit to Gilpin county and other parts of Colorado.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, is at present in Arkansas making an examination of manganese ore properties.

W. B. Le Veque, manager of the Richmond Mining Association at Salina, Boulder county, Colo., has been making a business visit to Marietta, Ohio.

Charles A. Mau, of Los Angeles, Cal., has been appointed manager of the United Gold Mining and Milling Company at Chinese, Tuolumne county, California.

Hermann A. Keller, of New York, will sail for Europe early next week, partly on business and partly on pleasure. He expects to return about the end of the year.

J. C. Deloney, recently in charge of the Tennessee Coal, Iron and Railroad Company, has been appointed superintendent of mines for the Alabama Steel and Wire Company.

Dr. A. P. Low, deputy minister of mines for Canada, who has been on sick leave for about a year, has recovered his [illegible]

[illegible] tion of the Next President mine at Central City, Colo., in the interest of Eng- [illegible]

George K. Kimball, manager of the Old Town Consolidated Mines Company, of Gilpin county, Colo., is making a business visit to Pittsburg to consult with stockholders regarding the erection of a mill.

President William G. Sharp and Managing Director A. F. Holden have re- [illegible] tion of the Utah properties of the United States Smelting, Refining and Mining Company.

George Vivian, formerly of Georgetown, [illegible] Trinidad Smelting Company, at Silver City, New Mexico.

Milton H. Farr has resigned as superintendent of the Bingham Car and Manu- [illegible] position of superintendent of coal mines for the Birmingham Coal and Iron Company, with office at Birmingham, Alabama.

W. Fleet Robertson, provincial mineralogist for British Columbia, who late in September returned to Victoria from a three months' trip to the Findlay river district, where he investigated reports of new placer gold discoveries, is now in the Crow's Nest Pass coal district.

R. W. Brock, acting director of the Geological Survey, of Canada, is visiting the Slocan district of British Columbia, accompanied by W. H. Boyd and O. E. LeRoy, members of the Survey staff, who are about to commence preliminary work on a geological survey of the Slocan.

George Leyson, formerly of the Silver Queen, has been appointed manager of the Silver Leaf mine at Cobalt, Ont., with Stuart M. Thorne as assistant. The arrangement by which the mine was worked by H. G. Symmes for the company has been terminated, and the directors have taken over the management.

Obituary

[illegible] engineer in charge of the Mina Poderosa, Huelva, Spain, was stabbed by a miner [illegible] and died immediately.

[illegible] Bellevista, Penn., after a short illness. He graduated from the Michigan College of Mines in 1893, and had been employed at mines in South Dakota, Montana and California. Some years ago he went to Peru for the Cerro de Pasco Mining Company, but later left that company to engage in private work. At the time of his death [illegible] vian Mining, Smelting and Refining Com[illegible]

Societies and Technical Schools

[illegible] The next meeting will be held in Charleston, W. Va., Dec. 1 and 2. Several inter- [illegible] topics of interest to the coal-mining industry of the State will come up for discussion. John S. Cummings, Tunnelton, W. Va., is secretary.

[illegible] ond annual meeting at Chicago, Oct. 14, 15 and 16. The following officers were elected for the ensuing year: President, J. C. Reed, Pennsylvania Steel Company; first vice-president, G. M. Sturgess, Lackawanna Steel Company; second vice-president, S. R. Palmer, Jones & Laughlin Steel Company; treasurer, E. W. Yearsley, Midvale Steel Company; secretary, G. H. Winslow, National Tube Company, Pittsburg. A number of papers were presented and plants visited and in conformity with the specific purpose of the society, all were discussed fully.

[illegible] recent bulletin outlines a comprehensive program for its School of Mines as follows: "The School of Mines, to cover fully its field, must give instruction in the forms of minerals, their properties and characteristics, including crystallography, the use of the goniometer and polariscope, or optical, microscopical, descriptive and determinative mineralogy. It must give instruction in the study of rocks, as covered by the science of lithology and petrology, or petrography. In the study of the earth it is necessary to cover the general principles of chemical, physical, stratigraphical and field geology, particularly in their applications to mining and engineering. It must further include the study of the ancient animals and plants, or paleontology and paleobotany, with their use, in determining the age and relations of geological formations. On the side of economics or mining geology there are to be studied all the metalliferous and non-metalliferous deposits of use to man. This work takes up their mode of occurrence and classifications; the methods of searching or prospecting for them, their uses or [illegible] its branches, comprising wet and fire assaying; hydro-metallurgy and electro-metallurgy; the preparation and use of fuels and refractory materials; calorimetry, pyrometry, and furnaces, their construction, equipment, and use, with ex- [illegible] location, particular attention must be given to iron and steel metallurgy and to the manufacture of coke. Lastly, mining in all its numerous ramifications must be covered."

New Publications

THE MINERAL INDUSTRY, Vol. XVI. Edited by W. R. Ingalls. Pp. 1127, illustrated. 6¼x9½ in.; cloth, $10 or 42s. New York and London, 1908: Hill Publishing Company.

"The Mineral Industry" has so fully established its place as an essential part of the working library of everyone who is interested in the production, distribution, or manufacture of the metals and commercial minerals, together with many chemical products derived from them, that any extended reference to its usefulness is hardly necessary. It is enough to say that the appearance of this yearly volume is an event to those who read it, or rather use it; for the chief value of such a book is not and cannot be found in the immediate reading which it furnishes, but rather in its constant presence as a book of reference, which may be turned to at any time. Only those who so use it, and learn that they are sure to find the essential information that they need, appreciate its full value. I do not say—nor do I think the editor will claim —that it is an encyclopedia of all possible knowledge; but it is a compendium of current information of such character that one seldom appeals to its pages without finding what he needs in some form.

Vol. XVI—for 1907—is the largest of the series, comprising 1127 pages. Its make-up follows the style that has been standardized in previous volumes, i.e., the minerals and metals are treated in alphabetical order, everything pertaining to each subject being classified under the main head. This makes it easy for the reader to turn directly to the subject under his investigation without reference to the usual index at the end of the volume. The latter is supplied with commendable care, but in fact the whole volume is in itself an index.

The list of subjects treated in Vol. XVI is longer than in any previous volume, the editor carefully keeping step with the advances in the art. Thus it will be noticed that the new volume reports for the first time the production of metallic bismuth, cadmium and calcium in the United States, while the production of such new substances as the ore of tantalum and the manufacture of calcium cyanamid and calcium nitrate are treated.

The list of contributors to Vol. XVI is also noteworthy for its length and the high standing of all. The reviews of industrial progress are uniformly prepared by recognized experts in each line, while the records of current events are supplied by thoroughly informed reporters. Thus, the progress in the mining industry of each mineral is to a large extent described by the State geologists, or members of the State geological surveys, nearly all of whom are contributors to Vol. XVI, including Doctor Bain, of Illinois; Professor Barbour, of Nebraska; Mr. Beeler, of Wyoming; Professor Blake, of Arizona; Professor Blatchley, of Indiana; Doctor Buckley, of Missouri; Doctor Clark, of Maryland; Professor Gould, of Oklahoma; Doctor Grimsley, of West Virginia; Doctor Haworth, of Kansas; Doctor Hotchkiss, of Wisconsin; Doctor Kümmel, of New Jersey; Doctor Lane, of Michigan; Mr. Lees, of Iowa; Professor Leonard, of North Dakota; Mr. Newland, of New York; Professor Perkins, of Vermont; Doctor Pratt, of North Carolina; Doctor Sellards, of Florida; Doctor Smith, of Alabama; and Mr. Veatch, of Georgia. These contributors give an official character to the publication, which constitutes a valuable and appreciated medium for collating and bringing to general attention the statistical researches and commercial investigations in the several States. This is work that is most properly done by the State geological surveys, and "The Mineral Industry" affords them a means for the coördinated presentation of reports that otherwise might remain buried in local libraries.

Similarly "The Mineral Industry" brings together the mineral and commercial statistics of all the countries of the world, assembling them in a concise form that enables easy comparison. In this work the editor enjoys the active coöperation of the statistical departments of the foreign governments, several of which communicate their figures in manuscript in advance of their own publication, thus contributing materially to make the tables in "The Mineral Industry" up-to-date, which is the keynote of its preparation. As in previous years, a large part of the statistics given in "The Mineral Industry" are collected by itself by direct reports from the consumers, especially the domestic, although this work also extends to foreign countries. A consideration of these many ramifications of attention gives an impressive idea of the immensity of the work and multiplicity of detail that must be involved in preparing a volume of "The Mineral Industry."

The reviews of progress in metallurgy and technology are treated by the regular contributors, who have become identified with "The Mineral Industry." Thus Professor Austin writes on "The Metallurgy of Copper," Professor Hofman on lead, Professor Fulton and Alfred James on the cyanide process and gold ore treatment in general, Prof. J. W. Richards on aluminum, Prof. R. H. Richards and Prof. Charles E. Locke on gold milling, ore dressing and coal washing; Mr. Hobart and Professor Stoughton on iron and steel, Mr. Ingalls on zinc, Professor Kemp on ore deposits, Mr. Colcord on sampling and assaying, Mr. Parsons on coal, Mr. Lesley on cement and Mr. Atwater on coke. These reviews differ somewhat in character, it being evidently the policy of the editor to preserve the individuality of the contributor within reasonable limits. Thus certain of these contributors confine themselves to a digest, always intelligent and discriminating, of the technical literature of the year; others make the literature the basis of their review, but add their own comments and criticisms; while others write what is more in the nature of a professional report, summarizing the progress of the year from their own experience and observation, with, of course, references to the important literature when necessary.

As usual, Vol. XVI contains many noteworthy monographs. Undoubtedly the most important of these is the paper by Robert Sticht, on "Mining and Smelting at Mount Lyell," in which he describes the geology of the ore deposit, the history of the mining enterprise, and the methods of mining and smelting, illustrated by excellent engravings, and illuminated by wonderful sets of figures of cost from the very beginning of operations right down to date. This contribution will surely be one of the classics of mining and metallurgical literature. Other noteworthy contributions are those of Dr. Hohagen, director of the Bolivian mint, who describes tin mining and smelting in Bolivia; Dr. George F. Kunz, who writes about precious stones in his usual engaging way, and Dr. A. C. Veatch who contributes a valuable monograph on the mining laws of Western Australia. But it is impossible within the limits of this review to refer to all of the noteworthy contributions long and short. Many of the short contributions are particularly valuable inasmuch as they supply precisely the information that is needed.

There are two classes of information that are constantly needed. The first is the statistical. Everyone interested needs to know something about the production, consumption, uses of and market for the metals and mineral products of commercial value in the mining or manufacture of which he is concerned. It is at the foundation of his business that he should be able to estimate the supplies, the probable demand and the course of prices of his product; and that he should be able to gage the extent of these, and the competition with which he is likely to meet. This information he can find in this volume, with the addition, in many cases, of indications of probable new supplies and other matters affecting the future of the product or products in which he is interested. The publication of general statistical tables by governments is essential, but the average man—even if these are readily accessible to him—has not the time or the disposition to analyze and compare the figures and to work out their meaning. To have this done for him is by itself a great service, and this "The Mineral Industry" does certainly render. On the second side, the technical one, what the busy engineer wants is a summary of progress in the arts of mining and metallurgy, as condensed as possible, but with such references as will enable him to [illegible] any special subject in greater detail.

It is impossible to go over a book like this critically. Its extent and the diversity of its contents prevent this, nor is it at all necessary. The test of a book of reference is found in its use, and I am confident that no one [illegible] "The Mineral Industry" can spare it. Briefly, Vol. XVI is fully up to the highest standard of its predecessors, and it has some improvements of its own.

[illegible]

Notes from Tonopah, Nevada

Special Correspondence

The Tonopah mines are producing $120,000 weekly from [illegible]. Dividends, however, are rare, only two having been declared in 1908; both of these were by the Tonopah Mining Company, and amount in all to $500,000. If the above estimate of $6,000,000 annually be correct, the dividends are only 8 per cent. of the gross product—a discouragingly low proportion.

Henry Krumb's report on the Tonopah Extension mine, lately made public, does not give much encouragement to those holders who paid $6 to $8 per share for their holdings. His conclusion is that the mine has $266,550 profit in sight—provided that the ore can be worked for $4 per ton. At present it costs $10.50 for the lowest grade ore, and probably $15 per ton for the average grade of ore shipped by this mine. To build a 20-stamp mill will cost $200,000. If this cost be reckoned against the ore now in sight in the mine, 35,000 tons, and on the dump, 25,000 tons (with the profit as stated above of $266,500), there will be practically nothing for the shareholders. The only salvation for this mine—and for a number of other Tonopah mines—lies in consolidation with its neighbors.

During the last few months good ore has been found in the Belmont on the 1000-ft. level, and has been followed to the 1100 level. It is asserted that this ore is below the rhyolite-dacite intrusion, which is said to cut off all the pay ore in the camp. As a matter of fact, the rhyolite-dacite is not always barren, for good orebodies have been found inclosed in it in the West End, MacNamara, and Tonopah Extension mines. In the West End, for instance, there is fully 15 ft. of $70 ore with rhyolite-dacite on both sides of it. However, in the Tonopah, Montana and Midway mines the good ore is cut off by the rhyolite-dacite and no pay ore has been found much below the 700 level.

The Tonopah Mining Company is sinking the Mizpah shaft to the 1500-ft. level. The shaft, which is 1250 ft. deep, is still in rhyolite-dacite. This company is also prospecting from the Red Plume shaft with a Calyx drill, and intends sinking to the 1700-ft. level. For some weeks the work has made no progress, as caving ground has interfered, and filling up the hole with cement and then redrilling has not yet proved successful. Prospecting in depth has also been started at the Montana mine from the 765-ft. level at a point 1000 ft. north of the shaft. Here the company is sinking a three-compartment winze. The formation is earlier andesite, the "lode-porphyry" of the camp, but as yet it is barren. This prospecting in depth is most important for Tonopah and unless it finds ore the future of the camp looks dark. A ray of light, however, comes from the west; the finding of good ore in the extreme western end of the MacNamara mine on the 300-ft. level making it probable that the unprospected ground to the west of this will be productive. A large area here is controlled by the West End and will be prospected during the coming year. Unfortunately some of the more favorably situated claims—owned by the Red Rock, and McKane companies—are tied up by litigation [illegible] litigants.

Air hammer drills are now being largely used in Tonopah, especially in raises; the advance in some of these raises is astonishingly rapid. The record so far seems to be held by the Waugh drill, which made 113 ft. in one week in a raise in andesite. This was for two eight-hour shifts daily.

The 40-stamp mill of the Montana company has proved a success. It handles some 4200 tons of ore monthly at a cost of $3.75 and works the ore to 87.5 per cent. This mill will be of great benefit to Tonopah. It has already worked ore for the North Star mine and is now working 50 tons daily for the MacNamara. There is an excellent article describing this mill by its manager, G. H. Rother[illegible]

The labor situation is quiet; there are no rumors of strikes, and idle miners are too plentiful. When compared with conditions of a year ago, Tonopah is prosperous. Local real-estate agents report that all the better-class houses are occupied. The large Mizpah hotel, work on which was stopped in November, 1907, will be opened in a few days. The local banks are in good shape. The only bank of Tonopah that has not pulled through, the State Bank, made a bad failure and, it is now thought, will not pay over 30 per cent. to its depositors. Its president, T. B. Rickey, has already spent a night in jail and is now out on *habeas corpus*, fighting off his trial for embezzlement.

One noticeable feature this fall is the entire absence of prospectors. In October, 1906, and to a less extent in 1907, the town was full of teams in charge of hardy, hopeful men starting out in their [illegible] few prospectors that come into camp are [illegible] discoveries in Nevada.

Power Company Litigation in California

[illegible]

[illegible] California, has decided in favor of a number of farmers on Cow creek in that county, in the second suit against the Northern Light and Power Company, which sought to condemn their riparian water rights for "public use." The court holds, virtually, that riparian rights cannot be condemned for such a public service [illegible] sells power to whosoever may buy. This is the first time such an issue has been made in a California court.

H. V. Gates is seeking a patent on a stone placer claim called the Excelsior, which the Northern California Power Company, of Redding, Shasta county, is contesting. The company attacks the validity of the location on the ground that while the placer claim was ostensibly filed upon for the building stone it contained, the real purpose was to locate a dam site, a reservoir site, and a tunnel site. The claim is on a proposed location of a tunnel site which the power company desires, the tunnel being intended to divert water in Pit river under the north flank of Hatchet Creek mountain, across what is called the big bend of the Pit. The tunnel is to be [illegible] electrical energy at the downstream outlet. The location of the Excelsior claim upset the power company's plans altogether, and the case is now being heard at Redding to determine the real character of the stone deposit location. Government geologists have already been examining the ground and their testimony will be taken. The mine is in the Shasta National Forest reserve.

Indian Gold Production

[illegible] in Mysore, India, in September, was [illegible] August. For the nine months ended Sept. 30 the total was 304,102 oz. bullion in [illegible] of 1036 oz. The bullion reported this year was equal to $7,207,130, or 353,030 [illegible]

To stop leaks in cyanide tanks W. H. Gaze suggests several hot applications of a saturated solution of asphaltum in turpentine.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

BAUXITE

SULPHATE OF ALUMINA—Improvements in the Treatment of the Residue or Sludge Resulting from the Production of Sulphate of Alumina. H. D. Pochin & Company, Ltd., and John H. Richardson, Salford, Manchester, Eng. (Brit. No. 25,227 of 1907.)

TREATMENT PROCESS — Improvements in, and Connected with the Treatment of Bauxite or Aluminous Material. H. D. Pochin & Company, Ltd., and John H. Richardson, Salford, Manchester, Eng. (Brit. No. 25,228 of 1907.)

COAL AND COKE

BRIQUETS—Improvements in the Manufacture of Briquets for Metallurgical or Other Purposes. William F. Collins, Mong-tse, Yunnan, China. (Brit. No. 17,546 of 1907.)

BRIQUETS—Improvements in the Manufacture of Fuel Briquets. William F. Collins, Mong-tse, Yunnan, China. (Brit. No. 17,545 of 1907.)

COAL-CUTTING MACHINES — Improvements in Coal-cutting Machines. Siegmund Schauberger, Tiefbau, Austria. (Brit. No. 20,116 of 1907.)

COAL-CUTTING MACHINES — Improvements in Mechanism for Driving Coal-cutting Machines. Anderson, Boyes & Company, Ltd., Motherwell, Lanarkshire, Eng. (Brit. No. 25,256 of 1907.)

COAL-MINING MACHINE. Leslie W. Veitch, Des Moines, Iowa. (U. S. No. 900,003; Sept. 29, 1908.)

COAL WASHING—Improvements Relating to Apparatus for Washing Coal, Coke and Other Materials. Hardy Patent Pick Company, Ltd., Heeley, Sheffield, and George Smith, Abbeydale, Sheffield, Eng. (Brit. No. 24,097 of 1907.)

COKE-DRAWING APPARATUS. James Reed, Pittsburg, Penn. (U. S. No. 900,206; Oct. 6, 1908.)

COKE-OVEN — Horizontal Regenerative Coke-Oven, etc. Francis J. Collin, Dortmund, Germany. (U. S. No. 898,439; Sept. 15, 1908.)

COKE-OVEN. Thomas J. Mitchell, Connellsville, Penn. (U. S. No. 899,886; Sept. 29, 1908.)

COKE-OVENS—Improved Construction of Regenerative Coking Ovens. Franz Richter, Sheffield, Eng. (Brit. No. 2550 of 1908.)

COKE-OVENS—Improvements in Coke Ovens. Rene Fabry, Chesterfield, Derbyshire, Eng. (Brit. No. 21,593 of 1907.)

COKE-OVENS—Improvements in, or Relating to Coke Ovens. Arthur O. Jones, Whitley Bay, Northumberland, Eng. (Brit. No. 27,443 of 1907.)

COKE-OVENS—Improvements in, or Relating to Coke Ovens. Arthur O. Jones, Whitley Bay, Northumberland, Eng. (Brit. No. 25,262 of 1907.)

CONVEYERS—Improvements in, or Relating to Conveyers for Incandescent Material, such as Coke, etc., Berlin Anhaltische Maschinenbau-A-G, Berlin, N. W., Germany. (Brit. No. 10,601 of 1908.)

CONVEYING APPARATUS—Improvements in, and Relating to Apparatus for Conveying Coal from the Working Face of a Mine to the Tubs or Trams. Wilhelm Hinselmann, Hochheide, Rheinprovinz, Germany. (Brit. No. 17,932 of 1907.)

GASES—Improvements in Apparatus for Measuring Dangerous or Obnoxious Gases in Mines and the Like. Communicated from Hartmann & Braun, Aktien Gesellschaft, Frankfort-on-Main, Germany, and Emmanuel Amédée della Santa, Brussels, Belgium. (Brit. No. 18,060 of 1907.)

SLATE-PICKER. William J. Devers, Scranton, Penn. (U. S. No. 900,087; October 6, 1908.)

COPPER

BESSEMERIZING MATTE—Method of Bessemerizing Copper Matte. George H. Benjamin, New York, N. Y. (U. S. No. 900,345; October 6, 1908.)

SMELTING—Method of Smelting Copper Ores. George H. Benjamin, New York, N. Y. (U. S. No. 900,346; Oct. 6, 1908.)

GOLD AND SILVER

AMALGAMATOR. Fred Stringham, Manitou, Colo. (U. S. No. 900,965; Oct. 13, 1908.)

FILTER-PRESS. Charles W. Merrill, Lead, S. D. (U. S. No. 900,185; October 6, 1908.)

GOLD-SAVING APPARATUS. Richard G. Steele, Rutherford, Cal., assignor of one-half to Thomas B. Edington, Rutherford, Cal. (U. S. No. 899,271; Sept. 22, 1908.)

PRESSURE-FILTER. Charles W. Merrill, Lead, S. D. (U. S. No. 900,184; Oct. 6, 1908.)

RECOVERING SILVER FROM SOLUTION. Thomas A. Ross, Selby, Cal. (U. S. No. 901,124; Oct. 13, 1908.)

RECOVERY FROM SOLUTIONS—Process of Precipitating and Recovering Materials From Solutions. Charles W. Merrill, Lead, S. D. (U. S. No. 900,186; October 6, 1908.)

TUBE MILLS—Improvements in Tube or Ball Mills. Alfred James, London, E. C. (Brit. No. 13,096 of 1908.)

IRON AND STEEL

BASIC BESSEMER PROCESS—Improvements in, or Connected with the Manufacture of Iron or Steel by the Basic Bessemer Process. Josy Flohr, Dudelange, Luxembourg, France. (Brit. No. 9554 of 1908.)

BLAST-FURNACE. Julius H. Meissner, Pittsburg, Penn. (U. S. No. 900,291; October 6, 1908.)

BLAST-FURNACE-CHARGING APPARATUS. Albion P. Aiken, Braddock, Penn., assignor of one-third to John F. Lewis and one-third to Michael Killeen, Braddock, Penn. (U. S. No. 898,818; Sept. 15, 1908.)

BLAST-FURNACE PRACTICE—Improved Arrangement for Filling Blast-Furnaces and the Like. Paul Thomas, Düsseldorf, Germany. (Brit. No. 7022 of 1908.)

BLAST-FURNACE PRACTICE—Improvements in Connection with Means for Running off Slag from Blast Furnaces. Joseph Marsden and Edward Pearson, South Bank, Yorkshire, Eng. (Brit. No. 1211 of 1908.)

CHARGING APPARATUS—Improvements in Apparatus for Charging Open-Hearth Furnaces and the Like. Benjamin W. Head, London, S. W. (Brit. No. 19,814 of 1907.)

DESULPHURIZING—Method of Desulphurizing Ores. Karl A. Johansson, Sandviken, Sweden. (U. S. No. 899,219; Sept. 22, 1908.)

FOUNDRY PLANT — Improvements in Foundry Plant for the Vertical Molding and Casting of Pipes. Fred Herbert, Birtley, Durham, Eng. (Brit. No. 26,390 of 1907.)

HEAT TREATMENT and Quenching of Alloyed Steels. James Churchward, New York, N. Y. (U. S. No. 899,713; Sept. 29, 1908.)

INGOT-MANIPULATOR. David L. Mekeel, Sewickley, Penn. (U. S. No. 899,832; Sept. 29, 1908.)

INGOTS—Method of Producing Ingots Free From Blow-Holes. William F. M. McCarty, Pleasantville, N. Y., assignor of one-fourth to George O. Eaton, one-fourth to Thomas M. Acken, and one-thirtieth to Alexander J. Guttman, New York, N. Y. (U. S. No. 898,770; Sept. 15, 1908.)

INGOTS—Process of Making Ingots. Frank Cutter, Providence, R. I. (U. S. No. 899,827; Sept. 29, 1908.)

MALLEABLE IRON AND STEEL—Improved Process for the Manufacture of Malleable Iron and Steel and Other Alloys of Iron, and Improved Apparatus Relating Thereto. Communicated from the Rombacher Hüttenwerke, and Wilhelm Schemann, and Jegor Bronn, Rombach, Lorraine, Germany. (Brit. No. 25,400 of 1907.)

MANUFACTURE—Improvements in, and Means for Use in the Manufacture of Steel. Felten & Guilleaume Lahmeyerwerke Actien Gesellschaft, Frankfort-on-Main, Germany. (Brit. No. 24,213 of 1907.)

MANUFACTURE—Improvements in, and Relating to Steel Suitable for the Manufacture of Armour Plates, Projectiles and Other Bodies. Compagnie des Forges et Aciéries de la Marine et D'Homécourt, Saint Chamond, Loire, France. (Brit. No. 25,742 of 1907.)

MANUFACTURE—Improvements in the Manufacture of Iron or Steel by the Open-Hearth Process or in Electrical Furnaces. Josy Flohr, Dudelange, Grand Duchy of Luxembourg, Germany. (Brit. No. 19,348 of 1907.)

MANUFACTURE—Improvements in the Manufacture of Iron and Steel. John W. Moon and Wesley J. Moon, Old Hill, Staffordshire, Eng. (Brit. No. 12,607 of 1907.)

MANUFACTURE—Method of Manufacturing Steel. John W. Maxwell, Williamsport, Penn. (U. S. No. 900,564; October 6, 1908.)

MANUFACTURE—Process for the Production of Pig Iron for the Manufacture of Steel in the Converter. Alexander Zeuzes, Charlottenburg, Germany. (Brit. No. 23,627 of 1907.)

MOLDING MACHINE—An Improved Portable Molding Machine for Foundry Use. Communicated from Badische Maschinenfabrik and Eisengiesserei vormals G. Sebold and Sebold & Neff, Durlach, Grand Duchy of Baden, Germany. (Brit. No. 8981 of 1908.)

ORE TREATMENT—Method of Treating Ore. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 899,405; Sept. 22, 1908.)

ORE TREATMENT—Process of Treating Ferruginous Ore for the Manufacture of Iron and Steel Therefrom. Montague Moore, Melbourne, and Thomas J. Heskett, Brunswick, Victoria, Australia. (U. S. No. 12,856; reissue; Sept. 22, 1908.)

SMELTING—Method of Smelting Ores. Ralph Baggaley, Pittsburg, Penn. (U. S. No. 900,466; October 6, 1908.)

TREATMENT OF IRON—Improvements in the Treatment of Iron Which is to be Converted into Steel. Hermann Röchling and Johannes Schœnaiva, Volklingen-on-Saar, Germany. (Brit. No. 27,556 of 1907.)

MICA

MICA POWDER—New or Improved Process for the Production of Mica Powder. Arthur B. C. Rogers, Agra, United Provinces of Agra and Oudh, British India. (Brit. No. 12,570 of 1908.)

SPLITTING MACHINE — Machine For Splitting Mica. Bernhard Walchner, New York, N. Y. (U. S. No. 901,130; Oct. 13, 1908.)

NICKEL

SEPARATING METALS FROM MATTE, Art of. Albion J. Wadhams, Riverton, N. J., and Robert C. Stanley, New Brighton, N. Y., assignors to International Nickel Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 900,452 and 900,453; October 6, 1908.)

SEPARATING METALS FROM SPEISS, Art of. Albion J. Wadhams, Riverton, N. J., and Robert C. Stanley, New Brighton, N. Y., assignors to International Nickel Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 900,454; October 6, 1908.)

SULPHUR AND PYRITES

TREATING PYRITE LIQUOR—Improvements in Treating or Utilizing Liquor Obtained from Pyrites, Pyrites Cinder and the Like. John H. Thwaites, Peterborough, Eng. (Brit. No. 27,426 of 1907.)

TIN

EXTRACTION PROCESS—Improvements in and Relating to the Extraction of Tin From Ores, Slag or Refuse. Hermann Mühlinghaus, Wiesbaden, Germany. (Brit. No. 25,460 of 1907.)

TIN CHLORIDE—Improved Manufacture of Tin Chloride or the Like. Dr. Heinrich Brandenburg, Kempen-a/Rhein, Germany. (Brit. No. 1461 of 1908.)

ZINC

ELECTRIC FURNACE for the Continuous Extraction of Zinc from Its Ores. Eugene F. Cote and Paul R. Pierron, Lyons, Rhone, France. (Brit. No. 22,283 of 1907.)

OXIDE OF ZINC—Process of Treating Complex Ores Containing Zinc and Other Volatilizable Metals for the Production of Oxides. George M. Rice, Worcester, Mass. (U. S. No. 899,322; Sept. 22, 1908.)

OXIDE OF ZINC. Treating Oxide of Zinc. Frederic P. Dewey, Washington, D. C. (U. S. No. 900,088; October 6, 1908.)

MINING—GENERAL

DUST IN MINES. Method of Removing Dust and Gases from Mines. Frank T. Byers, Mount Pleasant, Penn. (U. S. No. 899,509; Sept. 29, 1908.)

EXCAVATION SYSTEM. Improvements in the System of Excavating and in the Construction and Operation of the Scoop-Buckets or Scrapers Employed Therein for Conveying and Discharging the Material Excavated. John Abbott, Eastbourne, Eng. (Brit. No. 16,054 of 1907.)

EXPLOSIVE or Blasting Agent For Blasting Rock and the Like. Wilhelm Eberhle, Ettlingen, Grand Duchy of Baden, Germany. (Brit. No. 15,195 of 1908.)

HOISTING. Improved Method and Device for Regulating Power-Supply in Hoisting Plants. Jakob Iversen, Charlottenburg near Berlin, Germany. (Brit. No. 3231 of 1908.)

MINE-DOOR—Automatic Mine-Door. Benjamin O. Byers and Charles F. Thiede, Columbus, Ohio. (U. S. No. 900,262; October 6, 1908.)

MINE TRACKAGE—System of Mine-Trackage. Freeman R. Willson, Jr., Worthington, Ohio, assignor to the Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 900,903; Oct. 13, 1908.)

UNDERGROUND WATERS—Process for Stopping or Sealing Off Underground Flow of Water Into Mine-Workings, etc. Edmund B. Kirby, Flat River, Mo. (U. S. No. 900,683; October 6, 1908.)

ORE-CHUTE. John Ross, Landlock, Alaska. (U. S. No. 899,076; Sept. 22, 1908.)

VENTILATION—Means for Ventilating Mines and Removing Dust and Gases Therefrom. Frank T. Byers, Mount Pleasant, Penn. (U. S. No. 899,508; Sept. 29, 1908.)

ORE DRESSING

CLASSIFICATION—Improvements in Machines for Grading or Classifying Pulverulent or Comminuted Materials. Arthur R. Robertson, Kingston, Glasgow, Scotland. (Brit. No. 19,736 of 1907.)

CONCENTRATING-TABLE. Albert M. Kemp, Merton W. Loomis and Joseph E. Fitzwater, Denver, Colo. (U. S. No. 900,285; October 6, 1908.)

CONCENTRATOR—An Improved Concentrator of the Endless Traveling Belt Type. Charles L. Buckingham, Denver City, Colo. (Brit. No. 6413 of 1908.)

CONCENTRATOR. Ray H. Manley, Stockton, Cal. (U. S. No. 899,312; Sept. 22, 1908.)

CRUSHING-MILL. Waldemar M. Mueller, Los Angeles, Cal. (U. S. No. 899,176; Sept. 22, 1908.)

CRUSHING MILLS—Improvements Relating to Crushing Mills. Armelin Bernard, Carloforte, Sardinia. (Brit. No. 8980 of 1908.)

ELECTRIC SEPARATOR. Henry A. Wentworth, Lynn, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a Corporation of Maine. (U. S. No. 899,364; Sept. 22, 1908.)

MAGNETIC ORE SEPARATOR. Charles E. Stebbins, Iola, Kan. (U. S. No. 899,348; Sept. 22, 1908.)

ORE CONCENTRATOR. Albert H. Stebbins, Los Angeles, Cal. (U. S. No. 900,442; October 6, 1908.)

ORE-FEEDER. Samuel T. Graham, Los Angeles, Cal. (U. S. No. 899,527; Sept. 29, 1908.)

ORE SEPARATOR. Joseph F. Pagett, Denver, Colo. (U. S. No. 900,581; October 6, 1908.)

ROTARY SCREENS—An Improvement in Rotary Screens Applicable to Stone and Ore Crushing Machines, and for Screening Gravel and Like Material. Joseph Broadbent and James E. Broadbent, Stalybridge, Lancashire, Eng. (Brit. No. 24,740 of 1907.)

SEPARATION—Apparatus for Recovering Mineral Values. James W. Boardman, Josephine, Mont., assignor of one-fourth to Lucy E. Phillips and one-fourth to Melissa French, Harlem, Mont. (U. S. No. 899,710; Sept. 29, 1908.)

SEPARATION—Improved Process for Separating Parts of the Constituents of Ores from the Remainder Thereof. Auguste J. Joseph de Bavay, Kew, Victoria, Aust. (Brit. No. [illegible] of 1907.)

SEPARATION—Process for Separating Metals from Their Ores. James D. [illegible], London, England. (U. S. No. 899,478; Sept. 22, 1908.)

SEPARATION—Separation of Metals From [illegible]. James D. [illegible], London, England. (U. S. No. [illegible]; Sept. 22, 1908.)

SEPARATOR. Machine for Separating [illegible]. Frank E. [illegible], Denver, Colo., and [illegible] Franz L. [illegible]. (U. S. No. [illegible]; Oct. 13, 1908.)

SLIMES SEPARATOR. [illegible] (U. S. No. [illegible]; Sept. 22, 1908.)

METALLURGY—GENERAL

BAG HOUSE. Holland E. Benedict, Salt Lake City, Utah, assignor to United States Smelting, Refining and Mining Company, Salt Lake City, Utah, a Corporation of Maine. (U. S. No. 898,426; Sept. 15, 1908.)

BY-PRODUCT RECOVERY—A Process for the Utilization of Products and By-Products of the Chemical Treatment of Ores, Especially Mixed Ores. George Evans, Stroud Green, London, N. (Brit. No. 17,125 of 1907.)

CASTING—Improvements in, and Connected with the Casting of Metal Ingots. Communicated from Freidrich W. Winner, Hanyang, Province of Hupeh, China. (Brit. No. 20,[illegible] of 1907.)

ELECTRIC FURNACE PROCESS. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors, by mesne assignments, to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 898,691; Sept. 15, 1908.)

FLUE-DUST. Composition for Solidifying Flue-Dust. Samuel W. Ramsey and Geo. W. Smith, Youngstown, Ohio, assignors to the Ramsey-Smith Company, Youngstown, Ohio, a Corporation of Ohio. (U. S. No. 900,587; October 6, 1908.)

FLUE-DUST. Method of Recovering Values From Flue-Dust and Fines. Ralph Baggaley, Pittsburg, Penn. (U. S. No. 900,467; October 6, 1908.)

REFINING. Process of Refining Metals. Karl O. Kretschmer, Elizabeth, N. J., assignor of two-thirds to Charles J. Canda and Ferdinand E. Canda, New York, N. Y. (U. S. No. 898,116; Sept. 8, 1908.)

SINTERING PROCESS—Improvements in, and Relating to Apparatus for Roasting and Sintering Ores. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. [illegible] of 1907.)

SINTERING PROCESS—Improvements in, and Relating to Process of Roasting and Sintering Ores. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. 17,[illegible] of 1907.)

SMOKE PREVENTION. Improvements in Means for Preventing or Consuming Smoke and Economizing Fuel in the Furnaces of Steam [illegible]. Henry [illegible] and Sydney Oram, Buxton, Eng. (Brit. No. 18,138 of 1907.)

MINING MACHINERY AND APPARATUS

DREDGING APPARATUS — Pins for Dredges or Dredging Chains. Communicated from the Taylor Iron and Steel Company, Highbridge, N. J. (Brit. No. 6576 of 1908.)

ELEVATING APPARATUS. Improvement in, and Relating to Elevating Appliances for Use in Mines and the Like. Karl Teichmann, Salzdetfurth, Germany. (Brit. No. 25,547 of 1907.)

EXPLODING APPARATUS—Apparatus for Exploding Mine Charges. Charles I. Dodson, Pittsburg, Kan. (U. S. No. 898,847; Sept. 15, 1908.)

EXPLODING APPARATUS. Means for Exploding Blast Charges. Charles I. Dodson, Pittsburg, Kan. (U. S. No. 898,848; Sept. 15, 1908.)

HAMMER DRILL. Albert H. Taylor, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 898,702; Sept. 15, 1908.)

HOISTING APPARATUS—Controlling Device for Hoisting Apparatus. Carl Notbohm, and Heinrich Eigemann, Essen-on-the-Ruhr, Germany. (U. S. No. 899,794; Sept. 29, 1908.)

HOISTING-ENGINE. Sven T. Nelson, Chicago, Ill., assignor to Sullivan Machinery Company, Chicago, Ill., a Corporation of [illegible]. (U. S. No. 900,768 and 900,769; Oct. 13, 1908.)

MINERS' LAMPS—Improvements in Miners' Lamps. Boleslaus Rynkowski, Branck near Gladbeck, Germany. (Brit. No. 20,979 of 1907.)

[illegible] (Brit. No. [illegible] of 1907.)

[illegible] DRILL. [illegible] (U. S. No. [illegible].)

[illegible] APPARATUS. [illegible] manton, Yorkshire, Eng. (Brit. No. 23,111 of 1907.)

[illegible] Co., Ottumwa, Iowa. (U. S. No. 896,475; [illegible].)

ROCK DRILLING APPARATUS. [illegible] (Brit. No. [illegible] of 1907.)

ROCK DRILLING MACHINE. John B. Damas and Joseph Francis, Sonora, Cal. (U. S. No. [illegible]; August [illegible], 1908.)

ROCK DRILLING MACHINES—Improvements in Fluid-Actuated Rock-Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. No. 13,758 of 1908.)

ROCK DRILLS. Improvements in [illegible] (Brit. No. [illegible] of 1907.)

ROCK DRILLS. Improvements in Rock Drills. Henry J. C. Keymer, Gorleston-on-Sea, Great Yarmouth, Eng. (Brit. No. 10,251 of 1907.)

ROCK DRILLS. Machine for Sharpening Rock Drills. [illegible], New York, N. Y. (U. S. No. [illegible].)

SAFETY APPARATUS. Improvements in [illegible] Newcastle-on-Tyne, Eng. (Brit. No. [illegible] of 1907.)

SAFETY APPARATUS. [illegible] Safety Apparatus for Mining [illegible] Newcastle, Northumberland, Eng. (Brit. No. 6571 of 1908.)

SAFETY HOISTING DEVICE. An Automatic Stop Guide That Will Prevent the Descent of Cages or Hoists if the Sustaining Tow or Wire Rope Breaks. James Martin, Coatbridge, Scotland. (Brit. No. 19,754 of 1907.)

SAFETY LAMPS. An Improved [illegible] for the Locking Bolts of Miners' Safety Lamps. John C. Best, Morley, Yorkshire, Eng. (Brit. No. 23,086 of 1907.)

TUNNELING MACHINE. [illegible], Denver, Colo., assignor by mesne assignments, to the Terry, Tench & Proctor Tunneling Machine Company, a Corporation of New York. (U. S. No. [illegible]; Oct. 13, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

BRIQUET PRESS—An Improved Press with Intermittently Rotating Mound-Table for Making Briquets, Artificial Stone Blocks and the Like. Wilhelm Surmann, Cologne, Germany. (Brit. No. [illegible] of 1907.)

CASTING APPARATUS—Improvements in Apparatus for Handling and Pouring Metals into Molds for Casting Operations. Edgar A. Custer, Philadelphia, Penn. (Brit. No. 16,747 of 1907.)

CASTING APPARATUS. William S. Weston, Chicago, Ill. (U. S. No. 900,807; Oct. 13, 1908.)

CONVERTERS. Improvements in Converters. Richard Cremer, Leeds, Eng. (Brit. No. 10,835 of 1908.)

CHARGING FURNACES. Improvements in Means for Bringing Charges into Position to be Taken up by Apparatus for Charging Furnaces. [illegible] W. [illegible], Westminster, London, S. W. (Brit. No. [illegible] of 1908.)

CRUCIBLE FURNACES—Improvements in, [illegible] Louis Rousseau, Seine et Oise, France. (Brit. No. [illegible] of 1908.)

DESULPHURIZING FURNACE. Robert Hübner, New York, N. Y. (U. S. No. 899,[illegible]; Sept. 29, 1908.)

ELECTRIC FURNACE. [illegible], Trolhättan, Sweden. (U. S. No. 900,488; October 6, 1908.)

ELECTRIC FURNACE. James H. Reid, Cornwall, Ontario, Canada, assignor of one-half to [illegible], Ottawa, Canada. (U. S. No. [illegible]; October 6, 1907.)

ELECTRIC FURNACE. [illegible], London, England. (U. S. No. 897,[illegible]; Aug. 25, 1908.)

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and Goldfield

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 20—The Greek laborers having been discharged and trouble with the miners' unions thus avoided, it is probable that the cleaning out and repairs to the Campbell ditch, in Yuba county, will be done by the Tarr Mining Company with American laborers, if they can be obtained. Until this ditch is completed no profitable work can be accomplished at the Blue Point mine at Smartsville, which is being reopened by the company. There are immense beds of unworked gravel in this mine, which was formerly a large hydraulic property; it is now to be worked on some different system but large quantities of water must be used. Yuba county now ranks fourth among the gold-producing counties of this State and numbers of old mines long idle are being reopened. Of course, the main seat of the gold-mining industry is the dredging ground near Marysville and this is being extended and more dredgers are being built. Indeed it is the opinion of many that this Marysville, or Yuba field, is the best in the State for dredging, and will have the longest life.

The Canada Hill Consolidated Mining Company, formerly owned by L. Charronat & Sons, on Canada Hill, Nevada county, was supposed to be worked out a couple of years ago but the superintendent, A. Charronat, succeeded in getting the company to go on until finally the ledge came in again. A modern equipment of hoisting and pumping machinery was then installed and deep mining commenced. The company has now got on far enough to build a 10-stamp mill. The mine was formerly among the dividend payers of Nevada city district.

The Four Metals Mining Company, of Inyo county, has completed its new smelter and is about to work up old slags which have accumulated from former operations of the mines at Cerro Gordo. The new smelter will primarily be used for the company's own ores, but some custom smelting will also be done for the benefit of the miners in that locality. A large power generating plant is being put up on Lone Pine creek from whence transmission lines will be run from Keeler to Cerro Gordo. The company is about to put up 27,000 ft. of ¼-in. steel cable for its aërial gravity tramway. There is a fall of some 4000 ft. between Cerro Gordo and the smelter. The tramway system will deliver 20 tons of ore hourly to the smelter.

The new district of Kewanee in San Barnardino county has now several companies actively working and others ready to let contracts for shafts, tunnels, etc. For such a young camp to have as many as five properties nearly ready to turn out bullion, is something worth note. The object of the companies is now to gain depth and the sulphide zone, where it is expected that the gold ores found on the surface will become richer. Moreover, a water supply will be developed, which is necessary for milling the ores in any quantity. Ore worth $25 to $30 per ton is common, and some found is of quite high grade. The Chico, Sunnyside and Casa Grande properties are looking well, and the Morning Star is considered a good milling proposition. The Meadville company, owning the West End claim, is producing gold-silver-lead ore. Numbers of prospecting parties are outfitting at different points in this county, which is a very large one, and are scattering in many directions. Hart, another of the new districts, is doing well for a place so recently opened, and the discoveries there are opening up other small camps within a radius of 100 miles. In addition to gold, silver and lead mines, deposits of borax and soda are being looked for and opened.

Prospectors who have been in the Surprise valley region of Modoc county this summer, speak highly of the mining possibilities of that section. The only mining of any extent being done in the county is near Fort Bidwell, where a number of properties have been opened and a few are now producing in a small way. More milling facilities are needed. A quicksilver mine is being opened near Cedarville, but has not yet become productive. In the section around Surprise valley some gold prospects have been found and are being opened in a small way. There is plenty of water, but the country is undeveloped, as it is far from any railroad transportation.

Wallace, Idaho

Oct. 20—Efforts to compromise the difficulties between the Federal Mining and Smelting Company and the Bunker Hill & Sullivan Mining and Concentrating Company have failed, and now there is to be litigation between the two, which promises to be a serious matter. Pope Yeatman, chief consulting engineer for the Guggenheim interests, was sent out from New York to endeavor to effect a compromise, but he failed to do so, and decided that the litigation should proceed. Consequently the Federal company has brought suit against the Bunker Hill & Sullivan. The questions involved, which pertain to extralateral rights, are very complicated, and the present outlook is that there will be a costly and vexatious law suit, once more illuminating the hideousness of the law of the apex.

Salt Lake City

Oct. 24—The controlling interest in the Carisa mine in the Tintic mining district has been obtained by E. C. Loose, of Provo, and associates. Mr. Loose is manager of the Sioux Consolidated, an adjoining property, in which some important developments have been made during the past six months; the supposition is that the orebodies opened in Sioux ground extend into Carisa ground. The strike of the vein also crosses the Iron Blossom property. Some extremely interesting developments are taking place in this portion of the Tintic district which may prove to be as richly mineralized as any of the older exploited portions of it.

Another deal of importance in which Tintic property is involved was the obtaining of a controlling interest in the Opex group by a Utah syndicate at the head of which is Jesse Knight, of Provo. This property is adjacent to the Centennial Eureka mine. A company has been formed to exploit the property and is to be known as the Opex Consolidated Mines Company, having a capital stock of 1,000,000 shares, par value $1 each. Provo is to be the headquarters of the corporation. New machinery was installed at the mine last year. Frank P. Swindler, of Salt Lake, is manager.

Apparently some shareholders, friendly to Guggenheim, or American Smelting company, inteests, are opposing the construction of a new copper smelter by the Utah Consolidated Mining Company. Consequently, further than exercising the options held on a large area of land in Tooele county, the Utah Consolidated management has taken no steps toward carrying out its plans to erect the proposed plant. The American Smelting company interests are doing what they can to prevent any more competition in Utah, and that is what it will mean to them if a smelter is built in Tooele county. It is contended by Utah Consolidated officials that a 5-year contract with the American Securities Company on the basis of the one now in existence would mean a large loss to shareholders and unless the terms were modified materially it would be against good business judgment to continue shipments of ore to the Garfield smeltery for treatment. The Utah Consolidated is charged 40c. a ton for ore transported from Bingham to Garfield, for the Denver & Rio Grande Railroad rigidly enforces the terms of an old contract; other companies are charged at the rate of not to exceed 25c. a ton. By building a smelter in Tooele county, the ore could be transported from mine to smeltery by means of an aërial tramway.

The regular monthly report shows the financial condition of the several Knight mining companies at the end of September to be as follows: Iron Blossom, cash, $20,755, treasury stock, 100,000 shares; Crown Point, cash, $13,199, treasury stock, 120,300 shares; Ibex Gold Mining Company, cash, $5965, treasury stock, 53,300 shares; Colorado, cash, $2358, no treasury stock; the company has ceased the payments of dividends temporarily owing to the shutting down of the Tintic smelter; Uintah Treasure Hill, accounts payable, $5558—shareholders have been called on for an assessment of 1c. a share, or $30,000; East Tintic Consolidated, cash, $707, treasury stock, 163,000 shares; Mineral Flat, accounts payable, $7935; this company is installing power equipment; Mountain Lake, cash, $16,123, treasury stock, 123,425 shares; King David, cash, $29,858, treasury stock, 400,000; Beck Tunnel Consolidated, accounts payable, $19,341; Indian Queen, cash, $9065, treasury stock, 91,300 shares; Black Jack Consolidated, accounts payable, $2475.

The annual report of the Consolidated Mercur covering the operations of that company during the fiscal year ending June 30, 1908, shows net profits of only $2436. Gold bullion sold during the year amounted to $644,354, while receipts from other sources brought the total earnings up to $659,941. The net operating expenses were $657,505. There was mined and milled 87,492 tons of base and 138,737 tons of oxidized ores; the average extraction was $2.85 a ton, while the average value of the tailings for the twelve months was 92c. per ton, making the total value of the ore treated $3.77 per ton. The cost of mining was $1.65 and the milling cost $1.27 per ton. The exploitation of the Brickyard mine was quite successful and the reopening of the Magazine vein insures two or three years' supply of ore for the mill on the basis of 800 tons a day.

Shareholders of the Talisman and Cedar Mining companies, whose properties are in Beaver county, have concluded arrangements for consolidation. The Cedar-Talisman Consolidated Mining Company, has been organized, shareholders of the respective corporations having equal representation.

Butte

Oct. 22—The mines of the Boston & Montana company are now producing at their normal rate of 3500 tons daily, which is sent to the company's smelter at Great Falls. The company's largest producer is the Mountain View, with the [illegible] and Leonard mines next in order. Between 15 and 20 per cent of the ore shipped is first class.

On October 1, 540,000 shares of the Davis-Daly Estates Copper Company, together with the 50c. per share assessment, were turned in to the new Davis-Daly Copper Company in exchange for shares of the latter company. Since then other shares have been turned in, leaving only 7½ per cent. of the stock forfeited by failure to pay the assessment. Under the terms of the agreement with the underwriters, this remaining 7½ per cent. of the stock will go to them as compensation for their services.

Paine, Webber & Co. have begun action against the British-Butte Mining Company, of this city, to recover $2971 as damages for the refusal of the mining company to transfer upon its books certain shares of stock. It is alleged that in February of the present year the plaintiffs purchased in the open market 5000 shares of British-Butte stock. The mining company, claiming that the stock was subject to a pool agreement whereby no sales were to be made until January 1, 1909, refused to transfer the stock on its books. The brokerage company sues to recover commissions and profits which it lost by the alleged wrongful refusal of the mining company.

Denver

[illegible]—In the Cripple Creek district the deep drainage tunnel is in 3800 ft. from the portal, and a flow of 350 gal. of water per minute is reported as having been encountered.

According to some published reports, there is marked depression in mining in the Cripple Creek district. These are not substantiated by the production of the district which is now quite as large as it has been for two years past; nor by the number of miners at work, which is large. Of course, it has been demonstrated that the richest part of Cripple Creek was on the top. There has been no reduction of the value of the product, but less of it contained in the rock broken, and as the mines are now deep, there is the increased cost of pumping and hoisting. This has been counterbalanced to a certain extent by improved metallurgical methods and lower treatment charges. Now that these treatment charges have been increased, it is possible that some depression in the district will result.

That the mining and engineering interests of the State of Colorado are being injured by the misplaced zeal of the Reclamation and Forestry bureaus of the Government, is patent to everyone, and the worst feature of it is that though the officials have been shown their error, it has so far been impossible to get the re- [illegible] Petitions, verbal and written [illegible] doing" is the result. Withdrawal of immense tracts for forest reserves where there are no forests, barring out prospectors from the same by an impossible rule which requires him to prove his claim valuable before his stake holds good, and withdrawal of lands by the Reclamation Service where there is nothing to reclaim, [illegible]

There are instances where the building of a much needed railway was delayed, and its projectors subjected to heavy legal costs, because the Reclamation Service wished to make an immense reservoir through which the line would pass. And although the railway has been allowed to go through, the Reclamation Service will not release the valuable lands included in the withdrawal, some of which is high mountain range, containing valuable deposits of limestone and other minerals, which cannot be acquired or utilized.

The chief of the Forest Service, however, now seems amenable to reason, and has arranged a conference between himself and committees representing Colorado mining men and the American Mining Congress, with a view to correcting wrongs.

Toronto

[illegible] The Ontario Government has undertaken the building of a wagon road, 47 miles long, to render accessible the new mining region around Gowganda lake, which lies in unsurveyed territory west of Mickle township. The road leaves Earlton, a point on the Temiskaming & Northern Ontario railway, 25 miles north of Cobalt, passes through Elk City and Smythe on the Montreal river and continues westward through James and Mickle townships, and thence through a section interspersed with many small lakes where a large number of claims have been staked out, especially around Miller, Leroy and Everett lakes, terminating at the northern end of Gowganda lake. The last point is distant 25 miles from Elk City. Construction work, including a bridge over the Montreal river, will be pushed as rapidly as possible.

Four Cobalt properties were recently disposed of by the Temiskaming & Northern Ontario Railway Commission by tender. Sixteen acres of the Cobalt station grounds and lots 388 and 389 of the townsite were secured by A. Rosenthal and G. P. Dickson, of Ottawa, for $30,000. Four acres of lot 44 and lot 338 in the town were bought by W. J. [illegible] and Raymond Mancha, of Detroit, for $5575. The property is leased for 999 years, subject to a royalty of 25 per cent. of the gross value of the output.

At a preliminary meeting held at Kenora, Ont., on Oct. 15, an organization, to be known as the Mine Owners and Prospectors' Association of Western Ontario, was formed. The details are to be completed at a later meeting in November.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Yavapai County

Consolidated Arizona Smelting Company—The property of this company is to be sold at auction at Prescott on Nov. 10, for the benefit of its creditors. The company is now in the hands of a trustee in bankruptcy.

California

Amador County

Keystone—At this mine, Amador City, the old owners have cleaned up the mill and other property, and most of the men have been laid off in the expectation that those who hold the bond will make the other payments and take the mine. The first payment of $5000 was paid, but the second has not yet been met. The electric company has been notified that no more power will be required. The plans of the new management call for the expenditure of about $200,000, so the sale may not "come through" after all. If work is not resumed, this will make three large Mother Lode mines to close within the year—the Oneida, Gwin and Keystone.

Butte County

Steiffer—The Butte county grand jury has returned an indictment against the president and secretary of this company of Magalia, which has been operating on the old Perschbacker gravel mine. It is alleged that stockholders have discovered that the company does not own the property at all, but that it is in the name of an attorney.

Calaveras County

Wickham Group—This group, consisting of the Reed & Wickham, Old Consolidated, and Bear Creek mines, is being developed by M. D. Wickham & Son, who have put in an overshot wheel for power in pumping and hoisting.

El Dorado County

Woodside-Eureka—This company, after unwatering the Eureka shaft and doing the necessary sampling, has put up boilers, engines, pumps, etc., at the shaft. It is now about to begin the unwatering of the Woodside shaft, which has been filled with water for the past 40 years.

Inyo County

Niter Deposits—At the lower end of Death valley, in the hills along the Willow creek branch of the Amargosa river, Los Angeles men have taken up and patented 4000 acres of land supposed to contain niter deposits of value. A laboratory has been built on Willow creek, near the China ranch, where samples are being tested. The surface of a considerable area has been removed so as to get at the bedrock where it is expected that the deposits are richer than on the surface. John E. Fishburn, president of the National Bank of California, of Los Angeles, is largely interested in this enterprise. These deposits have long been known, but transportation facilities have been lacking.

Kern County

Golden Group—J. B. Ferris, at these mines in Caliente cañon, has erected a new mill with a capacity of 25 tons daily. The ore runs $10 in gold and $12 in silver.

Lassen County

Some rich placer ground has been found just north of Susanville, and numbers of claims have been located on the north side of Indian Camp.

Modoc County

Bald Mountain—J. P. Rathburn has sold to W. C. Stanley and others 25 mining claims at this place for $65,000, and the purchaser will commence work in spring.

Nevada County

Rose Hill—Hemmingson & Green, who have a bond on this Grass Valley property, are clearing away the caved-in portion of the old tunnel. Sinking will commence from the end of this tunnel.

Shasta County

Mammoth—The smeltery of this company is now running at full capacity. The production in 1908 is expected to be 30,000,000 pounds.

San Bernardino County

Coolgardie Placer Company—This company, operating on the desert near Barstow, is putting in engines to run its dry-washing machinery.

Fremont—In this property near Barstow, on the 260 level, ore of high grade has been struck. Enough has been developed to warrant the construction of a mill and one is to be built.

Long Horn Consolidated—This company at Garrett Cañon has put in place a five-stamp mill to prospect the ore from its wide ledge.

San Diego County

Escondido Mine Development Company—This company at Escondido, has taken a 10-year lease on the Oliver Oaks property, with the privilege of purchase. The ground is to be prospected at once.

Shasta County

Delta Consolidated—This company is preparing plans for a narrow-gage railroad from Delta to Dog Creek, where the mines are located.

Mountain Copper Company—This company has started one of its McDougal roasters to remove the sulphur from the ores being shipped to its smelter near Martinez.

Siskiyou County

Granite—This property near Yreka has been sold to Chas. Mitchell, representing New York men, and work will commence upon it at once.

Scott Bar Hydraulic Company—Work has been commenced on the ditch of this company near Fort Jones, which is to be cleaned out and put in repair. The old channels to be worked are high above the present river bed.

Tehama County

Tom Head Copper Mine—The company owning this mine has done over 12,000 ft. of development work, mainly in prospecting. The vein in No. 3 tunnel is 52 ft. wide and new levels will be run to cut it still deeper; a large force of men, with machine drills, is to be put on. It is the intention to block out enough ore to warrant smelter construction.

Trinity County

Brooks—This mine on Eagle Creek, owned by P. Grace and P. L. Young, has over 1000 tons of ore ready to be milled and a stamp mill will shortly be installed.

Salmon Summit—Seven tunnels have been run on this mine on Eagle Creek.

Tulare County

Jupiter Consolidated Jewel Company—This company has leased, with the privilege of purchase, the Venus Hill and Baby Venus chrysoprase mines. The company now owns 14 gem mines in Mariposa and Tulare counties. The main offices of the company are in Fresno.

Tuolumne County

Sweeney—This mine, after being in litigation over 30 years, is now to be [illegible] again by C. H. Segerstrom, and the shaft is being cleaned out and retimbered. New machinery is to be installed.

Colorado

Boulder County

United States Gold Corporation—This company is going to erect a 200-ton cyanide mill at the property on Sugar Loaf mountain, and has placed the matter in charge of the Burnite-Leonard Engineering Company, of Denver, which has designed the plant and is now putting in the concrete foundations. The machinery will be contracted for this month.

Lake County—Leadville

Cleveland—The main shaft on this property, South Evans gulch, will be sunk another 100 ft., making it 750 ft. deep; work will be commenced within a short time. The fissure vein at the 650-ft. level has been opened for 1500 ft. each way, north and south, and the width of the vein will average 8 ft. for the whole of the 3000 ft., carrying an average value of $40 per ton; this is outside of the high-grade ore which runs high in gold and is sacked separately. The object in sinking the shaft deeper is to develop the fissure vein and to give the company sufficient stoping ground to keep it busy for another two years.

Fanny Rawlings—At this mine, Breece hill, the upraise started from the lower workings has opened a body of ore that is, so far as known, 30 ft. high and 10 ft. wide; 30 tons daily are being sent to the smelter.

Greenback—It is reported that the Clark interests in this property, Carbonate hill, have been sold to a party of Boston capitalists, and that work will be started within a month, the ore going to an independent smelter.

Hilltop—The owners of this property, Horseshoe district, are preparing for active work. The mine is in charge of J. C. F. Berger, who was manager of the Silent Friend, South Evans gulch. The Hilltop has produced a high-grade zinc ore, and from now on the shipments will be increased; all the ore goes to the smelters in Kansas.

Jennie June—This shaft, East Tennessee district, has been sunk 75 ft., making it 250 ft. deep; drifts have been run from the bottom of the shaft east and west on the vein, and in the west drift ore has been found that runs high in gold; as work proceeds the vein becomes larger and stronger. From the bottom level of the Jennie June it is the intention to develop the Golden Gate, an adjoining claim.

Jolly Shaft—From this shaft, East Fifth street, lessees are shipping in the neighborhood of 15 tons daily of a good grade of iron and oxidized carbonate; the ore coming from the lower level.

[illegible] this property, Fryer hill, showed a good streak of ore at the bottom of the shaft, but the lessees were compelled to abandon work on account of the heavy flow of water. Arrangements are now being made to install a heavier pumping plant and to sink the shaft 100 ft. farther.

Black Prince—In this mine, Breece hill, a good body of silicious ore has been opened in one of the lower levels, and 20 tons daily are being sent to the local smelter. The mine joins the Highland Chief, and one set of lessees is working both.

Coon Valley—The installing of electric power at this mine, Rock hill, is now completed, and a force of men is at work underground breaking ore and doing development work.

Dinero Tunnel—The work of piping the spring water from the 2000-ft. point in the tunnel is nearly completed, and the work of crosscutting at the breast to find the hanging wall has been started.

Favorite—In this mine, South Evans gulch, the body of ore recently opened at the 175-ft. level, is now 18 ft. high with width unknown; three shifts are steadily at work and shipments amount to 50 tons daily.

[illegible] The Park Range Company is at present sinking a shaft on the Park Range and following a streak of ore. Work will be continued during the winter. The Majestic group is being worked by a tunnel, which is in 350 ft. with another 200 ft. to be driven, when crosscutting to the vein will be started; at this point the breast of the tunnel will be 700 ft. from the surface. The work is being done by Leadville men.

[illegible] Sugar Loaf district, is to the south of the Dinero and the company controls a large acreage. Work of driving the adit has been started; it is to be 5000 ft. long.

[illegible] *Company*—The report just issued by this company shows that between Jan. 4 and Oct. 4, 1908, a total of 7805 tons of ore, with a gross value of $70,337, have been mined by lessees, and the company has received royalties to the amount of $7027. Unfortunately, on Oct. 15, the buildings and machinery of the mine were destroyed by fire, entailing a loss of $25,000 it is said.

Victor Gold Mining Company—The Victor and Little Joe lode mining claims, owned by this company, situated on the [illegible] leased for a two-year term to the Western investment company. The mine workings are to be thoroughly exploited and all [illegible] leasing purposes and later sub-leases will be granted. Work underground has already [illegible] on a number of leasing blocks of the Stratton estate and also on the main [illegible] Raven hill.

[illegible]

Atlas-Klondike—Drifts in three directions from the shaft are showing a good body of silver-lead ore. No stoping will be done until further development is completed, but some ore taken from the drifts is being shipped.

[illegible] ing this mine, are shipping some good ore.

Ouray Consolidated—This company has made arrangements to continue the Blowout adit. Machine drills are being installed.

[illegible]

[illegible] Animas Forks is to be resumed under charge of Daniel McLean, who was recently appointed receiver.

Hammond Tunnel—Work on this adit in the Red Mountain district is being pushed, but there has been some trouble in securing the mines needed.

Kittimac—At this mine, near Animas Fork, the mill is nearly completed. It will have a capacity of 100 tons daily. Joseph J. Clark is general manager.

San Antonio—The Koehler adit is now in 200 ft. Regular shipments are being made; in September they amounted to 1075 tons.

Teller County—Cripple Creek

Accident—Morrell & Co., lessees in this mine on Gold hill, are reported to have cut a 4-ft. vein of good ore, 285 ft. from the surface.

[illegible] grade is being taken from the vein recently opened in this mine on Beacon hill.

Pharmacist—At the annual meeting, Oct. 21, the stockholders elected the following board of directors: Walter F. Rock, E. R. Whitmarsh, J. E. Jones, H. L. Shepard and A. Halter. James F. Burns, of Colorado Springs, the owner of 87,001 shares, was represented at the meeting by John Nicholls. The policy of the president in leasing property was approved by unanimous vote of the stockholders at the meeting of the directors following the stockholders' meeting the following officers were elected: President [illegible] president and treasurer, H. L. Shepherd; secretary, E. R. Whitmarsh.

Teutonic—In this mine on Ironclad hill [illegible] which is being sunk by Smith & Co., lessees.

Idaho

[illegible]

and other liens, show promise of being straightened out and shipments from the mine have commenced once more.

Snowstorm—This company on Tuesday last disbursed its first dividend for the year, at the rate of 3c. per share, a total of $45,000.

Tarbox—J. L. Ford & Co., of Spokane, acting on behalf of a number of New York capitalists have taken an option on the control of this company. This option is for 90 days and covers 55 per cent. of the stock.

Standard—The famous tailings suits begun by Josiah and J. S. Hill against this company have at last been settled out of court after a great deal of litigation. The suits were commenced years ago to recover damages for farm lands alleged to have been destroyed by the dumping of tailings into the Cœur d'Alene river.

Callahan—Shipments of ore are about to commence again to the Salida, Colo., smelter. Arrangements have been made for all winter work.

Liberty Group—A good strike of about 1 ft. of rich copper ore has been made on this group of claims in the Lookout district.

Star—The ore shoot in this property on which a sensational strike was made some time ago has now been proved to a distance of over 500 ft. The orebody is about 4 ft. wide.

Panhandle Smelter—The blowing in of the furnaces comes as a boost to shipping mines all over the district. It is understood that contracts for all the ore the smelter can treat have been secured from the Cœur d'Alene district and from Montana.

Imperial—The big Pelton water wheel for this property, together with most of the other machinery, has been delivered and work has commenced on the installation.

Evolution Mining Company—Shipments of ore have commenced. Last week 10,000 lb. of ore was sent to the Pendoray smelter and if the returns on this are satisfactory further shipments will be made.

Hecla—This company has declared its regular monthly dividend of 2c. per share, total $20,000. This is the 64th dividend and makes a grand total of $1,660,000 of which $140,000 has been paid this year.

Surprise—Two feet of shipping ore and 4 ft. of milling ore have been opened up on this property. The strike was made in the west drift. The mine is located in the Wardner district.

Thompson Falls Power Line—A power line from Thompson, Mont., to the Murray mines has been successfully financed by Senator Ed. Donlan, of Missoula, and work on the construction will be commenced in a short time. The project will cost between $2,500,000 and $3,000,000. The line from Thompson to Murray will be approximately 31 miles long. From the Summit district a branch of the line will be built to the Burke and Wallace mines. It is estimated that at the lowest season of the year not less than 29,000 h.p. can be developed.

Bear Top—This company is awaiting the completion of the Idaho Northern railroad into the North Side district to commence shipments at the rate of 350 tons a month. The ore averages about $85 to the ton. Everything is in readiness at the mine and the big 100-ton concentrator, operated by water power, is ready to start at a moment's notice.

Granite & Allie—The recent strike of 34 ft. of concentrating ore in this mine has practically decided the management to erect a 100-ton concentrator within the next year.

Paragon—Work has been resumed on this property and the mine will join the regular shippers as soon as the railroad is completed. The mine has a full line of machinery.

Monarch—A force of men has been set to work in this mine to pump out the upper workings which have been closed since June, 1907. When this has been done the men will commence on the driving of a 760-ft. upraise from the lower tunnel and the mine will be in a position to ship. The Idaho Northern railroad passes within 500 ft. of the mill, which has a capacity of about 50 tons a day. The property was recently leased to the Cœur d'Alene North Fork Mining and Smelting Company.

Amazon-Dixie Mining Company—Herman J. Rossi, of Wallace, has purchased from Mark Everett a one-sixth interest in this mine for a consideration of $20,000.

Corrigan Mine—Work is about to be resumed by the Federal Mining and Smelting Company, and as soon as a new 20-drill compressor can be installed a force of between 60 and 70 men will be put to work.

Butte & Coeur d'Alene—Shipments of ore will commence as soon as the wagon road at present under construction has been completed.

Birthday Group—Six feet of good concentrating ore has been found in this group of claims, situated in the Grand Forks district. The strike was made in the face of the No. 2 tunnel, and the owners have started the driving of a long tunnel to get under the showing just opened.

Federal—Still another suit has been started by the Federal Mining and Smelting Company against the Bunker Hill & Sullivan Company. This suit is for the purpose of quieting title to the Nellie lode claim, part of which is claimed by the defendant company to belong to the Cheyenne lode claim. This makes the third suit started by the Federal company almost within as many days.

Indiana

GREENE COUNTY

That the town of Elliston is underlaid with coal is a discovery made recently by the Evansville & Indianapolis Railroad Company, while sinking a deep well at its stockpens in Elliston. At a depth of 129 ft., the drill passed through a vein of coal 5 ft. 9 in. thick and below that vein another was tapped that measures 4 ft. 3 in. In other portions of Greene county coal mining is carried on extensively, but this is the first discovery made in this locality Steps have been taken to organize a company to sink a shaft.

Michigan

COPPER

Seneca—A new hoisting engine, capable of operating from a depth of 1500 ft., has been delivered at the property and will soon be put in regular commission; with this engine doing duty greater progress will be made in sinking the shaft which is down about 112 feet.

Ojibway—No. 1 shaft is down to a depth of 500 ft., and at that point preparations are being made to begin crosscutting to the lode; this will be the first level of the shaft.

Cliff—Exploratory work continues at this property under the management of the Tamarack company. A crosscut has been driven from the 260-ft. level to the old Avery shaft, a distance of about 1500 ft., and this shaft is to be reopened and the tributary ground opened up. The crosscut is driven on a fissure vein, which lies at right angles to the bedded lodes and is yielding about 80 tons of stamp rock weekly. Several lodes have been cut, but no drifting has yet been started.

Michigan—The lower levels in "B" and "C" shafts of this company are encountering a better grade of copper rock; the vein has widened out and is heavily charged with shot copper. This company is also carrying on extensive explorations in view of opening up the Lake and other lodes that traverse its lands.

Superior—Drifting continues at the various levels of this property, and the same favorable ground is being blocked out. The work of enlarging the shaft is nearing completion. The shaft house has been inclosed and a breaker installed. The new compressor is being assembled, and everything is gradually reaching the point when rock shipments will be made to the Atlantic mill and a thorough mill test made. No. 2 shaft is sinking below the 260-ft. level.

Atlantic—This company is opening up encouraging ground; the south drift at the 13th level continues in the same rich ground, and copper was recently found at the 15th level. This gives about 300 ft. of proved stoping ground. Drifting north at the 12th level has again been started and some copper is being exposed. The shaft is sinking about half-way between the 18th and 19th levels, and the ground continues to be disturbed. Everything is in readiness at the stamp mill to handle this rock.

Osceola—The permanent equipment for No. 4 shaft of the North Kearsarge branch of this company is being rapidly put in shape; nearly all the machinery is on the ground and is being assembled. The shaft is now down to the 10th level, and from this point a crosscut will be driven to the lode. The shaft is going down in the footwall about 75 ft. behind the lode. Crosscuts have been driven to the lode at the sixth and eighth levels and a high grade of mineralization has been exposed. The ground tributary to this shaft has been proved both by diamond drilling and drifts extended from No. 3 shaft

Missouri

ZINC-LEAD DISTRICT

American Zinc, Lead and Smelting Company—Chas. Hart, of Joplin, and associates are developing the south 20 acres of the Hockaday 80 on Center creek, north of Webb City. The lease is from the American company. The Royal mill will be moved from Carterville to the lease.

Cardinal—This old mine has been leased by Snyder & Watkins, of Joplin, the water drained and ore is being produced. This mine is located on Turkey creek, northeast of Joplin and south of the old Dividend. There are now seven companies at work in this locality.

Grace Holmes—This company has bought the Carnegie-Galena mine on the Dinkelbihler lease, southeast of Joplin. Jas. Stoop is president of the company, and R. D. Sims, of Joplin, secretary and treasurer.

Haines Land—A rich drill strike has been made on this land south of Spring City at 45 and 110 ft. Adam Scott, of Joplin, owns the first lease.

Maple Leaf—This company has incorporated with a capital stock of $50,000. Frank Forlow, of Webb City, and associates, of Montreal, New York and Chicago, are the stockholders.

Twin Cherry--This company, at Granby, has made a rich lead strike in six drill holes in its lease on the Massey land.

United Zinc Company—The 500-ton mill and mine, formerly owned by this company, north of Duenweg, will soon be producing again. Pumps are at work Clarence Playter, of Joplin, is manager.

South Town—This company, of Webb City, has been incorporated with a capital stock of $4000. H. G. Gaston, F. R. Cornett, H. W. Pyatt, all of Webb City, and W M. Robinson, of Jefferson City, are the stockholders.

[illegible]—The company is erecting a 100-ton mill on the lease on the Allen land at Spring City. C. V. Millar, of Joplin, is manager.

Tidionte—This company, at Zincite, has installed the cheapest small power plant in the district. A 40-h.p. gas engine drives a line shaft, from which belts run a 5-in. single-stage centrifugal pump, and the hoister. J. Wise Brown, Zincite, is manager of the 40-acre lease.

Montana

BUTTE DISTRICT

Parrot—At the Parrot mine the shaft has been sunk to the 2000-ft. level within the past year. Crosscuts are now being run on the 1900 and 2000, and it is expected that the veins on both levels will soon be cut. At the Little Mina, sinking below the 1000 mark has begun. The hoisting engine now on the Anaconda company's Bell mine will be taken to the Little Mina. On the 1000-ft. level considerable development work has been done on what is known as the "blue vein."

North Butte Extension—The creditors who instituted involuntary bankruptcy proceedings against the company filed a motion to dismiss the proceedings last week, stating that their accounts had been paid. The company has defaulted in its payment under its option on the Michigander and Third Sphinx claims. W. T. Van Brunt, president of the company, has resigned.

Red Metal—The shaft at the Tramway mine is now down 1660 ft. The ore from the company's Tramway, Minnie Healey and Rarus mines is all hoisted through the Rarus shaft. About 2,000,000 lb. of copper is being produced monthly by the properties.

Butte & Boston—This company's shipments to the Washoe smelter at Anaconda have lately been averaging 26,000 tons per month. Of this output the Berkeley mine contributes 8000 tons. At the West Grey Rock the ore contains chiefly gold and silver, with a small amount of copper.

JEFFERSON COUNTY

Boston & Corbin—Manager Emerson states that the vein on the 600-ft. level of the company's property at Corbin has been cut. It is supposed that it is the same vein found on the 500-ft. level

Nevada

[illegible]

The production for the week ending Oct. 17 amounted to 1806 tons valued at $140,630. The Combination mill treated 630 tons of ore; the Kinkead mill treated 45 tons. The Western Ore Purchasing Company handled from Florence Consolidated, 128 tons; Engineers' Lease, 208; Florence Wheeler, 55 tons; Butte Boys' lease, 4 tons. The Nevada-Goldfield Reduction Company handled: From the Consolidated Red Top, 127 tons; Combination Fraction, 120; Begole Syndicate, 300; Baby Florence, 100; Great Bend, 22; Diamondfield Horseshoe, 15; Little Florence, 89; Florence Annex, 28 tons.

[illegible] tons of ore are being shipped per day from this property, but none of the companies shipping from the district will state whether or not they have received ore from the Daisy. The ore is said to come from the 300-ft. level.

Little Florence—The litigation with the Florence Goldfield has been settled out of court. It is said that $100,000 and other concessions have been made to the Little Florence company. The shaft is 450 ft. deep, and a drift is being driven north to catch the Combination Fraction vein.

Hazel Goldfield—The shaft on this lease on the Laguna claim of the Goldfield Consolidated company is 700 ft. deep, being the deepest shaft on any lease in the district. The shaft is being sunk to a [illegible]

Combination Fraction—Shipments have been resumed, as the compressor blast has been fixed and the shaft repaired.

Zinn Florence—Air drills are now used, power being obtained from the Florence Consolidated company. The crosscut being driven toward the Florence Consolidated oreshoot is 80 ft. long; 100 ft. remains yet to be driven. An automatic dumping arrangement and a bin are being installed at the mouth of the shaft.

Engineers Lease—The high-grade ore in the shoot on this lease, which has paid $300,000 in dividends, has been almost exhausted. The production in the future will be limited to sweepings and second-grade ore, as there is not sufficient time to develop another orebody. Another dividend will be paid.

Oklahoma

QUAPAW-BAXTER DISTRICT

Big Jack—This company, of Baxter Springs, Kan., has bought 12 acres, including the Big Jack mine, from Norton & Haskett for $10,000.

[illegible]—The company is figuring on another power dam at Wyandotte, Oklahoma

Pennsylvania

BITUMINOUS COAL

Morris—At this coal mine, near Punxsutawney, a fire recently started, which threatened serious consequences, as the workings connect with those of the Berwind-White Coal Company's colliery adjoining. The fire started in a heap of refuse near the mouth of the slope, and hard work was required to bring it under control.

[illegible] started in this company's Hazel mine Oct.

24. There were about 500 men working in the mine at the time, but ample warning was given and all got out before there was any real danger. It is stated that the operations in the mine will not be discontinued. The origin of the fire is not known. Two theories are advanced—a blown-out shot and electric wires. The fire was discovered in entry 25, which is more than a mile from the entrance and at a point underneath the North Strabane hills. There was no explosion. As soon as the fire was discovered the mine officials began pumping water into the burning entry. There is an abundant supply of water and plenty of fire-fighting apparatus in the mine. Orders were at once given to brick up the burning entry, and this was completed by night.

South Dakota

LAWRENCE COUNTY

Lucky Strike—Superintendent Frank Allen has sunk the shaft 220 ft., and will continue it to the 300-ft. level. The company is controlled by Minnesota and Wisconsin men.

Mogul—Under the management of W. L. McLaughlin, of Deadwood, the October output will be more than 400 tons per day.

Two Bit District—J. D. Hardin and P. H. Smith, two of the principal owners of ground, have settled their difficulties, and both will shortly resume work in this old section.

PENNINGTON COUNTY

Ama Queen—Sherman Brothers, of Pactola, will commence pumping out the shaft before the end of the month and resume regular treatment of some of the ore from a 4-ft. lode of free-milling ore at the 70-ft. level.

King Solomon—Investigation of this claim has been completed by an Eastern expert, said to be in the interest of the old Pittsburg Mining Company, the former owner, and it is believed that operations may be resumed on the ground, which is near Redfern.

Kimball—This ground, adjoining the King Solomon, a free-gold property, was also investigated, and shows three small veins that will bear developing.

Omega—President Clark, of New York, has decided to erect a large mill on this property on Rapid creek; also a power plant. The ore runs about $3 per ton.

Sunbeam—Dr. J. Y. Scott, of Washington, Penn., has just purchased this mine at sheriff's sale, but has not announced his plans.

Tennessee

POLK COUNTY

Tennessee Copper Company—The acid plant is producing 150 tons per day, which will be increased to 250 tons. The capacity of the plant is 120,000 tons per annum. The plant is said to have cost $1,000,000. It is reported that various technical difficulties have now been overcome.

Texas

Pipe-line and refinery returns for September show a production of 896,750 bbl. petroleum, a decrease of 26,050 bbl. from August. Rail shipments in September were 524,904 bbl.; water shipments, 227,678; total, 752,582 bbl. Refinery consumption is estimated at 150,000 bbl., so that stocks decreased a little. The number of new wells completed in September was 46, of which 34 were producers and 12 dry. On Oct. 1 there were 80 new wells under drill.

Utah

JUAB COUNTY

Tintic Ore Shipments—Last week shipments amounted to 99 carloads. The Bullion Beck shipped three carloads; Centennial Eureka, 41; Colorado, 25; Eagle & Blue Bell, 1; May Day, 2; Uncle Sam, 2; Yankee Consolidated, 3; Sioux Consolidated, 8; Beck Tunnel, 2; Eureka Hill, 4; Mammoth, 2; Grand Central, 2; Carisa, 1; Gemini, 3.

Tintic Smelter—It is expected that at least one lead furnace will be in commission within two weeks. The plant was closed recently, the reason assigned being inadequate electric-power facilities. Two additional transmission lines are being built.

King William—Development of this property has begun through the Eagle & Blue Bell mine from the 1000-ft. level of the shaft.

TOOELE COUNTY

Consolidated Mercur—The developments on the Magazine vein in the Brickyard mine are very promising. A crosscut has exposed ore averaging for a length of 80 ft. $6 gold per ton.

Great Divide Mining Company—A compressor plant is being installed; air drills will be used to develop its group of 40 claims located opposite Bingham and on the west side of the Oquirrh range.

United States—This company, through its subsidiary, the Centennial-Eureka, is reported to have bought a controlling interest in the Bullion, Beck & Champion Mining Company, of the Tintic district.

SALT LAKE COUNTY

Utah Apex—This company, in Bingham, has begun a raise to the 700-ft. level from the Parvenue adit; this adit is to be made the main entrance to the mine. Other improvements are being made which the management declares will decrease the mining costs 60c. per ton.

Boston Consolidated—The mill is up to a capacity of 1000 tons daily, and the entire operation is financed from an advance of 85 per cent. of the value of concentrates stored for treatment at the Goldfield smeltery after Jan. 1. The saving is about 71 per cent. Costs in September, 28,365 tons being milled, were 47.2c. per ton; the cost is expected to be below 40c. per ton when the mill reaches full capacity. Production for October promises to exceed 1,000,000 lb. copper.

SUMMIT COUNTY

Park City Shipments—Last week shipments amounted to 1493 tons; the Daly-Judge shipped 374 tons; Silver King, 544; Daly-West, 575 tons.

West Virginia

HARRISON COUNTY

Harrison County Coal Company—This company has bought the mine and plant of the Gunton Coal Company on the Short Line road between Clarksburg and Fairmont. The new owners will make improvements in the plant and will introduce coal-cutting machinery. The officers are George C. Johnston president; P. M. Chidester, vice-president; E. B. Reese, Pittsburg, Penn., secretary; R. S. Monroe, Fairmont, W. Va., treasurer.

Wisconsin

ZINC-LEAD DISTRICT

Board of Trade—This mine, a new producer, is turning out green concentrates testing above 55 per cent. zinc and is said to be earning a profit of $1000 per week.

Cuba City—The Dall is building 1000 ft. of tramway, connecting its new shaft with the mill; a new 150-h.p. Allis-Corliss engine is being installed.

Gogebic—A shaft will be sunk on this property by W. J. Power, of Hibbing, Minn., who recently purchased one-half interest in the lease; the property lies between the Kohinoor Blende and Klar-Piquette, and was proved by drill two years ago.

Pittsburg—The 75-ton mill on this property turned out its first car of concentrates recently. Besides a run of hard-sheet ore, a huge clay opening 30 ft. high and 25 ft. wide, carrying about 12 per cent. of jack, has been proved over 100 ft.; a crevice, carrying this clay and jack continues down into the St. Peter sandstone.

Platteville—The Kohinoor Blende has been unwatered; development work will be continued and a 75-ton mill erected. The Klar-Piquette has resumed operations after a year's shutdown. The 35-ton mill erected in 27 days on the Cruson has turned out its first car of concentrates, testing 50 per cent. metallic zinc. The Wisconsin Zinc Company has doubled the roasting capacity at the Empire by adding the roasting equipment of the Royal. This company has declared a dividend of 3 per cent. on its capitalization of $75,000, payable Oct. 15. The Grant [illegible] is being unwatered; the new shaft will be sunk to the clay-bed and connected up with the main drift before milling will be begun.

Toadville—This mine, on the Hartshorn land in the St. Rose district, is being opened up by shaft.

Annie Laurie—This company is encountering good lead and carbonate in a new shaft just north of the Corr, on the mine known formerly as the Lake Superior-Benton.

Benton—The Bureau Mining Company has replaced the mill equipment destroyed by fire on the Rooney-Swift property, and will reopen this mine.

Coon Branch—The miners at work here broke into a large opening Oct. 19, and are taking out chunks of lead and jack weighing 5000 lb. in some cases.

Drumm—The Benton Mining and Developing Company, operating this lease, has just completed a sinking plant, including a 10-in. Cook steam pump, and shaft sinking has been resumed.

Hoosier—This company has just installed a power plant, including a Columbus centrifugal pump, to complete its [illegible] on the Graham land, two miles south of the Vinegar Hill; a vein of ore varying from 6 to 17 ft. in thickness was proved by drill.

Canada

Canada Iron Corporation—This company has been formed by the amalgamation of the Canada Iron and Foundry Company, the Canada Iron Furnace Company, John McDougall & Company, the Annapolis Iron Company and the Londonderry Iron Company. The last two are in Nova Scotia, the others in Quebec. The properties include iron ore and coal mines, coke and charcoal blast furnaces and foundries. The new corporation is capitalized at $5,000,000 common and $[illegible]000,000 preferred stock and there are $2,500,000 in 6 per cent. first mortgage bonds. The directors are T. J. Drummond, president, G. F. Drummond, Edgar McDougall, C. C. Chipman, A. Cockshutt and George Gudwell.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 17 were as follows: Kerr Lake, 61,170 lb.; La Rose, 120,000; McKinley-Darragh, 178,000; Nipissing, 185,200; Right of Way, 123,100; Temiskaming & Hudson Bay, 180,000. Total 847,470 pounds.

Chambers Ferland—The La Rose vein has been struck at a depth of 85 ft. by crosscutting at a distance of about 150 ft. from the Right of Way main shaft. The vein is about 4 in. wide and is similar to those found on the La Rose property.

Cobalt Central—A 2-ft. vein showing smaltite, native and ruby silver was cut recently by diamond-drilling at a depth of 185 ft. It parallels the main drift and can be reached by a 20-ft. crosscut.

Coniagas—A cobalt vein was recently encountered in a trench that was being dug to lay water pipes. It will be worked from an adjoining shaft.

La Rose—According to [illegible] the production of ore in September was 499 tons containing 256,625 oz. silver valued at $115,845. The estimated expenses were $14,000 leaving net profit for the month $101,845. The net profit for June, July, August and September is stated to be $420,644 derived from 1,034,742 oz. silver.

[illegible] District

[illegible] Frank C. Loring is developing this property. The big vein, 2 ft. in width has been traced across the location. It carries silver estimated at from 1500 to 2000 oz. per ton; the wall rock shows silver to a depth of 6 or 8 in. Another find was made on the property recently and a quantity of native silver was extracted near the surface.

Mexico

CHIHUAHUA

Parral Production—The production of the Parral camp for the week ending Oct. 17 [illegible] with 9415 tons for the preceding week. The product shipped to smelters for these periods was, respectively, 3745 and 3950 tons, while the ore treated at local milling plants was, respectively, 5450 and 5465 tons. The October output will be approximately 40,000 tons.

[illegible] organized company, in which Chihuahua men are mainly interested, is prosecuting [illegible] lead-silver location in the Uruachic section. D. J. Carson is in charge of operations.

Parral Consolidated—This company has nearly completed the erection of crushing and sampling plants at its Prieta mine in Parral camp. With these improvements and its electrically operated pumping and transportation systems, the company's properties are equipped second to none in the district. The manager in charge is D. H. Bradley, Jr.

[illegible] tion of this company, holding a lease on Pedro Alvarado's Palmilla mine in the Parral camp, was lately perfected, and [illegible] The direction of the company affairs is now in the hands of J. A. Creel and Thomas S. Shepperd of Chihuahua, and James I. Long of Parral. F. C. Morehouse remains as superintendent. It is the plan to drive a new working tunnel. The erection of [illegible] proposed plans.

JALISCO

Amparo—The company has placed an order for 500,000 young eucalyptus trees to be set out on the Embocada ranch in the Etzatlan district. The trees are to furnish a future timber supply for the mines. The Virginia & Mexico company in the Hostotipaquillo district is also setting out eucalyptus trees.

Eldorado—This company which began operations in 1905 has issued a statement to its stockholders giving the condition of its mines in Jalisco and Tepic. It recommends the installation of a cyanide plant for the ores of several of its mines.

[illegible] *Ltd.*—This new concern is developing the Juarez acreage adjacent to the Providencia and Resolana properties in the Parral section. Sinking is in progress. P. N. Skousman is in charge.

Chihuahua Copper—The monthly shipments, mainly concentrates, total about 450 tons. With the proposed enlargement of the milling plant the output will be doubled. R. W. McCausland is the manager in charge. This property is reached from Falomir on the Orient railroad.

Sampling Works—The Chihuahua state government has granted a concession to Harvey B. Lawrence for the erection and operation of sampling works and ore testing plant at Chihuahua. Sufficient funds are said to be available for the purchase of custom ores in quantities.

Las Vigas—It is reported that George E. Voorhees and associates are shortly to resume productive operations at these copper mines near Coyame in the eastern part of the state. The properties have been closed down about a year.

[illegible] pany, operating in the Ocampo district, has resumed mining operations under the personal direction of President Warren Bennett, of Birmingham, Ala. The mill is also being prepared for early starting.

Africa

TRANSVAAL

The labor report of the Witwatersrand for September shows that the number of Kafirs employed in the mines on Sept. 30 was 138,180, an increase of 2632 during the month. The number of Chinese was [illegible] year ended Sept. 30 there was a decrease from 40,260 to 14,055 in the number of Chinese at work. At the present rate the Chinese will be entirely out of the mines in six months.

Oceanica

[illegible]

[illegible] posit on the island of Makatoa. Other [illegible] on Ocean and Pleasant islands, outlying atolls of the Gilbert group. It is said that a French company has been organized [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Oct. 28—The coal market in the West continues to show a slight improvement, and better reports are received from Indiana and Illinois mines than for some time past. In the Pittsburg district, however, trade continues dull, partly owing to light Lake shipments, and partly to the long stoppage of the River trade. Local demand is improving a little.

In the East the bituminous trade is also showing some improvement, and the markets are reported more active, with only a few exceptions. Consumers are putting in winter stocks on a larger scale than had been expected.

The anthracite trade, however, is dull. This is largely due to continued mild weather. In fact, a "weather market" may be anticipated for some time to come.

The Coastwise trade is improving, and is more active than it has been for several months. Vessels are in good demand, and rates are consequently higher.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 17, in short tons:

	1907.	1908.	Changes
Anthracite......	4,562,056	4,043,329	D. 518,727
Bituminous.....	31,264,996	26,334,082	D. 4,930,914
Coke.............	11,243,846	5,456,059	D. 5,787,787
Total..........	47,060,898	35,833,470	D. 11,227,428

Total increase this year to date was 23.9 per cent.

Coal tonnage through the Sault Ste. Marie canals for the season to Oct. 1, short tons:

	1907.	1908.	Changes.
Anthracite.....	1,035,790	971,088	D. 64,702
Bituminous....	7,553,120	6,142,621	D. 1,410,499
Total.........	8,588,910	7,113,709	D. 1,475,201

Total decrease this year was 17.2 per cent. The total this year, however, exceeded that of 1906 by 968,922 tons.

The Pittsburg Coal Company reports for nine months ended Sept. 30, short tons:

	1907	1908.	Changes.
Pittsburg district	13,302,634	9 726,387	D. 3,576,247
Ohio district.....	1,018,481	773,588	D. 244,893
Total coal......	14,321,115	10,499,975	D. 3,821,140
Coke...............	5.370	382,205	D. 376.835

Decrease in coal tonnage this year, 26.7 per cent.; in coke, 98.6 per cent.

Coal shipments from Seattle and Tacoma, Wash., eight months ended Aug. 31, were 481,210 tons in 1907, and 386,519 in 1908; decrease, 94,691 tons.

Coal receipts at St. Louis, eight months ended Aug. 31, were 4,883,953 short tons in 1907, and 4,196,983 in 1908; decrease, 686,970 tons.

Coastwise shipments of coal from chief Atlantic ports, eight months ended Aug. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	9,877,041	6,557,376	16,428,417	62.4
Philadelphia	1,403,219	3,041,920	4,445,139	16 9
Baltimore....	161,692	2,434,920	2,596,612	9.8
Newp't News	....	1,757,820	1,757,820	6.7
Norfolk......	.. ..	1,095,337	1,095,337	4.2
Total......	11,441,952	14,881,373	26,323,325	100.0
Total, 1907.	12,727,221	15,981,172	28,708,393	.....

Total decrease this year, 2,385,068 tons, or 8.3 per. cent.

New York

Anthracite

Oct. 28—Prepared sizes are active and in good demand, but small steam sizes are inclined to be dull. Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35 @2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

Local business is almost at a standstill. New York harbor seems to be more inactive than any other consuming territory. The reports from shoal-water ports indicate that consumers have quietly and steadily taken fairly good supplies of coal, and now seem to be well stocked for the winter. Along the Sound the demand is good and the all-rail trade shows a more healthy condition. It would, therefore, seem that New York harbor was the only point suffering from extreme dullness. Good grades of coal fetch $2.45@2.65 with a little demurrage coal reported at $2.25. Transportation is good.

In the Coastwise vessel trade freight rates are firm and unchanged. In New York harbor small vessels are reported scarce. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

Birmingham

Oct. 26—All demands for coal and coke in this State are being met promptly, but the normal condition as to production has not been reached as yet. The demand, however, is picking up rapidly and more men are being placed at work in the mines.

A new coal company has been organized to develop coal lands in Tuskaloosa county, near the Warrior river. Negotiations are also under way for development in the northern part of Jefferson county and in St. Clair county.

Coke is being accumulated; it is believed that the time is not far distant when the pig-iron make will increase so that the daily production of coke will not be sufficient, hence the stocking of the product.

Chicago

Oct. 27—The wholesale coal market is in general by no means strong. Warm weather and the continuance of depressed conditions in the industrial field have made the week dull. Western and eastern coals have suffered considerably from demurrage. Conditions at the Illinois and Indiana mines are such that the average operator is by no means yet in touch with the Chicago market; his shipments consequently vary with his product. Demurrage sales cannot compare with the open-market conditions that have prevailed. The demurrage evil is by no means felt generally as yet, but dealers are anxious. Chicago seems to the local dealer to be a dumping ground to which consignments are ordinarily made after other fields have been judged unprofitable.

Illinois and Indiana coals remain comparatively strong as to lump, and weak as to fine sizes. Lump and egg sell for $1.80@2.65; run-of-mine for $1.65@2.15, and screenings for $1.10@1.55. Hocking Valley coal is somewhat subject to demurrage and brings 15@25c. less than the $3.15 standard. Pittsburg No. 8 is steady at $2.75@2.85 for ¾-in., and Youghiogheny moves on contracts at $3 for steam and $3.15 for ¾-in. gas. Smokeless brings $4.20@4.30 for lump and $2.90@3.45 for run-of-mine, with the market overloaded. Anthracite continues a steady though quiet seller.

Indianapolis

Oct. 27—The owners of the Hudson mine near Terre Haute, have been awarded $3000 by the Operators Association to cover the aggregate amount lost by the owners on account of the strike compelling a closing down July 23. The origin of this trouble was trivial; but the strike led to a dispute between the State and National officers of the miner's union, which is now in the courts.

Pittsburg

Oct. 27—Production in the Pittsburg district has fallen off considerably [illegible] the past week and today it is estimated the mines are not running to more than 40 per cent. of capacity. Large independent interests continue to quote prices on the basis of $1.15 a ton for mine-run coal at mine, but many of the small concerns and probably a large one are still shading this rate.

Connellsville Coke—A further reduction in production is noted today and conditions are dull, although prices are unchanged for contract coke. Furnace is quoted at $1.65@1.85 and foundry at $2.10@2.25 at ovens. For prompt delivery these rates may be shaded. The *Courier* gives the production in both fields at 198,315 tons. The shipments were 7692 cars as follows: To Pittsburg, 3138; to points west of Pittsburg, 4114; to points east of Connellsville, 440 cars

Foreign Coal Trade

Spanish Coal Trade—Coal imports into Spain, eight months ended Aug. 31, were 1,281,984 metric tons, a decrease of 19,657 tons; coke imports, 186,756 tons, an increase of 20,609 tons.

Transvaal Coal Mines—Coal mined in the Transvaal, seven months ended July 31, was 1,685,144 tons in 1907, and 1,709,671 in 1908; increase, 24,527 tons.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 17: Best Welsh steam, $3.60; seconds, $3.48; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3; best small steam, $1.80; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 28—The general tone of the market is still a waiting one. The activity in pig iron which began to develop early in the week quickly subsided after a few orders for foundry and basic pig had been placed. Southern furnaces just now are best supplied with orders and are accordingly firmer on prices.

In finished material the only special activity is in wire, the mills being reported full of work. In other branches from 60 to 70 per cent. of capacity is the report. Some bridge orders have been placed, which will call for a good deal of material. A few new orders for cars are also reported. No large orders for rails have been given out. In structural steel, outside of bridge work, contracts are still held back.

There are reports that a general reduction in finished-steel prices may be made before long. In some lines this will confirm the cuts already made. Nothing definite can be ascertained as to the truth in these reports.

United States Steel Corporation—The statement for the quarter ended Sept. 30 gives the following figures:

[illegible]

[illegible] $16,698,011 as compared with the corresponding quarter of 1907; they were however, greater by $6,840,418 than those for the June quarter, and $8,877,269 than those for the March quarter of 1908. The dividends declared were the same as in the previous quarter—1¾ per cent. on the preferred and ½ per cent. on the common stock.

The unfilled orders on the books on Sept. 30 reached a total of 3,421,977 tons of material; an increase of 108,001 tons over June 30, but a decrease of 343,366 tons from March 31; and a decrease of 3,003,031 tons as compared with Sept. 30 last year.

Baltimore

Oct. 27—Included in the imports for the week were 50 tons spiegeleisen and 505 tons ferromanganese; 5500 tons iron ore from Cuba, 2250 tons iron pyrites and 5608 tons cupreous pyrites from Spain. The exports included 930,117 lb. tin scrap to Rotterdam; 562,500 lb. steel billets to Liverpool.

Birmingham

Oct. 26—There seems to be a consensus of opinion in this section of the country that within another fortnight a change for the better will be apparent on all sides in the pig-iron market. There is some iron being sold now but it is yet in small lots and for immediate delivery. A few large interests have been sounding the market.

Quotations hold firm despite the inclination on the part of consumers to put off buying to the last moment. No. 2 foundry is still quoted at $12.50@13 per ton. Some inquiry is being received for iron to be delivered into next year but no concessions are being offered to secure that business.

There is a healthy home consumption in the Southern territory again, cast-iron pipe foundries, machine shops and foun- [illegible]

Chicago

Oct. 25—Iron and steel conditions continue dull, but the feeling is optimistic. Sales of pig iron are in general small. Melters are buying only as much iron as is necessary for their immediate wants, though inquiries for 1909 deliveries continue large and increase in numbers. If one might safely infer anything from the situation it is that the average melter of pig iron looks for good business for the future, but his caution against the unforeseen has been developed largely in the last year.

[illegible] run beyond the requirements of one to three months, and on such business [illegible] Chicago), continue the ruling quotations for Southern; the exceptional contract obtains special prices, 25c.@50c. either way representing the extremes. Northern iron at $16.50@17 continues to be the favorite. Lake Superior charcoal iron is firm at $19.50.

Iron and steel products are in general stationary, except there is a strong development of structural iron sales. Coke is quiet, but firm at $4.90 for first-class Connellsville, with Southern cokes 25c.@50c. lower

Philadelphia

[illegible] served in the pig-iron situation as to sales or prices. There are more inquiries, and many of them are from large consumers. The sales for the past week have been of special brands in small lots, but the correspondence which led to these sales was accompanied with inquiries relating to next year's iron. Very few furnaces are now hungry for business. Most makers feel that things are coming their way even though prices may not advance. Malleable iron is under better inquiry than for months. Basic pig is stronger. Forge is coming in for more attention; it is quoted delivered close to $16, and $16.50@17 is asked for No. 2X foundry.

Steel Billets—No large sales have been made, but negotiations are under way.

Bars—Two or three mills took orders this week for prompt delivery at outside figures.

[illegible] winter delivery have been sent to the mills.

Scrap—More mill scrap has been contracted for this week than for any week in months. Dealers are holding out for [illegible]

Pittsburg

Oct. 27—The lull before the election is [illegible] as there is no business of any consequence [illegible] lines. While the general run of small orders are being placed and there are still some specifications on old contracts unfilled, the mill operations continue practically the same as a week ago. The Re- [illegible] ing its big bessemer-steel plant at Youngstown for the third consecutive week and [illegible] night. In the Pittsburg district there is no change in operations of the Carnegie company, the principal works running a trifle over 50 per cent., which 30 of its 55 blast furnaces are running. The National Tube Company is still operating at about 68 per cent. of capacity. Shading of many finished-steel products continues although "official" prices are strictly maintained by the Steel Corporation and large independent concerns.

Pig Iron—There is nothing doing in pig iron this week, the market being absolutely dead. The Jones & Laughlin Steel Company will blow in its idle Soho furnace tomorrow, when all of its blast furnaces will be running. This company seems to be using most of its product, but has large stocks on hand in readiness for a rush if a good buying movement develops. The contract placed last week by the Pittsburg Steel Company did not strengthen the market and is not as big as it looks. While it calls for a total of 360,000 tons of basic pig iron covering a period of five years, it provides for the shipment of 6000 tons only a month. This is the product of one furnace for about two weeks in each month. The price as reported is not regarded as desirable for a merchant furnace. Another feature in the contract developed this week is that it may be terminated at the end of 2½ years. Pig-iron quotations are as follows, f.o.b. Valley furnaces: Standard bessemer, $14.75; malleable bessemer, $14.25; basic $14; No. 2 foundry, $14.25 to $14.50; gray forge, $13.50.

Steel—There is nothing doing in billets or sheet-bars. Bessemer and open-hearth billets are $25, Pittsburg, and sheet-bars $27.50. Merchant-steel bars are 1.40c. and plates 1.60c.

Sheets—Cutting in sheet prices continues, but is not bringing out new business. Regular prices remain 2.50c. for black sheets and 3.55c. for galvanized No. 28 gage.

Ferro-Manganese—Little demand; prices remain $45, Pittsburg.

Foreign Iron Trade

British Iron Trade—Values of exports from Great Britain, as given by Board of Trade returns, nine months ended Sept. 30, were: Iron and steel, £28,246,022; machinery, £23,204,786; new ships, £8,274,358; total, £59,725,166, a decrease of £7,241,402, or 10.8 per cent., from 1907. Imports for the nine months were: Iron and steel, £5,550,393; machinery, £3,645,594; total, £9,195,987, an increase of £79,166, or 0.8 per cent. The quantities of iron and steel were, in long tons:

	1907.	1908.	Changes
Exports	4,002,919	3,109,820	D. 893,099
Imports	643,197	791,649	I. 148,452

Imports of iron ore into Great Britain, nine months ended Sept. 30 were 5,967,809 tons in 1907, and 4,428,896 in 1908; a decrease of 1,538,913 tons, or 25.8 per cent. The imports in 1908 included 3,259,540 tons from Spain.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 28.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1908..	$ 3,974,391	$ 4,695,894	Imp.$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 24: Gold, none; silver, $949,817, to London and Paris. Imports: Gold, $492,354, chiefly from Australia; silver, $71,700, from the West Indies and Central America.

Notwithstanding reports of probable gold shipments, the only exports for the week were $500,000 to Canada. On the other hand, a shipment of $412,000 was received from Australia.

Gold holdings of the leading European banks Oct. 24 reached a total of $2,253,496,760; New York banks, $306,290,200; making $2,559,496,960 in all.

Notwithstanding its heavy gold reserve, amounting to $656,000,000, the Bank of France is still accumulating gold, having paid 77s. 11¾d.—a premium of ¼d.—this week for $5,000,000 gold in the London open market.

Silver

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
22	4.8655	51½	23¾	26	4.8655	51⅜	23 11/16
23	4.8660	51 [illegible]	23 11/16	27	4.8655	51¼	23⅝
24	4.8655	51⅜	23 11/16	28	4.8650	51¼	23⅝

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The London silver market is still under pressure of sales of bullion for future delivery on Indian bear account; and so long as no very active demand for spot silver arises there does not seem much chance for a rise in price of any importance.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 15:

	1907.	1908.	Changes.
India	£9,741,954	£7,349,863	D. £2,392,091
China	68,400	516,400	I. 448,000
Straits	625,950	112,385	D. 513,565
Total	£10,436,304	£7,978,648	D. £2,457,656

Receipts for the week, £133,000 from New York, £5000 from Mexico, and £108,000 from China; £246,000 in all. Exports, £20,000 to India.

Copper, Tin, Lead and Zinc

Oct.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
22	13⅝ @14	13¼ @13½	60⅝	29½	4.22½ @4.27½	4.77½ @4.82½	4.62½ @4.67½
23	13⅝ @14	13¼ @13½	60 13/16	29½	4.22½ @4.27½	4.77½ @4.82½	4.62½ @4.67½
24	13¾ @14	13⅜ @13⅝	....	29½	4.25 @4.30	4.77½ @4.82½	4.62½ @4.67½
26	13¾ @14	13⅜ @13⅝	61 1/16	29⅜	4.25 @4.30	4.80 @4.85	4.65 @4.70
26	13¾ @14	13½ @13⅝	61¼	29⅝	4.27½ @4.32½	4.80 @4.85	4.65 @4.70
27	13¾ @14	13½ @13⅝	61 5/16	29⅝	4.27½ @4.32½	4.80 @4.85	4.65 @4.70

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—On Oct. 22 the sudden advance of £1 in the London market inspired buyers, both foreign and domestic, to come into this market and sales of electrolytic copper were made at an advance of ⅛c. per lb. and more, while the Calumet & Hecla made sales of its particular brand of Lake copper at 14c. The United Metals Selling Company successively raised its asking price to 13⅝ and 13¾c., delivered, 30 days, or respectively about 13½ and 13⅝c., cash, New York. The aggregate sales of all the agencies during the week, Oct. 22-28, were approximately 50,000,000 lb., including large transactions both in electrolytic and Lake copper, and both for domestic and foreign account. The majority of the business was done for export, but although the sales to domestic manufacturers were somewhat less than the normal ratio, nevertheless they figured prominently in the market. Consumption is gradually increasing, both in this country and abroad, and inasmuch as manufacturers are not well covered, the market looks strong.

The bulk of the business this week was done for delivery in November and December, but sales were made for as far ahead as February, and several of the important producers are now sold out for November-December delivery.

An interesting feature of the week was the wide range in prices for Lake copper. While the Calumet & Hecla was obtaining 14c. for its particular brand, other standard grades of Lake copper were selling at 13⅝c., and business in Lake, other than Calumet & Hecla, was done right along at 13¾c. At the close the market is strong at 13¾@14c. for Lake and 13½@13⅝c. for electrolytic in cakes, ingots and wirebars. Business in casting copper has been done at an average of 13⅛@13¼c., closing higher.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15c. base, carload lots at mill.

The London market for standard copper has also been strong and active, and the daily turnover has been larger than for some time past. Prices have steadily advanced, and at the close spot is quoted at £61 2s. 6d.

Refined and manufactured sorts we quote: English tough, £65; best selected, £64@65; strong sheets, £76@77.

Copper exports for the week from New York and Philadelphia, 2783 long tons. Our special correspondent gives the exports from Baltimore at 1022 tons.

Tin—The London market throughout the week has remained steady and closes firm at £133 15s. for spot, £135 5s. for three months.

An active business was transacted in the domestic market, and the close is quoted at about 29⅝ cents.

Lead—Immediately after the close of last week the market took an upward turn, consumers showing more interest in the metal at the lower prices. On the advance some good business has been done, but the transactions have been restricted by the failure of consumers to meet the views of producers who are now looking for a further rise in prices. At the close the market is 4.27½@4.32½c., New York, and 4.12½@4.17½c., St. Louis.

The London market remains unchanged at £13 6s. 3d. for Spanish lead, £13 8s. 9d. for English lead.

The plants of the American Smelting and Refining Company are said to be operating now at 90 per cent. of their capacity.

Spelter—The demand for this metal has improved slightly, and the market is firmer at 4.65@4.70c. St. Louis, 4.80@4.85c. New York.

The London market is strong, good ordinaries being quoted at £20, specials at £20 5s. per ton.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—Market is quiet both in New York and abroad, with little buying. Quotations, 8.15@8.50c. for Cookson's; 7⅞@8⅛c. for Hallett's; 7⅜@7⅝c. for ordinary brands.

Aluminum—A further reduction is reported. Base price, No. 1 ingots, is now 25½c. per lb. for ton lots; 26½c. for less than one ton.

The former convertion among the European producers having expired on Oct. 1, aluminum is now available in Europe at 14c. per lb., at which price the metal can be imported into this market to undersell the American product. High grade French aluminum has been offered here this week at 23c. per lb. We quote [illegible]

Platinum—Demand is increasing, especially from the jewelry trade. Quotations are higher at $20@21 per oz. for refined metal; the higher price being named by regular dealers.

Quicksilver—Business in New York is good, and prices have been advanced to $47 per flask for large orders. San Francisco, $44@45 for domestic sales, $42@43 for export. London, £8 10s. per flask; 1s. less from second hands.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Nickel—Large lots, 40c., New York.

Zinc and Lead Ore Markets

[illegible] $37 per ton was the highest price paid for zinc ore on a basis of $35@36 per ton of 60-per cent. zinc. For 80-per cent. lead [illegible]

Shipments, week ended Oct. 24:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	20,000
Hazel Green	337,600	74,700	....
[illegible]	[illegible]		
[illegible]	[illegible]		
Highland	[illegible]		
[illegible]	[illegible]		
Mineral Point	[illegible]		
Totals	[illegible]	[illegible]	[illegible]
Year to Oct. 24	[illegible]	[illegible]	[illegible]

There were shipped last week, not then reported, from Highland, 115,200 lb.; from Linden, 164,700 lb.; from Harker, 60,470 lb.; and from Mineral Point, 168,000 lb. zinc ore.

In addition to the above there was shipped to the Electrostatic Separator, at Platteville, from Benton, 250,080 lb.; to the Joplin Separator Works, at Galena, 69,200 lb.; to the Enterprise roaster, at Platteville, 54,470 lb. zinc concentrates.

Joplin, Mo., Oct. 24—It is reported that one small lot of ore assaying 64.5 per cent. zinc sold at $40 per ton, but the high price for any quantity was $39, the assay general base being $35@36 per ton of 60-per cent. zinc, with some slime ore selling as low as $34 base. Silicate ore sold as high as $25.50 on an assay base of $18 per ton of 40-per cent. zinc. The average price, all grades, was $32.60. As high as $54 per ton was paid for a few bins of lead, and a considerable quantity sold at $53@53.50, with medium grades at $52@52.50 per ton. The average price, all grades, was $52.52 per ton.

[illegible] the purchasing agents to lower the price of zinc ore was met by concerted action on the part of Webb City producers declining to sell. This week a $36 base was also declined by one strong [illegible]

[illegible]

	Zinc, lb.	Lead, lb.	Value
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	544,830	66,430	[illegible]
[illegible]	412,700	114,930	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	240,720	101,[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	246,300	10,700	4,470
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		1,170
[illegible]	[illegible]		1,078
[illegible]	[illegible]		[illegible]
[illegible]		[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
Totals	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Zinc value, [illegible]	[illegible]	[illegible]	[illegible]
Lead value, [illegible]	[illegible]	[illegible]	[illegible]

MONTHLY AVERAGE PRICES

Month	[illegible]											
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	41.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	41.75			[illegible]			[illegible]					
November	[illegible]			[illegible]			[illegible]					
December	31.50			[illegible]			[illegible]					
Year	[illegible]			[illegible]			[illegible]					

[illegible]

Chemicals

[illegible] general market is steady but business is not large. Imports are not heavy and with curtailed production supplies are not much in excess of demand.

[illegible] market quiet. It is reported that outside makes are offered at $4.50 per 100 lb.; but standard goods are quoted $4.65 per 100 [illegible] quantities.

[illegible] During the recent depression large sales were made at 2.12½c. and under for 1910 delivery. Quotations are 2.12½c. for spot; 2.15c. for the balance of 1908 and for 1909. The 96-per cent. grade sells 5c. per 100 lb. higher.

Mining Stocks

[illegible] have been rather inclined to advance this week, though they have not been especially active, and dealings have been generally of the professional kind. The public is not doing much trading, and the general impression is that the market is being held until after election, when a [illegible]

On the Curb the course of prices followed the Exchange for the most part. The copper stocks showed strength, but no very large buying demand. The Cobalt stocks were unsteady, with a fair amount of trading. Other shares were inclined to be quiet, but rather firm.

Boston

Oct. 27—The stock market has shown general strength through the week and a fair amount of activity. Nevertheless there has been a waiting element in it with some degree of uncertainty. The banks have been inclined to be cautious as to loans, and are not helping speculation.

Amalgamated Copper touched $80.75 today, closing near that point. North Butte sold a good number of shares above $84. Copper Range rose $1.75 to $78.50, losing the 50c. later. Superior & Pittsburg was active, and sold up to $17.50, a gain of 50 cents.

Calumet & Hecla sold today at $660; Calumet & Arizona at $121; Centennial at $35; while Atlantic jumped $1.25, closing at $19.25. The other copper stocks were firm all around.

An attempt is to be made to put life into the old National Mining Company, which has been closed down since 1893. A special meeting has been called for Nov. 24 to provide for raising money.

The Curb generally followed the lead of the Exchange, with no special feature.

The often-adjourned Osceola annual meeting has gone over to Dec. 15 next.

STOCK QUOTATIONS

NEW YORK Oct. 27 Name of Comp.	Clg.	BOSTON Oct. 27 Name of Comp.	Clg.
Alaska Mine	½	Adventure	8
Amalgamated	80⅝	Allouez	38
Anaconda	46⅜	Am. Zinc	25
Balaklala	‡2 1/16	Arcadian	3¾
British Col. Cop.	6⅞	Arizona Com	34½
Butte & London	....	Atlantic	19
Butte Coalition	27¼	Bingham	‡ 30
Colonial Silver	13/16	Boston Con	14¼
Cum. Ely Mining	8⅛	Calumet & Ariz.	118
Davis Daly	2	Calumet & Hecla	660
Dominion Cop.	1	Centennial	35¼
Douglas Copper	3⅜	Con. Mercur	.37
El Rayo	4¼	Copper Range	77⅞
Florence	3 11/16	Daly West	9
Foster Cobalt	69	Franklin	13⅞
Furnace Creek	.16	Greene Can	10⅝
Giroux	4⅛	Isle Royal	23¼
Gold Hill	½	La Salle	13¾
Goldfield Con.	6⅜	Mass	5¼
Granby	‡100	Michigan	13¾
Greene Gold	⅜	Mohawk	67
Greene G. & S	⅛	Nevada	18⅛
Greenw'r & D.Val.	‡ 75	North Butte	84¼
Guanajuato	1⅝	Old Colony	.60
Guggen. Exp.	177	Old Dominion	53⅞
Hanapah	15	Osceola	116
McKinley Dar.	1.06	Parrot	28
Micmac	2 7/16	Quincy	94
Mines Co. of Am.	1⅛	Rhode Island	4
Mitchell Mining	⅛	Santa Fe	1¾
Mont. Sho.C	⅞	Shannon	15½
Nev. Utah M. & S	3 9/16	Superior	28
Newhouse M. & S	4⅞	Tamarack	76
Nipissing Mines	9¾	Trinity	17¼
Old Hundred	1/16	United Cop., com.	11¼
Silver Queen	1.15	U. S. Oil	26¾
Stewart	¾	U. S. Smg. & Ref.	39¾
Tennessee Cop'r.	45½	U.S.Sm. & Re.,pd.	44½
Tri-Bullion	1	Utah Con	40½
Union Copper	11/16	Victoria	4½
Utah Apex	5	Winona	5½
Utah Copper	44½	Wolverine	141
Yukon Gold	4½	Wyandotte	2¼

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	27½
Am. Smelt. & Ref.	93⅝
Am. Sm. & Ref., pf.	105¾
Bethlehem Steel	‡20⅛
Colo. Fuel & Iron	37⅛
Federal M. & S., pf.	‡85
Inter. Salt	18½
National Lead	84
National Lead, pf.	103½
Pittsburg Coal	11
Republic I. & S.	24
Republic I. & S., pf.	81⅛
Sloss-Sheffield	71
Standard Oil	623
U. S. Red. & Ref.	9
U. S. Steel	48⅜
U. S. Steel, pf	110¾
Va. Car. Chem	32½

BOSTON CURB	
Ahmeek	‡115
Black Mt.	‡3½
East Butte	7⅛
Hancock Con.	‡7⅞
Keweenaw	3½
Majestic	69
Raven	.81
Shawmut	06
Superior & Pitts.	‡14
Troy Man.	‡ 25

ST. LOUIS Oct. 24

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.04	.03
Center Cr'k	1 80	1.50
Cent. C. & C.	68 00	65 00
C.C. & C. pd.	76 00	75 00
Cent. Oil	110 00	100 00
Columbia	5 00	4.00
Con. Coal	21 00	19 00
Doe Run.	125 00	110 00
Gra. Bimet.	30	25
St. Joe.	15.00	12 60

LONDON Oct. 28

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind	0 1 0
Camp Bird	0 14 6
Esperanza	3 7 0
Tomboy	1 0 7½
El Oro	1 2 9
Oroville	0 10 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Oct. 28.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.15
Belcher	26	St. Ives	.23
Best & Belcher	.46	Triangle	.03
Caledonia	20	BULLFROG STOCKS	
Chollar	.18	Bullfrog Mining	‡ 03
Comstock	‡ 24	Bullfrog Nat. B	‡ 04
Con. Cal. & Va.	60	Gibraltar	03
Crown Point	.25	Gold Bar	‡ 03
Exchequer	35	Homestake King.	15
Gould & Curry	.17	Montgomery Mt.	‡ 05
Hale & Norcross	.50	Mont. Shoshone C.	81½
Mexican	.61	Original Bullfrog.	‡ 01
Ophir	1.87½	Tramp Cons.	.16½
Overman	.15	MANHAT'N STOCKS	
Potosi	.19	Manhattan Cons	‡.05
Savage	.45	Manhat'n Dexter	‡ 03
Sierra Nevada	.32	Jumping Jack	‡ 03
Union	.26	Stray Dog	‡.03
Utah	.03	MISCELLANEOUS	
Yellow Jacket	.50	Golden Boulder	‡ 05
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	1 10	Lee Gold Grotto	...
Extension	.58	Nevada Hills	1.60
Golden Anchor	.01½	Nevada Smelting	.87½
Jim Butler	.23	Pittsburgh S. Pk	.99
MacNamara	.53	Round Mt. Sphinx	.17
Midway	.29		
Montana	.83		
North Star	.06		
Tono'h Mine of N.	7.31¼		
West End Con	.54		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.22		
Booth	.38		
Columbia Mt	20		
Comb. Frac	1 28		
Cracker Jack	.06		
Dia'dfield B. B. C.	.14		
Goldfield Belmont	05		
Goldfield Daisy	1 01		
Great Bend	.35		
Jumbo Extension	.32		
Katherine	...		
Kendall	.14		
Lone Star	.08		
May Queen	.06		
Oro	.12		
Red Hill	.24		
Roanoke	..		
Sandstorm	.21		

COLO. SPRINGS Oct. 24

Name of Comp.	Clg.
Acacia	‡6½
Black Bell	....
C. C. Con	‡3½
Dante	6
Doctor Jack Pot.	‡7⅛
Elkton	65
El Paso	44
Findlay	‡19
Gold Dollar	9
Gold Sovereign	3
Isabella	28
Index	...
Jennie Sample	‡2½
Jerry Johnson.	3⅞
Mary McKinney	28
Pharmacist	3¼
Portland	1.00
Un. Gold Mines.	3⅞
Vindicator	78
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
American Fork, Utah	Oct. 28	Nov. 25	$0.01
Birchville, Cal.	Nov. 2	Nov. 20	0.03
Brookland, Utah	Oct. 24	Nov. 9	0.01
Brunswick Con., Cal	Oct. 20	Nov. 19	0.03
Butte & Yerrington, Mont.	Oct. 20	Nov. 15	0 01
Caledonia, Nev	Oct. 21	Nov. 11	0.05
Constellation, Utah	Oct. 23	Nov. 20	0.01¼
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Glenwood, Utah	Oct. 29	Nov. 17	0.01
Gould Mont	Nov. 7	Dec. 7	0.05
Highland, Utah	Oct. 23	Nov. 16	0.01
Lady Washington Nev.	Oct. 26	Nov. 16	0.05
La Palma Mex.	Nov. 2	Nov. 21	0.10
Mexican, Nev	Nov. 12	Dec. 3	0.10
Mountain Monarch Cal	Oct. 24	Nov. 24	0.05
N. Y. Bonanza, Utah	Nov. 5	Nov. 25	0.02
Overton, Cal	Oct. 12	Nov. 16	0 01
Silver King Con., Utah	Nov. 4	Nov. 25	0 05
Uintah Treas., Utah	Nov. 2	Nov. 20	0.01
Utah-United, Utah	Nov. 10	Nov. 27	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55 678	31 769	25.738
February	68 835	56 000	31 852	25 855
March	67 519	55 365	31 325	25.570
April	65 462	54 505	30 253	25.133
May	65 971	52.795	30 471	24.377
June	67 090	53 663	30 893	24.760
July	68 144	53.115	31 366	24.514
August	68 745	51.683	31 637	23.858
September	67 792	51 720	31 313	23.877
October	62 435	......	28 863	...
November	58 677	....	27.154	.....
December	54 565	.....	25 362	.....
Year	65 327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106 739	62 386
February	24 869	12 905	25 246	13 098	107 356	58 786
March	25 065	12 704	25.560	12 875	106.594	58 761
April	24 224	12 743	25 260	12 928	98 625	58.331
May	24 048	12 598	25 072	12.788	102 375	57.387
June	21 665	12 675	24 140	12 877	97 272	57.842
July	22 130	12 702	21 923	12 933	95 016	57 989
August	18 356	13.462	19 255	13 639	79.679	60.500
September	15 565	13.388	16 047	13.600	68 375	60.338
October	13 169	......	13 551	......	60 717	....
November	13.391	......	13.870	......	61 226	....
December	13 163	......	13 393	......	60 113	....
Year	20 004	......	20.661	......	87 007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41 548	27 380	July	41 091	29.207
February	42 102	28 978	August	37 667	29.942
March	41 313	30 577	September	36 689	28.815
April	40 938	31 702	October	32 620	......
May	43 149	30 015	November	30 833	......
June	42.120	28 024	December	27 925	......
			Av. year.	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6 000	3 725	19 531	14 250
March	6 000	3 838	19 703	13 975
April	6 000	3 993	19 975	13 469
May	6 000	4.253	19 688	12 938
June	5 760	4 466	20 188	12.600
July	5.288	4.447	20 350	13 000
August	5 250	4.580	19 063	13.375
September	4 813	4.515	19 775	13.125
October	4 750	......	18 531	.....
November	4.376	......	17.281	.....
December	3 658	......	14.500	.....
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6 732	4 513	6 582	4.363	27 125	20.563
February	6 814	4 788	6 664	4.638	25 938	20 875
March	6 837	4.665	6 687	4.527	26 094	21 075
April	6 685	4 645	6 535	4.495	25 900	21 344
May	6 441	4.608	6 291	4.458	25 563	19.906
June	6.419	4.543	6 269	4 393	25 469	19 000
July	6 072	4.485	5 922	4.338	23 850	19 031
August	5 701	4.702	5 551	4.556	21 969	19.350
September	5 236	4.769	5 086	4.619	21 050	19.563
October	5 430	......	5 280	......	21 781	......
November	4.925	......	4.775	......	21.438	......
December	4 254	......	4 104	......	20 075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, NOVEMBER 7, 1908. NO. 19.

Advanced Methods of Mining Coal in Silesia

A System Is Used in Which Filling Is Flushed into the Workings and Total Extraction of Unusually Thick Seams Is Accomplished

BY LUCIUS W. MAYER*

Silesia is the second largest populated province in Germany, being second to Rhenish Prussia. It has about 5,000,000 inhabitants. Breslau, having nearly 500,000 inhabitants, is the second city in Prussia and the seat of government of the province of Silesia. One-third of Silesia is governed in turn by Germany, Austria, and Russia.

The area on the east border in the southern extremity of Silesia is known as Ober Schilesen (Upper Silesia). This district is the center of great coal, lead and zinc operations. Important towns included in this territory are Glerwitz, Labrze, Königshütte, Myslowitz, Kattowitz, Tarnowitz, and Beuthen. The district includes about 1,000,000 people.

At Myslowitz, there is what is known as the "Dreikaiserreichsecke," which infers the bordering of three nations, namely, Germany, Russia and Austria. Germany is on the west shore of a small stream called Prozemessa, which is a stone's throw across. Russian soldiers are stationed on the bridge crossing the stream, and which marks the boundary of the nations. Any attempt to cross this line without passport, which, in addition, has to be renewed monthly in Russia, is met with severe challenge. Only Russia makes the challenges to entrance.

A large number of Russian workmen come into the German territory from Poland, to work in the mines, and these are required to recross the bridge at night before the hour of seven; no one is allowed to enter Russia from a foreign country after that hour.

A great part of the surface work about the mines, such as tramming, shoveling, and washery operations, is done by women; these latter, however, are not allowed underground.

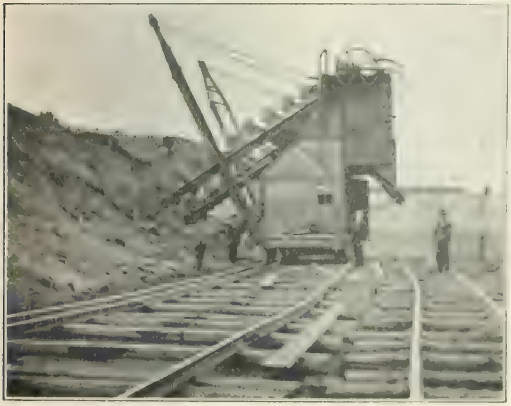


FIG. 1. SAND BANK, AND DREDGE [illegible] MATERIAL FOR USE IN FILLING.

FIG. 2. SHOWS [illegible] CARS HAULING FILLING MATERIAL FROM DREDGE TO MINE

THE COAL SEAMS VARY FROM 14 TO 27 FEET THICK

The coal underlying the area from Glerwitz to Myslowitz also extends into Russia, and its approach to the eastward seems to converge. To the west there are four principal seams; the uppermost of these is known as Einsidel, and is 17 ft. thick; other beds are the Schuckmann, 17 ft.; Heinitz, 14 ft., and the bottom seam, known as Raden, which varies from 23 to 27 ft. thick. The latter seam is a coking coal, the others are gas coals. In Russia the [illegible] unite, becoming two [illegible] each about 33 ft. in thickness.

The average dip of the coal is 10 to [illegible] deg. The formation is called Sattal Flotze (saddle veins) which name indicates the physical nature of the measures. Geologically, the formation is entirely carboniferous, with intervening rocks of sandstone and schist.

Above the four main seams mentioned, and also below them, are several minor seams which have not yet been worked. The present annual output of the district is about thirty million tons. The demand is met readily from the seams mentioned, and development is well in advance, so that there is no immediate promise of working the lower measures.

To the north, where the triasic formation comes in, and where the dolemite appears, lead and zinc are mined to such an extent that Germany ranks as the foremost zinc producing country in the world. Metal mining in Silesia superseded coal mining.

The mines are owned by 13 different companies, aside from the enormous holdings of the Prussian government. Permission to enter the Kaiser's mines is not available, except when given by the government. An application for same has to be made to the native government of the applicant.

The German spoken in this vicinity is high-class, as compared to the southern country, to the westward, where the dialect is pronounced. English, as in France, is rarely heard outside the cities, and in the country, unless one speaks the language, an interpreter is absolutely necessary.

---

*Mining engineer, 71 Broadway, New York City.

To illustrate the progressiveness of the continental mining industry is cited the following, with a method for testing explosives.

TESTING EXPLOSIVES IN SILESIA

In a number of the great coal districts of Germany, such as Westphalia, Saarbrüken, and Ober Silesia, the operators are organized, and appropriate support of institutions where experiments of all sorts are carried on which may tend to elevate the industry.

At Beuthen, in Upper Silesia, this idea is well advanced, and experimentation with safety appliances, rescue apparatus in artificially smoke-clouded chambers, and the testing of explosives, are carried on with the utmost care.

For the testing of explosives, a so-called Versuch Stube has been constructed. This is an artificial drift approximately 100 ft. long, built in the shape of an ellipse, with 8 ft. vertical major axis, and 6 ft. minor axis Three layers of 1x3-in. tongue and groove plank, 4 ft. 6 in. long form the lining; the joints are tarred.

The tube is bound with railroad iron. Only about one-quarter of the drift is in daylight, the same being set in an embankment. At intervals of 3 ft. on the exposed segment are windows 6x12 in., of ½-in. plate glass. These are placed between the hoops of heavy iron, which bind the artificial drift. Each of these parts is numbered, beginning at the end where the explosion is effected. At this end, which is slightly higher than the outlet, a heavy hard-steel mortar is set, having a horizontal boring of 2½ in. diameter by 18 in. long. This hole, into which the explosive is charged, points downward to the floor of the drift. Its prolonged axis would intersect the flow 3 ft. distant from the mouth of the hole. All the conditions are made least favorable to explosive manufacturers.

The walls of the drift about the business end are now spread with fine coal dust, a known amount of powder is charged and fired in the mortar, either by fuse or electricity, according to the custom of the district. Atmospheric conditions are noted at the time of each test. The distance traversed by the flash is also noted, according to the number of the last port which the flame is seen to approach. Five charges are usually made in each experiment, and if the dust does not ignite in these attempts, the explosive is declared safe for the particular quantity tried.

A form of explosive composed of 30 per cent. potassium chlorate, and 20 per cent. rosin, was tried. In the first instance, five charges of 500 grams each were tried successfully, and in no case was there ignition. At 600 grams a voluminous flash set up, which could be clearly seen from the view point; the observation was made from a small house 75 ft. distant, this house having a narrow panel of glass as a window. A charge of 550 grams gave no flash, and the explosive was declared safe to this extent. The same percentage explosive was again tried, only in this second instance, the entire rosin ingredient had been treated with nitric acid, whereas the first was only partly so. Two hundred grams threw a flash to No. 9 port, 65 ft. from the point of discharge. The exhaust of fumes is readily accomplished by the action of a steam jet and the experiments expeditiously effected.

THE DEUTSCHLAND MINE

There are two different methods of mining coal in Upper Silesia: First, the old method of blocking out pillars the entire coal thickness, followed by pillar withdrawal and roof fall; second, a similar preliminary measure, with pillar withdrawal, and replacement.

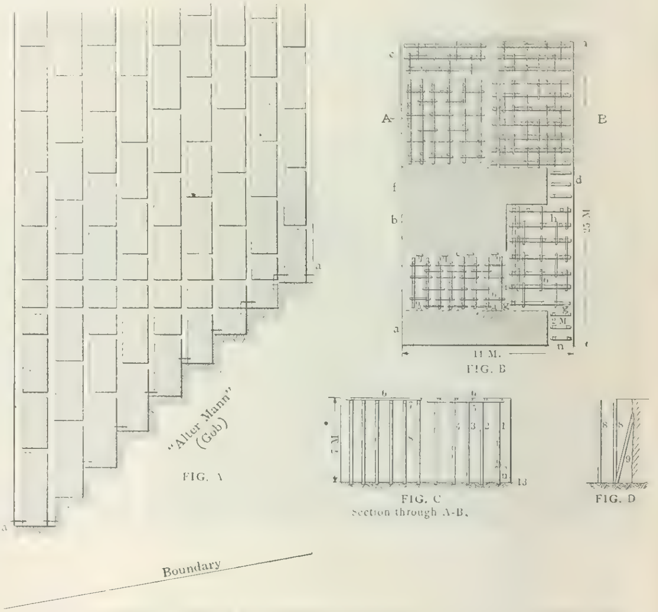


FIG. A

FIG. B

FIG. C
Section through A-B.

FIG. D

FIG. 3 GENERAL METHOD OF WORKING THE SEAM AT THE DEUTSCHLAND MINE

The work at the Deutschland mine typifies the former method. This mine is located about five miles out of Kattowitz, Upper Silesia, Germany, in a town called Schweintochlowitz. Three thousand tons of coal are mined daily, a good part of which is burned nearby, for domestic purposes and in the local steel works.

The seam here measures about 22 ft., and dips about 13 deg. It is mined in one lift, without replacement of any kind; timber is utilized for temporary support. The timber is eventually withdrawn, marked surface depression ensuing. In the fallen ground, particularly where the pillars have been robbed, (this fallen area is called "alter mann") gas is evolved, containing as much as 8 per cent. Co_2. Certain pillars are necessarily left, in this old Silesian method of mining, to maintain roof in particular areas. In time, these high pillars show signs of crushing, and heat is evolved, which renders the conditions dangerous. This method of mining, however, is generally used where filling material is not available.

The similarity to conditions in South Staffordshire are here noticed. The method of mining is distinctly different, and I am inclined to believe that there is something for the English engineers to study with advantage in this vicinity as regards the safe mining of thick coal seams with high recovery. The roof varies from a strong sandstone to a rock called shiebe, which latter is a hard clay.

THE METHOD OF MINING

Hoisting is done from two levels, 900 ft and 1400 ft. The method of mining is to block out the coal in the pillars 42x75 ft., with a 6-ft. roadway; then starting from the boundary, carry back the pillar robbing. This is carried on in steps, on the retreat, and withdrawing the timbers and allowing the roof to come in, is accomplished in a line approximating 45 deg., to the layout of the roads.

On account of the gaseous condition prevalent, similar precautions to those taken at South Staffordshire must be taken here in order to constantly have a supply of good air in the working places. Fig. A of Fig. 3 shows the dams which set off the "alter mann" (fallen ground) from the coal workings under attack. Approaching the roadway, Fig. B of Fig. 3, up to the point where a dam had previously been placed, a leg at *e* was left. The dam is now at *d*, the area beyond that being alter mann. The timbers have been removed, as is indicated by the cross-hatch patching.

The condition we will now assume is a dam standing at *d*, and the work being carried back. Working from *n*, the drift sets which maintain the roadway in the lower 6 ft. of the seam between the legs *a* and *f* are removed and the heavier operation commenced. The small timbers are left, as at *d*, next to the legs *a* and *f* until the very last. A six- to seven meter face is started at *g*, which includes the original roadway.

The hight that posts are required is measured with a pole. The men standing on ladders hold caps, and the posts are set under. A hole about 8 in. deep is cut in the floor to receive the posts, Fig. C of Fig. 3. The posts are all notched to receive the caps, this notch being cut underground.

The axeman first makes a cut about 2½ in. wide, and 3 in. deep, across the top of a cap, and then trims the edges of this incision to make the whole cut elliptical in form. One side of the cut is made deeper than the other, the high side being marked, so that when the timber is set, the miners know precisely in which direction to cut the post. Timber is first set under the cap at an inclination, and finally forced into vertical position in a way that the cap rests on the upper edge of the post, until the timber eventually takes the overlying weight, when the bearing surface becomes even. In Fig. *B* of Fig. 3, the 7-m. face, *g*, is carried on till it reaches *h*, when the work is started at *l*, as a face in the other direction, and the coal similarly removed. Finally the leg *f* is standing in a similar manner to *a*.

The method of getting the coal is by first cutting under, bringing down the overhang by use of powder. At the face, inclined posts 9, 9, 9, are set against the overhang, as shown in Fig. *D* of Fig. 3. Just before a shot is to be fired, certain timbers are withdrawn. Over the caps of the vertical timbers, small sticks 6, 6, 6, are set at frequent intervals. Eventually pillar *f* is removed, and all of the timber is drawn from this area, after which the roof falls, and we have only leg *a* standing. The dam is now placed at *n*, and work is carried on behind, as shown in drawing *A*, of Fig. 3.

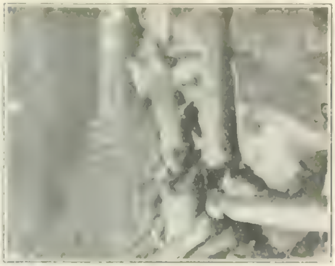
Dams are formed by setting up poles close together, driving slivers of wood between them, and finally making the dam tight by looting with clay and lime. The dam, it is remembered, is in the 6-ft. hight of original drift.

There are Few Accidents From Fall of Roof

In spite of the fact that there is about 8 per cent. of CaO_2 in the gob, the working area rarely shows more than one-half per cent. The system requires careful attention, and from all appearances is dangerous, due to the hight at which the work is carried on. However, I was informed that of the thirteen deaths which occurred during the past year, only four were the result of roof falls, the others being gas fatalities, and due to other causes; this record is far in advance of South Staffordshire.

As soon as a shot is fired in the face, the men return to the room, scale ladders, and proceed to bring down loose pieces of coal from the back or side. This they do with a long handled ax, swinging same with one arm and holding the ladder with the other. In changing the position of a ladder, the men do not necessarily come down to the floor, but hobble the ladder about the room from one timber to the other.

[illegible] which has been mined in part, with the completely fallen ground close by in the [illegible]



[illegible]

in the room where coal cutting was in progress.

Back Filling by Flushing

There is hardly a mining country where the flushing system for replacement of excavated areas underground has not been taken up. The idea of returning waste material in the mine by means of water originated in Pennsylvania, in the year 1896, at the Dodson colliery, Plymouth. As far as I know, the system is not used elsewhere in the United States than Pennsylvania. Experts from Silesia, Germany, looked into the Pennsylvania field, and have since then elaborated on this system to such an extent that it would hardly be recognized in America.

The northern coalfields in Germany, the Austrian mines, and the French mines, [illegible] after the Myslowitz colliery had shown [illegible] replacement of seams where surface subsidence was undesirable.

The system permits of much greater safety to the workmen underground, particularly where the seams are thick, [illegible] readily accomplished; a marked decrease in mine-timbering cost has resulted, since the introduction of flushing, in various mines. While timbering is generally used in conjunction with the filling, the recovery on withdrawal is greater. Surface damage suits, which formerly were so numerous, have now been practically suppressed. Pillar coal hitherto unminable, on account of permanent pillar requirements, is made available for market by replacement of the areas with filling.

Not alone has flushing been introduced in coal mines, but the iron and lead mines in Germany have taken it up. In England I have found but one instance of its introduction there, and that is at the Greater Moor Iron mine, where filling is introduced with water, with a view to removing pillars.

The English do not readily introduce or accept new ideas which are not the creation of English brain. However, of late, there appears to have been an awakening, and the engineers are entering the German field with a view to profiting by their ingenuity.

The method of filling as taken up in Carmaux, France, is also interesting. Here there is a closer correlation between the introduction of the filling itself with the removal of the coal, than at any of the mines in Germany, where the pillars are formed, as a rule, in the regular way, and the filling is introduced in conjunction with robbing operations.

The different materials used for filling are numerous. In Silesia most any material that can be moved with water and passed through medium sized pipes, is introduced into the workings. It is desirable that the filling shall have some binding qualities.

Filling was formerly introduced into the mine in cars, and in the chambers by manual labor, but this crude method was so expensive, that the flushing system has been generally adopted. An important consideration of cost in regard to the use of water is the necessity of not alone getting rid of the water after it has drained off and served its purposes, but also of clarifying the water before it enters the pumps.

[illegible]

An experimental plant was built near Kattowitz, Upper Silesia, for the purpose of trying out the idea of introducing filling with air under pressure, as a con- [illegible] system are readily seen, in that all the difficulties which arise in using water are done away with. The experiments have not been brought to a conclusion, but it is understood in Kattowitz that encouraging results have been obtained, though it appears that financial backing for the scheme has not been forthcoming. Not alone would the water manipulation difficulties [illegible] many mines now lacking a water supply could adopt a mechanical filling method.

The material experimented with was a crushed dolomite, the maximum size being about nut. Pipes were 10cm. in diameter, and after long experiment, it was found best to make the pipe line down the shaft in spiral shape, instead of straight in its vertical course. It was inferred that the air pressure used was only slight, and that the pipes could be varied in direction at will after reaching the workings, without interfering with the system, i.e., made to follow the undulations underground, vertically, or change direction horizontally.

Inquiries on the subject, at best, were only vaguely answered, but brought out the point that considerable dust resulted underground as the result of this method, and that the process as it now stands involves greater expense than water flushing. My own opinion of this process is that the dust difficulty could be obviated by spraying the filled material underground from the time it leaves the pipe mouth. I am inclined to believe that there will be a greater shrinkage in the packed area under roof-weight, as the particles could not be in such intimate contact. On this account the spraying would again be of advantage.

FIG. 5. GENERAL VIEW OF THE MYSLOWITZ COLLIERY

MYSLOWITZ COLLIERY

The Myslowitz mine is situated in the Upper Silesian frontier town of Myslowitz, and is one of the great collieries of the district. A general view of this plant is shown in Fig. 5.

Two 18-ft. circular shafts supply 2600 tons of hard steam coal daily from levels at a depth of 780 and 1100 ft. The thick seam in this mine varies from 28 to 37 ft. There are other seams from 8 to 21 ft. in thickness. Above the coal are stratifications of sandstone and material called schiefer, which is gray in color, and not as strong as the sandstone.

The equipment of this mine is high class. Everywhere the company's consideration for their 2100 employees is noticeable. This attitude of employer toward employee is evident at all mines on the Continent. The change room, for example, is a one-story brick structure, approximately 75x100 ft., standing about 35 ft. high. Within, instead of having lockers, the wearing apparel is hung on hooks, which in turn are attached to chains, and in this way the apparel worn in the mines is raised to a skylight in the roof, and a thorough airing made possible.

At the shafts, hoisting cages are of particularly heavy design, being double-deckers, each deck holding four cars. The teeth of the dogs are a series of sharp, curved steel blades. The hoisting rope was 6 cm. in diameter. On the cages there was suspended a metal bell which, when struck, spread alarm throughout the shaft, and attracted attention at the stations of the shaft, to some disorder on the cage.

For transmission of hoisting signal, there was a complete equipment. The system involves the same principle of interchange of signals as in use at Carmaux, and other mines previously described, whereby there was a thorough understanding between the person giving the signal and the hoisting engineer, previous to commencement of winding.

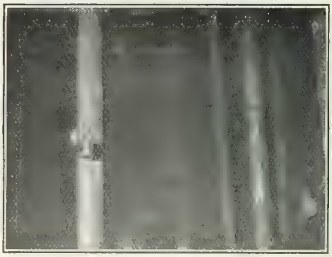


FIG. 6. SHOWING TIMBERS USED TO SUPPORT THE ROOF

The system of mining by sand replacement was first introduced in Europe at this colliery. The sand, which is a brown material, of fine texture, is quarried from a bank about 20 ft. high, and 1500 ft. long, and loaded by means of electrically operated bucket dredges. The quarry is located about a half mile from the mine plant.

THE MINE USES 3000 TONS OF FILLING MATERIAL DAILY

This filling material is quite free from dirt. Fig. 1 shows a view of the bank, and the dredge operating same. This dredge is equipped with a 30-h.p. motor, 500 volts direct current. The dredge runs on three tracks. The power line is hung on light, steel, lattice-frame poles. These are seen to the right in Fig. 1. The electrical contact to the motor is simply a bar extending from the dredge, which rests on this wire. This can also be seen in the figure. As the face of the bank advances the trolley poles are similarly brought forward.

The upper part of the dredge is equipped with a bin, from which the dump cars, seen in Fig. 2, are loaded. About 3000 tons of this sand is filled into the mine daily (one ton of sand equals 0.77 cu.m.). The dredge can give 3000 cu.m. in 24 hours.

There has been more or less difficulty, due to the freezing of moisture in the sand. This interfered with the unloading operations. Ordinarily, loading required about 10 seconds per car, and unloading eight seconds. In order to obviate the freezing difficulty, the space between the two legs or braces under the body of the car, has been equipped with a grate on which fires are built. In cold weather the bank itself freezes, becoming hard, and a similar difficulty was encountered. This is now ameliorated by spreading hot ashes on the surface of the bank where the dredge is operating. At night arc lamps serve for illumination.

In Fig. 2, the traction equipment is shown. Cars are standing over the grating, through which the sand filling passes into the large hopper; this in turn leads to the main pipe line which supplies sand to the underground workings. There is a considerable storage capacity below the grating. At the mouth of the funnel is an arrangement of water sprays, whereby clogging of sand is prevented as it passes down the mouth of the pipe.

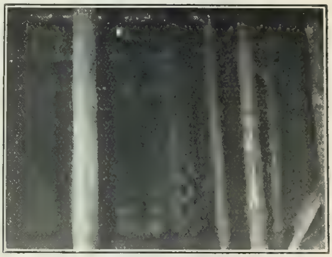


FIG. 7. SHOWING WHERE A PILLAR IS REPLACED BY TIMBERING

These sprays meet the sand under a pressure of eight atmospheres. The water, in being raised from the mine, after draining off from the sand underground and pumped to the surface, is accumulated in sumps. These are located about 50 ft. off to the left of Fig. 2. At this point, electrically driven pumps are operated, and supply the pressure required to keep the pipe line clear.

There are two bore holes supplying the two levels of the mine. Thus the work may be carried on at both elevations simultaneously. This is an advantage over the system used at the Dodson colliery, Plymouth, Penn., where one line intended for two levels, could supply only one at a time. Communication was maintained by means of telephones, between the chambers being filled, and the man in charge of the sand-unloading operations at the mouth of the bore hole.

A large part of the surface work is done by prisoners; such as track laying, and work around the dredge and on [illegible]

Two-thirds of the wage goes to the city, and one-third reverts to the prisoner on his release.

It seems difficult to obtain consistent opinions relative to the amount of water required as compared to the [illegible] sand. It is claimed at Myslowitz that the proportion is 1 to 1, whereas at other quarters this is questioned, it being claimed that the proportion is nearer 2 to 1. The figure in general depends, to an extent, on the horizontal distances through which the filling material has to pass underground, the head, the artificial pressure which may be supplied at the mouth, and the characteristics of the material being flushed.

It is figured that 1 m. of vertical fall affords transport of material over 10 m. horizontal, and 1 atmosphere of pressure is equal to 1 m. of vertical fall, so that an application of eight to ten atmospheres would mean eighty to one hundred meters transport in addition to the pressure head.

As before mentioned, the thickness of coal taken may be as thick as 12 m., and the method in this instance would be to remove same in slices of 6 m. each. The first slice may be taken at 7 m. The work consists in first blocking out the lower slice, by means of headings 2x2 m. into squares 10 m. to 12 m. in width, and [illegible] m. to 14 m. in length, the long dimension of the pillars being in the direction of dip, which attains 12 degrees.

The hard formation overlying the seam, and the dip above mentioned, in conjunction with a desirable material for filling, makes this an ideal flushing proposition.

COST OF PIPES USED IN FLUSHING.

Sand is conducted to the rooms in pipes of Mannesman steel, which are 178 mm. diameter. The steel is 8 mm. thick, and the pipes are in 6-m. lengths. There is at present in the mine approximately 24,000 ft. of pipe.

Various materials have been used, but the steel above mentioned has met with the greatest favor. The cost of pipe is given at about $3.25 per m. in France. Along the line of the pipe in the mine, turns are made by means of elbows, which usually have a radius of about 1.25 m. to 1.50 m. The elbows are usually made of cast iron, and wear out rapidly. A piece of sheet iron is held against the worn-out portion of the elbow by means of iron straps equipped with nuts and bolts. These branches are controlled by means of gate valves, which, at Myslowitz, are of the plunger type. The tendency is to abandon gate valves, and regulate the inflow by branching off, redirecting the flow when one place is filled.

The method of making connection is usually as shown in Fig. *F* of Fig. 8, where the end of the pipe has a flange, and movable rings. At this point on the pipe, reinforcement is often made, as shown. Fig. *G* of the same cut shows a slight angle joint. Flanges are held together by means of bolts, which pass through six to eight holes in the rings.

In making connections from the vertical line to the horizontal, it is found advisable to have an angle of at least 130 deg. between an imaginary line connecting the vertical and horizontal directions and the lines of directions themselves.

[illegible]

thick seam being blocked out in an area, the pillars are attacked, much in the same way as at the Deutschland mine, where, however, it is remembered, the withdrawal of the timbers is not done in conjunction with filling, but is accompanied by roof falls.

In setting the timbers, plugs are first driven into the roof, and the caps are hung from these plugs with wire, or light rope. Posts are now brought into the room and set under the caps in regular order. Figs. 6 and 7 show the condition of a portion of an area of a pillar where the coal has been replaced by timbers. These posts are set about 2 m. apart. The comparative hight of the roof above the floor can be estimated by observing the man standing on the floor at the right of Fig. 6.

At the upper end of the pillars, legs of protection are left, as at *a, a*, Fig. *E* of Fig. 8. These legs are finally mined with the main pillar of the next tier above, but not before the sand in the chamber outside it is entirely filled and drained. Before running the flushed sand into the chamber, dams are placed, as seen at *b, b, b*, which confine the sand. These dams are formed of posts and 2-in. plank, which latter are nailed to the posts and are made tight by means of some packing material, such as straw.

[illegible]

As the mass of filling rises behind the dam, the center boards are set. The chamber being filled, mining is started in the next room, and while there is more or less coal left standing, in approaching the adjacent filled chamber, it is surprising to see how firmly this sand sets after being allowed to thoroughly drain. The coal [illegible] miners in the course of the work, until the filling begins to break in from above, which does not generally occur until practically all the coal has been gotten away.

As seen in Fig. 8 there is an opening left in the legs, the filling pipe usually being brought through this opening. In flushing, the pipe is usually brought to about the center of the chamber, and when the area has been filled up to this point, the pipe is brought back until finally it is set close up to the roof at the head of the chamber.

The sand finds its way into the crevices of the coal in the adjacent pillars, and tends to strengthen same. It requires about three or four days for the water to drain off and the sand then sets in a concrete-like manner. At many points in the mine, a cane could be jabbed into the sand by hand for a few inches only.

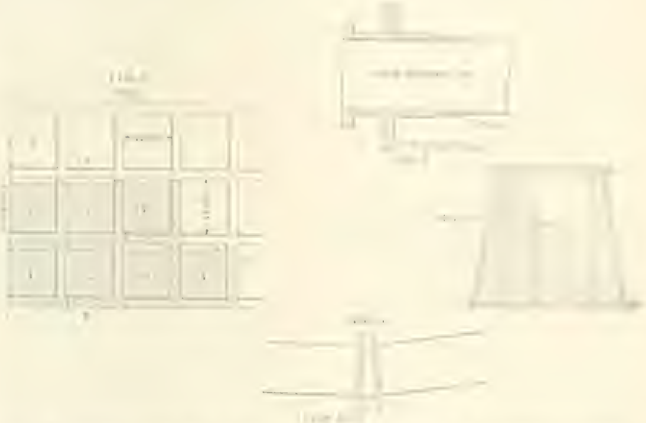


FIG. 8. [illegible] PIPES AND ARRANGEMENT [illegible]

Removal of a pillar requires about two shifts of six men; it also requires about sixteen hours to fill such a chamber with sand. It is said that 1 cu.m. of sand is filled for every 1.35 cu.m. of coal mined.

The work in the upper slice is carried on quite similarly to that in the lower slice. There is a certain settlement inevitable in the sand, which, it is claimed amounts to five or six per cent. of the hight of the area filled. In virtue of this settlement, a certain bending of the upper coal ensues, and it has been found that on account of this, the coal in the upper slice breaks easier than that in the lower.

The floor on which the men work in the upper slice is the sand filling of the lower slice. The track equipment is laid out in the ordinary manner. While this floor is quite hard, the pack is subject to more or less disintegration. In order to avoid a mixture of coal and sand, iron plates are laid on the floor, onto which the coal from the face is dropped.

The water, in draining off from the sand, has more or less solid matter in it, and is quite muddy in appearance. In order to clear this water of the suspended material, drifts are set apart in the lower part of the mine, and are dammed off with concrete masonry. The walls of these concrete dams are countersunk into the floor and hitched into the roof. The drifts may be set off several hundred feet long.

To permit the clarified water to pass the dam, short lengths of 3-in. pipe are set in this wall in a line, one above the other, about 2 ft. apart. The outer ends of these pipe lengths are fitted with stop cocks. Then the elevation from which water shall be permitted to flow off is regulated according to whether this water is clear or not.

The muddy water coming into the reservoir is allowed to rest, and the suspended material settles at the bottom. The clear water is drawn off by means of these pipes, and passes on to the mine sump. When one of these chambers has been entirely filled with mud, another one is selected, and similarly fitted with a dam.

Flushing at Other Mines in Silesia

Information was obtained relative to operations at various other mines where flushing with water was being carried on, though these mines were not visited. At the Heinitz mine, near Beuthen, cinders, clay, broken bricks, and all kinds of refuse, are flushed down a vertical hole 420 m. deep; the pipe is 182 mm. in diameter.

Before passing into the hole, all the material first goes through a grate having 90-mm. apertures. This material is swept to the hole from a waste heap by means of giants which pass a stream under 30 atmospheres pressure; this pressure is developed by a centrifugal pump.

At the Ferdinand mine, near Kattowitz, where the coal is 2½ m. thick, and dips 25 per cent., city waste is contracted for, for filling purposes. This material is brought to the shaft by 8 h.p. benzine locomotives, which draw dump cars of 1 cu.m. capacity. Sufficient clay and sand are added to make the conglomerate bind. Complete cost of running the above-mentioned locomotive per day is $1.80.

The water supply is pumped from a nearby stream. The dump cars discharge their load into a large hopper-shaped bin, the top of which is equipped with a grating. From this bin the material passes on to a funnel-shaped receptacle, which is connected directly to the main pipe line leading down the shaft; this shaft is 185 ft. in depth. There are two pipe lines, one, a reserve pipe, supported in the shaft at intervals by means of I-beams. Underneath the screen, which is placed in the funnel-shaped receptacle, there is a rising current of water; this screen has 100-mm. apertures.

Underground, a wooden nozzle spout is at the end of the pipe line, which permits of readily changing the direction of the inflowing current about the chamber. It is claimed that the cost of filling is about 13c. per ton. At Myslowitz the cost is said to be somewhat lower than this, figuring closely to 10c. per ton.

Flushing at the Trinity Colliery

At the Trinity colliery in Austrian Silesia, a mixture of sand, clay, and waste mine rock, is effected. The rock is brought to the surface filling plant and crushed. The sand is brought to a separate bin, the dumping being effected with an ordinary cylindrical type of dumper. These hopper units are 4 m. apart. The two materials are now led to the main hopper, which connects with the pipe line. This is 220 mm. long; the pipes are 145 mm. in diameter, and 6½ mm. in thickness. This main hopper is about 790 mm. in diameter at its upper end. At a distance of 450 mm. below the hopper top is a screen, which has square holes of 60 mm. dimensions. This screen is 450 mm. below the top of the funnel. Thirty-five per cent. of the mixture is clay, the other sixty-five per cent. being sand and broken rock.

In order to facilitate the flushing of this material, there are three branch pipe lines 50 mm., which emanate from a main conduit of 145 mm. One branch points directly downward, onto the grating in the funnel, and the other two branches pass below the funnel, enter same from below, and afford a rising current against the bottom of the screen.

At the Tielfau colliery in Moravia, (Austrian Silesia), up to recently, granulated slag only was conducted into the mine workings. The plant is so arranged that the slag comes either from the smelter works and passes directly down the shaft pipe line, or else passes into a storage bin. This bin, or reservoir, serves in case of stoppages at the smelter works.

Recently binding material in the shape of culm from the coal washery has been intermixed with the slag, The culm and slag is led to the main pipe line by separate hoppers.

At the Deutscher Kaiser colliery, Westphalia, the coal is 5 ft. thick, and dips at 33 per cent. Slag and sand is the filling material there also. An innovation is the use of canvas brattices instead of solid wooden dams, to hold back the filling in the chambers underground. Joists of timber are placed about 12 to 15 cm. apart, against the upright posts, and canvas is stretched over the joists. It has been found that by this method, the water which filters through the canvas is clean enough to pass on to the pumps without further settlement. Canvas brattices are also used at Lens Pas de Calais, France.

Nitric Acid from Air

It is just about ten years since we were following with interest the successive disclosures by the Badische Anilin und Soda-Fabrik of its sulphuric-acid contact process, with the development of which the name of Knietsch will be forever linked. In the meantime another great movement has been gaining ground, which seems calculated in time to work radical changes in the manufacture of the second of the staple mineral acids, nitric acid. And in this field also the work of the Badische company figures prominently, as is shown by the recent award of the Liebig gold medal to Dr. Schönherr, the chemist who has taken the leadership in the development of the Badische system of making nitric acid from air, and who has been appointed director of the Norwegian branch (Proceedings of the Annual Meeting of the Verein Deutscher Chemiker, *Chem. Ztg.* 1908 p. 578.)

The Badische nitric acid furnace consists of a long tube traversed from end to end by an electric arc discharge. Air is blown through this tube, being admitted tangentially so as to give it a whirling motion. This is found to raise the efficiency, no doubt by insuring that all portions of the air blown through shall come within the sphere of action of the arc. The entering air is systematically preheated by the outgoing reaction gases*.

Since the autumn of 1907 an experimental plant of 2000 h.p. capacity has been in operation at Christianssand, Norway. This comprises three furnaces of 600 h.p. each. The length of the arc is no less than five meters (16½ ft.). The life of the furnaces is said to be fairly long. The lower electrode is gradually moved up as it wears away. It is claimed as a special advantage of the system, that it gives a concentrated gas with a good yield and high power. Owing to the steady character of the arc, its prejudicial influence upon the power factor, especially marked with intermittent arces, can be reduced to a minimum. As compared with the principal forms of furnace designed by other inventors, the Badische apparatus is distinguished by great simplicity, the absence of moving parts and of electromagnets.

A plant is in course of erection by the Badische company at the Rukwan Falls. This is planned in the first instance on a scale of 120,000 h.p., with the project of enlarging it to double this capacity in the future.

Nearly one-half of the gold in the slime residues on the Rand (H. A. White, *Journ. Chem. Met. and Min. Soc. of South Africa*, August, 1908) is undissolved by aqua regia. Aqua regia breaks up pyrite, so the gold must be inclosed in the slime.

---

*Frankland, *Journ.* Soc. Chem. Ind., 1907, p. 178.

Metallurgy of Broken Hill, New South Wales

The Ores Carry Lead, Zinc and Silver and Are Similar in Many Respects, but Their Concentration Involves Some Variation in Practice

BY GERARD W. WILLIAMS*

Broken Hill ore consists [illegible] an intimate mixture of galena and zinc blende. Silver which varies at the different mines from 7.5 to 12 oz. per ton† occurs in combination with both the lead and the zinc, being usually equally divided between the two minerals. The gangue consists of quartz with varying quantities of calcite, rhodonite and garnet sandstone. The proportion of these minerals varies in the different mines and is responsible for considerable modifications in the treatment as will be seen when the individual mines are considered.

Apart from their hardness the presence of rhodonite and garnet-sandstone add considerably to the difficulty of concentration. Dana gives the hardness of rhodonite as 5.5 to 6.5; three kinds occur in these mines, the hardness of the hardest form being nearer 7 than 6.5. The specific gravity appears to be greater than usually recorded, for as against 3.4 to 3.7 (Dana) local tests on clean mineral rarely fall below 3.9. Especially is this the case in regard to the mineral from the deeper levels The specific gravity of rhodoniferous tailings (including 5 per cent. galena) varies, from 3.8 to 4.5. The great difficulty in regard to the treatment of rhodoniferous ore lies in the fact that owing to its superior hardness, which is reflected in the increased consumption of grinding appliances, the larger particles of the final product are rhodonite. Consequently classification by any form of impulse motion, such as oscillating tables of the Wilfley type is comparatively ineffectual, for, as is well known, size of the particles has an important influence on the concentrate. Although the blende has about the same gravity as the rhodonite, it is eliminated with comparative ease, for being friable the particles are equal in size to those of the galena.

The specific gravity of galena is 7 to 7.7 but the specific gravity of the concentrates varies from 5.9, for ores containing much rhodonite, to 6.5 for clean quartz-calcite ores. On such a clean ore the tailings average 3.5, so that the working difference, in water, is 5.5 to 2.5, or in other words the concentrates are 120 per cent. heavier than the gangue. At the mine which has the most difficult ore to treat, the Junction North, the concentrates average 5.9 to 6.2, as against 4.5 to 4.8 for the tailings; consequently the working margin varies from 1.7 in the best ore to

[illegible] although situated on one lode the individual mines have to adopt different methods of treatment in order to secure the best results.

[illegible]

Subject to individual modifications which will be described later on, the following is a brief description of the method at present in use: The ore from the mine, after passing the weighing tables is broken in Gates or Blake crushers to 2-in. cube and elevated to the mill bins. From the latter it is fed by means of shaking screens to Cornish rolls which crush it to pass a screen with circular holes 3 mm. in diameter. In most cases the oversize from the trommels is returned to the same rolls, which are run with choke feed, but at the Proprietary mine the ore passes three sets of rolls, the oversize product from each set being elevated up to another, and finer-grinding pair of rolls.

[illegible] MINES OF BROKEN HILL

[illegible]	Lead, [illegible]	Silver, Per Cent.	[illegible]
Proprietary..	67.3	41	12,000
Central .	[illegible]	46	6,000
[illegible]	75	[illegible]	6,000 (new mill)
[illegible]	[illegible]	[illegible]	4,000
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	68	[illegible]	3,000
[illegible]	[illegible]	15	2,000

This method which appears to be the most logical manner of crushing, since differential crushing always reduces the percentage of slimes formed, is said to prove economical on the Proprietary; but at smaller mines direct experiment has shown that a choke-feed return gives the best practical results. Rolls are costly in power and unless every pair of rolls is working full the costs must go up. At the Proprietary all the plant is driven by one engine, so that it is impossible to say what difference in power there is between crushing by stages, as in the new mill, and direct crushing as practiced in the old mill. The mine publishes no costs whatever; so the question as to the relative merits of direct and stage crushing rests on the general statement of the management that "stage crushing pays best."

The final product from the rolls, i.e., the product passing a 3-mm. punched screen is fed to jigs. These jigs save about 75 per cent. of the total lead recovered and yield a concentrate assaying 65 per cent. lead. The jig tailings are returned in part to the same jig or to another "fine" jig, and are in part reground in Krupp ball mills or grinding pans. The result- [illegible]

[illegible] concentrating tables.

[illegible] are usually collected in trucks and run out to the dump, where they are kept pending the recovery of their zinc contents. The slimes are thickened in settlers and passed over Lhurig or Warren vanners. These slimes after treatment assay somewhat higher in lead, zinc and silver than the original ore. As these slimes represent from 8 to 12 per cent. of the total ore milled this loss is very considerable, for, except at the Proprietary and Central mines, they are not treated, but run out into dams after leaving the vanner tables.

[illegible]

The percentage recovery at the several mines varies within wide limits, as may be seen from the accompanying table.

Both the Proprietary and the Central recover additional lead and silver in their zinc-recovery plants. The plants which I shall describe in some detail are those of the Proprietary, Block 10, Central, South and Junction North mines. Each of these plants embodies some distinct departure from the general treatment method previously epitomized. All data for costs, etc., were supplied by the several managements.

[illegible]

There are two mills on the property, but only the most modern one will be described. In this mill grinding is by stages. The ore, after crushing to 2-in. pieces in four Gates No. 5 breakers, is elevated to the mill-bin floor and distributed over the bin. The shells of the crushers are of manganese steel, and the cones have movable covers of toughened steel. The life of the former is 2700 hours, of the latter, 1350 hours. These four crushers handle the tonnage for both mills, about 12,000 tons per week.

The coarse crushing rolls are three in number, 36 in. in diameter, 15 in. wide, and are set 3/8 to 1/2 in. apart. They run at 37 r.p.m. The product from each of these rolls is fed to a shaking screen having holes 3/32 in. in diameter. The oversize falls upon a belt and is delivered to an elevator which in turn feeds to the second set of three rolls. These rolls are similar to the first set, but are spaced ⅛ to 3/16 in. apart and run at 45 r.p.m. The oversize product from these rolls, after passing shaking tables similar to those at the primary rolls, is returned by belt and elevator to a final set of two fine crushing rolls. These are of the same size as the others, are spaced 1/16 in. apart and run at 78 r.p.m. The oversize product is fed to a No. 5 Krupp mill. In this mill the last and hardest portions of the coarse ore are ground to the required size.

---

*Mining engineer, Melbourne, Australia.

†Throughout this article the long ton (2240 lb.) is used.

The feed from the several bins to the rolls is by means of a feed roll placed at the head of the chute from the bin. The shaking screens are stated to be much more efficient and more economical that the trommels which were formerly used. According to official tests the latter only passed 58 per cent. of ore fine enough to pass, while the shakers pass 70 per cent. The area of the shaker is 21 sq.ft., and the screen lasts six weeks, as compared with an area of 54 ft. in the trommels taking the same tonnage. The life of the screen in the trommels was only four weeks. The shaking screen requires less water than the trommel, and repairs can be executed in a few minutes.

The product fed to each set of rolls contains less lead than the previous set, the greater friability of the galena rendering it more easily crushed. The first rolls average 15 per cent. lead, which is reduced to 10 per cent. at the last set of rolls. It is certain that this type of crushing diminishes sliming. It is unfortunate that the power required for the several sets of rolls has not been accurately indicated; for it seems likely that the running of large rolls at high speed must be very costly indeed. A roll is a most expensive apparatus, unless kept running with the maximum feed, and the third sets of rolls must consume an amount of power out of all proportion to the work done.

Treatment of Fine Material

The ore that passes through the shaking screens is fed to nine "coarse" jigs of the May type, double five-compartment machines running 165 strokes per minute. On the way to the jigs the pulp passes a series of small spitzluten to remove the slimes which are sent to the settlers. The discharge from the jigs is automatic, through a small pipe in the center of the floor of each compartment. Concentrates assaying 60 per cent. lead are obtained from the first two compartments; the third and fourth compartments yield a product which assays 10 per cent. lead, 19 per cent. zinc and 10 oz. silver.

This product is fed to Krupp No. 4 ball mills with 1/32-in. slotted screens, and the crushed product is elevated to five "fine" jigs. The slimes produced in grinding are removed by a spitzluten. The fine jigs make concentrates assaying 40 per cent. lead. The middlings from the third and fourth compartments are returned to a ball mill having a 1/45-in. slotted screen. The pulp from this mill is fed to the elevator feeding the fine jigs.

The product from the fifth compartment of the fine jigs is run out into trucks, which are returned to the zinc plant for treatment. The coarse-jig tailings are dumped for future grinding and zinc-treatment.

The slimes from the several spitzluten are classified in spitzkasten into coarse and fine slimes. The former go over a set of seven Wilfley tables, the middlings passing to a set of four on a lower level. The tailings are collected and sent to the zinc plant. The fine slimes are classified into four grades and distributed over Luhrig vanners, 28 in number. These vanners are divided into two sets, the lower 14 taking the middlings from the upper 14 which treat the entire product.

Roasting Slime Bricks

The slimes which leave the Luhrig vanners are run out into dams where they are allowed to accumulate in shallow layers. When any dam has a foot of slimes in it a new dam is opened and the full one allowed to dry off. When dry the slimes are cut into blocks, about the size of bricks and allowed to dry in the sun. When dry the blocks are taken by rail to the outside of the town, stacked in rows with adequate air channels and fired. The heaps are about 20 ft. wide, 6 ft. 6 in. high and from 200 to 250 ft. long. Each pile contains about 1250 tons and requires about 1.5 per cent. of wood fuel to start combustion.

PERCENTAGE OF TOTAL AND ASSAY OF PRODUCTS.

	Per Cent. by Weight.	Lead, Per Cent.	Zinc, Per Cent.	Silver, Oz.
Lead concentrates (all sources). .	18	55	10	26
Coarse tailings (dump)	29	4	12	5
Fine tailings (zinc plant)	41	5	17	8
Slimes (sinter works)	12	17	16	18

After burning for 10 to 14 days the action slowly ceases and as soon as the heaps are cool enough to be handled they are broken up and shipped to the mine smelters at Port Pirie. The bulk of the sulphur and a good percentage of the zinc is driven off; lead losses are considerable. The slimes assay 17 per cent. lead, 16 per cent. zinc and 12.5 per cent. sulphur before burning. After burning the assay is 14.5 per cent. lead, 12.5 per cent. zinc and 7.1 per cent. sulphur, mostly as sulphate. Silver is reduced from 17.5 oz. to 15.8 oz. per ton. The loss of weight is about 5 per cent. The roasted slimes have to be shipped by rail 350 miles to the smelters, so that profits can only be small. The method is somewhat crude but, with the exception of the Central mine the Proprietary is the only mine that recovers anything from its slimes.

The following figures illustrate the chief points in this description of practice at the Proprietary mine:

	Recovery Per Cent. Total Lead.	Tons Handled per hour.
Coarse jigs. .	47.5	5.75
Fine jigs. . . .	13.5	2.75
Wilfley tables	3.15	0.75
Luhrig vanners	3.15	0.17

The lead concentrates, about 18 per cent. of the total weight of the crude ore, average 2200 tons per week; they are sent to the smelters at Port Pirie, South Australia.

Zinc Recovery Plant

The coarse jig tailings, previous to being discharged into trucks for disposal on the dump, are passed over a shaking 40-mesh screen. This removes about 30 per cent. of the total weight of tailings, and this fine product is sent to the zinc plant The fine jig tailings are run into 8-ton trucks which are sent by rail to the zinc plant. The latter is extremely simple. There are six W-shaped spitzkasten, but the apex of one of the V's is blind, the other one being fitted with a spigot. An iron pipe, shaped like an inverted U with its ends terminating a few inches above the apex of the two V's introduces a hot solution of dilute sulphuric acid and salt cake in rather greater excess than the outlet from the spigot. The acid is maintained at 180 deg. F. The supply vats are heated by superheated steam at 500 deg. F. The tailings are shoveled into these vats, which measure 4 ft. 4 in. in diameter x 4 ft. 8 in. in depth and are lead lined, on the side where the blind pocket is. This blind pocket arrests any coarse material or adventitious substance which might clog up the spigot.

The acid acts on the calcite and the particles of CO_2 liberated attach themselves to the mineral portion of the ore and float upward, aided by the excess upcurrent of hot acid liquor. The overflow from the lip of the vat carries the concentrate which is collected in wooden settlers. All solutions are handled by means of air-pressure pumps on the line of a continuously acting monteju. The discharge from the spigot carries the tailings, which are discharged upon a 3-ft. india-rubber belt, curved like a trough by means of side rollers. This belt, which takes the product from the six vats, runs up hill and so drains the sands settling on the belt. The solution is released to the heating vats. Finally the belt discharges upon another belt which in turn delivers the dried tailings to the waste chutes for use underground in the stopes.

Each vat treats from 10 to 12 tons per hour. The concentrates represent 23.5 per cent. of the total weight and contain 42 per cent. zinc, the recovery of zinc being about 66 per cent. The sulphuric acid [illegible] in the process is manufactured at the mine.

Costs and Management

Costs for the process, or indeed for any portion of the mining or milling operations are not published.* This mine does not publish any costs save a half-yearly statement wherein mining, smelter, custom smelting and any and all expenditures are lumped inextricably together. This is a survival of old-time methods and is not to be commended. Of course, the method may have its advantages from the point of the management, but in regard to this mine there is little to suggest that anything is to be gained by suppressing treatment costs. The large plant and big tonnages treated should make costs compare more than favorably with those at other mines.

Although hardly within the scope of this article reference may here be made to the excellent fire and ambulance service organized at this mine. A fire engine and trained brigade are maintained, together with trained ambulance men. The mine possesses a well equipped ambulance room fitted with every convenience for rescue work and assistance to injured employees.

Mill at the Central Mine

The present concentrating mill, erected a year ago to take the place of the old mill which was destroyed during the big "creep" is in certain respects the most complete plant in the whole field. This is the only mill in which both lead and zinc are recovered in one series of operations and in which the entire product is treated for zinc. The gangue is chiefly quartz, with some calcite and a good deal of rhodonite and garnet sandstone. The ore is intermediate in character between the quartz-calcite ores of the adjoining South mine and the highly rhodoniferous ores of the British and Junction North.

The ore from the mine is broken in Gates crushers and then sent by means of a Bleichert aërial tram to the mill bins. The mill is divided into four sections or units and as each unit is similar, only one of them will be described.

The crushed ore in 2-in. pieces is fed to the coarse crushing roll and the product passed over a shaking screen provided with punched 1/8-in. holes. The oversize gravitates to another roll, and after passing this roll the entire product is returned to the first roll without elimination of such of the product as may be fine enough to be removed on the shakers. The primary rolls are 30 in. in diameter and have a 15-in. fall. The interspace is approximately ½ in. The flanged roll runs at 15½ r.p.m. and the plain roll at 14 r.p.m. The secondary rolls are of the same size as the primaries but are set face to face for friction drive. The speed is 28 r.p.m. Such procedure must increase the percentage of slimes; but as this mine treats the slimes direct, the consideration need not carry much weight with the [illegible]

[illegible] point deserving of criticism, for this recrushing of already sufficiently crushed material is contrary to good practice in that it must tend to further subdivide the galena and so render it more difficult to obtain a high-grade jig concentrate which has an obvious influence on smelter [illegible]

[illegible]

The undersize from the shaker flows to a small spitzkasten, the overflow runs to the sump and the underflow is sent over a four-compartment May jig. The products from the first three hutches are concentrates and go direct to the shipping bins; the tailings from the fourth compartment are distributed over two 7½-ft. grinding pans, central feed. The pulp is fed into the center of the pan and passes down a cylinder surrounding the vertical axis to the muller plate. There is a free discharge at the periphery of the pan; 50 per cent. of the feed is reduced to pass a 0.5-mm. screen.

The product from these two pans is passed over a spitzkasten; the fine sands and slimes overflow and go to the sump and the coarse sands, representing 52 per cent. of the feed to the primary pans, pass to a third pan of similar size. This pan grinds with ordinary feed through a 0.5-mm. mesh, the crushed product flowing down to the sump. The pans are run at 30 r.p.m.

From the sump, which takes the product from two units, the pulp is lifted to the concentrating floor by means of 5-in. centrifugal pumps, and on this floor the pulp is again divided into two portions representing each individual unit. The product from the unit is divided without classification over five Card tables. The concentrates are removed to the bins, the combined middlings from the five tables pass over one Wilfley, and the slimes gravitate to the settlers. The tailings from the Card and the Wilfley tables are delivered upon a drying belt, which in turn delivers to two belts which raise the entire product of the four units to the zinc-recovery plant.

The settled slimes from each unit pass over four double Krupp vanners. These vanners are somewhat similar to the Luhrig vanner. The middlings from these vanners are returned to the same vanners; the tails are delivered upon the big drying belt that receives the sands from the concentrating tables. The belt conveyers are 116 ft. between center of end pulleys and [illegible] horizon. The belt itself is 18 in. wide of five-ply rubber. They travel at 130 ft. per minute.

[illegible]

The sands and slimes, which average 18 per cent. moisture, are delivered into mixers in which they are agitated with very dilute sulphuric acid and oil. The [illegible] Crude mineral oil is used. From the mixers, which are provided with steam pipes to bring the temperature up to 120 deg. F., the pulp runs to a 5x5x5-ft. V-[illegible] below the surface of the pulp. The underflow is less than the inflow and the excess runs over the front lip.

This overflow carries with it the zinc-lead concentrates which rise to the surface owing to the selective action of the bubbles of carbonic-acid gas generated by the action of the acid on the calcite in the gangue. The gas bubbles attach themselves to the mineral in preference to the gangue and so float the former to the surface. The presence of oil materially accelerates this action. From the first spitz the underflow is delivered to a second similar one, and from that to a third and final spitzkasten.

The concentrates are sent to the zinc bins, and the tailings and slimes to collecting vats fitted with filter bottoms. After leaching out the liquor, which is released to the mixers, the sands are discharged to the dump. This zinc process treats slimes as well as sand; indeed the process works better when a certain percentage of slime is present.

From the collar of the shaft to the settling vats the ore is not handled, nor is the continuity of the process interrupted. Three products only are obtained, lead concentrates, zinc concentrates, and tailings which go to the dump or underground for mine filling.

[illegible]

In each of the four sections in the lead mill one 75-h.p. motor drives: The primary and secondary rolls; crude and crushed ore elevator and shaking screen; one May jig; three pans for regrinding jig tailings. In the table and vanner department one 15-h.p. motor drives two sections comprising a total of 10 Card tables, five in each section; two Wilfley tables, one in each section; eight double belt Krupp vanners, four in each section; [illegible] tion; one 3-ft. draining belt receiving all [illegible] tions and delivering them to one of the two conveyer belts for elevation to the zinc section.

[illegible]

The Minerals Separation Company, which owns the patents for the zinc-recovery process described, also has a plant used for the treatment of the accumulated tailings. These tailings are crushed in [illegible] of three as in the mill, to 0.5-mm. mesh and then treated exactly as previously described. A joint plant was erected by the Central mine and the Minerals Separation [illegible] lated slimes, the latter company having purchased about 230,000 tons of accumulated slimes at the adjoining Block 10 mine. This slimes plant produces rather a curious concentrate which represents 53 per cent. of the total weight, and assays 24 oz. silver, 24 per cent. lead and 33 per cent. zinc. The plant treats 1000 tons per week. At present it is shut down; the management is waiting to secure favorable smelting terms before disposing of the concentrates.

Work Done in the Central Mill

The combined lead and zinc mill has a capacity of 4000 tons per week. The zinc mill takes the entire product less the lead concentrates, or about 3300 tons per week. The average grade of ore is 12.5 oz. silver, 15.5 per cent. lead, and 19 per cent. zinc. In the lead mill the recovery of silver is 46 per cent., of lead, 72 per cent., the concentrates representing 18 per cent. of the total weight, and assaying 32 oz. silver and 63 per cent. of lead. The zinc flotation process gives a recovery of 68 per cent. of the silver, 80 per cent. of the lead, and 75 per cent. of the zinc in the tailings treated. The concentrate assays 16.5 oz. silver, 14 per cent. lead and 42 per cent. zinc. The total recoveries from the crude ore are, therefore, 85 per cent. of the silver, 96 per cent. lead and 85 per cent. zinc; but the 10 per cent. of zinc in the lead concentrates and part of the lead in the zinc concentrates are not paid for.

In the dump treatment plant the recoveries are slightly different, being 76 per cent. of the silver, 66 per cent. lead and 82 per cent. zinc. It will be noticed that in this plant the lead extraction is decreased and the zinc extraction increased. The weathering of the mineral in the dumps which naturally affects their selective action on the carbonic-acid gas is probably the cause of this difference. The concentrates produced in the retreatment plant assay 15 oz. silver, 10.8 per cent. lead and 45.6 per cent. zinc. The cost of the retreatment plant averages 6s. 6d. a ton. Costs for the combined plant were not available at the time of my visit.

Prior to the introduction of the flotation process the company had experimented with magnetic concentration of the tailings. Treating tailings assaying 6.9 oz. silver, 5.9 per cent. lead and 21 per cent. zinc, a concentrate was obtained assaying 39 per cent. zinc, 9 per cent. lead and 10.5 oz. silver. The concentrate represented 37 per cent. of the total weight treated. Two magnetic plants were erected, but, although running at a profit, the profit was much smaller than that obtained from the flotation process. Owing to the lower grade in zinc the smelter return charges were also higher than with the present grade of concentrate.

Experiments with Zinc-recovery Process

The Sulphide Corporation, which controls the Central mine, has for many years struggled gamely with the zinc-recovery process. This company has incurred a great deal of adverse criticism in the past, criticism at the time perhaps not undeserved, but in the matter of zinc recovery the company deserves unstinted praise. The plant is the only attempt in Broken Hill at a logical, continuous process whereby both lead and zinc are recovered without a break in the treatment. The Proprietary mine, as shown, treats some of the tailings for zinc and treats the slimes by the distinctly uneconomical sintering method; but this mine treats the entire product, sands and slimes. The final product is available for filling as soon as it leaves the tailings collecting vats.

In many respects the plant is unique, certainly as far as Australasian zinc-lead plants go in that the zinc is a very real asset as regards the monthly profits. The Proprietary mine publishes no costs whatever; so the economic value of the zinc and slimes-sintering process is a matter for conjecture, while the Zinc Corporation, which purchased tailings from many companies, has so far proved a dismal failure. Of this company more will be written later on. The zinc plant at the Central places the mine in a sound financial position in face of the threatened drop in the price of metals.

WORK OF BROKEN HILL SOUTH MILL, LAST HALF 1907.

Product.	Net Tons.	Per Cent. Ore.	Lead, Per Cent.	Silver, Oz.	Zinc, Per Cent.	Per Cent. Metal Contents.		
						Lead.	Silver.	Zinc.
Concentrates	17,379	15.7	71.7	19.0	5.8	75.1	54.9	7.5
Tailings	84,145	76.3	3.9	2.7	13.6	20.1	38.5	84.4
Slimes	8,891	8.0	9.0	4.5	12.4	4.8	6.6	8.1
Total	110,715		15.0	5.4	12.3			

Broken Hill South Silver Mining Company

The gangue in this mine is essentially quartz-calcite; and although rhodonite does occur in the stopes, it is usually in the form of massive bars which are not rich enough in lead to be worth sending up to the mill. A new mill, with a capacity of 6000 tons per week, will be in operation within a few weeks; the present mill has a capacity of 4000 tons per week. The new mill is built near the main shaft, and the trucks of ore will be dumped directly to the ore breakers from which the crushed ore will be elevated to the mill bins. The procedure in the old mill is as follows:

After passing the grizzlies, manganese-steel bars set with 1½-in. interspaces, the coarse ore is fed to two No. 5 Gates breakers and the product, approximately 1½-in. cubes, elevated to the mill bins. The mill is fitted with three 30x15-in. Cornish rolls. The mills each crush 1800 tons per week from 1½-in. material to 4 mm. sand. Between the bins and the rolls the ore passes over a shaking screen with slotted holes 4 mm. wide and 12.5 mm. long. After passing the rolls the ore is screened through 4-mm. trommels, and the oversize is returned to the same rolls by elevators, a choke feed being maintained. The roll tires, made of Krupp steel, have a life of about 12 weeks. The undersize from the shaking screens and trommels is fed to two Hancock and two May double jigs. The following separation is effected:

	Per Cent. Total Weight.	Lead, Per Cent.	Silver, Oz.	Zinc, Per Cent.
Concentrates	10.6	76.0	19.0	6
Balance	89.4	8.4	4.0	13
Total	100	15.6	5.5	13

The product from the first two compartments of the jigs is concentrates, the third compartment is returned and the balance of the product is divided over 12 grinding pans and one tube mill 13 ft. 6 in. long and 4 ft. 9 in. in diameter. The sands leaving the pans size as follows:

	Per Cent. Total.	Lead, Per Cent.	Lead,[1] Per Cent. Total.
On 40 mesh	10	3.0	2.4
On 160 mesh	70	6.5	50.0
Through 160	20	22.0	47.6
Total	100	9.2	100

This product is distributed over 24 Wilfley tables fitted with a wooden surface of special design. The tailings leaving the tables assay 3.9 per cent. lead, 2 oz. silver and 13 per cent. zinc. The slimes from the tables run to thickeners and from these are fed to six double-belt Luhrig vanners. The vanners separate three products, the concentrate which assays 50 per cent. lead, middlings which are returned to the vanners and slimes which pass to the slimes dam.

The average weekly tonnage was 4178. Milling and concentrating costs average $1.04 per ton of crude ore treated. Mining costs average $2.50 including 35c. refilling charges. Development costs averaged 80c. per ton during 1907. The mill consumes a total of 210 gal. of water per ton of ore treated.

New Mill, Broken Hill South

The new mill is divided into four complete units, but any portion of these units may be placed in circuit with any other unit. The rolls are larger than in the old mill measuring 18 in. across the face by 36 in. in diameter. Running at 19 r.p.m. each set of rolls will have a capacity of 2100 tons per week. The product from the rolls will pass through trommels with 4-mm. screens, the oversize being returned on raff-wheels to the rolls, the undersize gravitating to four double May jigs. The tailings from the jigs will be ground in 32 Wheeler pans running at 52 r.p.m. and the crushed sands will be divided without classification over 64 Wilfley tables. The pans are arranged in two rows, so that it will be possible to run them in tandem if found desirable. The 64 Wilfleys are arranged in groups of eight. The four units are entirely separate as far as the grinding pans, but from the pans onward the power is distributed into two units instead of four. The slimes from the Wilfleys is thickened and then passed over 24 double-belt Luhrig vanners.

With this mill it is anticipated that the total concentrates will assay up to 75 per cent. lead and that the recovery of that metal will be materially increased. Costs are expected not to exceed 90c. per ton.

North Broken Hill Mill

The ore in the North mine, which is situated on the extreme north of the line of lode, is very similar to that in the South mine. As in that mine the gangue is essentially quartz-calcite. The mineral contents of the two ores and the recoveries from the mills are very similar, as shown in the following comparison of assays:

	Lead, Per Cent	Silver Oz.	Zinc Per Cent	[illegible]
South......	15	5.4	12.5	[illegible]
North......	16	6.0	13.3	74.9

The aim of the North mine mill is to produce three products, concentrates of lead and silver, tailings from the jigs which are too low in zinc to repay treatment and which may be sent underground for stope filling, and fine sands carrying zinc for sale to the De Bavay treatment plant. Every effort is made to reduce the proportion of slimes which are not treated by the De Bavay zinc-recovery process. The capacity of the mill is 2500 tons per week.

The ore from the mine is tipped from the landing platform to a No. 5 Gates breaker, and the 2½-in. product is elevated to the mill bins. From the bins the crushed ore is fed by means of a shaking screen to the rolls, which are two in number, each 33 x17 in. Running at 17 r.p.m. these rolls require about 25 h.p. The product from each pair of rolls is distributed over two trommels fitted with screens having 9/64-in. (approximately 4-mm.) punched holes.

The oversize from the trommels is returned by means of raff-wheels to the rolls, and the undersize product together with the undersize from the shaking screens which are provided with the same screen as that used in the trommels, passes to two "coarse" Hancock jigs. A small spitzkasten at the head of the jigs removes the slimes which pass to the settlers. Compartments one and two of the jig deliver concentrates, the product of the third compartment is returned to the same jig by means of an elevator. The product from the fourth compartment of each jig gravitates to five Wheeler pans. The product from the fifth compartment passes to three Wheeler pans and thence over a spitzkasten, to remove slimes which go to the settlers. The product of the spitzkasten is returned to two "fine" May jigs.

The product from the first four compartments of these "fine" jigs runs direct to the five Wheeler pans that treat the product from the fourth compartment of the "coarse" jigs. The product from the fifth compartment of the "fine" jigs is run out to the dumps and is used for filling underground. This product represents 41 per cent. by weight of the ore treated and assays 3.6 per cent. lead, 2.5 oz. silver and 10.9 per cent. zinc.

The five Wheeler pans, which are 4 ft. 6 in. in diameter, crush the ore to pass a 40-mesh screen, this being the present economic limit of fine crushing for the ore. From the pans the ore passes over nine Wilfley tables, the concentrates going to the bins and the tailings to the De Bavay Treatment Company's works. The slimes and fine sands from the spitzkasten and from the floor drainings are settled and then passed over six Wilfley tables; the sands from these tables go to the zinc works, and the slimes are thickened up [illegible] vanners.

DETAIL OF THE VARIOUS RECOVERIES, JUNE TO DECEMBER, 1907

Product	Net Tons.	[illegible]	[illegible]			[illegible]		
			Lead, [illegible]	Silver, [illegible]	Z[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6,944	11.71	73.0	18.3	5.5	52.98	33.55	4.56
[illegible]	[illegible]	4.66	66.8	19.3	7.4	19.34	14.88	2.59
[illegible]	485	0.82	51.0	18.5	14.1	2.59	2.50	0.87
[illegible]	10,195	17.19	70.17	18.57	6.49	74.91	[illegible]	[illegible]
[illegible]	24,312	40.98	3.6	2.5	[illegible]	[illegible]	17.21	33.63
[illegible]	19,507	32.88	4.4	3.5	19.7	8.96	18.92	48.7
[illegible]	5,309	8.95	12.8	7.5	13.8	7.09	11.12	9.27
[illegible]	59,323		16.1	6.05	13.28	[illegible]	[illegible]	

Milling and concentrating costs for the period covered by these figures averaged $1.12 per ton. General mining costs averaged $3.04 with development at 88c. per ton, a total of $5.04 per ton of crude of $28.42 per ton of concentrates.

Of the $3.04 mining costs timbering and maintenance absorbed 36c. and refilling stopes 26c. The miners are paid 84c. per ton of ore, the price including spalling up and placing in the shoots together with all necessary timbering. Trucking averages 15c. per ton and is placed on contract. The average ore broken and delivered to the shoots is 3.7 tons per shift per miner engaged in the stopes, and 1.9 tons per man engaged underground. As the lode varies in width from 30 to 90 ft. and is easy boring, this figure does not reflect much credit upon the miners engaged. The average wages per eight-hour shift at this mine for the half year ending December 1907 were $3.42 for miners and $2.84 for truckers. Considering the poor return for the high wages the [illegible] is not surprising.

The Rio Tinto Half-year

A circular from the directors of the Rio Tinto Company, Ltd., dated Oct. 6, says that the deliveries of pyrites to the United Kingdom have again been less than formerly, and on the Continent the chemical trade has not required quite such large supplies as in 1907. Sulphur ore shipments have, however, been well maintained, and are, so far, rather in excess of 1907. Operations at the mines have in no way been hindered by scarcity of water during the summer, and the reservoirs contain a good supply for future use. The subsidences which took place in the South Lode in the early spring have somewhat reduced the mineral production of that department, but during the next two or three months the quantity of ore available from this lode will, it is expected, again have reached the normal; the new and extensive opencast operations having this object in view are already well in hand. Even with a somewhat reduced output of ore, it is estimated that the make of fine copper at the mines will exceed by a few thousand tons the quantity produced in 1907. So far this year the copper market has been exceedingly disappointing. For the whole of 1907 the average public market price of refined copper was £93 14s. 5d. per ton, while for the past nine months the quotations have only averaged about £62 16s. 2d., making a difference in profit of more than £30 per ton of refined copper. Signs of improved commerce over the world generally are not lacking, but until business settles down in the United States after the election, it is not to be expected that there will be a greatly increased demand for copper. There are, however, indications that this may be looked for when more normal conditions in the trading centers have again been reached. Out of the estimated profits for the year, the directors declare a dividend for the six months ending June 30 of 2s 6d. per share, less income tax, on the 5-per cent. preference shares, and an interim dividend of 27s. 6d. per share, free of income tax, on the ordinary shares, both payable Nov. 2 next.

The rate of burning for fuse used in the mines of West Australia is limited by [illegible]

Regenerative Reverberatory Copper Furnace

Description of Furnace at Works of Peyton Chemical Company; Counter-current Heat Recuperation; Oil Used as Fuel

BY FRED A. LEAS*

The first oil-burning reverberatory furnaces installed on the Pacific coast were very similar to those used in Montana about eight or ten years ago. Their outer and inner lines were practically the same, with a pear-shaped type of hearth, and the same flue construction was used leading directly to a brick stack, or, where there was a large amount of fines to be handled, into a down-take, which connected with a dust-settling flue and a steel stack. The roof construction was also similar, pitching from the back or burner end toward the front. The only point in which they differed was that the fire-box construction of the coal-fired furnace was entirely omitted and oil burners were inserted in the back end through openings of sufficient size to admit the air necessary for combustion, which, of course, was taken in at the same temperature as the atmosphere surrounding the furnace. The flame from the burners played directly over the surface of the charge and the maximum temperature of combustion being well toward the burner end of the furnace, the major portion of the actual smelting was done in that section.

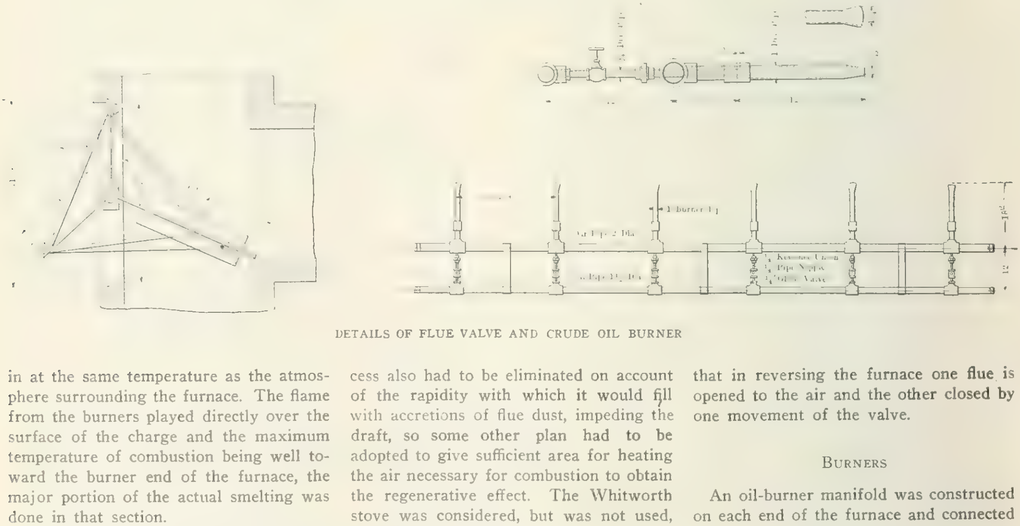
Under these conditions it was difficult to get any speed out of the furnace owing to the localization of the heat, and it was no easy matter to keep the front end sufficiently warm when skimming to get out a thoroughly liquid slag without excessive use of fuel. In some cases it became necessary to skim from the side of the furnace near the zone of maximum heat. The fact that the entire hearth was not utilized and that difficulty was experienced in keeping the entire bath in a thoroughly liquated condition made it essential that for rapid and economical work these features be eliminated.

Regenerative Flues

A regenerative furnace suggested itself as a possible solution, something in the nature of the Siemens-Martin type; but owing to the character of the work many modifications were made necessary. An opportunity presented itself to try the efficiency of the scheme in rebuilding a furnace for the Peyton Chemical Company, in January, 1907. The foundation was already in, and the company did not wish to go to any unnecessary expense; so that some scheme other than conducting the products of combustion to regenerators under the hearth had to be devised. The checkerwork used in the open-hearth process also had to be eliminated on account of the rapidity with which it would fill with accretions of flue dust, impeding the draft, so some other plan had to be adopted to give sufficient area for heating the air necessary for combustion to obtain the regenerative effect. The Whitworth stove was considered, but was not used, owing to the fact that if for any reason the change was not successful it could be put to no further use. At the same time the construction could not be altered to such an extent that it could not be readily brought back to the old condition.

I decided upon the following changes to produce the regenerative effect. The foundation, which would accommodate a furnace 20x40 ft. was straightened out, giving it as nearly as possible an equal width for the entire length, having the shape of a parallelogram. The invert was constructed in the usual way, and the side walls built to an equal hight all around, so that the roof would be on a straight line, not having any pitch toward either end. Welch-flue connections were used at each end, each of which led to a down-take which was connected with parallel flues 150 ft. in length, and separated by the length of the furnace. On the outer end these flues were brought together by turning at right angles and from their point of junction a single flue led to the steel stack. At the junction of the flues a valve was so placed that one flue would discharge the products of combustion into the stack, while the other flue would be open to the atmosphere admitting the air necessary for combustion.

The valve used in the flues consists of a cast hub with three wings of ⅜-in. steel plate bound with 6-in. angle iron and bolted in place. The wings are so placed that in reversing the furnace one flue is opened to the air and the other closed by one movement of the valve.



DETAILS OF FLUE VALVE AND CRUDE OIL BURNER

Burners

An oil-burner manifold was constructed on each end of the furnace and connected with the air and oil mains by means of flexible couplings so that it could be readily inserted and withdrawn from the furnace. The oil is carried in the pipe farthest from the furnace and consists of short pieces of ½-in. pipe and ½-in. tees so spaced that they come directly back of the burner openings. On the side outlet the tees are reduced to ¼-in., a short nipple is inserted, then a ¼-in. valve outside of which is another short nipple, a union coming on next, then a nipple with a long thread which is screwed through the ¼-in. opening in the tee of the air manifold. The air manifold is made in the same way with the exception that [illegible] instead of 1½-in. fittings. On the nipple coming through the 2-in. tee a ¼-in. sleeve with a piece of ¼-in. pipe [illegible] is attached to carry the oil about half way through the burner, the balance of the distance to the tip being used for atomizing. The side outlet on the 2-in. tee is reduced to one inch and [illegible] pipe a piece of one-inch pipe 18 in. long is placed, which completes the burner. The tip of the one-inch pipe is flattened to a 3/16-in. opening, and is rounded off to give a fish-tail effect to the flame. The two manifolds comprising the complete burners are securely clamped together to make them rigid and to prevent the possibility of leakage in the many joints.

---

*Metallurgical engineer, Oakland, Cal.

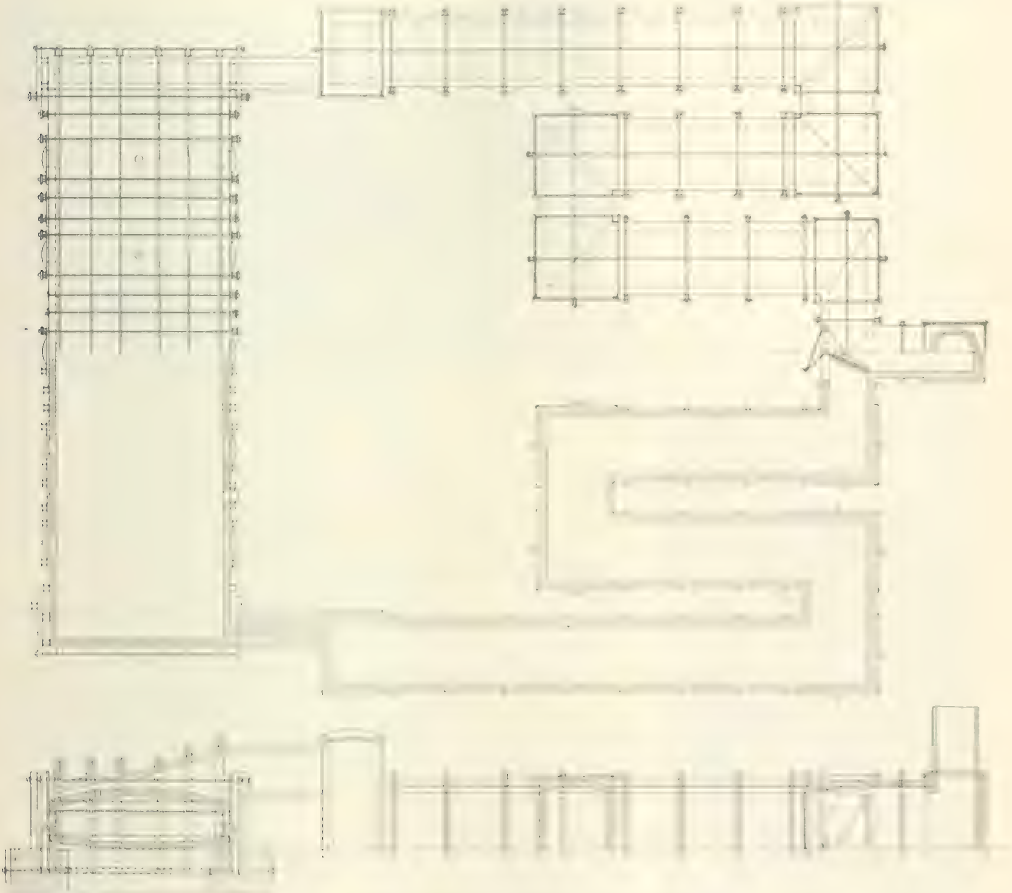
Air for atomizing the oil is supplied by a Connersville high-pressure blower, which delivers the air at a pressure of 7 to 10 lb. and the requirements of each burner is about 50 cu.ft. of free air per minute.

Method of Operation

Upon getting the furnace into operation I found that the stack had ample draft to supply suction to the flue which was left open, this to my mind, being the most doubtful feature of the reconstruction. There was, therefore, no question about the furnace getting all the air it needed. It was found advisable to change fires from one end to the other twice during the period occupied in working a charge, usually from two to three hours, and in that way the fires would be on each end from one to one and one-half hours depending on the nature of the charge in the furnace. It was not found advisable to change fires as often as in open-hearth practice, for the reason that the area in the flues was so large that the heat was not taken away as rapidly by radiation to the air traveling back to the furnace, and also to the outside atmosphere as it was taken up in the cold flue. This demonstrates that the regenerative effect could be accomplished in a much shorter flue, [illegible] owing to the large amount of fine ore which it was necessary to recover.

It is essential to change the valve rapidly so as to keep the fires off the shortest possible time; as the valve is designed this can be done very quickly, for one flue is closed and the other opened by one movement. This type of construction is superior to the butterfly valve used in some regenerative furnaces for the reason that it does not have to be water-cooled and the bearings are all on the outside away from the dust and are cooled by the air.

Working under the regenerative principle proved to be a very decided advantage, increasing the capacity of the furnace fully 50 per cent. Under the old conditions the furnace handled from [illegible]



PLAN AND ELEVATION OF A REGENERATIVE REVERBERATORY FURNACE tons per day; after the change the tonnage increased to an average of more than 90 tons, and the furnace has smelted as much as 112 tons in 24 hours. The decided increase was due to two reasons, i.e., the entire hearth area was in use at all times and the temperature of combustion was very materially increased owing to the fact that the temperature of the entering air had been raised from that of the atmosphere to a point ranging from 400 to 1000 deg. C., depending on the length of time that had elapsed since changing the fires.

A Modified Plan

As additional capacity was needed, another furnace was built according to the accompanying plans. The inside dimensions of the hearth was 17x60 ft. The same connections were made from the furnace to the regenerative flues as in the construction of the original furnace. The flue construction was changed, however, from the long parallel flues to those shown in the illustration to economize in the space occupied, and also by causing the products of combustion to change directions six times at right angles during their course to the stack in order to settle a larger amount of dust. This furnace, with an available hearth area of 1020 sq.ft., has smelted during a period of 24 hours 176 tons under condition not exceptionally favorable; the charge at that time consisted of 56 per cent. hot calcines, 25 per cent. cold calcines, and 15 per cent. silicious copper ore. The components of the charge were not thoroughly incorporated before entering the hoppers and the cold calcines and silicious copper ore contained about 2 per cent. moisture. The tonnage gives 345 lb. per square foot of hearth area. This is a very decided increase over the old furnace which smelted, before remodeling, about 200 lb., and after being made regenerative about 300 lb. per sq.ft. I feel confident that the second furnace constructed could handle 200 tons per day if it were possible to run it on such a charge as used to prevail in Butte when nothing but hot calcines were handled, producing a matte not less than 15 to 20 per cent. of the total burden.

The furnace as constructed is not only applicable to the use of oil or gas as fuel, but offers possibilities in the use of powdered coal as well. Thus far the experiments with coal-dust firing have not been very successful owing to the fact that the flues clog with accretions of ash. In the regenerative furnace that difficulty could readily be overcome by running sufficiently long on one end to thoroughly clean the flues on the other. The generation of power by the installation of waste-heat boilers can also be accomplished with this type of furnace for the stack gases at the end of the 150-ft. flue have a temperature of about 500 deg. C. As the heat is built up more rapidly than it is taken away, the regenerative effect can be obtained by the use of shorter flues, reversing more frequently with boilers beyond the valve.

Efficiency of the Furnace

Taking the heat-producing constituents of California crude oil as carbon 87 per cent. and hydrogen 10.2 per cent., the tables of "Richards Metallurgical Calculations" give a calorific value of 10,584 cal. Oil of the composition given comes sufficiently close to the formula C_2H_4 to make the following calculations admissible:

According to the equation, $C_2H_4 + 3O_2 = 2\,CO_2 + 2\,H_2O$, two volumes of carbon dioxide and two volumes of water vapor are formed from the combustion of one volume of C_2H_4 and three volumes of oxygen. The nitrogen accompanying the oxygen is 11.42 volumes, making the total volume of air necessary to burn one volume of C_2H_4 14.42 volumes. The maximum temperature of combustion being that temperature to which the heat generated can raise the products of combustion, by the use of Richards' formulas of the specific heat of the products formed, and taking into consideration the calorific value of the fuel, the theoretical temperature of combustion can be obtained, both at atmospheric temperature (30 deg. C.) and in a preheated condition, which we will assume to be 60 deg. C., as follows:

$$N = 11.42\,(0.303\,t) + (0.000027\,t^2)$$
$$H_2O = 2\,(0.34\,t) + (0.00015\,t^2)$$
$$CO_2 = 2\,(0.37\,t) + (0.00027\,t^2)$$
$$Q(0\text{-}t) = 10584\text{ cal.} = (4.88026\,t) + (0.00114834\,t^2)$$

As the air for combustion is brought in at 30 deg. C. it will add additional heat as follows:

$$Q(0\text{-}30) = 14.42\,[0.303(30) + 0.000027(30)] = 1314\text{ cal.}$$
$$1314 + 10584\text{cal.} = 4.88026\,t + 0.00114834\,t^2$$
$$T = 1733\text{ deg. C.}$$

Making the calculations after preheating the air to 600 deg. C., the following results are obtained:

$$Q(0\text{-}600) = 14.42\,[0.303(600) + 0.000027(600)^2] = 2762\text{ cal.}$$
$$2762 + 10584\text{ cal.} = 4.88026\,t + 0.00114834\,t^2$$
$$T = 1893\text{ deg. C.}$$

The temperature of the air entering the furnace as determined by Le-Chatelier's thermo-electric pyrometer is, just after reversing the furnace, about 1000 deg. C., and drops from that point to about 400 deg. C. in 1½ hours. In the calculations less than the average temperature is taken to balance the unheated air taken in through burner openings, doors, etc.

The calculated heats agree very closely with those determined with the pyrometer, both when the furnace was in operation under the original construction and after it was changed to the regenerative type.

Estimation of High Temperatures in Works Operations

Dr. F. W. Skirrow (*Journ. Soc. Chem., Ind.*, May 15, 1908) has employed the following simple means with entire satisfaction: The temperature in question is compared with the melting point of a known substance of definite melting point, which is contained in a narrow iron tube welded up at one end. A stiff wire passes down the tube and into the solid substance at the bottom in order to indicate when the substance melts. This wire remains fixed as long as the substance is below its melting point, but when the substance melts the wire becomes loose and can be freely moved up and down.

A number of these tubes are prepared, containing a series of substances having melting points covering the range within which it is desired to work. The ends of these tubes are placed in the apparatus under observation, and by noting which of the wires are fixed and which loose, can readily be ascertained the approximate temperature. It is generally sufficient to use two tubes, one containing a substance melting somewhat below the upper temperature limit, and the other containing a substance melting somewhat above the lower temperature limit. The workman is then instructed to regulate his fire so that one of the wires is loose and the other fixed. For materials which would act on iron, other metals might be used, and there seems to be no reason why porcelain tubes should not be employed if account be taken of the greater temperature lag.

Metal and Mineral Production of Ontario

The Ontario Bureau of Mines reports that the output of the metalliferous mines and works of the province for the six months ending June 30, was valued at $8,082,264, the various items being as follows:

Substance.	Quantity.	Value.
Arsenic, tons	256	$ 1,573
Cobalt, tons	365	39,822
Gold, oz	1,524	27,672
Silver, oz	7,746,537	3,888,991
Copper, tons	3,887	547,417
Nickel, tons	4,779	932,828
Iron ore, tons	84,440	214,284
Iron pyrites, tons	8,728	27,968
Pig Iron, tons	148,365	2,401,709
Total	......	$8,082,264

The Kafir running machine drills on the Rand in South Africa must drill, according to T. Lane Carter, 4 holes, 6 ft. deep, in order to get his day's pay.

The death rate per 1000 persons employed in the metal mines of Queensland during 1907 was 0.84.

Notes on Air Agitation

By Mark R. Lamb*

This method of agitation has been perfected by F. C. Brown at the plant of the Waihi Grand Junction Gold Company, Ltd., in Aukland, New Zealand. Mr. Brown has worked along entirely original lines and has developed an agitation tank which is startling at first glance. Air agitation heretofore has not been a success, due largely to [illegible] power [illegible] the small, wide tanks used, but this disadvantage seems to have been entirely overcome by Mr. Brown's tanks of apparently abnormal shape. The first of these to be built in Mexico were erected by A. Grothe at the Hacienda de San Francisco, Pachuca, in the face of considerable adverse comment. These are 15 ft. diameter and 45 ft. high and are giving excellent results. The power required to agitate a charge of thickened battery pulp, varying up to 100 tons dry weight is, according to a recent test, [illegible] 1.7 h.p. The entire mill pulp is treated by agitation, and a look at the surface of the charge fully satisfies the skeptic that the agitation is good. The slowly revolving mass in a mechanically [illegible] tank seems quiescent in comparison. An 8-in. centrifugal pump using 20 h.p., cannot equal this agitation. Repairs and maintenance are very small. Tanks of this type are now being placed in many plants in Mexico, and it is astonishing how much the cost and size of a plant is reduced by planning to agitate all the ore [illegible]

[illegible]

Mr. Brown gives figures of power required which are extremely interesting, a few of which are quoted below. I may say first that he increases the quantity of air until the sides of the cone bottom of the tank are kept clear of settling material. This is determined from the working floor at the top of the tank simply by means of a lead weight attached to a cord. The theory upon which the hight of the tanks has been increased so much is that the indicator of the quality of the agitation is the velocity of the material [illegible] in very tall tanks will produce a greater velocity down the sides of the cone, per ton of material, than in short tanks. The quantity of air necessary for this clearing of the cone varies, of course, with the material; coarse sand, thin pulp or concentrates require more air than fine sand [illegible]

SHEET IRON [illegible]

Size of Tank Diam. Ft.	Size of Tank Hight Ft.	Material.	[illegible] Tons	[illegible] Cu. Ft.	[illegible]	[illegible]
7.5	37	Slime	[illegible]			
7.5	37	Concentrates	[illegible]		[illegible]	[illegible]
10	40	Slime	35	[illegible]	[illegible]	[illegible]
13	[illegible]	Slime	[illegible]	16	[illegible]	[illegible]
10	40	Fine Sand	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] while 10 cu.ft. of free air under 25 lb. pressure will agitate this material, it has been found advisable to use more than this amount in order to guard against accidental stoppages. A volume of 15 to 20 cu.ft. is used, which gives a vigorous [illegible] A [illegible] ground concentrate showed that only [illegible] screen. The concentrates assay from £15 to £20 per ton and the extraction is 92 [illegible] with [illegible] concentrates.

Herewith is the tabulated agitation data.

[illegible] ence with other material Mr. Brown expects to treat thickened battery pulp in his plant now building for that purpose with the following quantities of air in tanks of the dimensions given:

[illegible]	[illegible]	Sq. In.	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Such tanks are necessarily built of steel [illegible] pump from settlers or thickeners into the tall tanks, but even with this disadvantage and under the most unfavorable conditions as to site, the tall tanks will still possess great advantages in low power [illegible] silver ores seem to show that a more [illegible] use of air, expedites extraction more than enough to pay for the slight increase in the necessary power. Finally, Mr. Brown reports that contrary to expectations, the cyanide consumption during this agitation is actually less than when agitating by means of ordinary mechanical agitators.

[illegible]

From experiments extending over a period of six months he finds that the consumption of cyanide treating concentrates in tall tanks is 6d. less per ton, and that the loss in treating slime similarly is 1d. per ton less than when treating by mechanical agitation. Probably the saving is largely due to the great reduction in time necessary for treatment.

---

*Milling and cyaniding engineer, Apartado 1421, Mexico City.

The Ruble Boulder and Gravel Elevator

The Ruble gravel elevator and undercurrent is a patented device for separating boulders and coarse gravel from the finer gold-bearing material, and at the same time elevating the coarse waste material to the dump pile. The working parts consist of a coarse grating of timber reinforced with metal above a smooth, inclined floor of planks which conveys the fine material to a sluice and the gold-saving apparatus. There are no moving parts, the gravel being washed and driven up the incline by means of a stream from a hydraulic giant, the spent water transporting the fine material to the sluice. The whole is mounted upon a timber frame which may be provided with trucks for convenience in moving from place to place.

Among the advantages claimed for the Ruble system are the following: It handles boulders as large as one ton quickly and with comparatively little water, the inclination of the grate bars and the metal surface being such that irregular masses of rock slide up the incline with less resistance than on ordinary level ground. Since only the finer material reaches the sluices, the riffles are placed nearer together than in the ordinary sluice, and the sluiceway being wider than usual the entire system may be shortened to 48 ft. The sluice may be cleaned in from one to two hours. The elevator makes its own dump, the material being picked up near the foot of the incline and after a short journey over the grate bars dropped back upon bedrock.

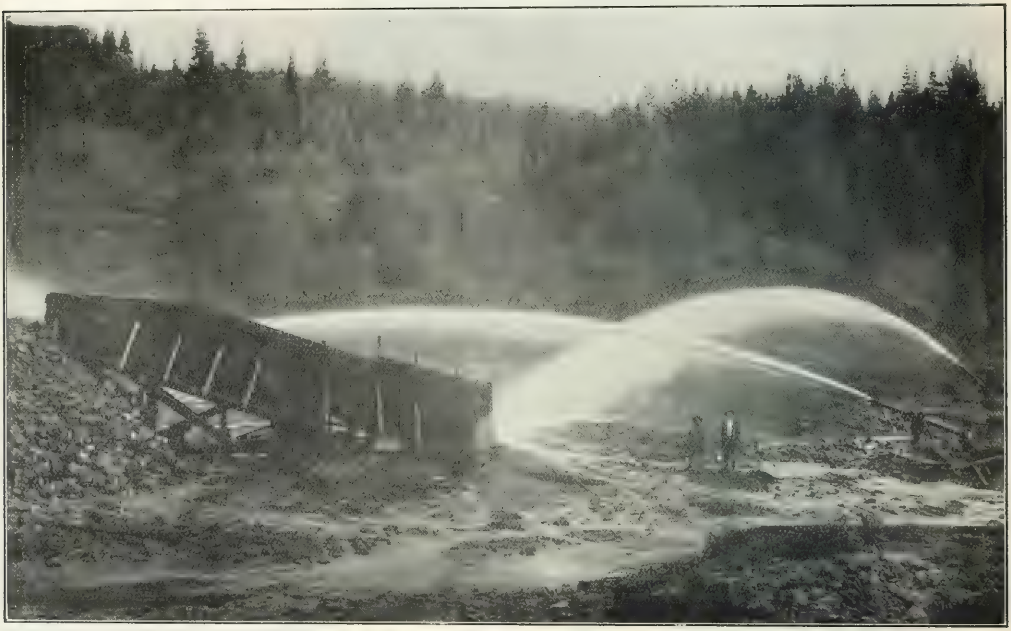
Method of Operation

The giant which forces the material up the elevator incline is placed from 50 to 150 ft. from the foot of the apparatus, leaving space for from 200 to 500 cu.yd. of gravel. The material may be piped from the bank to the machine by means of another giant, which in case the supply of water is limited, may be used alternately, the pressure being shifted to the two nozzles as required. The operator of the elevator first directs his stream upon the pile of material, forcing a suitable quantity upon the lower end of the incline. He then lifts the stream gradually from the foot of the elevator to the dump.

The surfaces of the bars upon which the boulders slide are inclined upward at a slightly greater angle than the bed of the machine proper. This prevents the boulders from sliding back and prevents edges of rock from catching in the spaces between the bars. The inclination is also said to aid in transporting the boulders by directing upward the stream of water which strikes the metal surfaces of the bars, the force of the blow literally lifting masses of rock over the bars.

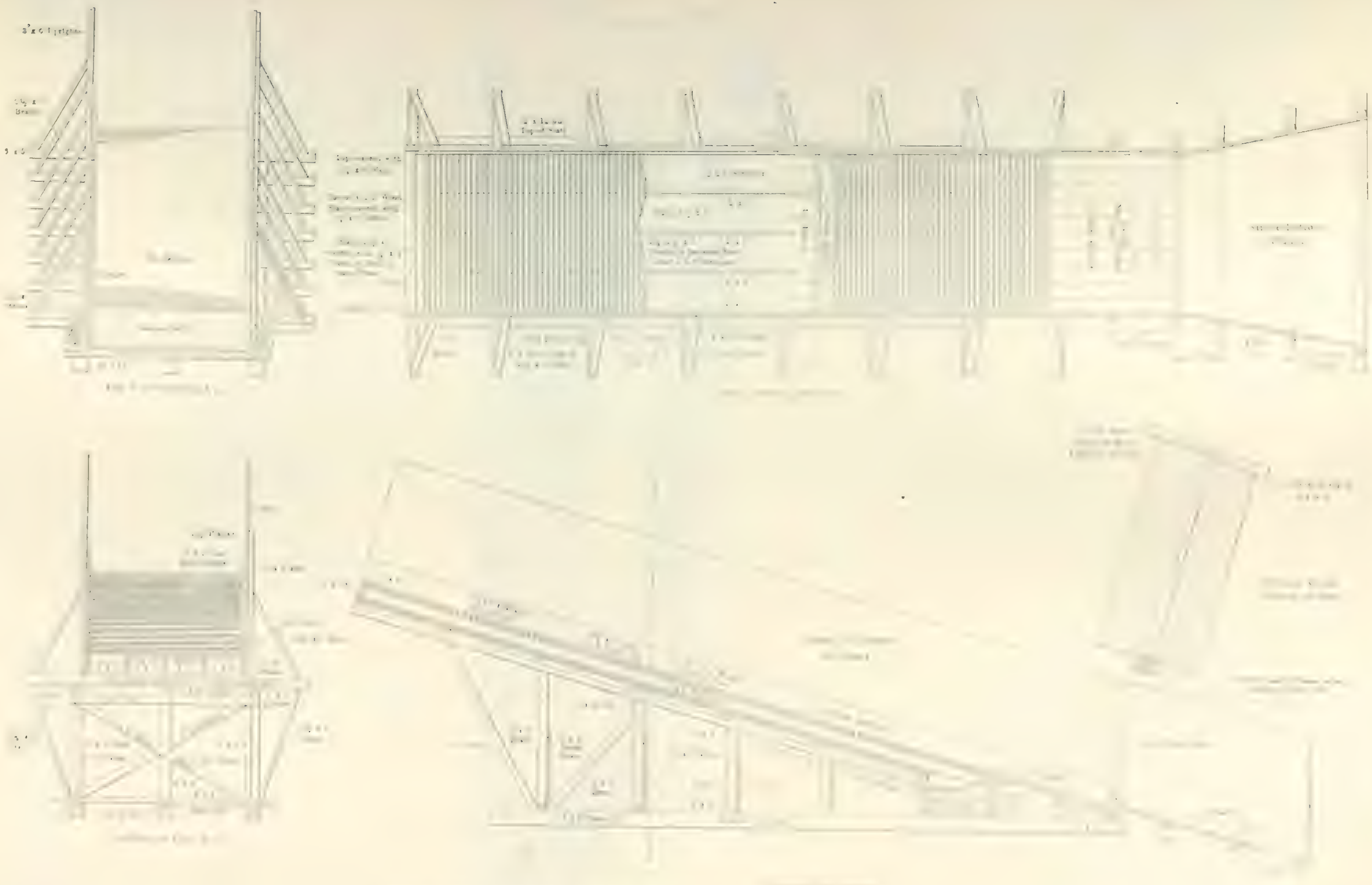
To avoid driving the fine material upon the dump, the gravel is fed upon the foot of the incline in masses of from 3 to 5 cu.yd. There by careful manipulation the fine gravel is washed out into the sluice before the full force is employed to drive the boulders up the elevator incline to the dump. The elevator is said to handle easily boulders, stumps, roots and logs of any size that can be piped to it.

An operator, writing from a mine which has a supply of water for one giant at a time, fed through a 5-in. nozzle under a gravity head of 190 ft., states that about 56 cu.yd. of material passes over the elevator per hour, or 560 cu.yd. in a 10-hour shift. This includes feeding upon the incline as well as the washing proper. The material contains numerous boulders weighing 2000 lb. and upward. Beds of material from 14 to 30 ft. are worked by this method at a profit. One boulder handled measured 4 ft. 8 in. long, 2 ft. 7 in. wide and 18 in. thick. During one season the volume of material treated measured 450 ft. long by 238 ft. wide and 15 ft. thick To drive this ground over the elevator required 1073 hours.



RUBLE GRAVEL ELEVATOR. ONE GIANT HANDLING BOULDERS, ANOTHER SUPPLYING MATERIAL

Tom Johnson (*Journ.* Chem., Met. and Min. Soc. of South Africa, March, 1908) suggests that the size of a shaft should be regulated not by the amount of ore to be hoisted but by the amount of air required by the number of miners necessary to mine such a tonnage of ore. If the shaft is large enough to furnish the air, it will be ample in size for hoisting the tonnage through it.

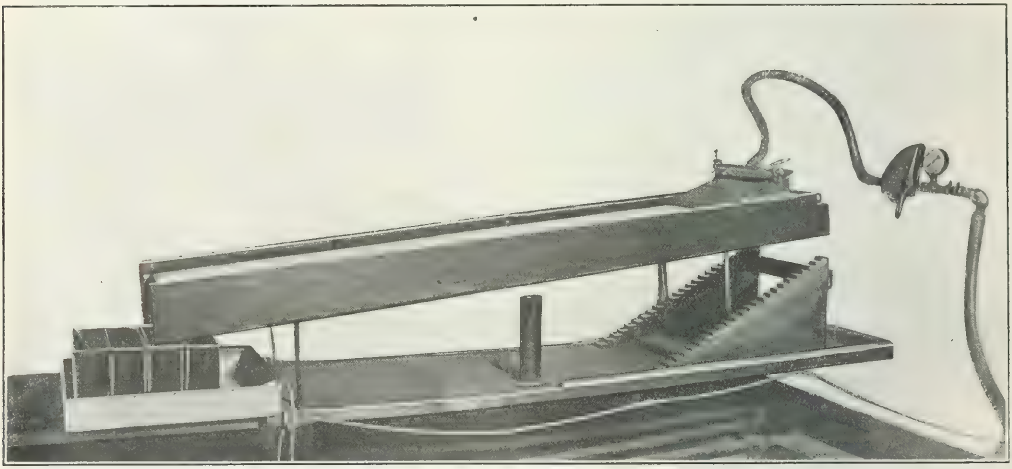


[illegible]

Experimental Work in Ore Concentration *

By John Allen Davis†

The object of this investigation was to obtain data and to determine the proper adjustment of the quantity of water, the amount of slope, and the size of ore grain to secure the greatest efficiency in concentrating a classified product upon a glass table. A classified product is one in which the grains are of different sizes, depending upon differences in specific gravity, the heavier grains being the smaller. Quartz and galena were chosen as the materials for this work because of their wide divergence in specific gravity; and the pure minerals were employed to obviate the difficulty of occluded or included grains. They were crushed separately and mixed, forming an artificial ore. This was fed to a free-settling, hydraulic classifier, and a series of closely sorted products obtained for treatment on the glass table.



THE GLASS TABLE USED IN THE EXPERIMENTS

The glass table is an experimental apparatus devised to reproduce as nearly as possible the conditions which exist upon the round table, a familiar slime-concentrating machine. Although both machines utilize the relative transporting power of a film or thin sheet of water, as it flows over a quiet, inclined surface, to separate the minerals of a sorted product, there is one important difference. The film or sheet of water upon the round table gradually diminishes in thickness from the center to the edge of the table, while on the glass table it remains constant. There are two methods of operating such tables, which may be distinguished as the "racing" and the "departure" methods.

In the previous work upon this subject,[1] the departure method was employed. The ore was allowed to settle upon the glass table, and the lighter mineral was rolled off while the heavier remained behind. The explanation of the action of the table under these conditions is as follows: The grains of higher specific gravity move down the slope slowly or not at all, since, being smaller, they are acted upon only by the slow-moving portion of the water in contact with the table; while the larger grains of lower specific gravity move faster since they project upward into the more rapidly moving water of the free surface. By this means concentration is effected. It was further shown that the presence of waves upon the table was of vital importance, since they struck distinct blows upon the larger grains which projected high enough to receive them. The conclusion was reached that the best results were obtainable with a flat slope, and a small quantity of water. But with such an adjustment the quartz rolls away very slowly, and it is necessary to remove the galena, which remains, by means of a secondary operation. If applied to the round table, these conditions would tend to limit the capacity of the machine, and for this reason it was suggested that some study be made of the racing method.

In the racing method, which was, therefore, employed in this investigation, nothing was allowed to come to rest upon the table. Sufficient water and enough slope were furnished to keep the light and the heavy minerals in motion, with the former, however, traveling the faster. The products fed to the glass table were much more closely sorted than is common in practice, and ranged in size well above and below the usual limits of the feed upon a round table. To secure these products a set of classifier velocities was chosen which began with 200 mm. per sec. and descended in the double-Rittinger ratio in 24 spigots to 3.8 mm. per sec. The average diameters of the grains in these products were computed from a table of settling velocities by Robert H. Richards.

Description of Glass Table Used and Mode of Operating It

The glass table (shown in an accompanying illustration) consisted of a frame which carried a sheet of ground plate glass 6 ft. long and 1 ft. wide. There were two pairs of supports 4 ft. apart, and by means of a movable set of 24 steps of ½ in. altitude each, under the head end, the glass table could be set at any desired slope in intervals of ⅛ in. per foot. At the head of the table was a device for distributing the water and ore uniformly. The supply pipe for the feed-water carried a pressure gage and a dial cock. At the lower end of the table were several tin boxes, sliding in an overflow pan, which were used to collect separately the heads, middlings, and tailings as they came over the end.

The manner of operating the table and of obtaining the experimental data was as follows: (1) A spigot product was chosen. (2) The dial and gage were adjusted to give the lowest quantity of water which would wet the whole table. (3) The lowest step was taken at which the ore would move. (4) The feed was brought to the table in a spatula made to fit the corrugations in the distributing de-

---

*Published with the permission of the Massachusetts Institute of Technology. The author was assisted in the experimental work by John M. McMillin.

†Junior Geologist, U. S. Geological Survey, Washington, D. C.

[1] "Sorting Before Sizing," Robert H. Richards, *Trans.* A. I. M. E., Feb., 1897.

vice and thrust under its jets of water. (5) The conduct of the ore was noted and described as below. (6) the slope was varied, repeating 4 and 5. (7) The quantity of water was increased, repeating at each increase, 3, 4, 5, and 6. Owing to lack of time, it was possible to study but 8 of the 24 spigots. These were spigots numbered 5, 8, 10, 12, 14, 20 and 23.

The conduct of the ore was described as follows: If it settled upon the table so that galena was piled upon the quartz, preventing the latter from separating out, the ore was said to be "banked," *B*. If the ore moved down the table irregularly, fingering out into streams, it was described as "streaked," *S*. If the quartz started down the table ahead of the galena, with a comparatively sharp line of separation, and the overlap of the two (the extent of middlings) was less than 2 ft., it was recorded as "fair," *F*. The term "good," *G*, was used for the best conditions of separation; that is, when the quartz moved down ahead of the galena with a sharp line of boundary and an overlap of less than a foot. If the quartz and galena were washed down the table together so rapidly that no separation was effected, the conditions were described as "hustle," *H*.

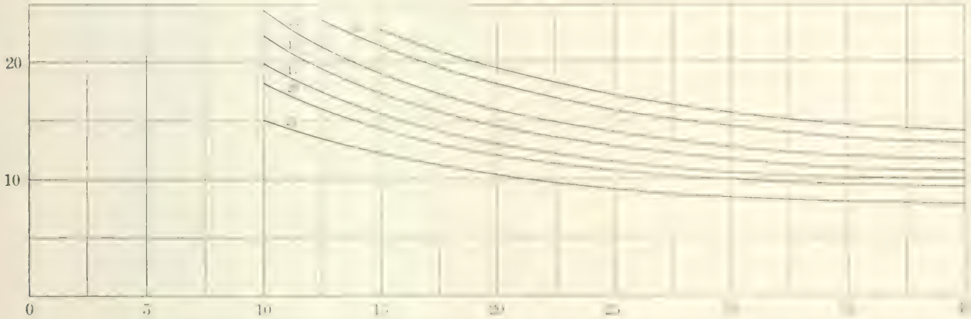


FIG. 1. CURVES SHOWING "G" VALUES, ORDINATES=SLOPE OF TABLE USED; ABSCISSAS=[illegible]

Method of Plotting the Curves

The data for "good" conditions obtained in this manner were represented graphically by means of points, using the slope in steps as ordinates and the amount of water in pounds per minute per foot of width as abscissas. Upon examination of the points thus plotted for each of the spigots studied, it was found that a smooth regular curve could be drawn approximately through all of the points and that the curve deviated from a straight line in a regular manner. This at once suggested that these curves (Fig. 1) might be rectified by one of the various methods.[2] The reciprocal method was applied successfully in this case, and by plotting steps as ordinates and the reciprocals of the water quantity as abscissas, the straight-line plots were obtained, which are shown in Fig. 2. The equations of these lines were derived by analytical method, using the formula

$$\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2},$$

where x_1, y_1 and x_2, y_2 are any two points on the line. The equations were found to be:

Spigot	[illegible]	Equation
[illegible]	[illegible]	$S = [illegible] \left(\frac{1}{W}\right) + 8.8$
10	0.417	$S = [illegible] \left(\frac{1}{W}\right) + 8.1$
12	[illegible]	$S = 176 \left(\frac{1}{W}\right) + 7.1$
14	0.186	$S = 160 \left(\frac{1}{W}\right) + 6.6$
[illegible]	[illegible]	$S = 140 \left(\frac{1}{W}\right) + 6.1$
20	0.113	$S = [illegible] \left(\frac{1}{W}\right) + 5.8$
23	[illegible]	$S = [illegible] \left(\frac{1}{W}\right) + 5.4$

Derivation of Formulas

It will be observed that these equations are in the form

$$S = k\left(\frac{1}{w}\right) + c$$

where *S* is the slope in steps, *w* the pounds of water per minute, and *k* and *c* are two constants. By comparing the various equations it will be seen that both *k* and *c* decrease in value directly with the average diameter of the quartz grain in the different spigots, suggesting that some relation exists between them. In order to determine the nature of such a relation, *k* and *c* were plotted separately against the average diameters, *d*, of the quartz grain for the several spigots, and it was found possible to construct a smooth curve through these points in each case. By plotting values of *k* as ordinates, and the square roots of the reciprocals of the average diameters of the quartz grain as abscissas, the first curve was transformed into a straight line and its equation, computed by the usual method, was found to be

$$k = 275 - 50\sqrt{\frac{1}{d}}$$

In like manner, by plotting as ordinates the logarithmic values of *c*, and as abscissas the logarithmic values of the reciprocals of the diameters of the quartz grains, the equation for the other curve was found to be

$$c = \frac{10}{\sqrt[4]{\frac{1}{d}}}$$

Substituting these values in the general equation noted above, we obtain the equation,

$$S = \frac{275 - 50\sqrt{\frac{1}{d}}}{w} + \frac{10}{\sqrt[4]{\frac{1}{d}}}$$

in which there are three variables, viz: the slope in steps, the amount of water in pounds per minute, and the average diameter of water in pounds per minute, and the average diameter of the quartz grain in millimeters. We have compared values computed from this equation with the corresponding values in our original data and found that the agreement of the two sets of figures was well within the limits of observation, the average difference being [illegible] 0.6 per cent.

It is more convenient to express the slope by some function of its angle, as the sine, for example, for which it is necessary to divide *S* in the above equation by 96, due to the fact that the steps are each ½ in. high and the distance between the supports 48 in. After making this transformation, the equation becomes:

$$Sin\ \theta = \frac{1}{96}\left\{\frac{275 - 50\sqrt{\frac{1}{d}}}{w} + \frac{10}{\sqrt[4]{\frac{1}{d}}}\right\}$$

[illegible] the variables to obtain the best results in [illegible] of this investigation. This law is known to hold true between the limits of 0.56 mm. and 0.08 mm. diameter of quartz grain, and between 10 and 40 lb. of water per minute per foot, and between the angles of 4 deg. 15 min. and 14. deg. 30 minutes.

---

[2] "Notes on Graphical Methods," H. M. Goodwin, Ph. D., Boston, 1904, Wm. [illegible], printer.

Close sorting was used in deriving this equation; that is to say, there was not a great difference between the sizes of the largest and the smallest particles of quartz or galena in any given spigot product. It was found in the experimental work, however, that for any given spigot there was a zone of several steps both above and below the best or *G* values, where the conditions were fair. By referring to Fig. 1 it will be seen that the various *G* lines are not far apart, and that anyone of the curves is well within such a fair zone for one or even two of the spigots above or below. These facts indicate that the sizing was carried much more closely than was necessary, and that several of our spigot products might have been mixed together with almost equally good results. It is probable that in such a case there might be a larger middling product, and that this factor would determine the scale of sizing to be used in actual practice.

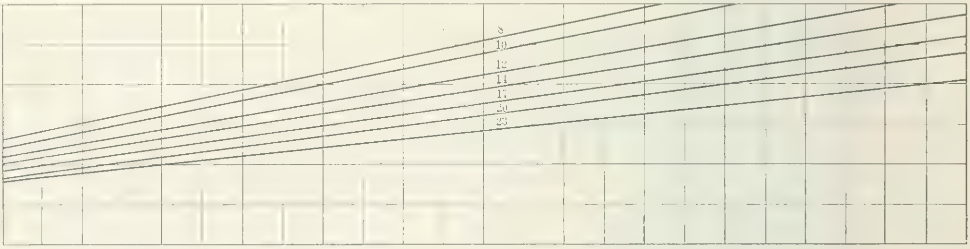


FIG. 2 CURVES SHOWING "G" VALUES. ORDINATES-STEPS; ABSCISSAS-RECIPROCALS OF WATER USED PER MINUTE

Conclusions

The time required for the tailings to be carried off from the table was recorded throughout the experimental work. This data shows upon analysis: That for any given size of ore, the time required is shorter when the larger quantities of water are employed; and that for any given quantity of water, the time is shorter when the larger sizes are being treated. Since it has been shown possible to obtain good results by the use of the larger water quantities, and since the larger water quantities would result in an economy of time, the application of the racing method to the glass table greatly increases its capacity.

In conclusion, we may state: That there is a definite relation, expressed by the law derived above, between the angle of slope, the diameter of the quartz grain, and the quantity of water to be used in the concentration of galena in a quartz gangue by the racing method; that this law may be used to predict the best conditions for such concentration; that the application of these results to the round table would undoubtedly increase its capacity; and that it is possible to treat ores both larger and smaller than the usual sizes fed to the round table. In applying these results, however, it must be understood: That the thickness of the water film upon the round table is not constant as it is upon the glass table; and that the material treated had the maximum divergence in specific gravity and contained no occluded or included grains.

Properties of Certain Silicates

G. Stein (*Sprechsaal*, 1908, XLI, 199–201) prepared a number of silicates by heating together silica and the metallic oxide in a carbon tube placed in an electric carbon-tube furnace. The temperatures reached were measured by a Wanner optical pyrometer, or by means of a thermocouple. Quartz heated alone became viscous at 1600 deg. C. and formed a mobile liquid at 1750 deg. Above this temperature it sublimed readily, probably owing to reduction by carbon, and subsequent oxidation of the volatilized silicon. The sublimate consisted partly of small crystals of tridymite, sp. gr. 2.4. In the following table some of the properties of the silicates prepared are given. The zinc siliçate was made in a porcelain tube instead of a carbon tube:

	M.p.	Specific Gravity. Crystallized.
Metasilicates.	Deg. C.	
$BeSiO_3$	above 2000	2.35
$MgSiO_3$	1565	3.06
$CaSiO_3$	1512	2.92
$FeSiO_3$	1500 1550	3.44
$MnSiO_3$	1470—1500	3.58
$ZnSiO_3$	1479	3.42
$SrSiO_3$	1287	3.91
$BaSiO_3$	1368	3.77
$NiSiO_3$		...
Orthosilicates.		
$2BeO\ SiO_2$	above 2000	2.46
$2MgO + SiO_2$	above 1900	3.2
$2ZnO + SiO_2$	1484	3.7
$2SrO + SiO_2$	1953	3.84

A few double silicates were also prepared, their specific gravities only being given: Na_2O, Al_2O_3, $2SiO_2$, crystalline, 2.50; K_2O, Al_2O_3, $2SiO_2$, crystalline, 2.60; CaO, Al_2O_3, $2SiO_2$, amorphous, 2.81; Li_2O, Al_2O_3, $4SiO_2$, crystalline, 2.42; Na_2O, Al_2O_3, $4SiO_2$, amorphous, 2.43; K_2O, Al_2O_3, $4SiO_2$, amorphous, 2.44. They all begin to sublime at about 1300 deg., and form mobile liquids at 1600 deg. Silicates containing 1 mol. of alumina to 0.3—0.5 mol. of silica were completely liquid at 1900 deg., and solidified to crystalline masses. The silicate, Al_2O_3, SiO_2, gave only one kind of crystals, sp.gr. 3.03.

Amorphous Carborundum

According to G. Chesneau (*Ann. Chim. anal. appl.*, 1908, XIII, 85-89), in the preparation of crystallized carborundum, some of the amorphous modification is always formed. This is now used, either alone, or mixed with clay, for the manufacture of retorts for zinc distilling, etc. When it is examined under the microscope, black specks of carbon can be seen, but the main portion consists of an opaque green mass of the amorphous carborundum; the presence of crystallized carborundum (sharply defined dark blue crystals) and of a silicate of aluminum, iron, calcium and magnesium, of approximately the same composition as anorthite (colorless, translucent, doubly refracting crystals) can also be detected.

West African Gold

Gold production in West Africa—including the Gold Coast and Ashanti—was 25,123 oz. in September, being 72 oz. less than in August. For the nine months ended Sept. 30 the output was 219,362 oz. bullion in 1907, and 224,524 oz. in 1908; an increase of 5162 oz. The bullion reported this year was equal to $4,350,640, or 210,481 oz. fine gold.

On the Rand the ratio of the total number of white men employed underground at the gold mines to the number of natives is one to from 8 to 11.

The Rare Metals I—Beryllium

By Charles Baskerville*

Beryllium, or glucinum, is a relatively rare metal; its minerals, as a rule, occur in granitic rocks.

BERYLLIUM MINERALS

	Beryllia Content
Beryl, beryllium aluminium silicate....	11–15%
Chrysoberyl, beryllium aluminate	20%
Phenacite, beryllium orthosilicate......	44–46%
Leucophanite, a fluo-silicate of beryllium, sodium, calcium..............	10–12%
Euclase, a hydrous beryllium aluminium silicate	17%
Helvite, a thio-silicate of beryllium, iron and manganese	10–11%
Gadolinite, a basic orthosilicate of beryllium, yttrium, etc	[illegible]–11%
Beryllonite, a phosphate of beryllium and sodium	20%
Herderite, a fluo-phosphate of beryllium and calcium	[illegible]
Hambergite, beryllium borate	[illegible]
Bertrandite, a hydrous beryllium silicate	39–[illegible]
Meliphanite, a fluo-silicate of beryllium, calcium and sodium	10–14%
Trimerite, a manganese, calcium and beryllium silicate	16%
Eudidymite, a hydrous sodium beryllium silicate	11%
Danalite, a thio-silicate of beryllium, iron, zinc, manganese...............	14%

The important beryllium minerals are beryl, chrysoberyl, phenacite, danalite, herderite and beryllonite. Many of the varieties of beryl, as emerald, chrysoberyl, aquamarine, are valued as gems, when perfectly colored and crystallized, and are in demand in trade. Beryllium salts are used in the manufacture of incandescent mantles, and in scientific investigations, but there is no serious demand for them.

Beryl

Beryl is an accessory mineral in granite veins in all parts of the earth, especially in those of a pegmatitic character. It is associated with quartz, micas, feldspars, garnet, corundum, zircon and occurs in the United States in New Hampshire, Massachusetts, Maine, Connecticut, Pennsylvania, Virginia, North Carolina, Alabama, Colorado, South Dakota and in other parts of the country in sparing amounts. Many beryls contain alkalies, replacing beryllia, and also some combined water. Beryl is found in hexagonal prisms, from mere threads to several feet in length, but sometimes in large masses, coarse columnar or granular. It is usually some shade of green, but may be light blue, yellow, white, or pale rose-red. It is harder than quartz (7.5-8), and has a specific gravity of 2.6-2.8. Its luster is vitreous and the fracture is conchoidal to uneven. The streak is white.

Before the blowpipe, at a high temperature, beryl fuses on the thin edges, and ultimately a vesicular scoria results. If clear specimens are heated, they become white, clouded and translucent. Beryls containing considerable amounts of alkalies are more fusible than true beryls. Beryl dissolves in borax to a clear glass. Emerald colors the borax bead a fine green, owing to the presence of chromium. It is imperfectly decomposed by microcosmic salt; the cold glass is opalescent, and is green if chromium is present. Beryl is dissolved by soda to a clear, colorless glass. It is insoluble in acids.

Beryl is harder than apatite, tourmaline or quartz; it differs from the latter in its terminal planes. It lacks the distinct cleavage of topaz.

Chrysoberyl

This mineral occurs in green or yellowish tabular crystals; in thicker emerald-green crystals, which are raspberry-red by transmitted light; and in rolled pebbles. It is found at Haddam, Conn.; New Hampshire; Greenfield, N. Y.; and Norway, Stoneham, Stowe, Peru and Stanton, Maine. Chrysoberyl has a hardness of 8.5, and a specific gravity of 3.5-3.84. Its luster is vitreous to greasy, and the streak is white. It is brittle, and the fracture is uneven to conchoidal.

Chrysoberyl is unaltered before the blowpipe; with soda, the surface is rendered dull, but it is otherwise not attacked. It dissolves slowly in borax and salt of phosphorus to a clear glass. The pulverized mineral becomes blue with cobalt solution. It is unattacked by acids.

Alexandrite is an emerald-green variety, which is columbine-red by transmitted light. It is supposed to be colored by chromium, and is valued as a gem. Cat's eye, or cymophane, is a yellowish green, opalescent variety from Ceylon.

Phenacite

Phenacite occurs in colorless, wine-yellow, rose-red, or brown rhombohedral crystals, often lens shaped. It is sometimes found in prismatic forms. It occurs with amazon stone, beryl, quartz, emerald and mica, and is found in Colorado, New Hampshire and Virginia.

Phenacite is a brittle mineral with a conchoidal fracture. Its hardness is 7.5-8, and the specific gravity is 3. The luster is vitreous, and the streak is white.

It is infusible before the blowpipe, and is dissolved with great difficulty by borax unless in a very fine powder, when it dissolves to a clear glass. In the highly saturated glass white flocculent particles are produced by flaming. The pulverized mineral dissolves in salt of phosphorus, leaving a silica skeleton. A milk-white bead is produced with a little soda; with more it swells and becomes infusible. It is rendered dull blue by cobalt solution. Unaffected by acids.

Danalite

This mineral occurs in octahedrons of a flesh-red to gray color in Massachusetts and El Paso county, Colorado. Its hardness is 5.5-6, and the specific gravity is 3.4. It is brittle, and the luster is almost resinous. The streak is similar to the color, but is lighter.

Before the blowpipe danalite fuses readily on the edges to a black enamel. It gives a slight coating of zinc oxide when treated with soda on charcoal. It is decomposed by hydrochloric acid, with evolution of hydrogen sulphide and separation of silica in the gelatinous form

Herderite

Herderite is found at Stoneham, Auburn and Hebron, Maine. Its crystals, which sometimes resemble a low hexagonal pyramid, occur in various shades of yellowish and greenish white. Its hardness is 5, and the specific gravity is 3. The luster is vitreous, and the fracture is subconchoidal

Herderite phosphoresces before the blowpipe with an orange-yellow light; it fuses with difficulty, becoming white and opaque. It gives acid water in the closed tube when strongly heated, and takes a blue color on treatment with cobalt solutions. It is soluble in acids.

Beryllonite

This mineral is found loose in the disintegrated material of a granitic vein at Stoneham, Maine. It occurs in short prismatic to tabular crystals, which are colorless to pale yellow in color and possess a vitreous luster. The hardness is 5.5-6, and the specific gravity is 2.845. Its fracture is conchoidal.

Beryllonite decrepitates somewhat before the blowpipe, and fuses to a slightly colored glass; it colors the flame deep yellow with a green streak on the lower edge. It dissolves slowly in hot acids

---

*Professor of chemistry, College of the City of New York.

Gold Production in India

The mines in the Kolar district, Mysore, India, in September report a total production of 45,155 oz. bullion, which is 381 oz. less than in August, but 571 oz more than in September, 1907. For the nine months ended Sept. 31 the total was 405,779 oz. in 1907, and 408,404 oz. in 1908, an increase of 2625 oz. The bullion reported this year was equal to $7,507,548 or 367,504 oz. fine gold. The reports this year include two mines—the Hutti-Nizam and the Dharwar Reefs—outside the Kolar district proper.

In the Folsom district in California some people are starting an adjunct to bucket and suction dredges in the form of what they call a river-bed safety mining caisson. A large cylinder is dropped to the bed of the stream, down which men may go and get at the pot-holes and crevices in the bedrock. The matter is in an experimental stage at present

---

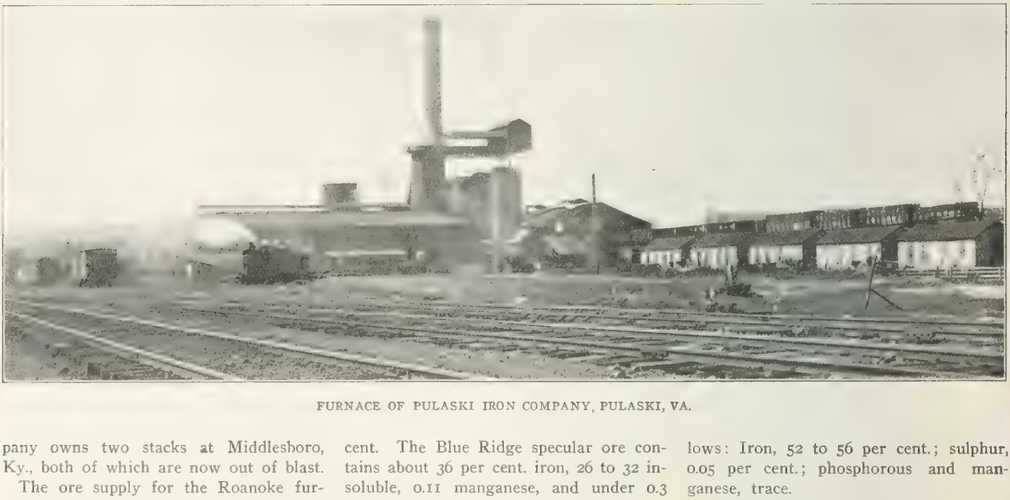
The chief difficulties in the metallurgy of bismuth are the volatility of the metal and the difficulty of dressing the lower

Iron and Zinc in Southwestern Virginia

Editorial Correspondence

The following notes regarding the operations of the Virginia Iron, Coal and Coke Company, with offices at Bristol, Va.-Tenn., will furnish an idea of conditions in the iron industry of southwestern Virginia, this company being the chief operator in the district.

The company has two stacks at Roanoke, Va., one of which is now in blast; one stack at Radford, Va., in blast; one stack at Pulaski, Va., not in blast; one stack at Max Meadows, not in blast; one stack at Bristol, in blast; one stack at Graham, Va., not in blast; one charcoal stack at Foster Falls, Va., in blast; one charcoal stack at Reed Island, Va., in blast. Outside of this district the company owns two stacks at Middlesboro, Ky., both of which are now out of blast.



FURNACE OF PULASKI IRON COMPANY, PULASKI, VA.

The ore supply for the Roanoke furnace comes from the Dewey, Grubb and Edith mines, at Blue Ridge, Va., all of which are now in operation. From time to time a little ore is shipped to this plant from the mines on the Cripple Creek extension of the Norfolk and Western railroad, this ore making a good furnace mixture with the product of the above-mentioned mines.

In the Cripple Creek district the Little Wythe and Eagle mines are both in operation. In this same district, at Speedwell, are the Ganaway, Percival, Andis and Porter mines; at Foster Falls, the Cedar Run, Sanders, Lobdell and Foster Falls mines; at Barren Springs, the Barren Springs mine; at Reed Island, the Hurst, Reed Island and Rich Hill mines. These mines supply the furnaces at Pulaski, Radford, Roanoke (and Max Meadows when in operation), as well as the charcoal furnaces at Foster Falls and Reed Island.

The ore for the Bristol furnace comes from the Yellow Hill and Haskell mines, at Shouns, Tenn. The Flint Knob mine is not in operation. The Middlesboro, Ky., plant when in operation, is supplied with ore from the McGuire mine at Cartersville, Ga., Ducktown, Tenn., Boones Pass, Va., and Cumberland Gap.

For its supply of coke, the company depends upon its coal operations in Wise and Lee counties. Limestone is found in abundance throughout the district and usually close to the furnaces.

About five-eighths of the ore used in the company's furnaces is limonite, the balance being "specular" and "mountain" ore. The limonite will show about the following analysis: Iron, 40 to 44 per cent.; insoluble, 20 to 26; phosphorus, 0.3 to 0.5; manganese, 0.3 to 1 per cent. The brown mountain ore will run about the same, with the exception that the phosphorus varies from 0.9 to 1.25 per cent. The Blue Ridge specular ore contains about 36 per cent. iron, 26 to 32 insoluble, 0.11 manganese, and under 0.3 phosphorus. This specular ore is used in order to keep the manganese in the charge down below 1 per cent.

The company mines its ore chiefly from open cuts, the steam shovel being employed in many cases to great advantage. The ore is trammed to log washers, whence it goes to railroad cars for shipment to the different furnaces.

Pulaski Mining Company

A great deal of interest attaches to the operations of the Pulaski Mining Company, with mines on the Cripple Creek extension of the Norfolk & Western railroad and roasting and sulphuric-acid plant at Pulaski, Va. Here pyrrhotite is being practically dead-roasted, sulphuric acid is being manufactured, and the resulting cinder employed as part of the charge in an iron blast furnace. The details of the process are not known, but the following is an outline of the operations of the company:

The ore is mined from open cuts, steam drills being used, and delivered to the plant at Pulaski at a cost of about 80c. per ton. The ore is first crushed and then conveyed to Herreshoff burners, where it is roasted. The cinder from these burners is taken to a 100-ft. rotary cement kiln and klinkered. Powdered coal is blown into this kiln at the end opposite the feed. The cinder, when fed to the kiln contains from 4 to 7 per cent. sulphur; after going through the klinkering process the sulphur content is reduced to 0.05 per cent.

The raw ore as it comes to the plant has about the following analysis: Sulphur, 27 to 32 per cent.; iron, 45 to 52; calcium and magnesium oxides, 3 per cent.; phosphorus, trace; manganese, trace; moisture, 3 per cent. The product, as it comes from the kiln will analyze about as follows: Iron, 52 to 56 per cent.; sulphur, 0.05 per cent.; phosphorous and manganese, trace.

The gases on leaving the Herreshoff roasters pass through a coke tower, a series of cooling towers made of lead, and finally through a platinum mass, known as a contact mass, into mixing vessels This part of the process is known only to the operators. The acid is stored in tanks just outside of the plant proper and is loaded into tank cars as required. About 75 tons of sulphuric acid and 100 tons of iron cinder are being produced daily. The cinder is sold to the Pulaski Iron Company, the furnace of which is only a short distance away, where it comprises from 1/16 to ⅛ of the ore mixture. The price paid for the cinder is in the neighborhood of 7c. per unit of metallic iron.

The Bertha Mineral Company

With one or two unimportant exceptions, the zinc industry in southwestern

FRONT AND REAR [illegible]

PLANT OF [illegible]

Virginia centers in the operations of the Bertha Mineral Company, of Pulaski, Va. At present the production of the mines and smelter of this company is far below normal.

The Bertha mine, on the Cripple Creek extension of the Norfolk and Western railroad, ceased production in 1898. Parts of the old tailings dump, however, are now being worked over, and, after concentration, used in the furnaces at Pulaski. The Clark mine, situated a few miles beyond Bertha on the same line of railroad, was closed down in 1903. The old Wythe lead and zinc mine [illegible] ville, which was acquired by the Bertha company late in 1902, is producing little ore at present. Here the energies of the company are being directed toward solving the problem of concentrating the "hard ore," a name locally applied to the fine-grained zinc-lead sulphide ore, carried in a limestone gangue. There is quite a little of this ore blocked out in the mine, and it is thought that the mill, with slight modifications, will be able to treat it successfully.

The smelting plant of the Bertha Mineral Company is situated at Pulaski, Va., on the main line of the Norfolk and Western railroad. It consists of 10 furnaces of [illegible] banks of two furnaces each, refining furnaces, power plant, stock house, a plant for the manufacture of retorts and condensers, blacksmith and repair shops, etc.

Since last December, only three of the 10 furnaces have been in operation; these are now making about 3300 lb. of spelter [illegible] ore charge for each furnace is about 6500 lb. of local and Tennessee ores. The effi- [illegible] cent.

Three brands of spelter are produced at this plant: Bertha pure spelter, 99.08 per cent. pure; Old Dominion, containing from 0.2 to 0.5 per cent. lead, and Southern, containing about 1 per cent. lead.

The future plans of the Bertha Mineral Company will have a far-reaching effect on the zinc industry in southwestern Virginia.

The production of borax in the United States is confined almost entirely to Inyo, San Bernardino and Ventura counties, California.

Zirconia as a Refractory Material

According to R. Ricke (*Sprechsaal*, 1908, XLI, 214-215), zirconium usually occurs in the form of the silicate, zircon, but recently there has come into commerce, at Hamburg, a mineral, known as "Brazilian zirconia," which consists mainly of the oxide of zirconium, together with ferric oxide, alumina, and small quantities of titanic acid and thoria, and some free and combined silica. It consists generally of nodular aggregates, with a spherulitic structure, like brown iron [illegible] a specific [illegible] and a grayish-green color, and is often striped, in crevices and hollow spaces, with reddish-brown iron oxide. Owing to the high content of zirconia (90 per cent.) the material is very suitable for the production of extraordinarily refractory crucibles.

If detonator caps, in which the explosive is mercury fulminate, become damp [illegible] phere the power of the explosive becomes diminished and if the fulminate becomes [illegible]

Miami Lead and Zinc District in Oklahoma

The Ore Is Richer Than That of the Joplin District and Much of It Is Heavily Coated and Even Impregnated with Asphaltic Oils

BY OTTO RUHL[*]

The Miami lead and zinc district in Oklahoma is the most recently developed addition to the Missouri-Kansas zincfield. Although ore was discovered only a little more than a year ago, there are in the district seven concentrating mills already in operation. Considerable development work and prospecting is also being done, for 22 companies other than those operating mills are developing lands or leases, and there are from 10 to 12 drills actively prospecting in the district. Four of the companies doing development work are erecting concentrating mills, and these mills will be running by the time that this article is published.

This new district is in the northeastern corner of Oklahoma, three miles north of Miami, a city having a population of 3000. The camp proper is located on a level stretch of prairie, cut into a few gentle depressions by a small, sluggish stream, which is dry except during the rainy weather. The drainage is toward Tar creek, a stream 1½ miles east of the camp. Near the mines a small town has grown up; this is called Hattonville after one of the most prominent mine operators of the camp. The town consists principally of dwelling houses, bunk houses and boarding houses for the accommodations of the rapidly increasing number of men working at the mines. Supplies are hauled by wagon from Miami.

PANORAMA OF MIAMI LEAD AND ZINC DISTRICT

Ore Occurrence

The surface rocks are shales and sandstones of Pennsylvanian age. The first 25 to 35 ft. consists of a yellowish-white clay soil below which comes a layer of well worn, unconsolidated, river gravel, 4 to 6 ft. thick. Beneath the gravel is a soapstone or carbonaceous shale 30 to 35 ft. thick. This shale is impregnated with iron pyrite, and sandstone boulders are found scattered through the beds. Below this shale is a black or dark limestone, which miners term the cap rock. This cap rock is coated and in some cases impregnated with oil and asphalt; in the limestone beds of flint occur. The ore occurs imbedded in this matrix of limestone, shale, flint and asphaltic oil. The oil, however, impregnates most noticeably the ore along the upper layers, close under the cap rock. This cap rock apparently makes a good roof. In the Emma Gordon mine some timbering has been done, and some of the shafts now being opened will have to be timbered when the drifts are widened into stopes, but judging from the present developments little timbering will be required in the mines of the Miami district.

The drilling throughout the field has shown great uniformity in the occurrence of the different formations and their relative thickness. In the mines so far opened the orebodies are in the Pennsylvania formation, and the drilling done indicates that these rocks in considerable part of the district are more than 150 ft. thick. The drilling has not been deep enough throughout the camp as a whole to determine the contact with the underlying Mississippian rocks.

Two ore horizons have been discovered, but only the upper one has been developed and worked. The upper horizon occurs at a depth of from 70 to 110 ft., while the lower horizon, determined only by drilling, occurs at a depth of 160 ft. At present the mines are obtaining their ore from the upper levels. The ore as it is hoisted assays from 15 to 30 per cent. lead and zinc, the lead and zinc being in the ratio of approximately 1 to 5. The ore also carries a heavy percentage of oil and asphalt, together with from 2 to 10 per cent. iron pyrite. The concentrates generally assay from 45 to 56 per cent. zinc, the purity depending entirely upon local conditions in the mine. The concentrates also carry considerable iron, on account of which they are penalized heavily when sold. The operators obtain for the concentrates from $7 to $20 per ton on a basis of $35 to $38 per ton for concentrates containing 60 per cent. zinc.

The lower run, which has been located only by drilling, has been found on at least four leaseholds. In each instance the assays of the cuttings from the drill holes showed a much better grade of ore than that being mined in the upper levels; one sample assayed 62 per cent. zinc. The development of this lower horizon by shafts is awaited with interest by all those operating in the camp.

Little water is found in the mines, and present developments indicate that unless the mines are sunk deeper there will be a scarcity of water for milling purposes. In many of the mines there are no pumps at all, and only a few mines use larger than a 2-in. pump. Several mills in the district store water for milling using the depressions in the old stream beds as reservoirs.

The importance of this new camp may be realized when it is known that the ore-bearing area has already been proved to amount to almost a square mile. Within this square mile the mills are producing per unit of time as large a tonnage of clean concentrates as any mills in the whole zincfield. The mine ore is rich and runs as high as 20 to 30 per cent. zinc blende and from 5 to 10 per cent. lead. Ore of still greater richness has been found, but only in small amounts. With such a large percentage of lead and zinc in the ore, the concentrating devices are all overloaded, and the tonnage of ore treated is low while the output of concentrates per unit of time is large.

---

[*] Joplin, Missouri.

Difficulties in Milling

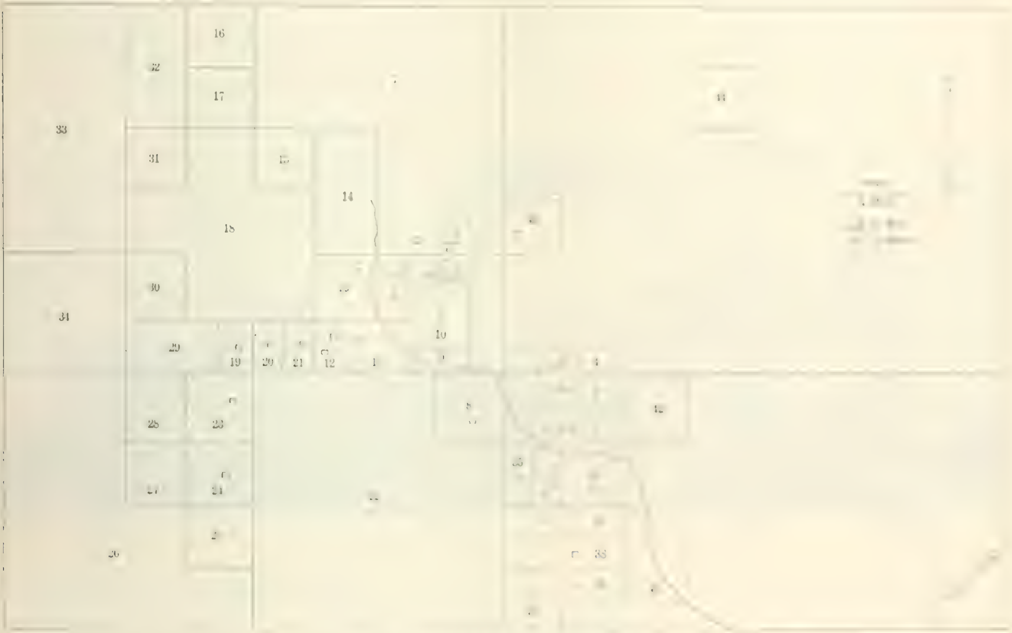
The mills have been designed after those used in the Joplin district, but the concentrating machines have not as yet been entirely adapted to the concentration of these ores. The jigs in the Joplin district are built to handle a large [illegible] of low-grade ore, while in the Miami district a jig adapted to treating a small tonnage of high-grade ore is necessary for good work. The result is that even with the mills making from 15 to 25 tons of clean concentrates per shift the tailings in many instances assay from 5 to 12 per cent. zinc blende, being higher in grade than the average ore in the Joplin mines. The sludge concentrates in a few instances assay as high as 40 per cent. zinc blende.

The losses in concentration are due partly to the peculiar character of the ore, and partly to the fact that the concentrating machinery is not as yet adapted to the ore. The richness of the ore and the fact that much of the ore is coated with asphaltic oils cause a considerable amount of the fine ore to pass over in the overflow, while the chats carry a large portion of the lead and zinc lost. The oil causes loss in concentration not only because, being attached to the ore and lighter than the water, it floats a large portion of the fine ore over into the tailings, but also because, as the asphaltic oils are sticky, it binds the zinc blende and galena to the gangue. The asphalt also causes some trouble in the first cell of the jigs by rolling up into small balls and gumming up the screens. Hot water introduced in the first cell only tends to carry the asphalt over into the second or third cells of the jig and merely transfers the trouble.

The problem of concentration is the one [illegible] the elimination of the oil and asphalt, as well as the iron. Likewise changes must be made in the concentration process so [illegible] mills. The tailings from the mills now running will in every case have to be retreated.

The rich character of the ore combined with the above sources of trouble necessarily limit the capacity of the mills, for in order to obtain a good concentrate the ore has to be passed very slowly through the jigs. Another necessity is a change in the jig's construction making the cells larger and thus allowing a better chance for the settling of the ore upon the screen. A jig differing from the Joplin type has been installed in the district, but extractions obtained while using it are no more satisfactory than with the usual Joplin type.

One company has been experimenting with a roasting process. In this process the oil and asphalt are driven off or burned, and the iron pyrite is partially desulphurized. The ore is then treated in [illegible] will yield concentrates of higher grade and that a better saving can be made. The cost of this process, the increase, if any, in the saving effected, and the increase in the grade of concentrates obtained will determine the applicability of this process to the ore.



[illegible]

1, Emma Gordon; 2, Old Chief; 3, Buckeye; [illegible] 10, Sullivan; 11, Nell; 12, Miami Yankee; [illegible] Luckett; 18, Baxter Royalty Co.; 19, [illegible] 24, Sixty Six; 25, Thompson; 26, Nancy; 27, [illegible] Patton; 32, E. E. Gordon; 33, Riverside; [illegible] Sunny Jim; 39, Banner; 40, Arizona; 41, E. E. Gordon; 42, Campbell; 43, Little Joe; 44, Charles Striker.

The grade of the zinc concentrates is much lower than the average for the entire zincfield, but the greater quantity of lead and zinc in the ore as compared with other camps offsets to a certain degree the quality of the concentrates. The lead concentrates are of good grade and amount to a considerable tonnage.

A feature showing the importance of this new camp is the great number of strikes made in the drilling of the leases. Upon one tract of 200 acres 52 holes have been drilled, every one of which showed ore of unusual richness. Upon the other leases the results have been equally as good. The results from mining development have been quite as uniform as the results of the drilling, and the shafts have all found the orebody indicated by the records of the drill holes. A few shafts have been lost through caving ground and improper management, but none have failed to strike good ore. This remarkable record, the richness of the strikes, and the amount of concentrates obtained from the ore seem exaggerated until one has made a visit to the camp.

EMMA GORDON MILL, THE LARGEST IN THE NEW DISTRICT

Capacity of Some of the Mills

The New State mine was the first mine to produce ore. It shows what can be done in the camp under the worst possible conditions. The mill is equipped with a mere "coffee-mill" plant, a conglomerated mass of machinery that apparently was designed in the earliest age of mining. But that little plant in six weeks, in May and June, although the mill was not running all the time, produced 190 tons of zinc concentrates and 103½ tons of lead concentrates. During that time the mill is estimated never to have handled more than 50 tons of ore a day. The sludge from this plant assays 50 per cent. zinc blende. The company has recently installed concentrating tables for treating this rich sludge. The Old Chief mine has produced 18 tons of zinc and 4 tons of lead concentrates in a single 10-hour shift. This was done without crowding the mill. Even then the tailings contained considerable lead and zinc.

The Emma Gordon mill rated as a 400-ton plant, while operating at half its capacity, from May 15 to June 11, 1908, produced 440 tons of zinc concentrates and 90 tons of lead concentrates. The other producing mills in the district have similar records. Few of the mines have yet developed their ground sufficiently to insure steady operation at full capacity. It is also true that the mills are all new and unadapted to the separation of this class of ore, yet the record of production is an enviable one.

Most of the land in the new camp is under first lease to the Miami Royalty Company. This company, through the activity of its members soon after the first strike was made, secured leases on about 8000 acres in the very heart of the new district. All the present companies doing development work either lease their properties from this corporation or operate adjoining lands. Leases may be had for a royalty of from 15 to 30 per cent., but the majority of the leases are second leases and pay 30 per cent. Most of the first leases were secured for a royalty of 5 per cent.

The royalties are abnormally high, and there has been considerable dissatisfaction among the developing companies since metal prices have been so low. Were the ores less rich, they could not be mined at a profit and the development would necessarily lag. A few of the developing companies have secured reductions in their royalties, and it is very likely that other companies will also secure reductions. The fact that the mines can pay such high royalties indicates the possibilities of the Miami district.

The most usual wet process for the extraction of bismuth is to dissolve in hydrochloric acid and precipitate either by iron or by diluting with water.

Zinc Smelting at Port Pirie

According to the last semi-annual report of the Broken Hill Proprietary Company, the experimental zinc-distillation furnace at Port Pirie was put in operation May 16, 1908. This furnace has 144 retorts, 72 per side in three rows of 24 each. It is fired with gas from a Schmidt & Desgraz producer. The furnace is of the Rhenish type. The secondary air is supplied by a fan and is preheated to about 800 deg. C. in passing through a flue between those which convey away the hot waste gases. The waste gases pass through a steam boiler which generates sufficient steam to run the fan and producer. The furnace is expected to treat 5½ tons (2240 lb.) of ore per day.

The directors of the company have authorized the building of nine more furnaces, at a further cost of about £81,000, about £19,000 having been already expended in the erection of the first furnace and experimental work. It is expected that the new furnaces will be ready in January, 1910, and will be producing spelter in July, 1910. The production of the 10 furnaces is estimated at 8000 tons of spelter per annum, for all of which a market is available in Australia and the East. With spelter at £20 per ton, it is reckoned that a satisfactory return will be secured. No difficulty is anticipated in securing suitable clay in Australia, but in the recent experimental work clay has been imported from Belgium.

A plant to produce 8000 tons of spelter per annum from this ore corresponds approximately to 25,000 tons of ore per annum. At the estimated cost of £9000 per furnace—which includes the requisite accessories—the estimated cost is a little less than $15.70 per short ton of annual capacity.

The Oriental Consolidated Company, Korea, in 1907 netted $1.58 on gold ore averaging $4.24 per ton.

October Dividends

The accompanying table shows the dividends paid by mining and industrial companies in the United States during the month of October, 1908. The table also includes the dividends paid by some foreign mining companies.

OCTOBER DIVIDENDS.

U. S. Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Alaska Mexican..	Alas.	$0.40	$72,000
Alaska Treadwell.	Alas.	0.75	150,000
Alaska United...	Alas.	0.25	45,050
Arizona, pfd.....	Ariz.	[illegible]	[illegible]
Am. Smg. and Ref. com......	U. S.	1.00	500,000
Am. Smg. and Ref. pfd	U. S.	1.75	875,000
Anaconda	Mont.	0.50	600,000
Bunker Hill & Sull..........	Ida.	0.25	75,000
Continental Zinc.	Mo.	0.25	5,500
Copper Range Con	Mich	1.00	384,185
Elkton Con......	Colo	0.01½	37,499
Hecla	Ida	[illegible]	[illegible]
Homestake	S. Dak	0.50	[illegible]
Jamison	Cal	[illegible]	[illegible]
Kendall	Mont	[illegible]	[illegible]
New Idria	Cal	0.30	[illegible]
Oroville	Cal	[illegible]	[illegible]
Portland........	Colo.	0.04	120,000
Puritan.........	Utah	0.01½	[illegible]
Silver King Co'l'n	Utah	0.15	183,661
Sioux Con	Utah	0.03	22,500
Snowstorm	Ida.	0.03	45,000
Tonopah of Nev..	Nev.	0.25	250,000
Uncle Sam	Utah	0.05	25,000
United States com	Utah	0.50	175,467
United States pfd...........	Utah	0.87½	425,114
Utah Con	Utah	0.50	150,000
Vindicator......	Colo.	0.03	45,000
Wolverine	Mich.	[illegible]	300,000
Total.........			[illegible]

U. S. Industrials.	Location	Amt. per Share	Amt. Paid
Am. Ag. Chem. pfd	U. S.	$3.00	[illegible]
Consolidation Coal	Md	1.50	153,750
Gen. Chem. pfd..	U. S.	1.50	150,000
National Lead, com	N. Y.	1.25	[illegible]
Penn. Salt Mfg...	Pa.	3.00	180,000
Pocahontas Coll. com..........	W. Va.	3.00	135,600
Sloss-Sheff., pfd...........	Ala.	1.75	117,250
United Metals Selling........	U. S.	5.00	250,000
Va. Car. Chem., pfd...........	U. S.	2.00	360,000
Westmoreland Coal..........	Pa.	2.50	150,000
Total			[illegible]

Foreign Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Buffalo	Ontario	$0.03	$27,000
Costa Rica Esperanza	C. A.	0.62½	62,500
Dom. Coal com..	N. S.	1.00	150,000
Dos Estrellas....	Mex.	0.75	225,000
Esperanza	Mex.	0.87½	[illegible]
Guggenheim Expl	U. S.	2.50	2,625,000
Kerr Lake	Ontario	0.15	90,000
La Rose Con....	Ontario	0.15	168,750
Mines Co. of Am	Mex.	0.02	10,000
N. Y. Hond. Rosario	C. A.	0.10	[illegible]
Nipissing	Ontario	0.15	180,000
N. S. Steel & Coal pfd	N. S.	2.00	20,600
Pinguico, pfd....	Mex.	3.00	60,000
San Carlos	Mex.	0.02	8,000
San Francisco...	Mex	1.00	6,000
Sta. Maria de la Paz	Mex	2.50	24,000
Temiskaming....	Ontario	0.03	75,000
Total			[illegible]

Chronology of Mining for October

Oct. 1—The director of the U. S. Mint announced the resumption of the purchase of about $125,000 worth of silver per week.

Oct. 4—Judge Knappen, of the U. S. Court at Grand Rapids, Mich., decides that [illegible] to vote its stock in the Osceola company, a right disputed by A. S. Bigelow.

Oct. 9—The Algoma Steel Company awarded a contract for 150,000 tons of coke to the Pocahontas Coke Company, Limited.

Oct. 10—Flurry in copper abroad due to the Balkan war scare.

Oct. 14—Portion of Bisbee, Ariz., destroyed by fire. Fire in the König coal mine, Königshutte, Siberia, destroyed a number of lives and much property.

Oct. 15—Article 144 of proposed new Mexican mining law, commonly described as the anti-foreign law, is decisively beaten. Amalgamated Copper Company declared a quarterly dividend of 50c. per share.

Oct. 16—Balaklala smelter, Shasta county, California, began operations. Details of the reorganization of the North Butte Extension company announced.

Oct. 19—U. S. Smelting, Mining and Refining Company purchased control of the Bullion Beck & Champion Company.

Oct. 24—Receiver appointed for the Greene Gold-Silver Company found practically no assets.

Oct. 27—The quarterly statement of the U. S. Steel Corporation showed a gain of nearly $7,000,000 in net earnings as compared with that of the last preceding [illegible]

Oct. 30—The price of silver dropped to 50c., a new low-record mark for the [illegible]

New Zealand Gold

Gold exports from New Zealand in July are reported by the Mines Department at 42,220 oz. bullion. For the seven months ended July 31 the total was 279,836 oz. bullion in 1907 and 297,037 oz. in 1908; an increase of 17,201 oz. The bullion reported this year was equal to $5,720,880, or 276,772 oz. fine gold.

Silver exports in July were 116,741 oz. in 1907, and 119,492 oz. in 1908; an increase of 2751 oz. The greater portion of the silver was obtained from the gold mines in the Ohinemuri district.

The two deepest shafts on the Rand ([illegible]. 1908) are the Jupiter, 4232.5 ft. deep, and the Cinderella Deep, 4200 ft. deep.

The Broken Hill Proprietary Company is going to install a baghouse in connection with its smeltery at Port Pirie.

A Curious Conflict of Rights

[illegible]

[illegible] appeal before the United States Circuit Court in San Francisco between the California Development Company and the New Liverpool Salt Company, which has some odd features. The salt company [illegible] annually from the low point at Salton in the Colorado desert, San Diego county, where they pumped salt water from wells and let it evaporate in that dry region. Then came the overflow of the Salton Sea, which wiped out the salt industry entirely, and left 20 ft. of water or more over the site of the old plant. The Circuit Court for Southern California awarded the salt company $500,000 damages against the Development company and granted a permanent injunction restraining that company from using the water of the Colorado river in such a way that it would add to the water already accumulated in the Salton sea. After this injunction the Development company is alleged to have continued using the water in its irrigating canals and further damaging the Salt company's property, so contempt proceedings were brought. From the original judgment and the contempt proceedings the Development company appealed, and this is now under advisement by the Appeals Court judges.

Tasmanian Production

The Mines Department of Tasmania makes the following report of production for the quarter ended June 30, 1908:

	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total value.....		£365,700

The gold production came from the following sources: 8581 oz. of gold from quartz; 235 oz. from alluvial; 2343 oz. by means of the cyanide and chlorination processes; 4308 oz. from blister copper from the Mount Lyell Mining and Railway Company; 144 oz. from the silver-lead bullion from the Tasmanian Smelting Company's works, Zeehan

---

[illegible] tained from tube mills.

The Araluen district is the chief gold-dredging center in New South Wales; [illegible]

Colliery Notes

In Europe, coal is being mined at a depth of 3773 ft., and operations at 4000 ft. are contemplated.

In deep mines, the services of a geologist are almost indispensable as the very foundation of the theory of deep mining, must begin with geology.

Heavy outbursts of gas are generally preceded by poundings, which warning sounds sometimes continue for several days before the outburst occurs.

The difference in the composition of the various fuels is due more to the extent of the metamorphic action to which they have been subjected than to age.

A good engineer always keeps his outgoing rope just taut, so on coming to a down grade, there will be no danger of the trip overrunning the haulage rope.

A gaseous coal seam is more easily worked than a bed in which no gas is found. Coal containing gas is generally more brittle, and as a consequence more susceptible to the pick.

More than 100,000 tons of cement rock and limestone was loosened by a tremendous blast in a cement quarry at Bath, Pennsylvania. The shock was felt 15 miles away.

The bituminous coal trade of the United States during the year 1907 attained a volume, which, if solid, would cover an area as large as Central Park, New York, and would be 300 ft. high.

The longest wire rope carrier in the world is being installed at Samarkand, in Turkestan, to bring coal from the mines which are located 80 miles from the city. The cable will be 54 miles long.

An ordinary briquet machine, similar to those used in Europe, is capable of turning out from 100 to 250 tons of briquets per day. The briquets vary in size from 2 lb. for domestic purposes, up to 22 lb. for marine purposes.

The sanitary arrangements of Austrian coal mines possess features that ought to recommend themselves to American mine owners. Portable sanitary closets must be provided for every 50 men. Baths are also provided on the surface.

Investigations have shown that gas travels more or less in currents or streams, which result is caused by the incomplete mixing of the gas and air. In making laboratory tests it is sometimes difficult to maintain a uniform mixture of the gas on this account.

The roof of a coal seam is often made heavy and dangerous because of the gases contained in the overlying strata. This trouble can be largely remedied by putting up bore holes in the roof at intervals along the heading and chambers, and in this way draining off the occluded gases.

Tests have shown conclusively that briquetting increases the commercial value of low-grade bituminous and lignite coals far beyond the cost of manufacture; it also increases the efficiency of the higher grades of bituminous coals so that they may be used in locomotives with more efficiency and less smoke.

Starch mixed with lime is found to be a good means of binding, in the manufacture of briquets; this system causes a rather large percentage of ash to remain after burning, but the heat generated is high, the smoke given off is small, and the cost is considerably less than when briquets are formed with pitch.

Normally fresh air contains about 20.9 per cent. of oxygen; when the oxygen falls to 20.5 per cent., the air is very bad. Recent investigations in a number of coal mines have shown the surprising fact, that in many instances, the air at the working faces has contained only from 20.2 per cent. to 20.3 per cent. oxygen.

When blasting coal, the "charge limit" of each explosive used should be carefully determined, and only this maximum charge should be allowed, as experiments have proved that all explosives have a certain fixed maximum weight which usually fails to produce an explosion when fired in an explosive atmosphere.

Many mining men erroneously regard peat as coal "in the making;" true coal owes its origin neither to peat bogs nor to forest trees, but to forests of cryptogamic plants. It has been estimated that some of the peat bogs in Great Britain have increased in vertical thickness by from 3 to 5 ft. in the past 2000 years.

The Rand-Victoria bore-hole which was put down south of the "Jack" gold mine in the Transvaal, reached a total depth of 2500 ft. Another bore-hole put down near the Charlton gold mine in the Transvaal struck a depth of 3500 ft. Two other bore-holes near Johannesburg each reached a total depth of nearly 5000 ft. All these holes were bored by the diamond drill.

All mine gases, with the possible exception of black damp (CO_2), when once absorbed by the air currents, are carried out of the mine; black damp requires a strong air current for its removal, and exhibits a tendency to settle gradually to the lower parts of the mine. Other mine gases are usually found at the point where they are generated, or issue from the strata.

When approaching a fault, it is generally best to anticipate a change in the condition of a mine; at such time, the miner should use extra precautions. Gas usually follows a fault because such a fracture is generally the line of least resistance. The miner may lose the gas after passing through a fault, or it may occur that fresh gas will be found on the other side.

Shrinkage of coal in transit can be easily detected if the tops of the loaded cars are sprayed with whitewash. All cars should be examined by the connecting lines when received and if the spraying is disturbed, the fact should be reported; in this way the place where the shrinkage occurred can be determined. If all handlers report on the condition of the cars it will be an easy matter to locate the leak.

During a squeeze, all standing timber in the waste should be withdrawn and all pillars that can be safely worked should be robbed out in order that a fall of roof may be brought about, and the entry pillars thus relieved. The roof over entry pillars should be broken by shots placed in the mouth of abandoned workings. Reinforce the pillars along the roadway by setting timbers and building cogs wherever possible. If these precautions are taken, it is often possible to control a squeeze. An undue increase of water through leakage from the overlying strata is often a forerunner of a squeeze.

One of the most delicate tests for the determination of carbon monoxide is to add three large drops of blood, drawn by pricking the finger, to a fluid ounce of water, making a yellowish solution. The solution is then placed in a test tube provided with a long and a short glass tube passing through the cork at the top. The air to be tested is drawn through the long tube and bubbles up through the liquid passing out the short tube. If the air contains but 0.01 per cent. of carbon monoxide, the gas will impart a pink hue to the liquid.

Fourteen months were occupied by a Sullivan drill, working 24 hours each day, in putting down a 5560-ft. hole at Doorkloof, Transvaal. For the first 700 ft. a 2-in. core was extracted; the total weight of the rods was between 15 and 16 tons, and they were hoisted in 50-ft. lengths, a 66-ft. tubular steel derrick being used for the purpose. Toward the final depth, from 7 to 10 hours were consumed in raising and lowering the rod. The cost of this drill and its entire equipment, including the boiler, etc., was $8,542.90.

A drill boring a 2-in. diameter hole (core 1⅜ in.) will require, when boring at about 600-ft. depth, 2¾ horsepower.

Any attempt to improve the foreign miner must begin outside the mine and deal directly with his habits of drink and his lack of appreciation of the American standards of truthfulness. He should also be taught the State mining laws and the fact that they are a benefit and a protection to him. Each man should be supplied with a pocket copy of the State mine laws and the rules and regulations of the mine in which he is employed. The law ought to demand of the inexperienced non-English speaking applicant for mine work, a term of apprenticeship under an experienced miner instead of leaving him, as is now done, to the tender mercy of some fellow countryman a degree less ignorant.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl St., New York
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, [illegible] of 52 numbers, including postage [illegible] States, Mexico, Cuba, Porto Rico, Hawaii [illegible] Philippines, [illegible] Canada.

To foreign Countries, including postage, [illegible] its equivalent, 33 [illegible].

Notice to discontinue [illegible] York office [illegible].

Advertising copy [illegible] New York [illegible] by Thursday, a week [illegible].

For sale by all newsdealers generally.

Entered at New York Post Office [illegible] the [illegible].

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1908, was 52,800 copies.

Nov. 7 12,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
The Proposed Mining Bureau. 915
Prospecting on the Government Reserves. 915
The Anthracite Combination 916
Panic and Gold Reserves. 916
***Advanced Methods of Mining Coal in Silesia** ...... *Lucius W. Mayer* 887
Nitric Acid from Air 892
Metallurgy of Broken Hill, New South Wales........ *Gerard W. Williams* 893
Rio Tinto Half Year.. 897
***Regenerative Reverberatory Copper Furnace** .... *Fred A. Lees* 898
Estimation of High Temperatures in Works Operations.......... 900
Metal and Mineral Production of Ontario 900
***Notes** on Air Agitation *Mark R. Lamb* 901
***The** Ruble Boulder and Gravel Elevator 902
***Experimental** Work in Ore Concentration... .. *John Allen Davis* 904
Properties of Certain Silicates 906
Amorphous Carborundum 906
West African Gold. 906
The Rare Metals. Beryllium *Charles Baskerville* 907
Gold Production in India. 907
***Iron** and Zinc in Southwestern Virginia *Editorial Correspondence* 908
Zirconia as a Refractory Material 909
***Miami Lead and Zinc District in Oklahoma**....................*Otto Ruhl* 910
Zinc Smelting at Port Pirie. 912
October Dividends. 913
Chronology of Mining for October...... 913
New Zealand Gold.. 913
Curious Conflict of Rights............. 913
Tasmania Production 913
Colliery Notes 914
Correspondence:
Sampling by Machine. *T. R. Woodbridge* 917
Loading Blast Holes. 918
Questions and Answers 919
New Publications 920
Personals, Obituaries, Societies and Technical Schools. 921
Special Correspondence... 922
Mining News.............................. 923
Markets, etc. 924
Chemicals, Minerals, Rare Earths, etc... 935
Mining Index..... 936
**Illustrated*

The Proposed Mining Bureau

We expect that the bill creating a bureau of mines, which we discussed extensively last spring, will pass in the early days of the coming session of Congress, it having been passed by the House before the adjournment. We do not approve the bill as it now stands and hope that the Senate will amend it. We believe that it will be a good thing to take the technologic work away from the Geological Survey and leave the latter more free to attend to geology. We do not conceive it to be a proper function of a government to engage in technologic investigations, particularly when there is an old and well organized profession to do such work, but we admit that there are certain lines of investigation, such as the prevention of mine accidents, which a Government bureau may follow usefully, inasmuch as although it may not discover anything that the profession does not already know and cannot put into effect (outside of the Territories) any regulations that it considers wise, nevertheless there is a prestige connected with a Government report that may lead to action by the States more quickly than private recommendations, especially if the official program is aided by a prodding from the press. Such objections as we have previously raised against this policy are to a large extent removed by what has already been done by the Technologic Branch of the Geological Survey, under the active and enlightened administration of Doctor Holmes, which has availed itself of the services of outside experts, who have brought to it the knowledge of long, practical experience rather than that of the study and college class room.

Our present objection to the proposed mining bureau is the breadth of the bill by which it is to be created. Such a law should be sufficiently broad to enable the organization to grow freely within the limits intended, but what is intended should be specifically laid down and not be left by a lazy or careless Congress to the subsequent determination of the bureau itself. We are quite sure that those who have been active in formulating the pending legislation have nothing but laudable purposes in mind, but it is necessary to think of their successors. Everyone knows how insidious is a bureau at Washington; how ambitious become its members to pick flowers in new fields; how a desk once installed can never be removed and how work must be found for the organization that cannot be dismissed; how appropriations may be wheedled out of a log-rolling and extravagant Congress.

The bill now pending in Congress will permit the mining bureau to do almost anything that it wants to, subject only to existing laws. Its capacity for meddling with the mining industry will be almost unlimited. Some persons seem to be desirous of such meddling right away. Thus we hear from the Pacific coast that the mining bureau is wanted to take a hand in the land troubles of California and Nevada; others hope that it will exterminate fraudulent mining promotions. We are not saying that there are no evils in both those matters, but we fear that the entrance of a bureaucratic regime into such questions would be soon regretted by those who invoked it. The experience of the mining men in the West with the Forest and Reclamation services ought to make them shoo away the agents of another bureaucracy.

We think that the bill ought to be rephrased so as to limit the scope of the mining bureau to the lines of scientific investigation that will aid the mining industry and not allow it at any future time to enter upon activities that may vex and harm legitimate private interests. Also we should like to see something incorporated in the law to the effect that the chief of the bureau is authorized and expected to employ engineers, or commissions of engineers, from private life, exempt from all civil service rules, thus duplicating the efficient policy introduced by Doctor Haanel in the Canadian bureau of mines, which, as we previously remarked, has already been adopted to some extent by Doctor Holmes in this country.

Prospecting on the Government Reserves

We have previously called attention to the complaints in the West respecting the administration of the national forest reserves, and several months ago there was a discussion of this matter by contributors to our pages. The chief grievance is the obstacles raised against prospecting on these lands. It was not intended by Congress in passing these laws that prospecting should be prevented in any way, and we believe the recent statement of Mr. Pinchot, the chief forester, that no such thing has been contemplated in his administration of the Forest Service, but nevertheless, it appears that mining interests have been injured by the proceedings of his agents in ways that evidently have not heretofore come to his attention, although they have been discussed in our columns and others.

The chief grievance pertains to the location of mining claims. According to the law of the land no location is valid unless a discovery has been made. This is one of the antiquated laws remaining on our statute books, and for many years has been conceded to be so irrational that by common consent it has been disregarded. Twenty-five to thirty years ago there was more or less pretense of making a "discovery"—specimens that will assay traces of gold and silver may be found in many places—but it is long since anyone has taken even that trouble, and the breach of the law has been connived at by the Department of the Interior. Otherwise, how could claims be allowed upon deep leads, for which the prospector must have some unassailable possessory right before spending the large amount of money to open the channel of auriferous gravel that has no surface showing to be discovered?

However, the field agents of the Forest Service seem to have revived this ancient law, which is about as applicable to modern conditions as one of the blue laws of Connecticut, and to have been construing it literally; indeed, in some cases they are said to have put a construction of their own upon it. Thus, one of these young men may find a prospector on the forest reserve. "What are you doing here?" says he. "Prospecting," says the miner. "Where is your discovery?" says the forester. "Here," says the miner. "But that's not pay ore," replies the forester, "and you have no right to stake a claim on this reserve. Get out!" Now we will admit that there is nothing to bring more joy to the prospector's heart than a discovery that will pay from the grass roots down, but where would have been Butte, Ely, Globe, and many of our big mining camps if the adventurers had been given no opportunity to dig through the zone of surface impoverishment? Of course, everyone knows that the Forest Service itself cannot legally eject prospectors from its reserves, and does not claim to exercise that right, but it can so interfere through another bureau of the Department of the Interior that the effect is the same, and this is the complaint rather than the charge of usurpation by the foresters.

The creation of the forest reserves was a wise thing which nowhere meets with warmer approval than in the West, and their administration under Mr. Pinchot has been intelligent and energetic. We are quite sure that since the complaints, which after all are comparatively few, have been forced to his own attention, such impediments to mining as have been developed in connection with mineral locations, the utilization of timber for mining purposes, etc., will be promptly removed, wherefore our Western constituents need not be unduly excited. However, it must be pointed out that the chief of a great organization cannot always guard against misplaced zeal on the part of his subordinates, and cannot select the latter from the ranks of experienced engineers who are able to command much higher salaries in private life. The troubles which the mining industry has had from the Forest and Reclamation services are simply a taste of what is always to be expected from bureaucratic administrations.

The Anthracite "Combination"

The taking of testimony in the Government suit against the alleged anthracite coal combination has been in progress in New York for two weeks past. Little progress has been made so far, and nothing has been brought out which was not already known. The fact is, that while the anthracite trade is more nearly unified and more closely controlled than any other great producing trade in this country, it is so by virtue of common ownership in different companies, and by tacit understanding. There is not—and probably never has been—any formal combination. No agreement exists which the law can prove or touch, because no proof can be obtained which will stand in court. The fact that certain prices are maintained by all the companies may be ground for a suspicion of combination, but is not legal proof.

In all probability the Government case will fail in court. This will not prevent the anthracite companies from acting as a unit, however, when any emergency arises. The practical unification of the trade which began when the Morgan interests obtained control of the Reading, is too strong to be broken.

Panic and Gold Reserves

It is now about a year since the panic of 1907 started. One of the results of such a commercial upheaval, after its first force is spent, is always an accumulation of money in the banks and depositaries; and this has been the case in the present instance. If we take the gold reserves reported by the large banks of Europe on Oct. 25, 1907, and add to them the specie reserve of the associated banks of New York, the total is $2,266,446,855. On Oct. 24, 1908, the total was $2,559,496,960; an increase of $293,050,105, or 12.9 per cent. The accumulation, as might have been expected, was greatest in this country, where the depression has been most severely felt; the New York banks showing an increase in specie during the year of $109,864,200, or 55.9 per cent.; while the increase in gold in European banks was $183,185,905, or 8.9 per cent.

It may be added that most of the European banks carry considerable amounts of silver coin in their reserves, especially the banks of Spain, France and Holland. The total of these reserves increased from $518,430,000 a year ago to $572,034,000 last week; a gain of $53,604,000, or 10.3 per cent. This makes a total increase of $346,654,000 during the year in the metallic reserves of the principal commercial nations.

A SUBJECT OF GREAT interest to prospectors and miners is the utilization of the rare minerals and metals, for which during recent years an important market has developed. This has led to the production in the United States of a large quantity of tungsten ore, while the minerals containing molybdenum, vanadium, uranium, tantalum, and other rare elements find a regular market. We receive from prospectors many inquiries as to the identification of these rare minerals, their uses, market value, etc. We are gratified, therefore, to be able to present a series of articles on this subject by Prof. Charles Baskerville, of the College of the City of New York, who is a recognized expert in this field and is famous as the discoverer of the elements carolinium and berzelium. In the present issue, Professor Baskerville treats of beryllium. His series of articles will continue in subsequent issues, each one taking up a special element.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sampling by Machine

I have read with interest the various articles in the recent issues of the JOURNAL following John. A. Church's description and criticism of the sampling department of the Great Cobar mill. If not too late I should like to join in the discussion and help to counteract the impression given by some of his statements that mechanical sampling is in a chaotic state and is operated on a fundamentally wrong basis.

If I have correctly understood these statements and the arguments in support of them Mr. Church has not sustained the charge of inaccuracy of modern sampling methods, and, as suggested by Mr. Mathewson, I think he would not have taken this position if he had had access to the results of tests which every uptodate sampling company is constantly making The public sampling works, having to maintain a standard different from that of mills directly connected with a smelter or reduction plant, make a business of hunting down causes for differences which may appear through the daily comparisons of their work which they are constantly receiving, and I know of at least one instance where the matters brought up in the articles referred to were considered and in part acted upon several years ago.

RETARDATION OF COARSE ORE

Mr. Church lays great stress on the possible unreliability and inaccuracy of mechanical systems of sampling due to the retardation of the coarse ore at one stage of the process, and to the retardation of the fines at later stages. I believe this danger is wholly imaginary, and contrary to sampling experience. I will grant that in the days of hand sampling (not entirely gone, unfortunately), the separation of the coarse and fines was a serious matter; and to those who still put faith in those systems as the final arbiters, the realization of how well this troublesome question has been eliminated by the correctly built mechanical sampler is most difficult; but with these present systems I cannot see why fine and coarse particles of ore which reach the crusher at the same time have any brotherhood, nor why they should continue on their tumultuous course together. As a matter of fact the best practice in mechanical sampling exaggerates this separation or retardation at the start by passing the ore on its way to the crusher over a perforated shaking tray or grizzly, taking the finer portion directly to the elevator or sampling machine far ahead of the coarse portion which halts awhile on its way through the crusher.

In Cripple Creek the Taylor & Brunton Company did not crush the ore as fine as was the general sampler custom before taking out the first sample cut, and I believe the Metallic Extraction Company, under Mr. Argall's management was the only large reduction mill which had adopted this plan. It is not necessary now to go into the proof of the accuracy of this system, but in order to convince some of our skeptical shippers that the first cut on a large lot could be accurately taken on ore crushed to 1½ or 2 in., it was our custom, when so requested, to sample an ore first in our ordinary coarse-crushing method, and immediately then after resample the entire lot after crushing to ½ in. In the different samplings the retardation was entirely different, yet it was a most rare occurrence that the two samples did not agree well within the accepted assaying limits, a condition which could not exist except accidentally had this retardation been a factor affecting the accuracy of the work.

INDIVIDUAL LOTS AS ORIGINALLY SAMPLED

Gross Weight, Lb.	Dry Weight, Lb.	Gold, Oz.	Silver, Oz.	Lead, Per Cent	Insol., Per Cent.	Iron, Per Cent	Sulphur Per Cent	Zinc, Per Cent	Copper Per Cent
		Assay and Analysis							
3,095	3,079	0.00	3.8	53.0	28.0	1.0	[illegible]	0.0	0.0
1,387	[illegible]	[illegible]	88.7	[illegible]	32.0	11.0	0.0	0.0	0.0
1,410	1,400	1.44	312.0	4.0	22.0	34.0	21.0	2.0	0.0
31,420	[illegible]	0.01	8.0	14.0	48.0	6.0	2.0	10.0	[illegible]
[illegible]	19,928	0.01	7.8	13.0	49.0	7.0	2.0	10.0	0.0
[illegible]	8,114	0.15	7.3	[illegible]	15.0	[illegible]	4.0	2.0	0.0
1,310	1,294	[illegible]	19.0	[illegible]	43.0	[illegible]	2.0	2.0	1.25
1,800	1,778	0.04	28.3	[illegible]	79.0	4.0	2.0	0.0	1.35
12,580	12,378	[illegible]	21.0	18.0	27.0	4.0	9.0	0.0	[illegible]
[illegible]	80,250	0.295	17.0	22.8	40.8	6.3	3.8	6.5	0.31
		As Sampled Together.							
First Sample		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Second Sample		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	80,154	0.325	[illegible]	22.7	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

Speaking of the application of shaking-tray feed in sampling mills Mr. Church says: "This has been done in a few mills, but they are too few to afford many samples of their work." Assuredly he could not have investigated this matter or he would not have made this assertion. In the 90's, while I was managing the Taylor & Brunton mill in the Cripple Creek district, Colorado, shaking-tray feeds were put ahead of every set of rolls, and were, therefore, ahead of every following sampling machine. All subsequent Taylor & Brunton mills were constructed in this manner and I have seen others which used them. This plan was adopted to change the intermittent discharge from the sampling machines into a continuous feed over the rolls immediately beneath them, and at the same time to feed this ore to the rolls in a perfectly even stream the full width of the rolls. Incidentally this eliminated the danger of error from a possible synchronism of motion between consecutive samplers; that is, it interrupted and retarded the direct drop of the ore and prevented the portion which had passed through one sampler from falling *en masse* into a single pocket or division of the machine immediately following.

As our samplers all had different speeds of oscillation this danger was remote, but this arrangement prevented any criticism on this score. Retardation has appealed so little to me as a source of error that I have considered the advisability of perforating all these feed trays in order to pass the fines directly to the following sampler and thus to increase the capacity of the rolls as well as to prevent the rolling of the sometimes damp fines into the troublesome "pancakes." But the increased cost and difficulty of cleaning the machinery between lots under such conditions has made this change seem inadvisable

[illegible]

To overcome the imaginary results of this retardation there is suggested the possibility and the desirability of so constructing a sampling machine that each revolution or oscillation will take a sample which will correctly represent in value per ton the whole amount of ore which happened to be presented to the sampler dur- [illegible] lation. Unless I have misunderstood the suggestion such a condition seems impossible of fulfilment, except in the case of an ore of absolute uniformity in value, such as a chemically pure compound of lead carbonate or sulphide barren of gold or silver, when any small portion taken anywhere from the pile of ore would as correctly represent it as one taken by the most scientific methods.

Ore as received at a sampling works is not an homogeneous mass, but usually consists of an imperfect mixture of pieces of all sizes, and of all values from barren rock to pure gold. And from the time the rock was mineralized in past ages, and through the mining and shipping, is not the tendency toward a concentration and a separation of the precious metals from the barren rock? Therefore, I cannot see just where a beginning should be made in lessening "the separation of particles which ought to be associated."

It would seem axiomatic that an accurate sample of any 60.6 lb. of coarse ore cannot be taken by any device, mechanical or otherwise, which takes in one oscillation, revolution or grab, any 9.9 lb. Nor would the probability of correctness be satisfactorily increased were the proportion taken one-half, or 30.3 lb. It is conceivable that such a 60.6-lb. mass might be presented to the crusher as a single chunk, and also that it might consist of quartz with a seam of gold running through it; but it is improbable that a single sample could be so taken as to correctly represent the whole chunk in value.

Averages and Size of Particles

Sampling by any means is bound to be a matter of averages, but this need not militate against correct results, if in the lot to be sampled, the relation between the size of the largest particle and the weight of the sample to be taken is within certain limits. This subject was considered thoroughly by D. W. Brunton in an article published in the *Trans.* A. I. M. E., Vol. XXV, p. 826, describing experiments made under his direction while I was with the Taylor & Brunton Company in Aspen, Colorado, in 1893, and all Taylor & Brunton practice follows the conclusions arrived at through these experiments. For instance, in the case of the chunk mentioned, the proper procedure would be to crush and roll it several times, and not present it to the sampler until the proper fineness had been reached, and then to reduce its volume by several small cuts rather than by one large cut.

The back numbers of the Journal are not available to me at this time, and, therefore, I cannot refer to Mr. Jones' article from which extracts are taken, and so cannot discuss them. Any conclusions, however, arrived at from a few selected experiments are always of doubtful value in determining the value of any process. In my experience I have found that the largest part of sampling differences has been caused by general carelessness, or improper handling of the ore *after* it has passed the mechanical samplers and has reached the bucking room; and I have examined mills where differences of 30 per cent. and more have often occurred in cutting duplicate samples from the few hundred pounds finally delivered to the sample room by the mechanical samplers. In such a mill it would have been unfair and misleading to ascribe any differences to the mechanical department unless all conditions governing the sampling had been investigated and contributing errors of the quartering and bucking rooms eliminated.

A Severe Test

While in charge of our Cripple Creek works it was our custom to sample and buy from leasers considerable ore in small lots which we stored in separate bins, and which we afterward united and sampled together as soon as sufficient tonnage had accumulated to make one or more carloads for shipment to the smelter or mill. I regret that I have not the results of a few years of this work to offer as an exhibit, but, as I remember, these figures were not kept longer than a year or two. I am safe in saying, however, that in over 95 per cent. of these mixes the resulting assays were well within the accepted assaying limits, although it was not unusual to have in the same mixture small lots assaying from 0.50 to 100 or more oz. gold per ton. In the resampling of these ores as a mix the ores were not previously bedded, but were wheeled directly to the crusher floor from which they were shoveled into the crusher. As these mixes frequently contained larger lots with 1-in. pieces, and of low gold value, and sometimes smaller lots of fine ore or slimes of very high value, they were excellent examples of variation in retardation. Not at all as an argument, but as a single instance of what can be done with proper care, I give in the accompanying table the details of a mixture made recently at our Murray, Utah, plant. Three months elapsed between the purchase of the first and last lot of the mixture, and different men had a hand in the sampling and bucking of the individual lots, but as the proper relation between the size of the largest particle and the size of the sample was maintained in the original sampling, and proper care was exercised in cleaning the mill, etc., close checking followed as a natural result.

Assaying Limits

On the ground that assaying in a large plant should be at its highest efficiency Mr. Church criticizes Mr. Mathewson's reference to the "assaying limits." I think there is a misunderstanding here as to what is meant by this term. It does not refer to careless work or incorrect methods in the laboratory, but to the mechanical condition of the pulp and to the limits of the delicacy of the pulp balances and to the personal equation of the man who weighs up the charges. For the details of this subject I will again refer to Mr. Brunton's article; the summary is that in weighing up two or more charges for separate assay the assayer may get one or more pieces of metal in one charge than in another and yet not be subject to criticism for carelessness. Such differences may amount to several hundredths or even tenths of an ounce in gold, and half an ounce or more in silver on even low-grade ores, and are recognized differences wherever ore is bought and sold, as is readily proved by the large numbers of repeat and umpire assays required before arriving at a settling basis. My understanding is that in a properly constructed and operated plant, average assays, both of the original and of the duplicate samplings will check more closely and more often than the check assays on the individual pulps.

T. R. Woodbridge.

Salt Lake City, Utah, Oct. 11, 1908.

Loading Blast Holes

Permit me to take issue with the editorial criticism of the method of loading holes as described in Mr. Adkinson's article in the Journal of Oct. 17. The following is the statement to which I refer:

"Experiments have shown that, provided there are no intervening air spaces, no difference in the effect of the explosion is noticeable whether the primer is near the bottom, near the top, or in the middle of the charge. Therefore, the primer should be placed near the top of the charge, as then there is less danger of the dynamite's burning instead of exploding."

Granted! There is certainly less danger of the dynamite's burning instead of exploding. But there is also the great certainty that, in the round of holes as described, with the primer placed near the top, there will be missed holes. Whether these missed holes will be caused by the explosion of one breaking the collar of the hole adjoining and carrying away the primer, or by the fact that placing the primer near the top leaves much the greater part of the fuse on the face of the drift where, even if neatly coiled, it is easily torn away, is not important.

Experience has taught most miners the necessity of putting the primer near the bottom, at the expense of considerable extra trouble in loading, at the risk of the holes burning, and if the drift be wet, at the increased danger of dampening the cap. It was this experience, probably, which caused Mr. Knowles in his masterly works to put the primer in the position to which exception is taken. Tom.

Pioche, Nev., Oct., 22, 1908.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often [illegible]. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the [illegible] conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed [illegible]

Manganese Ore in Texas

I own a deposit of manganese ore near Marfa, Texas, which assays 30 per cent. manganese, 12 per cent. iron and 3 oz. silver per ton, which can be concentrated so as to bring the manganese up to about 40 to 50 per cent. What market can I find for this ore?

W. T. E.

Address the American Smelting and Refining Company, El Paso, Texas.

Zinc Smelters in Canada

How many zinc smelting works are there in Canada? E. B.

There are no zinc smelteries in operation in Canada. The Canadian Metal Company erected at Frank, Alberta, a zinc smeltery a few years ago, but it made only an experimental run and is not now in operation. A small plant is being built at Nelson, B. C., for the trial of an electrothermic process of smelting, but so far as we are aware this is not yet in operation.

Making Coke from Peat

I have heard about coke being made from peat. Can you advise me if this is being done successfully?

W. P. H.

We have had occasion recently to examine a number of samples of coke made from peat. The coke was exceedingly heavy and still showed its woody texture. The porosity of the sample was not pronounced, and the cellular structure was very poor. It is not probable that coke made from peat will be a commercial success. The manufacture of briquets from peat is a profitable industry on the Continent.

Iron Ores

Please name the three greatest iron-ore fields of the United States in the order of their importance as producers.

H. A. K.

The most important iron-ore producing district in the United States is the Lake Superior region, in Michigan, Minnesota and Wisconsin, which furnishes the raw material from which 75 per cent. of the pig iron is made. Its production last year, in round figures, was 42,000,000 tons of ore. The second is the Alabama region with a production last year of 4,100,000 tons. For the third place there are several competitors: the Lake Champlain district—Port Henry and Chateaugay—in New York mined 785,000 tons in 1907; the Cornwall district in Pennsylvania, 705,000; New Jersey—Morris, Sussex and Warren counties—585,000 tons.

Blasting Powder

What is the annual consumption of blasting power for blasting purposes in the United States? What are the best technical treatises on this subject?

X. Y. Z.

We do not know of any statistics available as to the consumption of black powder in the United States. Probably the annual consumption is somewhat in excess of 125,000 tons.

There is no technical treatise on the subject that is thoroughly uptodate. However, the following works will be found useful: "The Manufacture of Explosives," two volumes, by Arthur Guttmann, price $9; "Explosives and Their Power," by C. Napier Hake and William Macnabb, price $9.75; this work is a translation and condensation from the French of M. Berthelot; "Manufacture of Explosives," by Courtenay DeKalb, price $1.

Specific Heat of Gases at High Temperatures

Is the specific heat of the gases common in metallurgical work the same at high temperatures as at low?

W. E. S.

In general, perhaps in all cases, the specific heat rises with the temperature. The latest measurements that we know (by L. Holbarn and L. Austin, Beiblätter, *Annalen der Physik*, 1905, vol. V, p. 621; Berliner *Berichte*, 1905, p. 175) are the following:

Temp. °C	Nitrogen	Oxygen	Air	CO_2
10-200	0.2438	0.2175	[illegible]	0.2168
20-440	0.2419	0.2240	0.2366	0.2306
20-630	0.2464	0.2300	[illegible]	[illegible]
20-800	0.2497		0.2430	0.2486

The large increase in the case of carbon dioxide is particularly noteworthy.

Silver in Lake Superior Copper Mines

Do any of the copper mines in the Lake Superior district contain silver, and, if so, is it recovered?

A. G. M.

A number of the mines in the Lake Superior district contain a little pure native silver, but except in two instances the silver is not recovered in commercial quantities. Some of the mines in Ontonagan county, such as the Mass Consolidated, Michigan and Adventure have, in the past, found silver, but, except that recovered by hand picking, none was saved. Some of the Calumet & Hecla copper contains an appreciable amount of silver and this is refined electrolytically at the company's plant in Buffalo, N. Y. Quincy copper also carries silver and a portion of the output is refined by the Calumet & Hecla company at Buffalo. Aside from these two, no other companies recover their silver.

Silver occurs native and in some instances in beautiful crystalline form. It is also found intimately joined to copper, but no alloying has occurred. This form is known locally as "half-breed," and the combination of native copper and silver is said to be unique and peculiar to this district.

A Safe Mine Atmosphere

There is much discussion at present concerning what is known as a "Safe Atmosphere in a Coal Mine." Will you kindly explain what is meant by a safe atmosphere, and state whether there is a dividing line or general rule by which the air in a mine may be considered safe or dangerous?

C. A. W.

The question is one in dispute, and in a number of instances has been the cause of litigation. Recently the mine inspector of a southern coal State decided that the air in a certain mine was dangerous, and ordered the officials in control of the property to provide safety lamps for all miners working underground. The mine officials refused to comply with the order, claiming that the mine was safe, and that the use of safety lamps would enforce unnecessary trouble and expense on the company. The case was carried to the court, and after hearing considerable testimony from various experts, the decision was rendered in favor of the coal company. The atmosphere in a mine may be [illegible] and permit the use of naked lights; however, the same atmosphere will be rendered highly explosive when subjected to the flame of a blown-out shot, or other intense heat. Mr. Haas, of West Virginia, whose paper, read before the recent meeting of the West Virginia Mining Association, was published in the Journal of Oct. 24, discussed this question in an admirable manner. [illegible] air could not be exploded by the flame of an ordinary lamp nor by the flame from the short-circuiting of an electric cable [illegible] aside as unworthy of consideration. There [illegible] phere containing fine coal dust is explosive [illegible] gas and air is most dangerous when the ratio is about 1 to 9.

New Publications

Elements of Railroad Track and Construction. By Winter L. Wilson. Pp. 320; illustrated. 5x7½ in.; cloth, $2. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

Hydraulics. Vol. II. The Resistance and Propulsion of Ships. By S. Dunkerley. Pp. 253, illustrated. 5½x9 in.; cloth, $3. New York, Bombay and Calcutta, 1908: Longmans, Green & Company.

Intercorporate Relationships of Railways in the United States as of June 30, 1906. Interstate Commerce Commission, Special Report No. 1. Prepared by the Division of Statistics and Accounts. Pp. 516, 6x9 in., cloth. Washington, 1908: Government Printing Office.

South African Companies Analyzed. Second Series. Pp. 76, 3½x6 in., boards. Price, in London, 1 shilling. London, England; *South Africa.*

This is a convenient reprint of a number of the analyses of reports of Transvaal mining companies, which have appeared from time to time in the London journal known as *South Africa.* It furnishes in condensed and convenient form many facts of interest to investors and dealers, which they might have some difficulty in digging out for themselves.

Scientific Books. Catalog. Pp. 176, 6x9-in., paper. New York and London: Hill Publishing Company.

This is one of the most extensive catalogs ever issued of books relating to mining, metallurgy, mechanical engineering, electrical engineering, chemistry, the construction and operation of power plants and kindred topics. It contains a large number of titles, carefully classified by subjects, with many notes as to the character and contents of the books, and particulars as to size, prices, etc. A full index of authors' names adds to the value and convenience of the catalog.

Report on the Fossil Iron Ores of Georgia. By S. W. McCallie. Geological Survey of Georgia. Bulletin No. 17. Pp. 199; illustrated. 7x10 in.; cloth. Atlanta, Ga., 1908: The Franklin-Turner Company.

This very creditable and highly valuable monograph, of which Doctor McCallie himself is the author, discusses at much length the origin of the fossil iron ores (Clinton ore) and data upon which to estimate the iron-ore reserves of the South. It is a contribution which will be highly appreciated by those interested in the iron foundry of the South.

Map of West Virginia, Showing Coal, Oil, Gas and Limestone Areas. I. C. White, State Geologist. 39x45 in.; paper, 50c. Morgantown, W. Va., 1908: West Virginia Geological Survey.

This map, which is on a scale of seven miles to the inch, has been carefully and fully brought uptodate. The topography is based on the topographic sheets of the United States Geological Survey. The coal and limestone areas are clearly shown; the principal anticlinal lines, as well as the developed oilfields and gasfields, are plainly indicated. A useful addition is the location, name and address of every shipping coal company in the State arranged by counties.

The Lime and Cement Resources of Missouri. By H. A. Buehler, Assistant State Geologist. Vol. VI, Second Series, Missouri Bureau of Geology and Mines. Pp. 256, illustrated, 6½x10 in., cloth. Jefferson City, Mo.; Hugh Stephens Printing Company, State Printers.

This volume is the result of field-work extending over a considerable period, and involving visits to nearly all the counties of the State. A large number of samples of limestone and shale were also analyzed. In view of the large and growing use of and demand for cement, the report is timely and interesting. The conclusion reached is that Missouri possesses great resources in lime and other materials for the manufacture of cement. The manufacture is growing rapidly; in 1900 portland cement was not made in the State; in 1907 there were factories in operation with a capacity of 6,000,000 bbl. yearly. The report includes a brief general description of the raw materials used in the manufacture of lime and cement; the uses and properties of those materials and the methods of manufacturing. Following this general section are descriptions by counties of the deposits of lime and cement materials, their geological position, occurrence and probable extent. In conclusion a table of analyses is given. The book is illustrated by maps, geological sections and many reproductions of photographs.

The Official Mining Directory of Mexico. Pp. 244, illustrated. 9½x12½ in., cloth, $6. Compiled and published under authority of the Government by John R. Southworth and Percy G. Holms; Calle del Eliseo, Mexico, D. F., Mexico.

This is an amalgamation of two separate publications, "The Mines of Mexico" and "Mining Directory of Mexico." The subtitle is "History, Geology, Ancient Mining and General Description of the Mining Properties of the Republic of Mexico." The general section is necessarily brief, being confined to an introduction of 30 pages, three of which are given up to a summary of the mining law. The rest of the book is devoted to descriptions of mines and accounts of the companies owning them, classified by States. These descriptions vary in length from a condensed paragraph to a page or more in the case of some important mines. The descriptions in all cases are condensed, only essential facts being given, without going into details. In view of the large investments in Mexican mines made from the United States, this book will be very useful, and there ought to be a good demand for it in the United States. It is well and clearly printed and is illustrated by maps and many reproductions of photographs. The introduction is given in Spanish and English, in parallel columns. The descriptions bear the marks of careful compilation and editing.

Supplementary Coal Report, West Virginia Geological Survey.. Vol. II(A). By I. C. White, State Geologist. Pp. 720, illustrated. 6x9 in.; cloth, $2. Morgantown, W. Va., 1908: West Virginia Geological Survey.

This is a companion volume to Volume II, published some time ago. The former work was devoted chiefly to the coals in the northern end of the State; much of the space in the present one is given to the Great Kanawha and New River regions, and the coalfields between those districts and the Kentucky line. It is accompanied by a map showing the location of bore holes mentioned in the text; also by elaborate tables of analyses of coal. The revised correlation of the coals of the Kanawha series is given in full, together with corrections of some errors made in the correlation in former volumes.

A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet. By S. G. Burrard and H. H. Hayden. Part I The High Peaks of Asia; Part II, The Principal Mountain Ranges of Asia; Part III, The Rivers of the Himalaya and Tibet. Pp. 230, illustrated. 9x12 in.; paper, 6 rupees. Calcutta, India, 1908: Superintendent Government Printing.

These volumes are a condensation of the information secured in explorations extending over 100 years, the first survey detachment having been sent out by the Surveyor-General of Bengal in 1807; this was the first expedition to the Himalayas undertaken for purely geographical purposes. The parts have been made each as far as possible complete in itself, but they are essentially interdependent; they will be completed by a fourth part, to be issued soon, on the "Geology of the Himalayas." The first three parts, now under review, are largely geographical, while this fourth part will be entirely geological. They are accompanied by a number of maps. While the compilers have included all the information obtainable uptodate, they admit the incompleteness of the existing surveys over large areas. Full references to various publications on the subject are included. The authors were assisted in their work by W. J. Eccles, J. H. Nichol, Lenox Conyngham, Shiv Nath Saba and Ishan Chaadra Dee, acknowledgement of whose work is made in the preface. The work is an interesting study on a subject of importance.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. H. Thompson has returned to Los Angeles, Cal., from Durango, Mexico.

H. Oren Cummins has opened an office at Redding, Cal., as consulting engineer.

L. C. Todd, Rollinsville, Colo., is manager of the Moon Gulch Gold Mining Company.

Albert Williams is superintendent of the Kentucky Ridge mine at Grass Valley, California.

Hiram W. Hixon intends to sail for Europe Nov. 7, and will be abroad for about a month.

Dr. Barrett, medical officer for the Guggenheims in the Yukon, is on a visit to his former home, Kingston, Ont.

We shall be obliged if R. F. Fitts, formerly of Greeley, Colorado, will send us his present address.

W. H. Knowles, of Los Angeles, Cal., has been in Gilpin county, Colo., to look after mining interests there.

Chester W. Purington is at St. Petersburg, Russia, and expects to be in London about the middle of November.

Forbes Rickard, of Denver, recently made an examination of the Saratoga mine in Gilpin county, Colorado.

Prof. Willet G. Miller, provincial geologist of Ontario, is making an examination of some of the outlying districts of the Cobalt silver area.

James Stirling, an Australian mining geologist, is now making an examination of the property of the Clara Consolidated Gold and Copper Mining Company.

Lester W. Strauss is in Peru, where he has been examining coal lands along the line of the Oroya & Huancayo railroad, and cinnabar deposits near Huancavelica.

Cortlandt E. Palmer, consulting engineer for the Guanajuato Development Company, has been spending some time at that company's mines at Guanajuato, Mexico.

Alexander Agassiz, president of the Calumet & Hecla Mining Company, accompanied by his son Rudolph, is at the property on his semi-annual inspection trip.

It is reported that J. W. Paul, chief of the Department of Mines of West Virginia will resign, in order to accept a position with the United States Geological Survey.

H. H. Heiner has resigned his position as first vice-president of the Sunday Creek Coal Company, to become president of the Maynard Coal Company in the Hocking Valley region.

J. J. Stein and Mr. Mackeridge, of London, England, have been looking over mining interests in the Frontenac Mines Syndicate, Ltd., operating in Gilpin county, Colorado.

Eugene G. Grace, heretofore superintendent, has been appointed general manager of the Bethlehem Steel Company, at Bethlehem, Penn. C. Austin Buck has been appointed superintendent.

S. E. Bretherton has returned to San Francisco, from Los Angeles, where he was engaged in the investigation of a new wet process for the extraction of copper and zinc from sulphide ore.

Walter L. Ehrich has resigned his position as superintendent of the Bonanza Belt Copper Company, at Johnson, Cochise county, Arizona. His address for the present is 463 Fifth avenue, New York.

H. P. Jones, general manager of the Pittsburg-Buffalo Coal Company, was overcome by smoke while directing operations against the fire in the company's Hazel mine, near Canonsburg, Penn. He is now recovering.

Alexander Leggat returned last week to Butte, Mont., after two months spent in eastern Montana. He has left Butte again to examine copper properties in Meagher county, Mont., for Eastern owners, and expects to spend the winter there.

Robert Hawxhurst, Jr., has recently completed an examination of the Miño silver mines and the Santa Jovitas copper mines in the district of Tarapaca, Chile, and remains in Chile as general manager of the Poderosa Mining Company of Collahuasi.

Allen Gibb, chief engineer for R. Williams & Co., of London, who is in charge of the development of the copper mines of Katanga, and has been visiting important mining and smelting districts of the United States, sailed for London on Saturday last.

Dr. R. W. Brock, acting director of the Geological Survey, of Canada returned to Ottawa, Oct. 28, after a three months' visit to British Columbia, during which he inspected a number of mining camps and accompanied the Canadian Mining Institute on a portion of its trip.

Albert Ladd Colby, of New York, consulting engineer, has returned with his family from Europe after over a year's [illegible] and recovery processes and testing American coal in different types of by-product [illegible] York, his address will be care Engineers' [illegible]

C. W. Henderson, who has been an assistant with Charles G. Yale in the suboffice of the Division of Mineral Resources, United States Geological Survey, at San Francisco, Cal., has been transferred and placed in charge of the similar office at Denver, Colo., while [illegible] Naramore has left the Denver and gone to the San Francisco office. The change was made by Waldemar Lindgren, in charge of the gold and silver inquiry, at [illegible] graduates of the mining college of Stanford University.

Obituary

Charles Hartshorne, who died in Philadelphia, Oct. 31, was long connected with the Lehigh Valley Railroad Company, and was for some time vice-president of the Lehigh Valley Coal Company. He had large interests in the anthracite region.

Samuel Devere Burr died at his home in Plainfield, N. J., Oct. 28, aged 53 years. He was born in New York, graduated from Rutgers College, and for a number of years was connected with the iron and metal industries. He wrote largely for the technical press, and was the author of several books on technical subjects.

Charles Redenbaugh was killed Oct. 17 by the accidental discharge of a gun, while hunting near Silao, Guanajuato, Mexico. His body was sent to the residence of his parents in Omaha, Neb., for interment. For two years past he had been superintendent of the mill of the Peregrina Mining and Milling Company, near Guanajuato.

James Kerr, who died at his summer residence at New Rochelle, N. Y., Oct. 31, was best known for his political activity, having been prominent in the Democratic party. His fortune was made in coal, however. Born in Mifflin county, Penn., in 1855, he was for many years a resident of Clearfield, Penn., and took an important part in the development of the Clearfield coal region. It was largely through his influence that the New York Central built its road into that region, which had been entirely tributary to the Pennsylvania. Mr. Kerr was president of the Pennsylvania, Beech Creek & Eastern Coal Company, and of several smaller companies, and was a director of the O'Gara Coal Company, of Illinois.

Societies and Technical Schools

Canadian Mining Institute—The office of the secretary and the library of the institute have been removed from 413 Dor[illegible] the Windsor Hotel, Montreal.

Mining and Metallurgical Society of America—The New York Section held its monthly meeting at the Times Square Hotel, Oct. 31. After an informal dinner, there was a general discussion of the [illegible] the society to secure the publication of reports by mining companies which shall [illegible] protection of the interests of mine investors." Local sections of the society are [illegible]

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and Goldfield

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 30—The United States Circuit Court in this city, temporarily presided over by Judge Frank S. Dietrich, of Boise, Idaho, has been hearing the case of the City of Oroville against the Indiana Gold Dredging Company, the operations of whose dredges in the Feather river, according to the complaint, threatened to alter the channel so as to endanger the city of Oroville by flood when high water prevails. Affidavits of a number of engineers were submitted to prove that the deposit of tailings left by the dredge company is not in the actual bed of the Feather river, and that its existence cannot ordinarily increase any danger of flood. On the other hand, District Attorney Robert T. Devlin pronounced the existence of the bed of tailings a menace to the new city levee.

Judge Dietrich finally entered an order modifying an injunction of the Superior Court of Butte county, and permitting the company to continue dredging for gold in the channel of the Feather river under certain restrictions. It is ordered that a 50-ft. cut must be made through the transverse ridge of tailings which now impedes the flow of the stream. Unless the cut is made to the level upon which the present objectionable ridge lies within 15 days, the order will become void. The Indiana company is permitted to dump gravel and rock tailings in elongation of the ridge which runs parallel with the Feather river, but it cannot erect or maintain a ridge extending above the present level of the ground upon which the dredger may be working. The judge said in his decision, that he did not believe that either party wanted to injure the other, but that the city desired to obviate the possibility of the deposit of tailings in the river bed contributing to cause such another flood as occurred in 1907 at that point. He thought that the transverse ridge of tailings was undoubtedly a menace to the welfare of Oroville, and would change the flow of the river in the event of unusual high water. It will be seen that this decision dissolves the injunction against the dredging company to a certain extent, as it is permitted to continue operations in the place where it has been at work; but at the same time it must remedy the evils complained of by the city. This is an exceptional case, as none of the other dredges in that locality are throwing up transverse ridges of cobbles, etc., anywhere in the river bed.

The plant owned by the Richmond Foundry and Iron Works, at Point Richmond, San Francisco bay, went into the hands of a receiver shortly after the financial panic of last year. It has now been changed from its original purpose and arranged for the treatment of custom ores. Being on the bay shore and close to the line of the Santa Fe railway, ores may be shipped by water or rail.

The committee of officials from the city of Sacramento who were appointed to investigate the dredge operations on the American river, near Folsom, has completed investigations, and failed to find any damage being done. The dredge operators showed them the dredges in operation. Most of these are from one to two miles from the main stream, and in fields. The committee was shown how the light soil was thrown back into the dredge ponds in which the boats float, and that on top of this soil the cobbles, rocks, etc., were dumped, holding it down in the ponds so it cannot escape. The stone heaps effectually dam all tailings away from the river proper. The committee decided that if any damage might be done to the river they could not determine it until seeing what effect the stone-pile dams had in the winter months. Also that the amount of sediment finding its way into the river would have to be determined by the city engineer. Also that while the discoloration of the river water was due to dredges, no legal steps can be taken at this time to put a stop to dredge mining in that locality.

The California commissioner to the Yukon-Alaska-Pacific exposition, to be held at Seattle next year, has sent a representative to the mining counties of the State to make a collection of California minerals to be exhibited on that occasion. He is visiting mine managers to get samples of ore and attractive specimens. Every time there is an exposition anywhere this same step is taken, and it may be said that very little comes of it in the end. Mere ore samples and a few fancy specimens attract little attention from mining men in other parts. A collection belonging to the State is in the museum of the State Mining Bureau, where it has been growing in size since first established nearly 30 years ago. There is another large collection at the State University and still another at the State Library. It would seem that from these three collections a good one could be chosen which would represent the mines of California better than a small one brought together hastily by the efforts of one man. Moreover, more graphic representations of the condition of the California mining industry could be made with a little effort than by showing a few cases of minerals.

The United States Circuit Court of Appeals in this city has affirmed the decision of the Alaskan court in the case of the Alaska Perseverance Mining Company against C. M. Thorndyke and others, thus giving 1000 in. of water in Lurney creek to the mining company.

Goldfield, Nevada

Oct. 29—This week all litigation between the Florence Goldfield Mining Company and the Little Florence, the leasing company, was settled out of court. This settlement involves not only the $117,935, in dispute between the two corporations on the claim that it belonged to the leasing company for ore extracted and shipped, but also the $2,500,000 damage suit brought by the Little Florence against the Florence Goldfield as an outgrowth of interruptions to the working of the lease and the declaring forfeited some of the lessee's territory. The exact terms of the settlement will not be made public until the two companies make their reports to their stockholders, but it is admitted that concessions were made by both sides. Mr. Keelyn, the managing director of the Little Florence company, is quoted as saying, "Under the terms of the agreement the sum paid to us was in excess of $100,000 together with other valuable considerations, which will be made public in our report to our shareholders, but not before." An order has been issued by Judge Langan directing that the $117,935, now impounded in the court be paid to the Florence Goldfield company. The first lawsuit between the two companies was an action for $125,000 damages brought by the Florence on the ground that the Little Florence had not strictly complied with the terms of the lease and had not operated the property in a miner-like manner. Then there was a cross bill brought by the Little Florence for $119,580 said to be due it from ores taken from the lease, the claim being made that the latter had been operated strictly according to agreement. This was followed by an action for $2,500,000, damages against the Florence Goldfield on the ground that that company had wrongfully forfeited a lease of the Little Florence on the Mohawk Florence property. Judge Langan some weeks ago ordered Mr. Lockhart, president of the Florence company, to pay into the court, pending the settlement of the dispute, the money claimed by the Little Florence which was held up by the Goldfield Florence company. Lockhart was found guilty of contempt in refusing to turn over this money, but appealed to the Supreme Court, which tribunal sustained the lower court. Lockhart then rather than go to jail gave a check for the amount in dispute and later the Little Florence filed an application with the court to have the amount paid by the clerk of the court to the Little Florence company. This action was still pending when the settlement was effected.

The Florence company has announced another 10c. dividend to be paid Nov. 2. This will make a total of $420,000 paid during the past 12 months. After this dividend is paid the treasury will still have a surplus of more than $500,000. All of this money has been derived from royalties paid by leasers.

The first official statement of the mineral output of the State for the first six months of 1908 ending June 30, has been submitted to the Governor by the bullion tax collector. The low production of Esmeralda county is ascribed to the industrial strife which kept the camp idle during last fall and winter, and from which it has not yet entirely recovered. The report gives the tonnage and value by counties as follows: Churchill, 449 tons, value, $41,916; Esmeralda, 87,658 tons, value, $2,078,347; Eureka, 10,492 tons, value, 88,135; Lincoln, 73,343 tons, value, $370,924; Lyon, 10,740 tons, value, $23,103; Nye, 150,170 tons, value, $3,906,456; Storey, 20,132 tons, value, $276,510. A total of 352,982 tons, value, $5,785,321. The total mining expenses amount to $4,567,154. The high ratio of operating expenses to the value of the ore will probably be considered by the next legislature and the law so amended that the mining companies will not be allowed to make the expenses in their returns so high that it frequently deprives the State of its just proportion as bullion tax.

Investigations made by the United States Government have disclosed the fact that about 300,000 acres of land valued at $100,000,000 have been wrongfully acquired and now held by Harriman for the Southern Pacific system. The investigations disclosed, in one instance, the fact that a section of land, on which at one time was located a town, contained mines which had been working for the past 40 years; this was the Olinghouse [illegible] the railroad company's agent filed a non-mineral affidavit in taking up the land. Some of the richest mineral territory of the State is involved.

After eight months of experiment and vicissitudes and Greenawalt chlorination mill has begun the regular treatment of custom ores. The new mill employs a new process invented by J. E. Greenawalt, of Denver. The ore is roasted after being crushed to only 20 mesh, and is [illegible] leached by an aqueous solution of chlorine in redwood tanks having a capacity of 100 tons of ore each. The chlorine is generated by the electrolysis of common salt. The claims for the new process are the high extraction and the low cost. The management expects to make treatment charges so low that the mining of Goldfield ores assaying as low as $15 per ton will be profitable.

Salt Lake City

[illegible] of the oldest silver-lead mines in Utah has been conveyed to the United States Smelting, Refining and Mining Company, the deal involving approximately $3 a share for stock in the Bullion Beck & Champion Mining Company, operating in the Tintic mining district. The Bullion-Beck mine was discovered in 1870 and has been almost a steady producer ever since, although during the last few years the ore extracted has come almost entirely from leases. In the latter part of the 80's and early part of the 90's, the Bullion-Beck was after the Centennial Eureka the most important shipper and dividend payer in Utah. The company's records show that $2,738,400 has been divided among shareholders, the last dividend being paid in June; this amounted to $10,000. The company is capitalized for 100,000 shares. Development has been carried to a depth of 1400 ft.; the Cen[illegible] a depth of 2200 feet.

The construction of at least two more smelters in Utah, both to engage in the treatment of custom ores, is believed to be a foregone conclusion. While the American Smelting and Refining Company is said to be putting forth every effort to block the plans of the Utah Consolidated to erect its proposed copper plant in Tooele county, it is believed here that the effort will fail and that President Broughton will soon let it be known that a majority of Utah Consolidated directors have sanctioned his smelter construction plans. In the meantime, Manager J. B. Risque has exercised all the options held by his company on lands in Tooele county, and everything is in readiness for starting construction. The plans for the proposed smelter have been drawn for some months.

[illegible] which financial backing will come from [illegible] largely identified with the Ohio Copper Company and the Silver King Coalition Mines Company. It has been intimated that possibly the Bingham Mines Company will join in the enterprise, yet, as far as the last named corporation is con[illegible] Before Mr. Heinze experienced financial distress in Wall Street a little over a year ago, he had laid plans to launch a gigantic mining and smelting enterprise in [illegible] the Ohio Copper Company, which he controlled, the Silver King Coalition and Bingham Consolidated companies, with which he had become identified. A smelter site and valuable water rights were secured in Tooele county, the Miners' Smelting Company was formed under the laws of the State of Maine and contracts entered into with the Silver King Coalition and Daly-Judge Mining companies at Park City. This insured a large supply of lead ore, as these are two of the leading lead producers of the State. Contracts were also made with the Ohio Copper Company, which will shortly rank among the most important producing copper mines of Bingham, while tentative arrangements had been made with other producers which guaranteed a tonnage justifying the erection of a smeltery of extensive proportions. While nothing has been stated officially to indicate just what is to be done, things have transpired lately which plainly indicate that Mr. Heinze has not given up his Utah projects and this includes the proposed smelter, but he is no longer a controlling factor in them. Former United States Senator Thomas Kearns and David Keith of the Silver King Coalition company have been moving spirits in the smelter enterprise and it is claimed that W. A. [illegible]

Butte

[illegible] Smelting and Refining Company's plant at Ponderay, Idaho, were blown in last week and the plant is now ready for the treatment of all ores sent by members of the Montana Mine Owners Association. The reconstruction of the smelter was instigated principally by the small mineowners of Idaho and Montana, who were dissatisfied with the rates on treatment of ores scheduled by the American Smelting and Refining Company's plant at East Helena, Montana.

[illegible] order to show cause why proceedings in bankruptcy against the North Butte Extension Copper Mining Company should not be dismissed, the Ingersoll-Rand company and the United States Fidelity and Guaranty Company, creditors of the mining company, filed objections to the dismissal. Hearing of the objections was [illegible] the objecting creditors so that the bank[illegible] enced in carrying out the plans for the [illegible] the North Butte Extension Develop[illegible] new company. The time for payment of the first assessment has been extended 10 days by the reorganization committee. A. M. Andrews, treasurer, has recently made a report covering the expenditures of the company during his term of office.

Bernard Noon, attorney for the Tuolumne Copper Mining Company, has returned from New York where he has been for the past three months in the interests of the company. He states that he has closed negotiations for the sale of the entire remaining treasury stock of the company.

Denver

Oct. 31—The reconstruction of Stratton's Independence, Ltd., though so long drawn out, is stated here to have been a success. The creditors of the company have been paid in full, and work is resumed on the completion of the mill for the treatment of the low-grade ores, which occur in such large quantities in the company's mines. When the last financial stringency occurred the force was considerably reduced, and all work was suspended about the middle of last April, since which the mill has been in the hands of a caretaker. It is now expected that milling will be in full operation by Dec. 1. Meanwhile the production of high-grade ore by the lessees is steadily increasing, and the shipments for last month exceeded $30,000, about 25 per cent. of which should accrue to the company.

The Fluorine, on Copper mountain, in the Cripple Creek district, is one of those peculiar surface ore deposits, which, in the early days, gave rise to the expression "shipping the scenery," for Jas. A. McClurg, of Denver, at that time took upward of $100,000 out of what might be termed yellow clay, possibly the result of disintegration of the surface outcrop of some lode not yet discovered. The cyanide plant put up later, and known as the Sioux Falls plant was a failure, but now it has passed into new hands, and is said to be running successfully on 75 tons per day, the output of the mine. It is worked under lease.

Another of the old-time shippers, known as the Hoosier, on Tenderfoot hill, and long idle, has been put in operation by a leasing company, and with excellent prospects of being a producer once more.

The Elkton Consolidated Gold Mining Company has distributed its regular bimonthly dividend of 1c. per share and an extra ½c. per share, amounting to $37,500 in all.

Strikes of unusually rich oreshoots are reported in several of the Cripple Creek mines this week.

London

Oct. 24—The general meeting of El Oro Mining and Railway Company, Ltd., of Mexico, was held in London on Oct. 20, R. T. Bayliss, the chairman, presiding. The official report is a document containing full information as to the working of the mine and the progress of the development work. It is acompanied by plans and tables of statistical data, together with a supplementary letter from the general manager, R. M. Raymond, enlarging on some of the most important points dealt with in the official report. Besides these reports the shareholders received an interesting address from the chairman, who being a mining engineer of wide experience, was in a position to explain and criticize in an exceptionally authoritative way, the position of the company.

In this address Mr. Bayliss drew attention to four important points in connection with the development of the mine. The first was the satisfactory results obtained in the south end of the mine, the second the large tonnage of ore developed in the footwall orebody in the north end of the mine, the third the developments in the 1000-ft. and 1150-ft. levels in the bottom, and the fourth the remarkably satisfactory developments on the San Patricio vein in the Somera claim, which has only recently been actively developed. The bulk of the ore during the past twelve months has come from the upper levels, and as this portion of the mine is approaching exhaustion, or perhaps it would be fairer to say has become a fixed or limited asset, it is satisfactory to find that the report speaks hopefully of the development in depth and is optimistic about the development of other veins, particularly those on the Somera claim. The total ore reserves on June 30, were 433,964 tons of an average value of $8.53 per ton, as against 606,119 tons of a value of $8.35 at the corresponding date of the previous year. These figures show a considerable reduction in the ore reserves, which is explained somewhat by the fact that scanty development work has been done in the bottom of the mine. The developments on the Branch vein on the 1000- and 1150-ft. levels of El Oro mine and upon the second level of the San Patricio vein in the center of the Somera claim, are considered satisfactory by the directors, so that the decrease in the ore reserves may before long be wiped out.

As regards the results of the past year's work, the 200-stamp mill crushed 267,387 dry tons of ore, which yielded, from treatment in the cyanide works, $2,253,086, being an average recovery of $8.43 per ton. This represents an all-round extraction of the gross gold and silver values of 89.41 per cent. The total average working cost, including every expenditure in Mexico was $5.27 per ton. This cost includes 70c. for development and 39c. for State and Federal taxes.

The accounts show a profit of £205,209 for the year. Two dividends of 1s. 6d. each have been paid, calling for £167,062. The issued capital now stands at £1,147,500, an increase of £67,500 over the amount issued last year, due to the purchase of outstanding interests in the Somera Gold Mining Company, Ltd.

The company has floated the Suchi Timber Company, with a capital of £60,000, retaining a half interest. A large sawmill has been erected and the company hopes to profit by the sale of heavy and finished lumber. The profits from the railway owned by El Oro company have been more or less as in the preceding year.

The Consolidated Mines Selection Company, Ltd., a financial company operating principally in South Africa, has issued a report for the year ended June 30, 1908. The directors refer to the depression that has existed for some time past in the Transvaal, owing to which the securities held by them have been greatly reduced in value. The depreciation at June 30, 1908, is given at £613,027, as against £480,760, the amount shown at June 30, 1907. The increase in depreciation is chiefly due to the reduction of valuation called for in the company's holdings in claims. The present valuations are made, "so as to bring them into line with the prevalent ideas as to the value of such assets, as established by the amalgamation and reconstructions carried through this year. These ideas may, and the directors believe will eventually prove to have erred on the side of caution."

Since the date of the report an improvement has taken place in mining business in the Transvaal and the benefit of these improvements, provided they are maintained, will be shown in next year's accounts. What this improvement in share-claim valuations means to this company will be seen from the statement that the estimated depreciation of £613,027, at June 30 has been reduced to £250,000, taking the value of the quoted securities on Sept. 30.

The report refers to the progress made by the developing and producing mines, and draws attention to the decrease in working costs obtained by the industry. For January, the Rand costs averaged 19s. 3d. per ton and the profits 12s. 7d. In June the average was 18s. working costs and 13s. 8d. per ton profits. The company has interested itself in some of the recent reconstructions, namely, those of the Bantjes, the Consolidated Vogelstruis Deep and the Cloverfield mines. The report contains information as to the more important holdings of the company, which are mostly situated in South Africa It has, however, interests in other parts of the world, among which are the Karabournon and Koniah mercury mines in Asia Minor and the Viloro Syndicate, a dredging company operating at Oroville, California. An investment in a mining proposition in Colorado has turned out unsuccessful.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Tennessee Coal, Iron and Railroad Company—This company has started up the DeBardaleben coke plant at Bessemer, which has been out of blast for a year. The coke will be stocked for the present. The two furnaces at Bessemer are being overhauled and made ready to go into blast soon.

Williamson Furnace—This furnace, at Birmingham, has been leased to W. C. Wilson, of that city, who has put it in blast. The furnace has been idle for two years.

Arizona

YUMA COUNTY

Clara Consolidated—Three shifts are working in shaft No. 1 sinking to the 500-ft. level, and ore has been encountered, believed to be the body which dips from shaft No. 2. Work is also pushed in the Morro tunnel, which is in about 200 ft. of ore carrying gold and copper.

California

AMADOR COUNTY

Bay State—The work of unwatering this property is going on slowly. The water is down to the 400 level. The shaft is 1000 ft. deep.

Original Amador—Work is being done at this property in the direction of substituting electricity as a motive power instead of gasolene.

BUTTE COUNTY

Cape Horn—This company has a large body of pay gravel, but the work this season was restricted, owing to lack of water supply. Electrical apparatus for power is about to be installed.

Gunn Channel—Operations have commenced upon this channel 2½ miles north of the Cape Horn mine. Extensive prospecting work to determine values has been started.

CALAVERAS COUNTY

Conradi—This gravel mine near Railroad Flat is being opened by Ed. Rigney and associates, and men are preparing the claim for winter work.

Grey—This mine has been leased by Geo. Conovich and the new tunnel is to be driven further into the lode.

Middle Fork—This mine, five miles west of West Point has been bonded to local men who will at once start development work.

[illegible] At [illegible] West Point, E. Rigney and others have secured a large tract of auriferous gravel, and 60 men are digging ditches and preparing for the water season.

Washington—This old mine, on the ridge between San Antone creek and Indian creek, has been placed under bond, and the work of reopening has commenced. The mine has been idle for some time.

[illegible]

Dallas Mining Company—This company, which is mining for gems, is preparing for increased activity the coming winter, and is putting up buildings, etc.

HUMBOLDT COUNTY

California Mining and Dredging Syndicate—This company at Orleans, Fred T. Hale, superintendent, has had a good season; repairs to ditches and flumes are now being made.

INYO COUNTY

Skidoo Mines Company—The 10-stamp mill of this company, with cyanide plant, has commenced turning out about $20,000 per month, and plans are being made for enlarging it. Fifty men are working for the company and 30 more on leases on the property.

NEVADA COUNTY

Alma—At this mine, Deadman's Flat near the head of Osceola ravine, men have been set at work. The ledge is narrow but rich, and has not been worked for some years.

Consolidated St. Gothard—This company, owning the Delhi mine at North Columbia, Hamilton Eddie superintendent, has declared a dividend of 5c. per share. The company has a good plant with chlorination works.

Golden Gate—C. C. Haub, who has this property at Grass Valley under bond, has again found the good shoot of ore encountered some time ago. A 10-stamp mill to be run by electric power, is to be erected.

[illegible]

[illegible] of this mine, has bought a boiler, rock-crusher and battery of Nissen stamps. The tunnel is now 1800 ft. in.

[illegible]

C. A. Bissell has applied to the California Débris Commission for a permit to mine by hydraulic process, the Lone Star mine and the Concordia mine near Crom-[illegible]

SHASTA COUNTY

[illegible] From these districts shipments are being made to the smelters from several other mines in addition to those from the Quartz Hill and Reed.

SIERRA COUNTY

Litigation is impending in certain portions of Sierra county, between the gravel miners and those who are locating quartz claims of late. What is locally called claim jumping seems to have been going on to a considerable extent. The gravel miners have located most of the ground and worked it more or less for years, but the discovery of rich quartz lodes in the past six months or a year has led a number of quartz prospectors to make locations on ground which has long since been taken up for gravel mining. The sinking of a shaft on the Pythian Hill property in Forest district has brought about ill will between the gravel ano quartz miners.

Cox—This ledge, below Howland Flat, has been bought by M. H. Heide and two tunnels are being run.

Sierra Buttes—The mines and plant of this company at Sierra City have been closed down for the winter.

SISKIYOU COUNTY

Great Northern Dredging Company—This company at Hamburg is building the main body of the DuBois suction dredge.

[illegible] is to be bonded for dredging purposes by J. R. Wade, of Callahan.

[illegible] owned by the G. A. Hicks estate, has been sold to Los Angeles men. The ditch will be repaired and extended to the Klamath river for power and hydraulic mining purposes.

TRINITY COUNTY

The rich strike of free gold ore in the [illegible] gulch has had the effect of drawing in that direction hundreds of prospectors. At the Hoodoo mine, on the east fork of Trinity river, six miles from the Yellow [illegible] Three other good finds have also been [illegible]

Golden Jubilee—At this mine, Carrville, 60 men are at work, and both the Huntington and the stamp mills are running. The new tramway will soon be finished.

Maple Creek—These mines above Junction City, have been sold and C. B. Rack, representing the new company, has taken possession. The mines will be equipped for the winter run.

TUOLUMNE COUNTY

Tarantula—This mine and adjoining claims, adjacent to the Eagle-Shawmut mine, at Chinese, are now being opened by the United Gold Mining and Milling Company. A tunnel is being driven and contracts have been made for a 40-stamp mill. Charles A. Mau, of Los Angeles, is manager for this new company.

Colorado

BOULDER COUNTY

Black Beauty—Longmont, Colo., men, with Dr. Ayer Stradley as manager, have resumed operations on this group near Wall Street, and they will drive a tunnel several hundred feet into Buckshot mountain.

Camp Albion—Boston people are interested with Thomas L. Wood, of Boulder, Colo., as manager in this mine, near Arapahoe Peak, and they have started up the Cashier mill and are reported to be turning out between 10 and 15 tons of concentrates daily. This is in the nature of a test, it being the intention of the company to erect a much larger mill next spring.

Richmond Mining Association—Ohio men are interested in mines at Salina, Colo., and they are investigating with a view to the erection of a mill for the handling of their own ores. W. B. Le Veque, Salina, Colo., is manager.

CLEAR CREEK COUNTY

Burnett Mill Site—J. B. McCormick, of Pennsylvania, has bought for $5000, this mill site in Jackson mining district.

Gambetta—A lease and bond calling for $10.000 has been taken up by the Joplin Tunnel and Mining Company, on the above group near Georgetown. B. J. O'Connell, Georgetown, Colo., is manager.

Lamartine—This property has been leased to John Lang, of Idaho Springs, for five years and is being worked by 12 sets of subleasers, the average daily product being 150 tons. A concentrating mill has been built at the tunnel mouth by John G. Roberts, of Idaho Springs, for the purpose of handling the dump, estimated to contain 150,000 tons, worth an average of $6 per ton.

Bellevue Hudson—A new mill with a daily capacity of over 100 tons has been erected by Law & Sons, who are working the Anamosa vein under lease. It is claimed that there is about 50,000 tons on the dump which will pay to handle. The property is situated at Georgetown.

Colorado Blue Bell Group—At this property in Virginia cañon, machinery is to be placed and property actively operated, under the management of P. Mixsell, Idaho Springs, Colo. It is the purpose of the company to erect a mill on the Mixsell mill site near Idaho Springs.

Diamond Joe—W. M. Kirk, Russell Gulch, Colo., has taken a lease and bond on this property and will install machinery at once, using electric power. He will work it through the Two Brothers tunnel.

Memphis & Idaho Springs Mining Company—This company is arranging for the resumption of operations on its Seaton Hill property; it will work through the Newhouse tunnel, as well as install heavier machinery at the shaft. Woodruff & Malone, of Denver, will be the local representatives.

Merry Monarch—A large air-compressor plant is being hauled to this property and heavier developments are planned.

GILPIN COUNTY

Bezant—Ore running high in gold, silver and copper has been opened up in Quartz Mill shaft at depth of 400 ft. J. H. Bawden, Central City, Colo., is superintendent.

Buckley—Denver men have taken hold of this property, with W. Morphy as manager, and are installing a Leyner air compressor. Daily shipments of 30 tons are being made to stamp mills.

Evergreen—An order has been placed for a 80-h.p. boiler and new concentrating tables are to be installed in the mill recently completed. Shad Reid, Apex, Colo., is superintendent.

Great Mammoth—M. B. R. Gordon & Co., of Russell Gulch, Colo., have taken a lease and bond on this property and are arranging for the installation of a steam plant of machinery. Large bodies of low-grade ore have been uncovered.

Hall—A 40-h.p. boiler is to be installed, the property passing into the hands of John Stewart, of Denver, under lease and option. The shaft is to be deepened. M. Whalen, Russell Gulch, Colo., is superintendent.

Hughes—A new shaft building has been completed and a steam plant of machinery installed on this property on Bellevue mountain, which has been started up under lease and bond by R. I. Hughes, of Russell Gulch, and B. F. Threewit, of Denver. Regular shipments are being made, the smelting ores carrying good values.

Moon Gulch—Indiana and Greeley, Colo., men have incorporated and have taken hold of the claims of the Siren Mining Company. L. C. Todd, Rollinsville, is manager. It is reported that the company will arrange for the erection of its own mill in spring.

Old Town Consolidated—Manager George K. Kimball, Jr., of Idaho Springs, is making a trip to Pittsburg, Penn., to consult with the directors in regard to the erection of a large mill at the mouth of the Newhouse tunnel, near Idaho Springs, for handling the ores of the Old Town, which average at least 100 tons per day.

GUNNISON COUNTY

United Colorado Mines Company—At this company's Enterprise mine, at Dorchester, in Taylor Park, work was started in July, the mine having been closed down since the previous fall. There is a flow of about 26 cu.ft. of water per min. from the tunnel. This was piped to the mill, 600 ft. below, where it is used to run an air compressor. The tunnel is in 5750 ft. During the winter 20 men will be kept at work driving the tunnel ahead, cutting a raise to No. 2 tunnel, 800 ft. above, and carrying on general prospecting. A good sized body of ore has been encountered, running well in gold and silver.

LAKE COUNTY—LEADVILLE

Bald Mountain Tunnel—In this adit, at the head of California gulch, work with three shifts using two machine drills is progressing favorably; already several small veins have been cut carrying gold. It is expected that the tunnel will reach the Sunday vein by the first of the year.

Berdella Tunnel—This enterprise, in St. Kevin district, was recently incorporated under the laws of Colorado and known as the Independent District Consolidated Mines Company, to develop this section of the district. The company is capitalized for $1,500,000; it controls an area of 390 acres and will continue the work of the Berdella and Rosse tunnels started last summer by a Kansas City outfit. The tunnel is now in 310 ft., and will be driven in the neighborhood of 2000 ft.; it is 4½x7 ft. in the clear. The first vein to be cut will be the President, 475 ft.; then the Amity at 725 ft.; then the Iron Hat and Fairplay group, and finally the Berdella vein at 2000 ft. The Rosse tunnel is in 600 ft., and will be driven another 620 ft. to cut the St. Kevin vein. The directors of the company are: Charles Cavender, J. A. Lamping, John A. Ewing and E. C. Davis, Leadville; W. C. Davis, Denver; G. W. Moorman, Cloversport, Ky.; Arthur Board, Louisville, Ky.; and W. E. Bowden, who is also general manager.

Dinero Tunnel—In this tunnel, in the Sugar Loaf district, the work of crosscutting on the vein is now in full swing, but as yet the hanging wall has not been caught. The water at the breast of the tunnel is diminishing as the old workings are drained.

Empire—This company has secured an option on the Anona claim, Empire gulch, and is taking out some fair ore. It is the intention of the company to do extensive exploration work south of Long & Derry hill, and to this end electricity has been installed. Good ore has been taken from the surface workings of the different claims that will be developed by this company.

Matchless—Two shafts are being sunk on this property, Fryer hill, and small shipments are being made. At No. 7 shaft prospecting is being carried on in virgin territory; it was in this shaft in early days where bodies of rich ore were found.

Idaho

Shoshone County

Charles Dickens—A special meeting of stockholders is about to be called for the purpose of investigating the company's finances. Suits against the company for approximately $90,000 were recently started in the district court of this county.

Butte & Coeur d'Alene—Shipments of ore will commence as soon as the wagon road now under construction is completed. Shipping by this means, it is estimated that enough ore has already been blocked out to last the mine for several years to come.

Oreano Property—A strike of about 6 in. of solid steel galena and about 2 ft. of good concentrating ore has been made. This ore was encountered in the lower adit at a distance of 900 ft. from the portal and at a depth of 700 ft. from the surface. The property adjoins the Standard mine of the Federal company on the northwest

Bunker Hill & Sullivan—Judge Dietrich, of the United States district court, has ordered that the judgment entered in favor of the plaintiff in the suit of James L. Stafford against this company for $7600 be vacated and set aside, it appearing to the court that the plaintiff is not entitled to recover, but that the defendant company is entitled to its costs in the action. Safford had an agreement with the company for the working of the tailings from the mill in the creek, and claimed that by the acts of the company he was prevented from working them.

West Hecla—A contract for 200 ft. of work has been let to John Backlund, of Burke.

Montana Standard—This property, located on Prospect creek, east of the town of Burke, has been forced to curtail its production because there is no place to put the ore, all the bins being full. A large amount of first-class shipping ore has been stored separately, and this will be sent across the snow to the railroad as soon as the season permits.

Michigan

Copper

Wyandot—The crosscut from the 700 ft. level of the exploratory shaft has passed through the recently encountered Amygdoloid lode which was found to be about 28 ft. wide and carrying a fair amount of copper. No lateral opening will be started on this lode at present, but the crosscut will be extended on to the approximated line of the Lake and Adventure strikes.

Copper Range—At this company's Globe shaft the drifts from the 1000-ft. level have been extended about 200 ft. each way on the Baltic Lode—copper has appeared from time to time but as yet payable ground has not been encountered

Superior—No. 1 shaft has been stripped down to accommodate two skipways for the entire distance and will soon be timbered and ready to receive the skiproad Work is progressing on the surface equipment, the shaft house is equipped ready to handle rock, and a combined engine and boiler house is in the course of erection. The boiler house will hold five boilers which are to be supplied by the Calumet & Hecla company from its recently closed boiler plant at Lake Linden. No. 2 shaft, which is down 260 ft. with a single-compartment, is being widened to two compartments and about 200 ft. of this additional width has been completed.

[illegible] electric power plant the third 2000-kw generator has gone into commission—which gives this plant a normal output of about 10,000 h.p. The first section of the new regrinding mill is practically ready to treat the tailings and will go into commission within a few days

North Lake—The sand pipe this company is sinking to accommodate its diamond drill outfit has reached depth of about 320 ft. and it is momentarily expected to strike the ledge. Drilling will then be started and the first drill core will be taken from this tract.

Lake—The new 20-drill air compressor will go into commission within a few days. As the present compressor is only capable of operating 3 drills, this new machine will greatly facilitate sinking. Drifting continues from the second level and both faces of the drift show the same characteristic rich formation. The north drift is in about 75 ft. and the south drift nearly 300 feet.

[illegible] the Kearsarge lode in the crosscut from the 2d or 500-ft. level of No. 2 shaft In the upper level the lode was decidedly shallow and leached, but it is believed by the management that with this additional depth the lode will be beyond sur[illegible]

Missouri

Zinc-lead District

[illegible] —This company has started up its lead furnace at Granby.

[illegible] Swarens, of Joplin, have leased 40 acres in Poor Man's gulch, north of Smelter hill, from the Granby Mining and [illegible] land at once.

Halloween—This company, of Spring City, has its shaft in ore at 160 ft. A 100-ton mill will be erected.

Indianola—This company, of Joplin, has been incorporated with a capital stock of $50,000. H. C. Kramer, of Kramer, Ind., and W. C. Kramer, E. Kreilsheimer and L. Kreilsheimer, of Joplin, are the stockholders

McAbee, Freeman & Co.—This company, of Joplin, is sinking a shaft west of the Halloween at Spring City and will soon be in the ore.

Old Dominion—This company, of Joplin, recently bought the 20-acre lease and mill at the John L. mine north of Webb City, in the sheet-ground district.

Montana

Butte District

[illegible] 95 days the shaft has been sunk a distance of 300 ft. and sinking is now in progress below the 1000-ft. level. The last crosscut was driven on the 700-ft. level and drifting was there done on the vein, both east and west. Orders from Duluth are being awaited before deciding whether to sink to the 1200-ft. mark or to start crosscutting on the 1000-ft. level.

Raven—The sinking of the shaft from the 1200- to the 1500-ft. level has been started. On the 1100-ft. level considerable development work has been done, but it cannot be said that commercial ore has as yet been found. A new level will be made on the 1400, and it is hoped that with an additional depth of 200 ft., ore will be found of better grade and in larger quantity.

Davis-Daly—The management in Butte has been instructed to order a new steel gallows frame for use at the Colorado shaft. A Webster, Camp & Lane. 20x48-in. first-motion hoist, good for a depth of 2400 ft., and formerly used at the Red Metal's Rarus mine, will be installed on the Colorado.

Anaconda—Foundations for the new hoisting engine are being laid at the Belmont mine. The gallows frame at the Red Metal Company's Corra mine has been sold to the Anaconda company and will be used at the Belmont

[illegible] Corra mine is being moved to the Rarus [illegible] plant. At the Tramway mine the station on the 1000-ft. level is nearly completed The total Red Metal production is averaging between 800 and 1000 tons daily.

North Butte—More than 900 men are employed on this company's properties. Shipments from the mine to the Washoe smelter in Anaconda average 1400 tons daily

North Butte Mountain—Sinking is in progress in the incline shaft. The shaft is down 100 ft. and will be sunk to the 200-ft. level before any drifting is done.

East Butte—Drifting east and west on the 900-ft. level is in progress, and it is stated that the vein is widening as the drift advances. The ore is chiefly bornite. On the 400-ft. level a new body of ore has been cut, but its extent is not yet determined.

FERGUS COUNTY

Chicago, Milwaukee and St. Paul Railroad—At a meeting of the operators and the miners of the company's coal mines at Roundup no agreement was reached regarding a settlement of the wage scale. The miners insist on 75c. per ton, which is 5c. more than the operators' offer. About 150 men are out of employment as a result of the disagreement.

LEWIS & CLARK COUNTY

Spring Hill—This property, situated four miles south of Helena, will be closed down Nov. 1. The ore from the mine has been treated at the mill of the Whitlatch Mining Company, but the lease on the mill expires on that date and cannot be renewed. It is planned to erect a 50-stamp mill on the Spring Hill property as rapidly as possible, when operations will be resumed.

Nevada

NYE COUNTY—TONOPAH

The production for the week ending Oct. 17 amounted to 5135 tons valued at $131,700. The Tonopah Extension company produced 45 tons; MacNamara, 300; Tonopah Mining Company, 2900; Belmont, 600; Montana-Tonopah, 745; Midway, 100; West End, 105; Jim Butler, 240 tons.

Belmont—Most of the work is confined to the lower levels of the mine. A crosscut to the vein has been started at a depth of 104 ft. in the winze sunk from the 1100-ft. level. This drift is fully 300 ft. deeper than any other working in the district. On the 1000-ft. level the winze is 20 ft. wide in some places in the stope. In the stope started from the west drift driven from this winze at a depth of 30 ft. 8 the vein is 4 ft. wide.

Tonopah Mining Company—During the week 402 ft. of development work was done. Sinking in the shaft, which is 1253 ft. deep, has stopped while a station is being cut at the 1200-ft. level so that the hoist used in sinking, now on the 900-ft. level, can be transferred to the 1200-ft. level. The hole being drilled from the bottom of the Red Plume shaft is 317 ft. deep, but slow progress is being made, owing to the necessity of frequently using cement in the shattered ground in which the drill is now working. In accordance with the plan of finding out more about the deeper formations a diamond-drill hole is to be sunk from the 740-ft. level of the Silver Top shaft, 30 ft. northwest of the shaft. It is planned to drill this hole to a depth of 1000 ft. below that level.

Tonopah Extension—Since the finding of ore in the rhyolite this company has been prospecting that formation considerably. The drift, started along the vein found in the north crosscut of the 770-ft. level, is now 50 ft. long; at first low-grade ore was found, but the ore in the face is considerably richer. On the 600-ft. level ore is being stoped along a distance of 300 ft. The winze started last week from this level at a point below raise No. 7 is now 10 ft. deep. This winze is following the footwall of the vein.

Jim Butler—The Stone Cabin shaft is now 707 ft. deep. A station is being cut at the 700-ft. level. The work is still confined entirely to the different levels of the Stone Cabin shaft.

Ohio

MEIGS COUNTY

Maynard Coal Company—A controlling interest in this company, heretofore owned by B. R. and H. J. Maynard, has been bought by H. H. Heiner and George H. Baker, both experienced coal operators. The property of the company includes two mines at Rutland and one at Connellsville, the three producing about 250,000 tons of coal yearly.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for September and the three months of the fiscal year from July 1 to Sept. 30 is as follows:

	July.	Three Mos.
Earnings...............	$2,513,762	$6,590,556
Expenses..................	2,359,323	6,407,081
Net earnings............	$ 154,439	$ 183,475

For the three months, as compared with last year, there were decreases of $2,177,986 in gross receipts; of $1,778,710 in expenses, and of $399,276 in net earnings. Expenses were 97.2 per cent. of gross earnings.

BITUMINOUS COAL

Pennsylvania Coal and Coke Company—The court at Scranton, Penn., on Oct. 26, authorized Receiver T. A. Watkins to issue $1,250,000 in 6-per cent. receiver's certificates to run for two years from Oct. 1, interest payable semi-annually, unless previously called for payment. This authorization supersedes that of August last, covering $500,000 receiver's certificates. The Scranton Trust Company, trustee for the bondholders, assented to the present issue. Of the certificates, $1,000,000 have been sold, the proceeds so far as necessary, to be used to take up valuable collateral, the remainder to be used to pay both the principal and interest of underlying obligations maturing at an early date.

Pittsburg Coal Company—This company's statement for the nine months ended Sept. 30 is as follows:

	1907.	1908.	Changes.
Net earnings..	$4,207,364	$2,106,791	D. $2,100,573
Charges	2,098,316	1,971,564	D. 126,752
Surplus.....	$2,109,048	$ 135,227	D. $1,973,821

Charges this year were made up as follows: Depreciation of plant and equipment, $777,514; depletion of coal lands, $409,269; interest on bonds, $784,781. The decrease in net earnings this year was 49.9 per cent.

BITUMINOUS COAL

Pittsburg-Buffalo Coal Company—The fire at the Hazel mine, near Canonsburg, which was reported last week, has been extinguished, and the mine is in operation again.

United Mine Workers—A special convention of district No. 5 assembled in Pittsburg, Oct. 28, to consider the following questions:

"The forcing of the parents of the miners under 21 years of age, to sign papers releasing the Monongahela River Consolidated Coal and Coke Company, from damages under the new liability law.

"The using of the so-called safety explosives.

"Operators' refusal to comply with the agreements on deductions and agreements on the increase in the amount of wages checked off."

Resolutions were adopted condemning all these practices. The convention was chiefly devoted to a rather disorderly discussion of the pending dispute between the local and National officers of the union

Texas

COOKE COUNTY

Arrangements are being made to open up a mine on the Inglish tract near Myra, where the existence of coal has been proved. P. C. Davidson, of Myra, is at the head of the enterprise.

Utah

BEAVER COUNTY

King David—This company has completed a five-mile pipe-line by which the property will be supplied with water for domestic and milling purposes. New power and hoisting equipment is being installed; it is expected that this equipment will be ready for operation by the end of the year.

Majestic Mines Company—The new management is in charge, but the plans for the future have not been fully outlined. Attention is now being directed toward the further exploration of the Harrington & Hickory lead mine

SALT LAKE COUNTY

South Columbus—In the Wedge mine at Alta, recently acquired by this company, leasers are working with considerable success.

Utah Apex—A raise from the Parvenue adit to connect with the upper workings of the mine has been started.

SUMMIT COUNTY

Daly West—The drift from the Ontario adit is now nearly 400 ft. within the sidelines of this company; 650 ft. yet remains to be driven in order to reach the main Daly West orebodies. The company is producing about 600 tons of ore weekly; the concentrating mill is being run on part time.

TOOELE COUNTY

Bingham Metal Mines—This company has spent about $75,000 in the acquisition of property, development and equipments; it is driving an adit which is projected to be run through to the Bingham side of the Oquirrh mountains and used for transportation purposes. A large area of patented ground has been acquired, but as yet no ore has been developed. The company is working on the theory that the lime beds of upper Bingham cañon extend to the Tooele side. It is understood that the company has at present about $25,000 in its treasury.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 24 were as follows: Coniagas, 64,498 lb.; Cobalt Lake, 62,940; Crown Reserve, 126,000; Chambers-Ferland, 140,000; Drummond, 125,000; La Rose, 385,000; McKinley-Darragh, 57,000; Nipissing, 189,380; O'Brien, 192,140; Silver Leaf, 114,870; Temiskaming & Hudson Bay, 60,000; Trethewey, 132,000; total, 1,598,828 pounds.

Little Nipissing—Superintendent S. D. Madden announces the finding of a new vein of native silver on the property leased from the Peterson Lake Company.

Red Rock—F. C. Chapin, who recently purchased this mine, states that about three-fourths of the surface has never been stripped. A force of 25 men will be put to work immediately. The shaft will be put down 100 ft. farther and a new boiler and compressor installed.

La Rose—A new vein was encountered recently in the face of a crosscut at the 90-ft. level, 260 ft. east of the main workings. The vein runs at right angles to the main vein and carries 4000 oz. silver to the ton. The company is working 170 men and 15 drills, the largest number of drills it ever operated.

Nancy Helen—The vein recently found at this mine is improving with depth. About 11 tons of high-grade ore already has been sacked and a carload soon will be shipped.

Temiskaming—Another rich vein has been struck at a depth of 200 ft.; it is 4 in. width and carries native silver. Vein No. 2 at a depth of 250 ft., has widened to 43 in. of high-grade ore, comprising silver sulphides, native silver, some smaltite and a little calcite. A new vein has been found in the new shaft in the course of cutting a station at the 100-ft. level within a few feet of the shaft. It is about 12 in. wide.

ONTARIO—MILLER LAKE

Bonsall Locations—These properties, comprising 320 acres, lying between Miller and Everett lakes, west of the Montreal river, are being developed by a syndicate of Cobalt men. Miners have been at work for some time, and seven good veins have been found, the largest 7 in. wide, yielding high-grade ore. A quantity of ore has been sacked for shipment.

ONTARIO—MONTREAL RIVER DISTRICT

Crown Jewel—A 12-in. vein rich in silver has been found.

ONTARIO—SILVER LAKE DISTRICT

Clinton Location—Two new strikes were recently made, consisting of a narrow vein on the surface rich in native silver, and a vein of decomposed matter 8 in. wide with quantities of leaf and native silver.

ONTARIO—LAKE OF THE WOODS DISTRICT

Olympia—The company has been working in a 4-ft. vein of gold ore and 250 ft. of tunnelling in the hillside has been done. A 10-stamp mill is in operation and satisfactory runs have been made.

ONTARIO—ALGOMA DISTRICT

Bruce—This copper mine has been sold to R. W. Leonard, one of the owners of the Coniagas mine of Cobalt, for $50,100.

Mexico

CHIHUAHUA

Greene Gold-Silver—A receiver was appointed on Oct. 24 for the assets of this company upon application of one of its creditors. The assets were found to be $1.48 cash in bank and an assortment of old furniture.

GUANAJUATO

Mills of the Camp—Guanajuato now has 580 stamps and 13 tube mills distributed among the mills as follows: Guanajuato Reduction and Mines Company, 160, and four tube mills; Peregrina Mining and Milling Company, 100, and two tube mills; Guanajuato Amalgamated Gold Mines Company, 100; Guanajuato Consolidated Mining and Milling Company, 80; Pinguico Mining and Milling Company, 40, and four tube mills; San Matias Mining and Milling Company, 40, and two tube mills; El [illegible] Mining Company, [illegible] Mining Company, 20; Santa Natalia Mining Company, 10, and one tube mill; Central Mine, [illegible]

Peregrina—This mill is dropping 100 [illegible] monthly. Practically all this ore comes from the mine which is in good condition.

Santa Natalia—The Shapley Brothers have completed their mill which includes 10 stamps and a tube mill. All the product is slimed and treated in cone tanks by air agitation.

[illegible] by E. J. Kimball to San Francisco men, the price being 120,000 pesos.

[illegible]

[illegible] nounced at this mine belonging to Santiago Sarabi, near Mapimi. The working force has been increased and considerable ore has already been extracted.

JALISCO

El Favor—Machinery, consisting of stamps, Wilfley tables, vanners, tube mills and cyanide apparatus, has been ordered for this mine in the Hostotipaquillo district. Oil engines will be used until electric power can be installed

OAXACA

Santa Catarina—Enlargement of the mill has been delayed by slow shipment of supplies. The mill is to have five additional stamps and a complete cyanide plant

[illegible]

Teziutlan—A circular to stockholders states that the smelting-converting plant has been completed. The mine has lately been operated at 50 per cent. of its normal production and the ore stocked in readiness for resumption of smelting. It has been decided not to start the smelting plant for the present and to defer payment of dividends until prices of metals improve. The Ocotes mine in Oaxaca is developing satisfactorily and will soon be a source of revenue for the company

[illegible]

Greene-Cananea—Everything is going along nicely at Cananea and an output of a little more than 60 tons of copper per day is being made, the concentrator running at two-thirds capacity. All of the machinery is giving the best of satisfaction, including the ore-receiving and reclaiming system. Besides reducing costs, this method of systematically mixing the charge is greatly improving the metallurgical results. At present the company is operating four blast furnaces, one reverberatory furnace, and two McDougall roasters. The McDougalls are operated merely to furnish tonnage to the reverberatory furnace, the blast furnaces not giving the required amount of flue dust. Four more blast furnaces and two more McDougalls are available The converter department has five stands, of which only two are in blast at the same time at present. Fuel oil is being used under the boilers for the concentrator and smelter; also in the reverberatory furnace.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 4—Coal trade in the West still shows some small signs of improvement here and there. The Lake trade is having a dull close, however; on the whole the season has been disappointing. There is a possibility of some trouble with the miners in the Pittsburg district, arising out of the explosives question and the attempt which the miners claim that some companies are making to evade liability placed on employers for injuries to minor employees under the new law.

In the East the Seaboard bituminous trade continues dull, and coal sales are slow. The anthracite coal trade is also quiet, only slight revival having followed the coming of cooler weather. The Coastwise trade is a little better. Coal continues in abundant supply, and there is no lack of cars.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct 24, in short tons:

	1907.	1908.	Changes.
Anthracite......	4,656,934	4,163,779	D. 493,155
Bituminous ..	32,074,344	27,070,636	D. 5,003,708
Coke............	11,515,031	5,620,934	D. 5,894,097
Total	48,246,309	36,855,349	D. 11,390,960

Total decrease this year to date was 23.6 per cent.

Coal shipments reported by Southwestern Interstate Coal Operators' Association, eight months ended Aug. 31, short tons:

	1907	1908.	Changes
Missouri..	1,776,335	1,374,271	D. 402,064
Kansas	4,146,205	3,021,155	D. 1,125,050
Arkansas	1,482,765	1,087,151	D. 395,614
Oklahoma.	1,892,570	1,477,700	D. 414,870
Total . ..	9,297,875	6,960,277	D. 2,337,598

The total decrease this year was 25.1 per cent.; due partly to a suspension of work in April and May this year.

New York

ANTHRACITE

Nov. 4—Prepared sizes are fairly active and in good demand, but small steam sizes are dull and in abundant supply. Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

Trade is light in all sections of this consuming territory and the demand is by no means urgent from shoal-water ports, which are liable to close up before long. In New England factories are not working steadily, and the demand for coal is light. In New York harbor trade is dull and without interest. Good grades of steam coal fetch $2.45@2.65, depending upon quality.

In the Coastwise-vessel market rates are firm but unchanged. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

Birmingham

Nov. 2—There is very little change in the coal production in Alabama. There is room, though, in the mines for many more laborers, and quite a number of miners are still waiting to be given employment. Sales agents look forward to a better condition in this market in the next few weeks. Prices remain firm.

Coke is in good demand and prices are above the usual amount. There is a little accumulation of coke, but it is expected that it will be needed during the winter.

Chicago

Nov. 2—The coal market continues to be uncertain because of the lack of demand in heavy business establishments and because of the lack of regulation of the market by concerted shipments adjustable to profitable or unprofitable conditions.

Eastern coals share in the demoralization due to over-shipments. Smokeless hovers near its cost to mine and ship, selling for $2.80@2.90 for run-of-mine and $4.05@4.30 for lump. Of other coals from east of Indiana, Hocking Valley is the most in demand and is fairly firm at $2.90 @3.15, though the prospect of lower prices holds off many purchasers of large quantities. Youghiogheny is uneventful at $3 for steam lump, shipments being confined to contracts.

Indiana and Illinois coals are dull, with the demand for domestic good and for steam sizes poor. Lump and egg bring $1.80@2.65 in carload lots; run-of-mine $1.65@2.15, with sales of low-grade coals large except for screenings, which are very dull at $1.10@1.65.

Anthracite finds steady and increasing sale, with the supply of all grades good and distribution fairly even

Pittsburg

Nov. 3—There has been no improvement in the Pittsburg district coal trade, the mines not being operated to more than 40 per cent. of capacity, and all of them are railroad mines. The river mines are doing nothing at all. Despite the lack of demand, the large interests continue to quote on a basis of $1.15 a ton for mine-run coal at mine.

Connellsville Coke—A decided improvement in the coke trade is noted this week. There are more inquiries than at any time since the opening of the year. Prices for prompt are much firmer and an advance likely will be made soon. Furnace coke for last-quarter shipment is $1.75@1.90; for next year it is believed that $2 will be the minimum price. Foundry coke continues strong at $2.10@2.25. One large interest has sold some foundry coke for the first half at $2.35 and another sold at $2.40, but the grade was considerably above the ordinary. The *Courier* gives production in both fields at 188,939 tons. Shipments were 8178 cars, as follows: To Pittsburg district, 3079; to points west of Pittsburg, 4527; to points east of Connellsville, 572 cars.

Foreign Coal Trade

Nova Scotia Coal Shipments—Shipments of coal from Nova Scotia mines, nine months ended Sept. 30, long tons:

Companies:	1907.	1908.	Changes.
Dominion	2,404,650	2,521,464	I. 116,814
Novo Scotia Steel ..	465,232	481,011	I. 15,779
Cumberland	213,409	276,524	I. 63,115
Acadia..............	230,243	239,081	I. 8,838
Intercolonial.......	176,572	192,730	I. 16,158
Inverness..........	202,574	191,992	D. 10,582
Total....	3,692,680	3,902,802	I. 210,122

Only one company shows a decrease this year. The total gain was 5.7 per cent.

German Coal Trade—Imports and exports of fuel in Germany, eight months ended Aug. 31, metric tons:

Imports:	1907.	1908.	Changes
Coal.....	8,631,967	7,564,503	D. 1,067,464
Brown coal........	5,953,375	5,770,370	D. 183,005
Total coal.......	14,585,342	13,334,873	D. 1,250,469
Coke.	361,372	363,354	I. 1,982
Briquets...........	118,434	121,227	I. 2,793
Exports:			
Coal.....	13,021,410	13,493,433	I. 472,023
Brown coal	13,768	18,029	I. 4,261
Total coal	13,035,178	13,511,462	I. 476,284
Coke	2,472,473	2,421,589	D. 50,884
Briquets.....	780,848	1,053,026	I. 272,178

The coke exports this year included 17,149 tons to the United States.

German Coal Production—Coal production of the German Empire, eight months ended Aug. 31, metric tons.

	1907	1908	[illegible]
Coal	95,012,415	[illegible]	[illegible]
Brown coal	40,393,072	[illegible]	[illegible]
Total mined	135,405,487	141,779,384	I. 6,373,897
Coke made	[illegible]	[illegible]	[illegible]
Briquets made	[illegible]	[illegible]	[illegible]

Of the briquets reported this year 9,330,809 tons were made from brown coal, or lignite.

Austrian Coal Trade—Imports and exports of fuel in Austria, half-year ended June 30, metric tons:

	Imports	Exports	[illegible]
Coal	4,920,570	[illegible]	Imp. [illegible]
Brown coal	14,742	1,467,382	Exp. [illegible]
Total coal	4,935,312	1,854,108	Imp. [illegible]
Coke	427,724	101,171	Imp. [illegible]
Briquets	77,372	49,698	Imp. [illegible]

Imports of peat and peat briquets, 2854 tons; exports, 3771 tons.

New Zealand Coal—Coal production from West Coast and Nelson district collieries, New Zealand, for the half-year ended June 30 was 506,127 long tons in 1907, and 527,832 in 1908; an increase of 21,705 tons.

Belgian Coal Trade—Imports and exports of coal in Belgium, nine months ended Sept. 30, metric tons:

	Imports.	Exports	Excess
Coal	3,971,203	3,470,382	Imp. 500,821
Coke	230,244	670,262	Exp. 440,018
Briquets	141,073	346,099	Exp. 206,026
Total	4,342,520	4,486,743	Exp. 144,223
Total 1907	4,308,311	4,467,960	Exp. 159,649

The changes shown in quantities this year were very small.

Welsh Coal Market—Messrs. Hull Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 24: Best Welsh steam, $3.66; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.24; seconds, $3.06; best small steam, $1.86; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 4—While the iron trade is still in rather a waiting mood, some revival has been manifest. This has shown itself most prominently in pig iron. There have been many inquiries for foundry and basic iron, and some contracts have been closed for considerable quantities. This is taken by sellers as encouraging, and there is a tendency to be firmer on prices asked for 1909 deliveries. Southern iron continues firmer than Northern, probably because the Southern furnaces have a larger proportion of their capacity engaged.

In finished material the general report is that about 60 per cent. of mill capacity is engaged. So far as new orders are concerned, there is still a good deal of hesitation; but the number of structural contracts is increasing. Some orders for railroad equipment are coming forward, but rail business is light. Reports of price reductions are current, and there is quite a general belief that some may be expected.

Baltimore

Nov. 4—Exports for the week included 920,304 lb. tin scrap to Rotterdam; 2,245,900 lb. steel billets to Liverpool; 10 locomotives to Panama.

Birmingham

Nov. 2—There has been some small-lot buying of iron in Alabama recently. Indications point to a steady improvement in the trade. The furnace yards contain quite a lot of iron, but the statement is made that this product belongs to consumers and awaits instructions for shipments. It is also announced that all demands for iron will be met promptly in this district. As soon as the stocks on hand are reduced or removed other furnaces will be in readiness. There has been no change in quotations, No. 2 foundry selling at $12.50 per ton, minimum, and $13, maximum. Two furnaces were blown in recently in this State, including the little Williamson furnace in the city, which produces less than 100 tons per day and which buys its raw material.

There is a better feeling among the home consumers. The cast-iron pipe manufacturers in the Southern territory are bidding on contracts throughout the country, which will require several months' operations to fill. Some of the larger pipe plants in this section are running full. The Dimmick Pipe Company is filling a contract for three miles of 48-in. pipe for the city of Detroit.

Chicago

Nov. 2—The market for pig iron continues firm and for iron and steel products it is perhaps advancing, though slowly. Sales of pig iron continue to be chiefly of small lots and for delivery within three months from the date of order; but the sales are more numerous.

For 1908 delivery Southern iron is on a basis of $12.50@13 Birmingham ($16.85@17.25 Chicago), still, with the large interests holding to $13. There can be little doubt, however, that the $12.50 price marks actual sales in many cases. For Northern iron the market is solid at $16.50@17. Next year's deliveries mean an adherence to the higher quotations generally.

Structural steel and railroad buying lead the market, but without heavy developments in either. Iron and steel bars have had good sale and other products have a fair market. Coke is considerably better, with Connellsville ruling $4.90, Chicago.

Cleveland

Nov. 2—Smoke from forest fires has interfered with navigation on the Lakes, and ore is coming in slowly. It is believed that November shipments will be light. A [illegible] which have ruled through the season: Old Range bessemers, $4.50; Mesabi bessemers, $4.25; Old Range non-bessemers, $3.70; Mesabi nonbessemers, $3.50. All f.o.b. Lake Erie ports, basis of 55 per cent. iron for bessemer and 51.5 for non-[illegible]

Philadelphia

Nov. 4—Business in pig iron outside of basic has been confined to small lots for December delivery. Offers of Southern iron are being made for winter delivery and negotiations are now pending. Local makers say they will make no effort to prevent orders slipping away from them if they have to make concessions. Hardware manufacturers have bought small lots of special brands. Foundry work throughout this territory is gaining.

Steel Billets—Business is insignificant but two or three consumers have named figures at which they are willing to do business.

Bars—Country storekeepers who handle iron purchased small lots. Car builders have been recently canvassed without result.

Sheets—A general improvement in store sales is in progress. Galvanized is doing better than other lines.

Pipes and Tubes—A moderate improvement is noted in retail lots.

Plates—A further improvement is noted in both large and small lots. Car builders are buying for winter requirements.

Structural Material—Small orders were placed during the week for winter construction work at many points in eastern territory.

Steel Rails—A fair demand has suddenly developed for traction rails and light steel rails, as a result of long pending negotiations.

[illegible] has been contracted for this week, including business in No. 1 yard. scrap. Concessions from previous quotations led to the business. In general, however, the dealers are holding prices high.

Pittsburg

Nov. 3—There is a decidedly better tone, particularly in pig iron. Operation of the mills of the large interests are about the same as a week ago, but the small plants are running a trifle better than usual. While waiting for the railroads to come into the market for steel rails the Carnegie Steel Company is operating its three rail mills at the Edgar Thomson works at about 35 per cent. of capacity and is booking small orders for both standard sections and light rails. Today official announcement is made that the Donora plant will hereafter be operated by the wire interest. Some important developments are expected, but [illegible]

Pig Iron—Inquiries for all grades of pig iron for next year's delivery are unusually heavy; conservative estimates place the aggregate at over 100,000 tons. The Massillon Iron and Steel Company, Massillon, O., wants 27,000 tons of Nos. 2, 3 and 4 foundry, but decided to defer placing the order until later in the week. This is the largest inquiry, but there are a number of 5000- and 10,000-ton inquiries and many for 1000 tons and less. Furnaces do not care to quote beyond first quarter, but some sales have been made for delivery through the first half at a trifle above current prices. One interest sold about 800 tons of bessemer iron for delivery up to July 1 at $14.75, Valley furnace, and another sold 2500 tons for first-quarter delivery at the same price. One lot of 600 tons prompt was sold at $14.50 and a sale of 1000 tons at $14.45 is reported for delivery this year, which is the lowest price reached for bessemer iron in many years. Malleable bessemer is firmer and $14.50 is named. Basic iron shows some weakness and last week dropped to $13.85, but it is said less than $14 cannot be done and there likely will be an improvement in the price shortly. Foundry iron is strong, No. 2 being quoted at $14.50@14.60. Gray forge is not in demand and is nominal at $13. These prices are f.o.b. Valley furnaces, the freight rate to Pittsburg being 90c. A Southern interest sold 600 tons of No. 2 foundry to a Pittsburg consumer at $13, Birmingham, which makes the delivered price $17.90. The Southern metal was needed for a special purpose.

Steel—Several inquiries are in for steel billets, two being for 500 tons each on which the regular price of $25, Pitsburg, was quoted. No contracts, however, have been placed. Sheet-bars remain firm at $27.50, Pittsburg; plates at 1.60c., and merchant-steel bars at 1.40c.

Sheets—The situation is unchanged. Some independents continue to shade prices, but the leading interest is adhering to the price of 2.50c. for black and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese — Prices have advanced, a sale being made today at $46, Pittsburg.

Foreign Iron Trade

French Steel Production—The production of steel ingots in France, half-year ended June 30 was, in metric tons:

	1907.	1908.	Changes.
Bessemer converter..	41,159	38,626	D. 2,533
Basic converter......	810,993	807,192	D. 3,801
Open-hearth....	456 841	508 368	I. 51,527
Crucible, etc.........	9 537	10,793	I. 1,256
Total........... ...	1.318,530	1.364 979	I. 46,449

Most of the open-hearth steel made is basic steel.

Belgian Iron Production—Pig-iron output in Belgium, eight months ended Aug. 31, was 950,640 metric tons in 1907, and 782,700 tons in 1908; decrease, 167,940 tons, or 17.7 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 4.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1908.	$ 3,974,391	$ 4,695,894	Imp.$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3.303.362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 31: Gold, $50,000. to Venezuela; silver, $912.820, to London and Paris. Imports: Gold, $79,409; silver, $73,597, both fro mthe West Indies, Central and South America.

The price of bar gold in London has fallen a little, being reported at 77s. 10¾d. per ounce. The Bank of France is still buying gold in the London market.

Silver

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
29	4 8645	50⅞	23$\frac{7}{16}$	2	4 8600	50	23$\frac{1}{16}$
30	4 8625	50	23$\frac{1}{16}$	3	......	....	23
31	4.8610	50⅜	23¼	4	4.8600	49⅝	22$\frac{15}{16}$

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 22:

	1907.	1908.	Changes.
India.......	£9,841,954	£7,477,463	D. £2,364,491
China.	68.400	516,400	I. 448,000
Straits......	625,950	112,385	D. 513,565
Total......	£10,536,304	£8,106,248	D. £2,430,056

Imports for the week, £6300 from South America, £7700 from the West Indies, £60,400 from New York; £74,400 in all. Exports, £127,000 to India.

Copper, Tin, Lead and Zinc

Oct.-Nov.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
29	13¾ @14	13½ @13¾	61½	29½	4 30 @4 35	4.82½ @4 85	4 67½ @4.70
30	13⅞ @14	13⅝ @13¾	61¾	30⅛	4 32½ @4 37½	4.85 @4 87½	4 70 @4 72½
31	13⅞ @14	13⅝ @13¾	....	30⅛	4 32½ @4.37½	4 85 @4 87½	4 70 @4.72½
2	13⅞ @14	13⅝ @13¾	62⅛	30⅜	4.32½ @4.37½	4.87½ @4.92½	4.72½ @4.77½
3	......	......	62	...	......	......	......
4	13⅞ @14	13¾ @13⅞	62⅛	30½	4.35 @4 40	4.87½ @4 92½	4.72½ @4.77½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Silver has touched today the lowest point yet reached in the decline. London advices, based on the collapse of the bull party in India, intimate that lower prices are to be expected before silver adjusts itself to present conditions of trade.

Copper—The market has been active and large transactions have taken place both for domestic consumption and for export. There appears to be little copper still unsold for November and December shipment, and several of the important producers have now withdrawn from the market. Considerable business has also been done for January and February of next year. Prices have advanced and the market closes strong at 13⅞@14c. for Lake copper; 13¾@13⅞ for electrolytic in ingots, cakes and wirebars. The average at which business in casting copper has been done during the week is 13¼@13½c., and at the close the market is higher.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15c. base, carload lots at mill.

The London market for standard copper has been very active in consequence of heavy orders from Europe as well as from this country. To-day the market at one time touched £62 10s. for spot, £63 5s. for three months, and it closes strong at £62 for spot, £62 17s. 6d. for three months.

Statistics for the second half of October show a decrease in the visible supplies of 700 tons.

Refined and manufactured sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Copper exports for the week from New York and Philadelphia, 5267 long tons. Our special correspondent gives the exports from Baltimore at 828 tons.

The Nevada Consolidated and Cumberland Ely companies are to pay the American Smelting and Refining Company a commission of 1 per cent. for selling their copper.

Tin—The London market throughout the week has been firm, and especially the favorable statistics published at the beginning of this month had the effect of further advancing prices. The close is cabled as firm at £137 17s. 6d. for spot, £139 2s. 6d. for three months.

Statistics for the month of October show a decrease in the visible supplies of 1200 tons.

The strong London market stimulated business here and fair-sized transactions took place. At the close this metal can be bought at about 30½c. per pound.

Visible stocks of tin on [illegible] reported as follows, in long tons:

	In Store	[illegible]	[illegible]
Great Britain	8,232	[illegible]	[illegible]
Holland	874	[illegible]	[illegible]
U. S., exc. Pacific ports	1,674	[illegible]	[illegible]
Total	10,780	6,744	17,524

The total shows a decrease of 585 tons during October.

Lead—There has been a fair demand for this metal, which has been freely met by some of the producers. Prices are somewhat higher, and lead at New York is quoted at the close at 4.35@4.40 cents.

The market for Spanish lead in London has been strong and advancing, and the close is cabled as £13 12s. 6d. for Spanish, £13 15s. for English lead.

Spelter—Consumption is gradually increasing, and while not much business is reported, the market is strong and higher at 4.72½@4.77½c. St. Louis, 4.87½@4.92½c. New York.

The London market for good ordinaries remains unchanged at £20, and specials at £20 5s. per ton.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is dull but prices are firm. Quotations are 8¼@8⅛c. for Cookson's; 7⅞@8⅛c. for Hallett's: and 7½@7¾c. for ordinary brands.

Aluminum—Unchanged. For American metal, No. 1 ingots, base 25½c.; sheets, base 35c. French aluminum is offered at 23c. We quote 23@25½c. for ingots.

Quicksilver—New York price steady at $47 per flask of 75 lb. San Francisco, $44@45 for domestic orders, $42@43 for export. London, unchanged at £8 10s. per flask.

Platinum—The market is unsettled, with a strong tendency to higher prices, and a good demand. Latest quotations from dealers are $21@22 per oz. for refined platinum, $24.50 for hard, and $18 for scrap.

Nickel—Large lots, 40c., New York.

The new Pennsylvania railroad station in New York is being roofed with [illegible] of Monel metal, a nickel-copper alloy, containing about 30 per cent. copper and 70 per cent. nickel. This is the first application of this metal to a large roof. The metal is furnished by the International Nickel Company, the sheets being rolled by the American Sheet and Tin Plate Company in one of its Pittsburg mills.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Spanish Metal Exports

Exports from Spain, eight months ended Aug. 31, metric tons:

[illegible]	1907	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Quicksilver	[illegible]	1,195	D. [illegible]
[illegible]			
[illegible]	6,218,778	5,216,901	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] and 431,527 tons this year.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 31—There was an unusually heavy shipment of zinc ore this week, and the assay base was sprung on Friday noon to a $37 base by one purchasing agent. The general market was, however, on a $36 base for best grades, ranging down to $35, and as low as $34 for sludge ore. Silicate sold on a $17@18 base price, the highest being $24.50 per ton. The average price, all grades, was $32.72 per ton.

SHIPMENTS WEEK ENDED OCT. 31

	[illegible]	Lead, lb.	Value
Webb City-Carterville	[illegible]	[illegible]	$72,701
Joplin	[illegible]	[illegible]	[illegible]
Galena	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		9,174
Miami	[illegible]	[illegible]	7,961
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	171,530	[illegible]	2,795
[illegible]	[illegible]		1,930
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	48,280		[illegible]
Totals	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

MONTHLY AVERAGE PRICES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	

[illegible] ores sold.

The highest settling price for lead ore [illegible] average price, al[illegible] per ton.

[illegible]

[illegible] $37 per ton was the highest price paid for zinc ore on a basis of $35 to $36 per [illegible] lead ore, $52 was paid; only one car is reported sold on this basis.

Shipments, week ended Oct. 31:

[illegible]	[illegible]	[illegible] ore, lb.	[illegible] ore, lb.
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
Mineral Point	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

In addition to the above, there was shipped to the electrostatic separator, at Platteville, 298,500 lb.; to the Joplin Separator Works, at Galena, 67,500 lb., and to the Enterprise roaster, at Platteville, 131,010 lb. zinc ore.

Chemicals

[illegible] is fairly active, but transactions are on a small scale.

[illegible] some life, stimulated by the stronger metal market. Standard goods remain at 4.05 [illegible] for smaller lots.

[illegible] standstill, and sales are infrequent. Quotations are 2.15c. for spot and futures up to and including 1910. The 96-per cent. grade sells 5c. per 100 lb. higher.

Phosphates—Messrs. J. M. Lang & Co. report shipments of Florida phosphate rock through the port of Savannah in September, in long tons: To Germany, 5373; Austria, 1641; Great Britain, 750; total, 7764 tons.

Mining Stocks

[illegible] have been influenced chiefly by election forecasts. The movement of prices has been moderate, but quotations have generally been firm on a moderate volume of business.

Today the election holiday has been followed by a strong and active market with many advances in quotations.

On the Curb the copper stocks have been strong, but business has been on a [illegible] some demand, but the Nevada gold stocks were quiet.

One sale of Homestake, of South Dakota, was made at $89.50 per share.

Boston

Nov. 3—Stock market prices have been irregular the past week, but managed to strengthen the day before the election. Prices, with some exceptions, are lower than a week ago. Heavy selling in Utah Consolidated caused a drop from $39.50 to $36 with recovery to $38.25 the same day; subsequently it rallied to $40.50, and closed Monday at $1 off net for the week at $39.50. The decline was characterized as a bear raid with stop orders uncovered on the decline.

Amalgamated ran off almost $2 to $78.87½, recovering all but a small fraction. Copper Range fell $1.50 to $76.50, recovering partially. North Butte fell $1.25 to $83 on rather free offering of the stock, but recovered to $84.75.

Report says that another Philadelphia director will be added to the Nevada Consolidated board at the annual meeting. There are said to be over 1000 La Rose Consolidated stockholders in New England out of the total 4000. The Raven Company has sold some 30,000 shares of treasury stock at $1 per share to leading stockholders.

The only Curb feature has been a split in that body so that there are two curbs, one a Lawson one, and an anti-Lawson crowd. They trade in two different sections of the city.

STOCK QUOTATIONS

NEW YORK Nov. 2

Name of Comp.	Clg.
Alaska Mine	⅞
Amalgamated	80⅜
Anaconda	46¼
Balaklala	‡2 1/16
British Col. Cop.	6¾
Butte & London	....
Butte Coalition	27
Colonial Silver	¾
Cum. Ely Mining	8⅛
Davis Daly	3⅜
Dominion Cop.	⅞
Douglas Copper	3⅛
El Rayo	4⅜
Florence	4⅛
Foster Cobalt	.65
Furnace Creek	.15
Giroux	4⅛
Gold Hill	⅜
Goldfield Con	6½
Granby	‡100
Greene Gold	⅛
Greene G. & S	.09
Greenw'r & D. Val.	‡.75
Guanajuato	1½
Guggen. Exp.	178
Hanapah	15
McKinley Dar.	1.24
Micmac	2⅜
Mines Co. of Am.	1¼
Mitchell Mining	⅛
Mont. Sho. C	¾
Nev. Utah M. & S	3⅜
Newhouse M. & S	4½
Nipissing Mines	10⅛
Old Hundred	1
Silver Queen	1.28
Stewart	⅝
Tennessee Cop'r.	44⅛
Tri-Bullion	⅞
Union Copper	⅝
Utah Apex	5⅞
Utah Copper	42¾
Yukon Gold	4⅝

BOSTON Nov. 2

Name of Comp.	Clg.
Adventure	8⅞
Allouez	37
Am. Zinc	24
Arcadian	3⅞
Arizona Com	34
Atlantic	18
Bingham	‡ 30
Boston Con	14⅛
Calumet & Ariz.	2¾
Calumet & Hecla	‡600
Centennial	33¼
Con. Mercur	.35
Copper Range	77¼
Daly West	9
Franklin	13½
Greene Can	10⅝
Isle Royal	23
La Salle	13⅞
Mass	5¾
Michigan	13½
Mohawk	67
Nevada	18
North Butte	84¼
Old Colony	.50
Old Dominion	52¾
Osceola	116
Parrot	27¼
Quincy	93
Rhode Island	4
Santa Fe	1¾
Shannon	16
Superior	27¼
Tamarack	78
Trinity	17¾
United Cop., com.	‡12¼
U. S. Oil	29½
U. S. Smg. & Ref.	39
U.S.Sm. & Re., pd.	44¾
Utah Con	39¼
Victoria	4¾
Winona	6⅛
Wolverine	140
Wyandotte	2¼

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	28⅞
Am. Smelt. & Ref	93
Am Sm. & Ref., pf.	105¼
Bethlehem Steel	21⅞
Colo. Fuel & Iron	36¼
Federal M. & S., pf.	83
Inter. Salt	18½
National Lead	82¼
National Lead, pf.	104
Pittsburg Coal	9
Republic I. & S.	24⅛
Republic I. & S., pf.	81
Sloss-Sheffield	7[illegible]
Standard Oil	622
U. S. Red. & Ref.	9
U. S. Steel	48
U. S. Steel, pf	111⅜
Va. Car. Chem	32⅞

BOSTON CURB

Ahmeek	100
Black Mt	‡13½
East Butte	7¼
Hancock Con.	‡7⅞
Keweenaw	5
Majestic	.66
Raven	.87
Shawmut	09
Superior & Pitts.	‡14
Troy Man	.25

ST. LOUIS Oct. 31

N. of Com.	High.	Low.
Adams	40	30
Am. Nettie	04	03
Center Cr'k	1 80	1 50
Cent. C. & C.	66 00	65 00
C. C. & C. pd.	76 00	74 00
Cent. Oil	110 00	100 00
Columbia	6 00	4 00
Con. Coal	21 00	19 00
Doe Run	125 00	110 00
Gra. Bimet.	30	25
St. Joe	15.00	12 50

LONDON Nov. 4

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind	0 1 3
Camp Bird	0 15 0
Esperanza	3 2 6
Tomboy	1 1 3
El Oro	1 2 9
Oroville	0 10 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 4.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.25
Best & Belcher	.47
Caledonia	.18
Chollar	17
Comstock	‡ 24
Con. Cal. & Va.	61
Crown Point	.25
Exchequer	32
Gould & Curry	18
Hale & Norcross	.45
Mexican	61
Ophir	1.82
Overman	.15
Potosi	.17
Savage	.41
Sierra Nevada	.32
Union	.26
Utah	.05
Yellow Jacket	.49
TONOPAH STOCKS	
Belmont	1.15
Extension	.58
Golden Anchor	01½
Jim Butler	.23
MacNamara	.51
Midway	.26
Montana	.80
North Star	.06
Tono'h Mine of N	7.12½
West End Con	.50
GOLDFI'D STOCKS	
Adams	.04
Atlanta	.22
Booth	32
Columbia Mt	21
Comb. Frac	1 27
Cracker Jack	05
Dia'dfield B. B. C.	.14
Goldfield Belmont	05
Goldfield Daisy	1 03
Great Bend	33
Jumbo Extension	30
Katherine	..
Kendall	15
Lone Star	08
May Queen	06
Oro	.12
Red Hill	.24
Roanoke	.
Sandstorm	23

Name of Comp.	Clg.
Silver Pick	14
St. Ives	24
Triangle	05
BULLFROG STOCKS	
Bullfrog Mining	‡ 03
Bullfrog Nat. B	‡ 04
Gibraltar	03
Gold Bar	‡ 03
Homestake King	17
Montgomery Mt.	‡ 05
Mont. Shoshone C.	81½
Original Bullfrog	‡ 01
Tramp Cons.	16½
MANHAT'N STOCKS	
Manhattan Cons	‡.05
Manhat'n Dexter	‡ 03
Jumping Jack	‡ 03
Stray Dog	‡ 03
MISCELLANEOUS	
Golden Boulder	‡ 05
Bonnie Clare	07
Lee Gold Grotto	...
Nevada Hills	1 50
Nevada Smelting	87½
Pittsburgh S. Pk	1 03
Round Mt. Sphinx	18

COLO. SPRINGS Oct. 31

Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	‡13½
Dante	‡6
Doctor Jack Pot	7
Elkton	65½
El Paso	43½
Findlay	19½
Gold Dollar	8
Gold Sovereign	‡3
Isabella	25½
Index	.
Jennie Sample	2½
Jerry Johnson	‡3⅞
Mary McKinney	‡28
Pharmacist	3⅝
Portland	1 02
Un. Gold Mines	3⅞
Vindicator	80
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
American Fork, Utah	Oct. 28	Nov. 25	$0 01
Birchville, Cal	Nov. 2	Nov. 20	0 03
Brookland, Utah	Oct. 24	Nov. 9	0 01
Brunswick Con., Cal	Oct. 20	Nov. 19	0.03
Butte & Yerrington, Mont	Oct. 20	Nov. 15	0 01
Caledonia, Nev	Oct. 21	Nov. 11	0 05
Constellation, Utah	Oct. 23	Nov. 20	0 01
Crown Point, Nev	Nov. 17	Dec 8	0.10
Glenwood, Utah	Oct. 29	Nov. 17	0.01
Gould, Mont	Nov. 7	Dec 7	.05
Highland, Utah	Oct. 23	Nov. 16	0 01
Lady Washington, Nev	Oct 26	Nov. 16	0 05
La Palma, Mex.	Nov. 2	Nov. 21	0.10
Mexican, Nev	Nov. 12	Dec. 3	0.10
Mountain Monarch, Cal	Oct. 24	Nov. 24	0.05
N. Y. Bonanza, Utah	Nov. 5	Nov. 25	0.02
Overton, Cal	Oct. 12	Nov. 16	0 01
Silver King Con., Utah	Nov. 4	Nov. 25	0 05
Uintah Treas., Utah	Nov. 2	Nov. 20	0.01
Utah-United, Utah	Nov. 10	Nov. 27	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55 678	31 769	25.738
February	68 835	56 000	31 852	25 855
March	67 519	55 365	31 325	25 570
April	65 462	54 505	30 253	25 133
May	65 971	52 795	30 471	24.377
June	67.090	53 663	30 893	24 760
July	68 144	53 115	31 366	24.514
August	68 745	51 683	31 637	23.858
September	67 792	1 720	31 313	23.877
October	62 435	51.431	28 863	23.725
November	58 677	.. .	27 154	.....
December	54 565	...	25 362	.....
Year	65 327		30 188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106 739	62.386
February	24 869	12 905	25 236	13 098	107 356	58 786
March	25 065	12 704	25 560	12 875	106 594	58.761
April	24 224	12 743	25 260	12 928	98 625	58 321
May	24 048	12 598	25 072	12.788	102 375	57.387
June	21 665	12 675	24 140	12 877	97 272	57.842
July	22 130	12.702	21 923	12 933	95 016	57 989
August	18 356	13.462	19 255	13 639	79.679	60 500
September	15 565	13.388	16 047	13.600	68 375	60.338
October	13 169	13.354	13 551	13.646	60 717	60.139
November	13.391	....	13.870	....	61 226	
December	13 163	......	13 393	......	60 113	
Year	20 004	....	20 661	......	87 007	..

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41 548	27 380	July	41 091	29.207
February	42 102	28 978	August	37 667	29.942
March	41 313	30 577	September	36 689	28.815
April	40 938	31 702	October	32 620	29.444
May	43 149	30 015	November	30 833	...
June	42.120	28 024	December	27 925	.....
			Av. year.	38.166	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6 000	3 725	19 531	14 250
March	6 000	3 838	19 703	13 975
April	6 000	3 993	19 975	13 469
May	6 000	4.253	19 688	12.938
June	5 760	4 466	20 188	12.600
July	5 288	4.447	20 350	13.000
August	5 250	4.580	19 063	13.375
September	4 813	4.515	19 775	13.125
October	4 750	4 351	18 531	13.375
November	4.376	......	17.281	......
December	3 658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6 732	4 513	6 582	4.363	27 125	20.563
February	6 814	4 788	6 664	4 638	25 938	20 875
March	6 837	4 665	6 687	4.527	26 094	21 075
April	6 685	4 645	6 535	4 495	25 900	21 344
May	6 441	4 608	6 291	4.458	25 563	19.906
June	6 419	4 543	6 269	4 393	25 469	19 000
July	6 072	4 485	5 922	4.338	23 850	19 031
August	5 701	4 702	5 551	4.556	21 969	19.350
September	5 236	4.709	5 086	4.619	21 050	19.563
October	5 430	4 801	5 280	4.651	21 781	19.750
November	4.925	.	4.775	.....	21.438	......
December	4 254	....	4 104	.....	20 075	......
Year	5 962	......	5.812	......	23 771	....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—	
Bort, good drill quality, carat	$[illegible]
Carborundum, f.o.b. Niagara Falls, powd. ....lb.	.08
Grains .... "	.10@.17
Corundum .... "	.07@.10
Crushed Steel, f.o.b. Pittsburg .... "	.05½@.06
Emery, in kegs; Turkish flour .... "	.01¾@.02½
Grains .... "	.03½@.04½
Naxos flour .... "	.01¾@.02½
Grains .... "	.03½@.04½
Chester flour .... "	.01½
Grains .... "	.03½@.04½
Peekskill, f.o.b. New York, flour .... "	.01¼@.01½
Grains, in kegs .... "	.02¼@.02½
Garnet, per quality ...sh. ton	25.00@35.00
Pumice Stone, Am. powd., 100 lb.	1.60@2.00
Italian, powdered .... "	.01½@.01½
Lump, per quality .... "	.03@.20
Rottenstone, ground .... "	.02@.04
Lump, per quality .... "	.05@.25
Rouge, per quality .... "	.05@.30
Steel Emery, f.o.b. Pittsburg .... "	.07½@.07¾
ACIDS—	
Acetic 28% .... lb.	.022@.027
Boric .... "	.08@.08½
Hydrofluoric, 30% .... "	.02¾@.03
" 48% .... "	.06
" 60% .... "	.10
Hydrochloric acid, 20°, per lb.	1.25@1.50
Nitric acid, 38° .... per lb.	4.25@4 62½c.
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.25
66°, bulk, ton	18.00
Oxalic .... "	.06½@.06¾
ALCOHOL—Grain 95% ....gal.	2.63
Denatured .... "	.45@.49
Refined wood, 95@97% ... "	.49@.55
ALUM—Lump .... 100 lb.	$1.75
Ground .... "	1.85
Chrome Alum .... lb.	.04½@.05
ALUMINUM—Sulphate, com'l. lb.	1.10@1.75
AMMONIA—24 deg. lb ...... "	.04½@.05½
" 26 deg. lb	.04¾@.05¾
AMMONIUM—	
Bromide .... lb.	.23
Carbonate .... "	.07¾@.08
Muriate grain .... "	.05¾@.06
Lump .... "	.09½@.09½
Sulphate, 100 lb.	3.05@3.10
Sulphocyanide com .... "	.30
" " chem. pure .. "	.40
ANTIMONY—needle, lump .. "	.03½@.03¾
ARSENIC—White .... "	.03@.03½
Red .... "	.07½@.07¾
ASPHALTUM—	
Barbadoes .... per ton.	40.00@80.00
West Indies .... "	20.00@60.00
Egyptian .... lb.	.10@.11
Gilsonite, Utah, ordinary per ton.	32.00
Trinidad .... "	22.50@30.00
California .... "	21.00@27.00
BARIUM—	
Carb. Lump, 80@90% lg. ton.	30.00@35.00
Precipitated 96@98%	36.00@40.00
Powdered, 80@90% ..... lb.	.02@.02½
Chloride com'l .... ton.	39.00@41.00
Nitrate powdered, in casks .. lb.	.05½@.06
Blanc Fixe .... per lb.	.02½
BARYTES—	
Am. Ground .... sh. ton.	14.00@17.50
Floated .... "	18.00@21.00
Foreign floated .... "	19.50@22.50
BISMUTH—Sub-nitrate ..... lb.	1.50
BLEACHING POWDER—35%, 100 lb.	1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	4.65
BONE ASH .... lb.	.02¾@.04
BORAX .... "	.04½@.05½
CALCIUM—Acetate, gray, 100 lb.	1.50@1.55
Acetate, brown .... lb.	1.00@1.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. .... sh. ton.	65.00
Chloride, f.o.b. N. Y. ... "	11.00@14.00
CEMENT—	
Portland, Am. 500 lb ..... bbl.	1.55@1.60
Foreign .... "	2.25@2.90
"Rosendale," 300 lb ...... "	.85
(in sacks) .... "	.65
Slag cement .... "	.75@1.25
CHROME ORE—	
New Caledonia 50% ex. ship N. Y. .... per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, M ton.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y. .... ton.	8.00@9.00
Foreign .... "	10.00@17.50
COBALT—Oxide .... lb.	1.40
COPPERAS—[illegible] 100 lb.	$[illegible]
In [illegible]	[illegible]
In bags .... "	.60@.70
CRYOLITE .... lb.	.06½@.06¾
FELDSPAR—Ground best sh. ton.	10.50@15.00
FIRE BRICK—	
[illegible] per M.	30.00@[illegible]
[illegible] "	30.00@[illegible]
St. Louis No. 1 .... "	18.00
No. 2 [illegible] "	[illegible]
[illegible] "	[illegible]
FIRE CLAY—F.o.b. St. Louis.	
St. Louis extra quality [illegible]	[illegible]
ordinary ...... "	2.50
FLUORSPAR—	
Domestic f.o.b. shipping port:	
Lump .... lg. ton.	8.00@10.00
Ground .... "	11.[illegible]
Foreign crude ex. dock	8.00@10.00
FULLER'S EARTH—Lump, 100 lb.	.75@.85
Powdered	[illegible]
GRAPHITE—Ceylon	
Flake [illegible] to best ... lb.	[illegible]
Dust .... "	[illegible]
Chip .... "	[illegible]
Lump .... "	[illegible]
Large lump .... "	[illegible]
GYPSUM—	
Fertilizer .... sh. ton.	5.00
Ground .... "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best .... lb.	.01¾
German .... lb.	.02½@.02¾
LEAD—Acetate (sugar of) brown, ... lb.	.07¾
Nitrate, com'l .... "	.08½@.08¾
MAGNESITE—Greece	
Crude (95%) .... lg. ton.	8.00@10.00
Calcined, powdered .... sh. ton.	26.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg .... M.	160@200
MAGNESIUM—	
Chloride, com'l .... 100 lb.	.90@1.25
Sulphate (Epsom salt). 100 lb.	.85@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide .... lb.	.01@.01¼
75@85% binoxide .... "	.01¼@.01½
85@90% binoxide .... "	.01½@.05
[illegible] binoxide .... "	.06½
Ore, 80%-85% .... sh. ton.	16.00@32.50
MARBLE—Flour ..... sh. ton.	8.50@10.00
MINERAL WOOL—	
Slag, ordinary .... sh. ton.	19.00
Selected .... "	25.00
Rock, ordinary .... "	32.00
Selected .... "	40.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, nominal .... lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single .... lb.	.09@.11
Sulphate, double .... "	.06½@.08
NITRATE OF SODA—100 lb 95% for '08	2.15
95% for 1909	2.15
95% for 1910	2.15
96% is 5c. higher per 100 lb.	
OZOKERITE—best .... lb.	.14@.1[illegible]
PAINTS AND COLORS—	
Litharge, Am. powdered .... lb.	.06½@.06¾
English glassmakers' .... "	.08½@.08¾
Lithopone .... "	.03¾@.07
Metallic, brown .... sh. ton.	16.50@22.00
Red .... "	14.00@18.00
Ocher, Am. common ... "	8.50@9.00
Best .... "	16.00
Dutch, washed .... lb.	.02½@.03
French, washed .... "	.01½@[illegible]
Paris green, pure bulk	[illegible]
Red lead, American .... "	.06½@.06¾
Foreign	.08½@[illegible]
Turpentine, spirits bbl., per gal.	.40
White lead, Am., dry ...... lb.	.05¾@.06
[illegible]	.06½@[illegible]
Foreign, in oil .... "	.10¾@.10¾
Zinc white, Am. extra dry ... "	.05¼@.05¾
French, red seal, dry ..... "	.08¼@.08¾
French, Green seal, dry ... "	.10¼@.10¾
PHOSPHATES—[illegible]	[illegible]
*[illegible] land pebble 68%	4.25@4.50
†[illegible] 75%	5.00@5.50
68% [illegible]	[illegible]
‡[illegible]	[illegible]
[illegible]	[illegible]
POTASSIUM—	
[illegible]	$.08½@.09
[illegible]	.09@.09½
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	.09@.09½
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Permanganate .... lb.	.09½@.10
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
PYRITE—	
Domestic, non-arsenical, furnace [illegible] per unit.	[illegible]
Domestic, non-arsenical, fines, per unit, f.o.b. mines	10@10½c.
[illegible]	[illegible] .13
Imported, arsenical, furnace size, [illegible]	[illegible] 12½
[illegible]	[illegible]
Imported fines, non-arsenical, per unit	10½@11c.
[illegible] An allowance of 25c. per ton is made when delivered in lump form.	
SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. [illegible]	[illegible]
SALTPETER—[illegible] 100 lb.	[illegible]
Refined, crystals .... "	5.50@6.00
SILICA—	
Ground quartz, ord'ry .. lg. ton.	10.00@15.00
Silex, ground .... "	13.00@15.00
Silex, floated .... "	35.00@40.00
[illegible]	[illegible]
[illegible]	[illegible]
SILVER—Nitrate, crystals .. oz.	.37½@.4
SODIUM—	
Acetate .... lb.	.04@.04½
"Alkali," per 100 lb., 58/48 ...	.80@.87½
Bicarb. soda, per 100 lb	1.00@1.30c.
[illegible]	[illegible]
[illegible]	[illegible]
Salt cake, per 100 lb., bulk	.40
Salt cake, bbl	.65@.85
Soda, monohydrate, per lb. ...	1.4@1.75c.
Bichromate .... lb.	.07½@.07¾
Bromide .... "	.13@.14
Chlorate, com'l .... "	.09@.09½
Cyanide ("100% KCN")	
Carloads (30,000 lb.) ...... "	18c.
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Phosphate [illegible]	[illegible]
Prussiate [illegible]	[illegible]
Sal soda, f.o.b. N. Y. ... 100 lb.	.65@.70
Foreign, f.o.b. N. Y. .. "	.80@1.00
[illegible]	[illegible] 1.15
Sulphate, com'l (Glauber's salt) .... 100 lb.	.60@.75
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate ..... lb.	.07¾@.8¼
SULPHUR—	
Louisiana (prime) to New York, Boston or Portland .... lg. ton.	22.00
To Philadelphia or Baltimore "	22.00
Roll .... 100 lb	1.85@2.15
Flour .... "	2.00@2.40
Flowers, sublimed ... "	2.20@2.60
TERRA ALBA—[illegible]	.85@1.00
TALC—Domestic .... sh. ton.	15.00@25.00
[illegible]	[illegible]
[illegible]	[illegible]
TIN—[illegible]	[illegible]
[illegible]	[illegible]
Oxide, lb .... "	.33@.35
URANIUM—Oxide .... "	3.50
ZINC—	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. [illegible]

Note—[illegible]

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ANTIMONY

7597—ANALYTICAL METHOD—A Method for the Determination of Antimony. M. F. Coolbaugh and J. H. Betterton. (West. Chem. and Met., Sept., 1908; 3½ pp.) The method in brief consists of decomposition to the ammonium persulphate, reduction of antimony with stannous chloride, taking up the excess with mercuric chloride and titrating with potassium permanganate. 60c.

ASPHALT

7598—MANJAK, as Worked at Vistabella Mine, Trinidad, British West Indies. J. C. T. Raspass. (Coll. Guard., Sept. 11, 1908; 1/3 p.) Abstract of a paper read at the North Staffordshire Institute of Mining and Mechanical Engineers, which describes the manjak industry of Trinidad giving analyses and a brief description of the deposits. 40c.

BARYTES

7599—CLAUSTHAL BARYTES DEPOSIT Ueber ein bemerkenswertes Vorkommen von Schwerspat auf dem Rosenhofe bei Clausthal. K. Andrée. (Zeit. f. prak. Geol., July, 1908; 3 pp.). Describes the occurrence and associations of the barytes in this locality. 40c.

CALCIUM CARBIDE

7600—ELECTRIC FURNACES for the Manufacture of Calcium Carbide and Ferrosilicon. (Electrochem. and Met. Ind., Oct., 1908; 6 pp.). Translation of a paper by Dr. Walter Conrad, before the Verein Deutscher Eisenhüttenleute in Düsseldorf, describing numerous electric furnaces from the oldest to the most modern. Illustrated. 40c.

CEMENT

7601—PLANT—A Typical Modern Portland Cement Plant. A. G. Adams, Jr. (Proc. Eng. Assn. South, Vol. XIX, 1908; 17 pp.) Describes carefully such conditions as location, market, fuel, water, transportation, labor, machinery, burning, grinding, etc. Illustrated by a drawing of a typical plant.

7602—THEORY OF SETTING—Zur Abbindungs- und Erhärtungstheorie der Portland- und Romanzemente. F. Janda. (Oest. Zeit. f. B. u. H., Aug. 29, 1908; 4 pp.). A discussion of the chemical reactions involved in the hardening and setting of cement. 40c.

7603—VIRGINIA Cement Materials of Western Virginia. R. S. Bassler. (Econ. Geol., Aug.-Sept., 1908; 22 pp.). Describes the distribution of cement materials, the cement rocks of northwestern, central western and southwestern Virginia, and gives the analyses of these rocks. Illustrated. 60c.

CHROMIUM

7604—PRODUCTION of Chromite or Chromic Iron Ore in 1907. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 4 pp.). Describes the production and principal features in the industry together with other statistical data of interest.

CLAYS

7605—ANALYSIS—Ueber die Bestimmung der Tonsubstanz, ein Beitrag zur rationellen Analyse der Tone. H. Bollenbach. (Chem. Ind., July 15, 1908; 3 pp.) Advocates an analysis of clay which shall mean something to a manufacturer of clay products, and suggests one such method. 40c.

7606—GEORGIA—Properties and Uses of Georgia White Clays. Otto Veatch. (Mfrs. Rec., Oct. 1, 1908; 1½ pp.). Describes the conditions existing in the clay industry of Georgia as well as the chemical, physical properties of clay. 20c.

7607—ORIGIN OF KAOLIN—Ueber Kaolinbildung, einige Worte zur neuesten Literatur. H. Rösler. (Zeit. f. prak. Geol., June, 1908; 3½ pp.) Discusses the various theories offered to explain the formation of kaolin. 40c.

7608—REFRACTORY CLAY. A. F. Greaves-Walker. (Salt Lake Min. Rev., Sept. 30, 1908; 1 1/3 pp.) Discusses the constituents of refractory clay including silica, alumina, iron, magnesium, lime, alkalies and titanium. 20c.

7609—STATISTICS of the Clay Working Industries in the United States in 1907. Jefferson Middleton. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 52 pp.) Describes the production and principal features of the industry together with other statistical data of interest.

7610—TEXAS—Note on Texas Kaolin. Arthur Mayer. (Trans. Am. Ceramic Soc., Vol. X, 1908; 6 pp.) Describes the physical properties before and after burning and the chemical properties of kaolin obtained from a mine near San Antonio, Texas.

COAL AND COKE

7611—AUSTRALIA—Coalfields and Collieries of Australia—XXVI. and XXVII. F. D. Power. (Aust. Min. Stand., Aug. 12 and 19, 1908; 3 pp.) Continuation of article previously indexed. 60c.

7612—BELGIUM—Le Marché Charbonnier Belge. G. de Leener. (Commission d'Enquête sur la Durée du Travail dans les Mines de Houille; Brussels, Belgium, 1908; 294 pp.) An exhaustive discussion of every phase of the coal industry of Belgium.

7613—BOILER FEED WATERS—Feed Waters for Boilers at Coal Mines. J. C. W. Greth. (Coal, Sept. 17, 1908; 3¾ pp.) Describes the losses due to impurities in solution and suspension in the water fed to the boilers. Illustrated. 20c.

7614—BRIQUETTING—Ueber Entstaugungsanlagen in Braunkohlen-Brikettfabriken. Gertner. (Zeit. f. B. H. u. Salinenwesen, Band 56, 2 heft; 91 pp.) An exhaustive discussion of the various methods of recovering and utilizing the dust produced during the manufacture of briquets.

7615—BRITISH COAL FIELD—The Wemyss Coal Field. John Gemmell. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1½ pp.) Describes a bore hole which was sunk in this field, modern methods of sinking, pumping machinery, etc. Abstract of paper read before Brit. Instn. of Min. Engrs. 40c.

7616—CAGES—Design of Cages for Modern Collieries—II. J. S. Barnes. (Iron and Coal Tr. Rev., Sept. 18, 1908; 1 p.) Continuation of articles indexed in the JOURNAL of May 2, 1908. Describes cage chains and shackles and cage hangers. Illustrated. 40c.

7617—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., Aug. 1, 1908; 3 pp.) Continuation of article previously indexed, dealing with the mines of the Glace Bay basin. 20c.

7618—COAL BIN—Method of Building a Concrete Coal Bin. Ernest McCullough. (Min. Wld., Aug. 1, 1908; 1¾ pp.) Gives formulas for calculating the pressure of coal and also the compression and tensile stresses of the walls and bottom of the bin. 20c.

7619—COAL HANDLING—Maschinelle Fördereinrichtungen vor Ort auf rheinisch-westfälischen Gruben. Forstmann. (Glückauf, Sept. 5, 1908; 9½ pp.) Describes a rather elaborate system of swinging chutes and conveyors for drawing coal out of rooms with moderate slopes. 40c.

7620—COKE—Ueber die Koksausbeute von Steinkohlen. F. W. Hinrichsen and S. Taczak. (Stahl u. Eisen, Sept. 2, 1908; 2½ pp.) A further attempt to determine the coking yield of a coal by laboratory methods. 40c.

7621—COKE-OVEN—The By-Product Coke-Oven. (Journ. Am. Soc. Mech. Engrs., Sept., 1908; 10 pp.) Discussion by various members of the paper by W. H. Blauvelt, in which further information is imparted. Illustrated.

7622—COKING OF PEAT by the Ziegler System. O. K. Zwingenberger. (Journ. Am. Peat Soc., Oct., 1908; 8 pp.) Describes the Ziegler process which consists of carbonizing air-dried peat in upright retorts and recovering the by-products. Contains data on the analyses of peat compared with coke and the uses of peat coke. 60c.

7623—COLLIERY PLANT—New Plant at the Penrikyber Navigation Colliery. (Iron and Coal Tr. Rev., Sept. 25, 1908; 3 1/3 pp.) Describes the hoisting plant, the electrical plant and the arrangement at the pit bottom. Illustrated. 40c.

7624—COLLIERY WORKING—Recent Developments and Future Problems in Colliery Working and Management. G. H. Winstanley. (Iron and Coal Tr. Rev., Sept. 25, 1908; 2½ pp.) Paper read before Nat. Assn. of Colliery Managers, reviewing recent progress in colliery engineering. The author discusses coal-cutting machines, drilling machines for blasting, mechanical haulage, power generation and transmission, the exhaust steam turbine, etc. 40c.

7625—DUST—Coal-Dust Experiments at Altofts. (Iron and Coal Tr. Rev., Sept. 4, 1908; 4 2/3 pp.) Describes experiments to ascertain the extent of the danger arising from the presence of coal-dust such as collects on the sides, roofs, roadways and screens of a colliery and to suggest remedies and furnish data to enable the danger to be safeguarded against. Illustrated. 40c.

7626—DUST—Coal-Dust to Date, and Its Treatment with Calcium Chloride. Henry Hall. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1¾ pp.) Historical notes; test of coal dust in airways; effects of watering; effects of calcium chloride treatment to dust. Paper before the Brit. Instn. of Min. Engrs. 40c.

7627—DUST—Spraying Coal Mines. D. Harrington. (Mines and Minerals, Oct., 1908; 2½ pp.) Describes the method used in Carbon county, Utah, of spraying the working faces with water. Gives the method of constructing pipe lines and the cost of operations. Illustrated. 20c.

7628—DUST—The Problem of Treating Dust in Coal Mines. Frank Haas. (Eng. and Min. Journ., Oct. 24, 1908; 3 pp.) Abstract of a paper read before the West Virginia Min. Assn. at Charleston, W. Va., Oct. 7, 1908. Claims that dust, as such, is not explosive. Preheating the intake air to saturation by exhaust steam is more effective than sprinkling. 20c.

7629—DUST—Vorrichtungen zum Abscheiden von Kohlenstaub auf den Zechen des Ruhrkohlenreviers. Hasebrink. (Glückauf, Aug. 29, 1908; 7 pp.) Describes installations at various German coal mines for preventing the dissemination of dust. 40c.

7630—ELECTRIC SHOT FIRING—The Science and Art of Electricity. George Farmer. (Sci. and Art of Min., Oct. 3, 1908; 1¾ pp.) Describes the use of the electric current to fire shots in mines. 20c.

7631—ELECTRICITY IN COAL MINING—Installations electriques des Charbonnages réunis Laura et Vereeniging. A. Genart. (Rev.

Univ. des Mines, T. XIII, 1908; 33 pp.) [illegible] description of the very comp[illegible] equipment at this Dutch coal mine [illegible] turbo-generators, hoists, locomotives, etc. $1.

7632—EXPLOSIONS—Effects of H[illegible] upon Coal Mine Explosions. [illegible] (Black Diamond, Aug. 15, 1908; 2¼ pp.) Discusses the fact that explosions [illegible] frequent in winter than in summer, and advances the theory that this is explained when it is known that the mine air, being warmer than the air used for ventilation, aids the tendency to absorb the moisture which is carried off through the upcast. 20c.

7633—EXPLOSIONS—Examen [illegible] de Deux grandes explosions de Poussières. V. Watteyne. (Ann. des Mines de Belgique, T. XIII, 3 livr., 1908; 120 pp.) Results of experimental tests on the explosion of coal dust, with a discussion of the evidence afforded by the Courrières and la Boule explosions.

7634—FUEL INVESTIGATION—The Nature of the Volatile Matter in Coal. H. C. Porter and F. K. Ovitz. (Eng. and Min. Journ., Oct. 10, 1908; 2 pp.) Discusses the fuel investigations being conducted by the United States Geological Survey along lines to determine the chemical and physical structure of coal. 20c.

7635—GEOLOGY—Geological Features of the Red Seam at Clydach Vale. D. Davies. (Iron and Coal Tr. Rev., Aug. 21, 1908; 3½ pp.) Contains a description of the [illegible] characteristics of the Red Seam in Wales. Illustrated by 49 sketches made by the author. Paper before the Nat. Assn. of Colliery Managers. 40c.

7636—GERMAN COAL SYNDICATES. (Iron and Coal Tr. Rev., Aug. 28, 1908; 2 1/3 pp.) Discusses the influence which has been exerted upon German industries by the syndicates which have been formed in the Empire. 40c.

7637—HAULAGE—Die Seilförderung im Carlstolln bei Diedenhofen. Schwartzkopff. (Stahl u. Eisen, Sept. 23, 1908; 5½ pp.) Describes in detail the overhead, endless rope haulage system at this German coal mine. 40c.

7638—ILLINOIS—Majestic Coal and Coke Company's Mine at Clinch, Ill. T. S. Moss. (Min. Wld., Oct. 3, 1908; 1½ pp.) Describes the method of mining, surface equipment and precautions taken to lessen danger from falls of roof. Illustrated. 20c.

7639—LIGNITE IN GERMANY—Die Braunkohlenlagerstätten des Hohen Westerwaldes. F. Freise. (Zeit. f. prak. Geol., June, 1908; 12½ pp.) Describes in detail the geology of the district to the northeast of the Rhine, occurrence of lignite, and the methods of working it. 40c.

7640—MINING METHOD—South Staffordshire Method of Mining Coal. L. W. Mayer. (Eng. and Min. Journ., Oct. 3, 1908; 3½ pp.) Circular brick-lined shafts with rope guides are in common use and one hoisting engine drum sometimes serves two shafts. Illustrated. 20c.

7641—NOVA SCOTIA—Operating a Nova Scotia Coal Mine. H. E. Coll. (Eng. and Min. Journ., Sept. 26, 1908; 2¾ pp.) The rules governing shot firing are so efficient when rigidly enforced, that 150,000 shots have been fired without causing an accident. Illustrated. 20c.

7642—OKLAHOMA—The Colliery Law of Oklahoma. N. H. Rowland. (Eng. and Min. Journ., Oct. 10, 1908; 1¼ pp.) Discusses a number of articles in the laws of Oklahoma relating to the operation of coal mines. 20c.

7643—OKLAHOMA COAL FIELDS Rich in Resources. (Black Diamond, Sept. 19, 1908; 2 pp.) Gives a description of the conditions governing the coal industry of Oklahoma, the geology and some of the mines. Illustrated. 20c.

7644—PRODUCTION of Coal in 1907. Edward W. Parker. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 222 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7645—PURE COAL as a Basis for the Comparison of Bituminous Coals. A. [illegible] (Bi-Monthly Bull., Sept., 1908; [illegible]) Gives a definition and description of [illegible] pure coal and compares this with certain bituminous coals.

7646—RESCUE APPARATUS.—The Practical Use and Value of Colliery Rescue Apparatus, and the Organization of Rescue Corps. George B. Walker. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 2/3 pp.) Discusses the rules as drawn up for German collieries but modified to suit the conditions of British mining. Paper before the Brit. Instn. of Min. Engrs. 40c.

7647—RESCUE APPARATUS [illegible] 20c.

[illegible] Colliery. John H. Haertter. (Mines and Minerals, Oct., 1908; 2¾ pp.) Describes the method of determining the course of a tunnel to connect a shaft with a slope full of water under unfavorable circumstances. Illustrated. 20c.

[illegible] Arching and Pit Bottom. S. D. Houghton. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 1/3 pp.) Describes the method of taking out an old arch and timbering up to keep the roof [illegible] timbering the shaft, and putting in a shaft bottom or inset. Illustrated. 40c.

7650—UNITED STATES—The Coals of the United States. N. W. Lord. (Chem. Engr., Sept., 1908; 6 pp.) Describes the various coals found in the United States, together with their composition and other points of interest. 40c.

[illegible] WATER GAS [illegible] Lemaitre. (Rev. Univ. des Mines, T. XXIII, 1908; 29 pp.) A discussion of the production of water gas, and its uses for mechanical and metallurgical purposes. $1.

[illegible] WEATHERING OF COAL [illegible] fahren der Steinkohle. M. Dennstedt and R. Bünz. (Zeit. f. angew. Chem., Aug. 28, 1908; 10½ pp.) Results of tests on the chemical and mechanical changes produced in a variety of coals by exposure to oxidation. 40c.

COPPER

7653—ANALYSIS—Zur Volhardschen Kupfertitration. H. Theodor. (Chem. Zeit., Sept. 16, 1908; 1 p.) A discussion of the Volhard titration for copper. 40c.

7654—ANALYTICAL METHOD—Some Observations on the Permanganate Method for Copper. John Herman. (West. Chem. and Met., Aug., 1908; 4 pp.) Describes F. G. Hawley's modification of the Guess method. The method is said to be extremely accurate if carefully performed and is much quicker and easier to perform than any other good method. 80c.

7655—BRITISH COLUMBIA—Granby Mining Methods. C. M. Campbell. (Quart. Bull. Can. Min. Inst., July, 1908; 23 pp.) Describes the deposit and method of operating together with some of the apparatus used underground and on the surface at this British Columbia mine. Illustrated.

[illegible] CHILEAN COPPER MINERALS—Notes on Some Chilean Copper Minerals. Harry F. Keller. (Reprint from Proc. Am. Phil. Soc., Vol. XLVII, 1908; 7 pp.) Describes the characteristics of cupreous man[illegible] copper and magnesium, brochantite containing arsenic acids and atacamite, which were included in a number of mineral specimens collected in Chile. Illustrated.

7657—COPPER ARSENIC—Neuer Unter[illegible] Leitungswiderstand von arsenhaltigem Kupfer. K. Friedrich. (Metallurgie, Sept. 22, 1908; 10 pp.) A study of the thermal characters and crystal structures of copper-arsenic alloys of various percentages. 40c.

7658—EARLY AMERICAN MINING—Notes on Copper Mining in the American Colonies. E. T. Wherry. (Journ. Franklin Inst., Oct., 1908; 6½ pp.) Describes some of the early mines known to exist previous to the R[illegible] War. [illegible]

[illegible] ELECTROLYTIC REFINING [illegible] Ton Electrolytic Copper Refining Plant. Charles C. Christensen. (Min. Wld., Oct. 3, 1908; ¾ p.) Gives brief calculations showing the consumption of electric power in depositing copper, size of vats, casting and arrangement of anodes, etc. 20c.

[illegible] JAPAN [illegible] Japans. W. Paul. (Metallurgie, Sept. 8, 1908; [illegible]) operation at the several Japanese copper mines, with analytical results of their various [illegible]

[illegible] Copper Smelters. H. T. Waller. (Inst. Min. [illegible]) scription of some of the laboratory methods [illegible] blast furnace work.

[illegible] MEXICO [illegible]

[illegible] 20c.

[illegible] mine. [illegible]

[illegible] pp.) Describes a rocking-tray slag-casting [illegible] Illustrated. 20c.

[illegible] (Min. Wld., Sept. 26, 1908; 2 pp.) De[illegible]

[illegible] Peru. (Min. and Sci. Press, Oct. 3, 1908; [illegible]) tion of the new smeltery that has recently been blown in at Rio Blanco. 20c.

[illegible] ing in South Australia. R. F. Baker. (Aust. Min. [illegible]) Describes the mines of the northern district and the conditions existing throughout the district. 20c.

FLUORSPAR

[illegible] this locality, and discusses its probable origin. [illegible]

GOLD AND SILVER

7670—AMALGAMATION—A Brief Discussion of the Proper Way to Clean and Dress Plates During Amalgamation. J. H. Haynes. (West. Chem. and Met., Sept., 1908; 5½ pp.) [illegible] clean amalgamating plates. Illustrated. 60c.

[illegible] AMALGAMATION [illegible] 20c.

[illegible] AMALGAMATION [illegible] W. F. A. Thomae. (Inst. Min. and Met., May, 1908; [illegible])

7673—AMALGAMATION—The Average Rate of Accumulation and Absorption of Gold [illegible] some details relative to the amount of service [illegible]

[illegible] BRITISH COLUMBIA [illegible] Bear Mine," Rossland, B. C. H. H. Yuill. (Quart. Bull. Can. Min. Inst., July, 1908; 21 pp.) Describes the methods of working, the [illegible]

[illegible] the Colorado desert is being rejuvenated by [illegible]

[illegible] the records of the two leading mines at Co[illegible]

[illegible] in this South American country. Illustrated. [illegible]

[illegible] Monthly Bull., A. I. [illegible]

7679—COLORADO—Hahns Peak, Colorado. (Eng. and Min. Journ., Oct. 24, 1908; ¾ p.) Describes the recent resumption of work in this old abandoned gold and silver district. Illustrated. 20c.

7680—COLORADO—Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., Sept. 24; 1908; 2 pp.) Eighth article of a series previously indexed which deals with the ore deposits of Eastern and Western Leadville. Illustrated. 20c.

7681—CYANIDATION—Agitation by Compressed Air. F. C. Brown. (Min. and Sci. Press, Sept. 26, 1908; 3¼ pp.) Describes the method of agitation in tall tanks which are known as B. & M. tanks in New Zealand and Australia, Pachuca tanks in Mexico and the United States and Brown's circulating tank in other countries. Illustrated. 20c.

7682—CYANIDATION—Le Traitement des Minerais d'Argent par la Cyanuration, au Mexique. A. Bordeaux. (Génie Civ., Sept. 12, 1908; 4½ pp.) Outlines the chemical reactions, and then describes the process as carried out at various Mexican mines. 40c.

7683—CYANIDATION of Silver Ores, Pachuca, Mexico. Claude T. Rice. (Eng. and Min. Journ., Oct. 3, 1908; 7¼ pp.) The ore is completely slimed and at the mills now building air agitation is to be used and the ore only roughly concentrated. Illustrated. 20c.

7684—CYANIDATION of Silver Ores. W. J. Sharwood. (Min. and Sci. Press, Sept. 26, 1908; 2½ pp.) A discussion of the article by F. J. Hobson in which the author furnishes additional information concerning the reactions which take place in the cyanidation of silver ores. 20c.

7685—CYANIDATION—Precipitation and Clean-Up at the Kendall Mill, Kendall, Mont. E. D. Cooledge. (West. Chem. and Met., Aug., 1908; 3 pp.) Describes the treatment of an oxidized silicious ore which is an altered lime occurring in a lime formation near the intrusion of a porphyry dike. The silver content of the ore is unimportant. 80c.

7686—CYANIDATION—Silver Cyaniding in Mexico. J. B. Empson. (Eng. and Min. Journ., Oct. 3, 1908; 1¼ pp.) Discusses the cost of mining, rapid cyaniding by agitation and aeration, electric precipitation, etc. 20c.

7687—CYANIDATION—The Estimation of Sulpho and Ferrocyanides, etc., in Cyanide Solutions Containing Copper. Leonard M. Green. (Inst. Min. and Met., Oct. 15, 1908; 7 pp.) Describes the titration of cyanide solutions containing copper; this metal greatly complicates the determination of ferro- and sulphocyanides. Methods used and precautions to be taken.

7688—CYANIDE PRACTICE—Recent Cyanide Practice in Korea. A. E. Drucker. (Min. and Sci. Press, Oct. 3, 1908; 3 pp.) Describes the mill and the treatment of ore at the Oriental Consolidated Mining Company's plant in northwestern Korea which is crushing about 30,000 tons of low-grade ore per month. Illustrated. 20c.

7689—CYANIDING SLIME. E. B. Wilson. (Mines and Minerals, Oct., 1908; 4½ pp.) Continuation of article previously indexed; describes the filter press process; method of construction and operation of the Sweetland press and the Blaisdell pressure filter. Illustrated. 20c.

7690—ELECTRICAL EQUIPMENT of Gold Mines. H. J. S. Heather. (Instn. of Min. and Met. Apr. 9, and July 9, 1908; 36 pp.) Discussion and contributed remarks on the above paper which was previously mentioned in this Index.

7691—FILTER PRESS—An Improved Press for Filtering Cyanide Slimes. Ernest J. Sweetland. (Min. Wld., Oct. 10, 1908; 1 1/3 pp.) Describes the Sweetland filter press, together with the construction and method of operating it. This press handles slime from the cyanide process efficiently and economically. Illustrated. 20c.

7692—GOLD DREDGING on the Choco River, Republic of Colombia, South America. H. G. Granger. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 27 pp.) Describes the conditions existing in the placer districts of the country and the various river systems together with data of the gravels in the country.

7693—IDAHO—Central Idaho Gold Districts—I. S. J. Jellum . (Northwest Min. News, Sept., 1908; 8 pp.) Describes the early discoveries, the geography, topography and geology and some of the principal mines in Central Idaho. Illustrated. 20c.

7694—MEXICO—Guanajuato, the Great Silver Camp of Mexico. Claude T. Rice. (Eng. and Min. Journ., Oct. 3, 1908; 3¼ pp.) The ore now milled comes mainly from the dumps, but the mine tonnage is increasing and the Veta Madre mines are being reopened. Illustrated. 20c.

7695—MEXICO—Jesus Maria and Flores Mills; Guanajuato. Claude T. Rice. (Eng. and Min. Journ., Sept. 26, 1908; 5½ pp.) By cyaniding the silicious gold and silver ore an average extraction of 86 per cent. silver and 88 per cent. gold has been obtained. Illustrated. 20c.

7696—MEXICO—Rejuvenation of Guanajuato Camp, Mexico. Thomas C. Welch. (Min. Wld., Oct. 3, 1908; 4 pp.) Describes the operations of the leading companies and the benefits derived from electric power and improved railway facilities. Illustrated, 20c.

7697—MEXICO—The Granadeña Mines. S. F. Shaw. (Min. and Sci. Press, Sept. 19, 1908; 2½ pp.) Describes the working methods of mining, character of the ore-body and the treatment of the ore in the mill of the Granadeña Mining Co., situated in the Hidalgo mining district about three miles northeast of Santa Barbara. 20c.

7698—MEXICO—The Silver Mines of Mexico. A. F. J. Bordeaux. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 12 pp.) Gives a general survey of the character and present condition of the silver mines of Mexico and is a summary which should be useful to mining engineers.

7699—MEXICO—The Working Mines of Guanajuato. Claude T. Rice. (Eng. and Min. Journ., Oct. 24, 1908; 2 2/3 pp.) Describes some of the recently reopened bonanza mines on Veta Madre and some mines near La Luz and some in the Sierra system. Illustrated. 20c.

7700—NEVADA—Present Conditions in Goldfield District, Nevada. G. E. Walcott. (Min. Wld., Oct. 10, 2 1/3 pp.) Describes the leasing system and the operations of the Goldfield Consolidated, Florence and other properties. Gives data of the royalties paid, the cost of electric power and other information. Illustrated. 20c.

7701—ONTARIO—Larder Lake. H. L. Kerr. (Can. Min. Journ., Oct. 1, 1908; 2 pp.) Describes briefly some of the conditions existing at this gold camp in northern Ontario and describes the route into the camp. Illustrated. 20c.

7702—ONTARIO—The Origin of the Silver of James Township, Montreal River Mining District. A. E. Barlow. (Quart. Bull. Can. Min. Inst., July, 1908; 24 pp.) Describes the geology and the occurrence of silver in this district lying northwest of Cobalt, Ontario, and describes the various minerals and rocks in the district. Illustrated by interesting photographs.

7703—PLACER MINING—Using Placer Water to the Best Advantage. D. A. Stovall. (Min. Sci., Oct. 1, 1908; 1¼ pp.) Gives practical suggestions for appliances to be used in placer work to increase both economy and efficiency. Illustrated. 20c.

7704—PROSPECTING—River Prospecting for Gold. M. MacFarlane. (Min. Journ., Sept. 19, 1908; 1 p.) Describes a simple and effective plant for river prospecting and methods of work in French Guinea. Illustrated. 40c.

7705—QUEENSLAND—The Mount Morgan Gold Mining Company, Ltd. (Queensland)—I. and II. J. B. Wilson. (Aust. Min. Stand., Aug. 12 and 19, 1908; 5½ pp.) Gives the history of the mine and a description of the ore occurrence. Also describes the methods of mining and timbering. To be continued. 60c.

7706—REFINING—Electrolytic Refining of Gold, Silver and Copper at the United States Mint, San Francisco, Cal. Robert L. Whitehead. (Electrochem. and Met. Ind., Oct., 1908; 2 pp.) Conclusion of article previously indexed. Describes the melting room and various furnaces used therein. Illustrated. 40c.

7707—REFINING OF SILVER BULLION Containing Arsenic and Antimony. B. Neilly. (Quart. Bull. Can. Min. Inst., July, 1908; 8 pp.) Describes the method used by the author and tells of some of the difficulties encountered which were overcome. Illustrated.

7708—SAMPLING—Rand Sampling Practice. J. S. Oliver. (Min. Journ., Sept. 19 and 26, 1908; 2½ pp.) Discusses the uniformity of the ore deposits on the Rand and some of the precautions which must be taken in sampling. Describes the systems of sampling employed, and points out some of the errors which are likely to occur. 60c.

7709—SIBERIAN MINING—Hints to Foreigners. (Min. Journ., Sept. 19, 1908; 2½ pp.) Gives much valuable information to any one contemplating a journey in Siberia. Discusses cost of traveling, conditions met with, labor, laws, taxes, freight, cost of supplies and weights and measures. Illustrated. 40c.

7710—SILVER MILL—Hacienda Buburon, an Old Mexican Silver Mill. Mark R. Lamb. (Eng. and Min. Journ., Oct. 3, 1908; 2 pp.) Primitive crushing and grinding appliances in the Guanajuato district were the predecessors of the stamp and the tube mills of the modern cyanide plant. Illustrated. 20c.

7711—SLIME TREATMENT in Western Australia. Percy Ifould. (Aust. Min. Stand., Aug. 12, 1908; 1½ pp.) Describes the Cassell process which has been installed at a number of mines in Western Australia. Illustrated. 40c.

7712—SLIMES TREATMENT—Method of Settling Slimes, as Applied to Their Separation from Solution in Cyanide Treatment. (Inst. of Min. and Met., July, 1908; 12 pp.) This is a further contribution by H. G. Nichols to the discussion of his paper on this subject and contains much additional information. Illustrated by curves.

7713—STAMP BATTERIES—Reinforced Concrete Foundations for Stamp Batteries. S. J. Truscott and J. P. Fuller. (Inst. Min. and Met., Oct. 15, 1908; 8 pp) Describes the replacement of wooden mortar blocks at Redjang Lebong, Sumatra, by reinforced concrete. Illustrated.

7714—STAMP MILL—An Electrically Driven 300-Stamp Mill on the Rand. Ralph Stokes. (Min. Wld., Oct. 3, 1908; 2 2/3 pp.) Describes the heavy stamp mill erected to serve the Jupiter and Simmer which has a capacity of 75,000 tons per month. Illustrated. 20c.

7715—STAMP MILLS—Some of the Large Stamp Mills of the World—I. Charles C. Christensen. (Min. Wld., Oct. 10, 1908; 3 2/3 pp.) Describes the arrangement of the Alaska Treadwell and Alaska Mexican mills, giving production and cost data. Illustrated. 20c.

7716—STAMP MILLS—Tremain Steam Stamps. C. E. Parsons. (Min. and Sci. Press, Sept. 19, 1908; 3½ pp.) Describes the operation of these stamp mills in Rhodesia and gives cost of their installation, also cost of mining, milling and general expense. 20c.

7717—STAMP MILLING—Weighing Ore in Stamp Mills. Frank A. Ross. (Eng. and Min. Journ. Oct. 24, 1908; 1¼ pp.) Describes the method of weighing ore immediately behind the batteries at the stamp mill of the Daly Reduction Company, Ltd., at Hedley, B. C. Illustrated. 20c.

7718—TAILINGS—Innovation in Gold Saving. F. B. Craig. (Am. Min. Rev., Oct. 10, 1908; 1¼ pp.) Describes the construction and operation of the Stover-Glaze gravity amalgamator and concentrator, a device for separating gold and concentrates from dredger and mill tailings. 20c.

GRAPHITE

7719—GENESIS OF GRAPHITE—A Contribution to the Discussion on the Genesis of the Graphite in Argenteuil and Labele Counties, in the Province of Quebec. F. Hille. (Can. Min. Journ., Aug. 1, 1908; 2½ pp.) Discusses the various hypotheses which have been advanced on this subject and contains some theories by the author. 20c.

7720—MEXICO—The Graphite Mines of Santa Maria. James C. Mills. (Mines and Minerals, Oct., 1908; 1½ pp.) Describes the occurrence of graphite and its uses. The deposit in Mexico is the largest on the Western Continent. The method of treating graphite is also briefly described. 20c.

7721—PRODUCTION of Graphite in 1907. Frank L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 4 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

IRON AND STEEL

7722—ANALYSES OF BRITISH PIG Irons Shown at the Franco-British Exhibition, 1908. (Iron and Steel Inst., Sept., 1908; 22 pp.) Describes various kinds of British pig iron, special alloy pig irons, raw materials and by-products. The paper contains complete analyses of the material shown and the exhibit is classified by districts.

7723—ANALYSIS—The Technical Analysis of Magnetite, Hematite and Limonite. R. Bolling. (Can. Min. Rev., Aug. 1, 1908; 1½ pp.) Describes sampling, crushing, drying, grinding and the chemical analysis of these ores of iron. 20c.

7724—BASIC OPEN-HEARTH PROCESS—The Chemical Control of the Basic Open-

Hearth Process. Alfred Harrison and R[illegible]ard V. Wheeler. (Iron and Steel Inst., Sept., 1908; 20 pp.) Indicates how far the chemist can control the basic open hearth, [illegible] and outlines a scheme for complet[illegible] [illegible]ing the reactions which take place. Illustrated.

7725—BLAST FURNACE—Ba[illegible] de[illegible] Eisenhochöfen, deren Beurteilung und Wahl. J. v. Ehrenwerth. (Oest. Zeit. f. B. u. H., June 20, 1908; 3 pp.) Discusses the shape and proportions of various kinds of [illegible] furnaces. 40c.

7726—BLAST FURNACE—The New Rebecca Furnace of the Kittanning Iron and Steel Manufacturing Company. (Iron Tr. Rev., Sept. 24, 1908; 5½ pp.) Describes the construction of this new blast furnace and the equipment at the plant. 20c.

7727—BLAST FURNACE PRACTICE—An Unusual Blast Furnace Product; and Nickel in Some Virginia Iron Ores. Frank Firmstone. (Bi-Monthly Bull. of Am. Inst. Min. Engrs., Sept., 1908; 2¼ pp.) Describes a peculiar trouble which occurred at Furnace No. 2, Longdale, Va., in which a salamander was formed which had a peculiar composition.

7728—BLAST FURNACE PRACTICE—The Relation of Slow Driving to Fuel Economy in Iron Blast Furnace Practice. J. E. M[illegible]. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 1½ pp.) Discusses the subject briefly and gives the rates of driving at a number of furnaces both in the United States and abroad.

7729—BLAST FURNACE SLAG—Die Verwendung von Hochofenschlacken. H. Passow. (Stahl u. Eisen, July 22, 1908; 2½ pp.) A discussion of cement manufacture from blast-furnace slag. 40c.

7730—BLAST FURNACE SLAG—Die Zusammensetzung der Hochofenschlacke in graphischer Darstellung. Graphische Möllerberechnung. W. Mathesius. (Stahl u. Eisen, Aug. 5, 1908; 21 pp.) Tabulates a great number of analyses of slag from German iron works, and illustrates methods for representing the results graphically, on a plane surface and on three dimensions. 40c.

7731—BLAST FURNACES—A Description of Messrs. Bell Brothers' Blast Furnaces from 1844-1908. Greville Jones. (Iron and Steel Inst., Sept., 1908; 15 pp.) The progress in British blast furnace construction is shown in this paper which is illustrated by a series of blast furnace drawings and plans of the works.

7732—CALIFORNIA—The Occurrence and Genesis of the Magnetite Ores of Shasta County, California. Basil Prescott. (Econ. Geol., Aug.-Sept., 1908; 16 pp.) Describes the deposits situated northeast of the junction of the Pit and McCloud rivers in Shasta county. Gives the topography, general geology, ore occurrence, mineralogy and genesis of the ore minerals. Illustrated. 60c.

7733—CARBIDES IN STEEL—Apparat zur Bestimmung der Karbidkohle in Stahl und Eisen. G. Mars. (Stahl und Eisen, July 22, 1908; 1½ pp.) Describes a simple apparatus for use in determining the amount of combined carbon in iron or steel. 40c.

7734—CARBON STEELS—The Constitution of Carbon Steels. Edward D. Campbell. (Iron and Steel Inst., Sept., 1908; 20 pp.) A further contribution to the theory of iron and steel, which discusses the constituents of carbon steels and the effect of heat treatment.

7735—CONCENTRATION of the Mesabi Ore. H. H. Stock. (Mines and Minerals, Oct., 1908; 1¾ pp.) Describes the new method of treatment installed at Coleraine by the United States Steel Corporation in order to treat the sandy ores of the Western Mesabi range. Illustrated. 20c.

7736—CONVERTER PROCESS—Experimentelle Untersuchung des Thomasprozesses. F. Wüst and L. Laval. (Metallurgie, Aug. 8, and 22, 1908; 57½ pp.) Describes the methods and tabulates the results of an exhaustive series of tests on the operation of the converter process for steel. 80c.

7737—CORROSION—The Inhibitive Power of Certain Pigments on the Corrosion of Iron and Steel. A. S. Cushman. (Eng. Rec., Sept. 19, 1908; 1½ pp.) A paper read before the Am. Soc. for Testing Materials. Discusses a number of methods for testing and several observations made with paint used on iron and steel. 20c.

7738—CORROSION of Steel and Iron Tubing. H. M. Howe. (Eng. and Min. Journ., Oct. 24, 1908; 1 p.) The author replies to a criticism by G. Schuhmann of a previous contribution by him on the above subject. 20c.

7739—CUPOLA CONSTRUCTION and Operation. Thomas D. West. (Foundry, Oct., 1908; 2½ pp.) Discusses the requirements of cupolas, construction, the arrangement and function of tuyeres and the manipulation [illegible]

[illegible] DESULPHURIZING PIG IRON—[illegible] chen Induktionsofen. B. Osann. (Stahl u. Eisen, July 15, 1908; 5 pp.) Results of experiments on the removal of sulphur from pig iron by the electric furnace. 40c.

[illegible] Blast Installation. (Iron Age., Oct. 8, 1908; 3½ pp.) Describes the new installation of the refrigerating plant of the dry blast equipment at the Illinois Steel Company's South Works, Chicago. Illustrated. 20c.

[illegible] Blast at Warwick Furnace. Edward B. Cook. (Paper read before A. I. M. E., Oct., 1908; 3 1/3 pp.) Cites results obtained by drying the blast at a merchant furnace of moderate size. Describes the plant used and the savings which were effected. Illustrated. 20c.

[illegible] ELECTRIC FURNACE—[illegible]ano Electric Furnace. (Iron Age., Oct. 8, 1908; 2¾ pp.) Contains a description of [illegible] use. Illustrated. 20c.

7744—ELECTRIC FURNACES—Progress in the Electric Iron and Steel and Ferro Alloy Industries—I. John B. C. Kershaw. (Iron Tr. Rev., Oct. 1, 1908; 1 2/3 pp.) Describes the improvements that have been made from time to time in the various electric furnaces. Illustrated. 20c.

[illegible] IRON FURNACE [illegible] neuer Drehstromofen und weitere Fortschritte in der Elektrostahl[illegible]nn. (Stahl u. Eisen, [illegible] 3 pp.) Describes the construction and operation of this electric furnace, and compares its results with those of the usual furnace. 60c.

7746—ELECTRIC STEEL FURNACES—Removal of Sulphur in Electric Steel Furnaces. (Electrochem. and Met. Ind., Oct., 1908; 2¾ pp.) Discusses experiments in which sulphur [illegible] and the Roechling Rodenhauser furnaces. Translation of articles by H. Gellenkirchen and B. Osann which appeared in *Stahl u. Eisen* of June 17 and July 15 respectively. 40c.

7747—FREEZING POINT of Iron. H. C. H. Carpenter. (Iron and Steel Inst., Sept., 1908; 12 pp.) Gives a review of the present condition of pyrometric science relating to the freezing point of iron and describes a reliable determination of the freezing point.

7748—GASEOUS FUELS—Sulphur in Gaseous Fuels. F. L. Grammer. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 2½ pp.) Contains a suggestion for the operation of open-hearth furnaces where sulphur is dreaded, which consists in using blast furnace gas en[illegible]

7749—GENESIS OF ORES—A New Theory of the Genesis of Brown Hematite Ores; and a New Source of Sulphur Supply. H. M. Chance. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 18 pp.) Describes the great range of hills and mountains stretching from New York to Georgia which consist of pre-Palaeozic schists, slates and gneissic and granitoid rocks. The author believes that the iron ores found throughout this range are the gossans or oxidized remains of pyrite deposits, practically in place, and therefore underlain by undecomposed pyrite in place.

7750—GENESIS OF ORES—Pyritic Origin of Iron Ore Deposits. G. L. Cabot. (Eng. and Min. Journ., Sept. 26, 1908; 1 p.) Discussion of the article by H. M. Chance in which further information is given. 20c.

7751—GERMANY—The Ilsede Hütte Iron Mines at Peine, Germany. L. W. Mayer. (Bi-Monthly Bull. A. I. M. E. Sept., 1908; 6½ pp.) Describes the operation of the mines and the methods of working. Illustrated.

[illegible] HARDENING—The [illegible] the Hardening Shop. J. Lord. (Birmingham, [illegible] pp.) Describes the equipment of a hardening shop in a large works wherein the hardening and tempering of tool steel is accomplished with great economy. Illustrated.

[illegible] IRON ORE BRIQUETTES—[illegible]ettieren von Eisenerzen—II. (Stahl u. Eisen, Aug. 19, 1908; 9 pp.) Describes the materials and methods for briquetting iron ores at several European plants. 40c.

7754—MAGNETIC CONCENTRATION—[illegible] Anwendung fur gerosteten Spateisenstein im Siegerlande. (Oest. Zeit. f. B. u. H., June 27, 1908; 6½ pp.) Discusses the suitability of magnetic separation for roasted spathic [illegible]

[illegible] trated. 20c.

[illegible] and steel. 40c.

[illegible] the evolution of and the purifying action of the mixer.

[illegible] their use. 40c.

[illegible] other features. Illustrated. [illegible]

[illegible] (Iron and Steel Inst., Sept., 1908; 15 pp.) Discusses the best method of treating any [illegible] easily [illegible]

7761—[illegible] Ex[illegible] ungs und Sch[illegible] thermal behavior of [illegible] particular reference to phosph[illegible]

[illegible] The Production of Finished [illegible]

7763—SIBERIA—The Kyshtim Mines and [illegible] mines, are being developed by the Perm Cor[illegible]

7764—SILICON—Influence of Silicon on [illegible]

[illegible] features which [illegible]

[illegible] STEEL PLANT—The [illegible] the Mill Buildings of the Gary Steel Plant. (Eng. Rec., Sept. 26, 1908; 3 2/3 pp.) Describes the gas cleansing process, the blowing engines, electric power station, car loaders, [illegible] 20c.

[illegible] taining the Relative Wearing Properties of [illegible]

[illegible] Stahl. M. Orthey. (Zeit. f. angew. Chem., [illegible]

[illegible]

of steels when tested in pieces into which incisions of different sizes had been made. 60c.

7770—TITANIUM IN IRON—Titan im Gusseisen. (Stahl u. Eisen, Sept. 2, 1908; 2½ pp.) A study, by analysis and testing machine, of the influence of titanium on the strength of cast iron. 40c.

7771—WELDING—A Fusion Process for Welding Steels. (Iron and Coal Tr. Rev., Aug. 28, 1908; 1¼ pp.) Describes a process in which the metals are placed in contact and fixed so, the surfaces being clean and no flux being used. Illustrated. 40c.

7772—WESTERN AUSTRALIA—Yampi Sound Iron Ore Deposists. (Western Australia.) W. D. Campbell. (Aust. Min. Stand., Aug. 12, 1908; 1¼ pp.) Describes the ore deposits on Koolan island which have been known for many years. The ore is a high-grade hematite. Illustrated. 20c.

LEAD

7773—LEAD SILICATE—Ueber die Bildung von Bleisilikaten und ihre Rolle bei den neuen Bleigewinnungsprozessen. S. Hilpert. (Metallurgie, Sept. 22, 1908; 4 pp.) A study of the thermal reaction between lead and silica, with reference to the recent pot roasting methods of smelting. 40c.

7774—MISSOURI—Lead and Zinc Ores in Missouri. J. R. Finlay. (Eng. and Min. Journ., Sept. 26, 1908; 5 1/3 pp.) Describes the mining districts of southeast and southwest Missouri, the general character of the ore, methods and general costs of mining. Illustrated. 20c.

LIME AND SAND LIME BRICK

7775—PRODUCTION of Lime and Sand Lime Brick in 1907. Edwin C. Echel. (Advance Chapter from Mineral Resources of U. S., Calendar year 1907; 9 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

NITRATE OF SODA

7776—CHILE—The Nitrate Deposits and Industry in Chile. L. Lema. (Min. Sci., Sept. 24 and Oct. 1, 1908; 5 pp.) Continuation of article previously indexed, which describes the attitude of the Chilean Government and of the nitrate owners, the methods of working and the labor and economic conditions, including data of costs. 40c.

PETROLEUM

7777—CALIFORNIA—The Santa Maria Field of California. (Petroleum Rev., Sept. 26, 1908; 2½ pp.) This field is called the Baku of America. Describes the wells and gives figures of production from 1902 to 1907. Illustrated. 40c.

7778—CALORIFIC POWER of Petroleum Oils and the Relation of Density to Calorific Power. H. C. Sherman and A. H. Kropff. (Journ. Am. Chem. Soc., Oct., 1908; 4½ pp.) Gives the record of the calorific power of a considerable number of represented American petroleum oils and points out the approximate relationship between the density and the calorific power of such oils. 80c.

7779—ILLINOIS—Geology of Illinois Petroleum Fields. H. Foster Bain. (Econ. Geol., Aug.-Sept., 1908; 13 pp.) Describes the history of the district, together with the geology, occurrence of gas and oil and gives the production of petroleum in Illinois during the last three years. Illustrated. 60c.

7780—OIL SHALE—The Working of Oil-Shale at Pumpherston. William Caldwell. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 p.) Describes the method of mining, the driving of levels, labor, blasting, conveyance of shale underground and methods of working Paper read before the Brit. Instn. of Min. Engrs. 40c.

7781—ORANGE RIVER COLONY—Petroleum in der Orange River Colony. (Süd-Afrika.) G. J. Kellner. (Zeit. f. prak. Geol., July, 1908; 1½ pp.) Discusses the associations and occurrence of petroleum in this ristrict. 40c.

7782—ROUMANIA—Les Gisements Petroliferes de la Roumainie. L. Demaret. (Annales des Mines de Belgique, T. XIII, 3 livr., 1908; 88 pp.) Conclusion of an illustrated description of the several oil fields of Roumania.

7783—STORAGE SYSTEM—A Modern Fuel-oil Storage System. H. W. Beecher. (Min. and Sci. Press, Sept. 19, 1908; 1 p.) Describes the system of oil storage at the plant of the Pacific Light and Power Co. at Redondo Cal., in which special attention has been paid to protection from fires. 20c.

7784—SUMATRA—The Koninklyke Nederlansche Petroleum Maatschappij. (Petroleum Rev., Sept. 26, 1908; 3¼ pp.) A review of the last 25 years in this petroleum district in Sumatra which is operated by the above company better known as the Royal Dutch Petroleum Company. Illustrated. 40c.

PLATINUM

7785—COLOMBIA—The Platinum Deposits of Colombia. (Iron and Coal Tr. Rev., Aug. 21, 1908; 1/3 p.) Abstract of article in the Journ. Royal Soc. of Arts which describes the early history of the platinum industry and gives production of platinum and gold in this South American country. 40c.

7786—DREDGING for Platinum in the Urals, Russia. L. Tovey. (Eng. and Min. Journ., Oct. 10, 1908; 5 pp.) The richer deposits are becoming exhausted and the gravels too poor to be worked by hand await development of an efficient dredge. Illustrated. 20c.

PHOSPHATE ROCK

7787—ANALYSIS—A Modification of the Volumetric Molybdate Method for the Estimation of Phosphoric Acid in Acid Phosphates and Commercial Fertilizers. Rinaldo Williams. (Chem. Engr., Sept., 1908; 3 pp.) The principal point in this modification is the precipitaton of phosphoric acid as mixed ferric and calcium phosphates.

7788—SOUTH SEA ISLANDS—Phosphates in the South Seas. (Am. Fertilizer, Sept., 1908; 1¾ pp.) Describes large deposits of high-grade phosphates in the islands of the Pacific ocean. 20c.

QUICKSILVER

7789—ASIA MINOR—Mercury Mines at Koniah, Asia Minor. F. F. Sharpless. (Eng. and Min. Journ., Sept. 26, 1908; 2½ pp.) Describes ancient workings discovered after probably 3000 years on deposits of cinnabar which are now being opened and prepared for operation. 20c.

7790—ITALIAN CINNABAR DEPOSITS—Un giacimento cinabrifero nel Pliocene presso Pereta in Provincia di Grosseto. B. Lotti. (Rassegna Mineraria, July 21, 1908; 2 pp.) Describes the geology and the occurrence of mercury ore in this locality. 40c.

RARE METALS

7791—SELENIUM—Die Schmelzdiagramme der Binäen Systeme Cu-Cu$_2$Se, Ag-Ag$_2$Se und Pb-PbSe. K. Friedrich and A. Leroux. (Metallurgie, June 22, 1908; 3 pp.) Experimental results on the physical and thermal properties of alloys of selenium with copper, silver and lead. 40c.

SAND AND GRAVEL

7792—PRODUCTION of Sand and Gravel in 1907. Ernest F. Burchard. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 6 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

STONE

7793—STONE INDUSTRY in 1907. A. T. Coons. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 45 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7794—WEATHERING OF BUILDING STONE—Die Prüfung der naturlichen Bausteine auf ihre Wetterbeständigkeit. J. Hirschmald. (Zeit. f. prak. Geol., July, 1908; 8 pp.) Describes methods of testing the durability of a building stone, with remarks on the relation between composition, structure and durability. 40c.

SULPHUR

7795—MEXICO—Geologia Quimica de los Criaderos de Azufre de Mapimi (Estado de Duango.) J. D. Villarello. (Sociètè Scientifique "Antonio Alzate," Mémoires T. 26, 1908; 30 pp.) Describes the deposits, discusses their origin, proposes a utility for the product of these sulphur mines.

7796—SULPHUR ORE FOR ACID MAKING—Impiego del Minerale di Solfo per la preparazione dell'acido solforico. G. Oddo. (Rassegna Mineraria, Aug. 21 and Sept. 21, 1908; 9½ pp.) A discussion of the possibility of utilizing the crude Sicilian sulphur rock for acid making. 60c.

TIN

7797—BOLIVIA AND PERU—Una Inspeccion de los Yacimientos de Estaño de Bolivia y una Exploracion por el Mismo Metal en el Peru. E. A. L. de Romaña. (Boletin del Cuerpo de Ingenieros de Minas del Peru, No. 57, 1908; 99 pp. and many plates.) An exhaustive description of the geology and mineralogy of the Bolivian tin deposits and the methods of working them; also a review of the discoveries of tin in Peru.

7798—QUEENSLAND TIN ORE—Einige Bemerkungen über die Zinnerzlagerstätten des Herberton-Distrikts in Queensland. (Zeit. f. prak. Geol., July, 1908; 5 pp.) A full discussion of the occurrence and origin of the deposits. 40c.

ZINC

7799—EUROPEAN SMELTERS—Leistungen von Zinköfen. (Metallurgie, Sept. 8, 1908; 7 pp.) A complete tabulation of the construction and operating details of the European zinc smelteries. 40c.

7800—MISSOURI—Lead and Zinc Ores in Missouri. J. R. Finlay. (Eng. and Min. Journ., Sept. 26, 1908; 5 pp.) See under "LEAD."

7801—ZINC LEAD WHITE—Making Zinc Lead White at Canyon City. (Min. Wld., Aug. 1, 1908; 3 pp.) Describes the method of utilizing Western zinc-lead ores, after concentration, for making a high-grade pigment. Describes the construction of furnaces and the uses of zinc-lead white. Illustrated. 20c.

ECONOMIC GEOLOGY

7802—BARBADOS—Geological Formation of Barbados. J. B. Harrison. (Bull. Pub. Co., 1908, Barbados; 16 pp.) Gives a sketch of the geological formation of the Scotland district of Barbadoes and other parts of the island. 20c.

7803—FAULTS—The Growth of Faults. W. H. Marston. (Journ. Brit. Fed. Sec. Min. Students, Aug., 1908; 6 pp.) Discusses earthquakes and the causes of faults. Illustrated.

7804—IDAHO—The Ore Deposits at Mineral, Idhao. H. W. Turner. (Econ. Geol., Aug.-Sept., 1908; 11 pp.) Describes the geology, ore deposits, calcareous replacement deposits, quartz-tourmaline veins and the effect of the basalt dikes on the deposits. Illustrated. 60c.

7805—IGNEOUS ROCKS—The Distribution of the Elements in Igneous Rocks. H. S. Washington. (Bi-Monthly Bull., A.I.M.E., Sept., 1908; 30 pp.) Discusses the general chemical composition of igneous rocks and the occurrence of certain elements therein.

7806—MAGMATIC WATERS—The Relation of Magmatic Waters to Volcanic Reaction. H. W. Hixon. (Journ. Franklin Inst., Oct., 1908; 10½ pp.) Discusses the relation of magmatic waters to valcanic action, ore deposition, mountain folding and kindred phenomena. It is shown that combined water varies from 0.6 to 7.4 per cent. in eruptive rocks and this fact is used as a basis for discussion. 60c.

7807—MEXICO—Le Minéral d'Aranzaxu, Estado de Zacatecas. J. D. Villarello. (Institut Géologique, Mexico, February, 1906; 26 pp and 3 maps.) A discussion of the ore deposits and brief description of the mines operating in this district.

7808—MEXICO—Le Minéral de Mapimí. J. D. Villarello. (Instituto Géologique de Mexico, 1906; 18 pp. and 2 maps.) A discussion of the mineral resources of this district.

7809—NEW SOUTH WALES—Report on the Drake Gold and Copper Field. E. C. Andrews. (Dept. of Mines and Agriculture, N. S. W., No. 12, 1908; 41 pp.) Describes the history, geography, geology and the mine workings in this neglected field in New South Wales. Illustrated by sketches and maps.

7810—NEW ZEALAND—The Geology of the Cromwell Subdivision, Western Otago Division. James Park. (Bull. No. 5, New Zealand Geol. Surv., 1908; 92 pp.) An elaborate description of the physiography, general and economic geology and petrography of this district of New Zealand. Profusely illustrated and accompanied by 10 maps and 6 sheets of sections.

7811—PORTUGAL—The Structure or Tectonic Geology of the Arrabidan Chain of Mountains, Portgual. Paul Choffat. (Min. Journ., Sept. 19, 1908; 2/3 p.) Describes the geology and rocks and the disposition of the strata of this section of Portugal. 40c.

7812—SCANDINAVIA—Explanatory Notes tb Accompany a Geological Sketch Map of Fenno-Scandia. J. J. Sederholm. (Helsingfors, 1908; 31 pp.) [illegible] geology of the Scandinavian [illegible] land, the West Coast of [illegible] of Denmark. [illegible] and some of the features of their occurrence in this region.

7813—SOUTH AFRICA—[illegible] of Northern [illegible] (S. African [illegible] Journ., Sept. 5, 1908; 1 p.) Describes the geology of the district, the water question and base metal indications. 20c.

7814—TASMANIA—The [illegible] Mining Field. L. K. Ward. (Geol. Surv. Bull. No. 3, Dept. of Mines, Tasmania, 1908; 120 pp.) [illegible] general and economic geology and mining properties in the district. Illustrated by four plates.

MINING—GENERAL

7815—ANCIENT MINING—[illegible] tenmännische Unternehmungen in Asien und Afrika Während des Altertums. [illegible] (Zeit. f. B. H. u. Salinenw., Band [illegible] 1908; 70 pp.) A very interesting [illegible] of the mining and metallurgical methods connected with iron, copper, and the precious metals, among the inhabitants of Egypt, Asia Minor, and other old countries.

7816—ASSAY PLAN—[illegible] (Min. and Sci. Press, Oct. 3, 1908; ¾ p.) Suggests a plan which has been used for the Smuggler-Union Mining Company which reveals at a glance the location, value and width of veins represented by the samples assayed. Illustrated. 20c.

7817—ASIA—Die Mineralvorkommen und die bergbaulichen Verhältnisse in Anatolien, Kurdistan und Arabistan. B. Simmersbach. (Zeit. f. B. H. u. Salinenw., Band 56, 3 heft, 1908; 4 pp.) Describes the mineral [illegible] and industries of this part of Western Asia.

7818—BORING—Brejcha's Improved System of Boring. W. Galloway. (Coll. Guard., Sept. 11, 1908; 12/3 pp.) Describes a system of boring which involves certain improvements in the diamond drills and [illegible] the appliances used in connection with it. Illustrated. 40c.

7819—BORING—Deep Diamond Boring at Balfour Mains, Fifeshire. J. G. Thompson. (Iron and Coal Tr. Rev., Sept. 4, 1908; ¾ p.) Describes the plant erected to sink a deep bore hole and the difficulties which were encountered and overcome. Illustrated. Paper read before the Instn. of Min. Engrs. 40c.

7820—CAVING SYSTEM—Surface Effects of the Caving System. Lucien Eaton. (Min. and Sci. Press, Sept. 26, 1908; 1 1/3 pp.) Describes the effect of caving in ground at a mine where the occurrence of the ore was unusually uniform. 20c.

7821—ECONOMIC MINE DEVELOPMENT. J. G. West. (Aust. Min. Stand., Aug. 12, 1908; ¾ p.) The author treats the subject mathematically and gives formulas for various kinds of development. 20c.

7822—GREAT BRITAIN—Twenty [illegible] of Mining. Edward Ashmead. (Min. Journ., Sept. 19, 1908; 2 pp.) This is the third division of the review and discusses the registration of the various companies in the [illegible] ing districts of South Africa. 40c.

7823—EXCAVATION—The Cost of Excavating Earth and Hauling in Small Steel Cars. (Eng.-Con., Sept. 30, 1908; 1 p.) Gives details of cost using V-shaped 1½-yd. all steel cars at Attleboro, Mass. Illustrated. 20c.

7824—HAULAGE—Vergleich einer Pferde- und einer Benzinlokomotivförderung im Michael-Schachte der Kaiser Ferdinands Nordbahn in Michalkowitz. F. Stiller. (Oest. Zeit. f. B. u. H., July 25, 1908; 4 pp.) Compares the cost and efficiency of haulage in this mine by horsepower and by gasolene locomotives. 40c.

7825—HYGROMETRY in its Practical Aspect. J. H. Hart. (Power and Engr., Oct. 6, 1908; 1¾ pp.) Describes the [illegible] moisture in the air and the field which has recently been opened in many industries. [illegible]

7826—MEXICO—Mining in Mexico, Past and Present. E. A. H. Tays. (Eng. and Min. Journ., Oct. 3, 1908; 2 2/3 pp.) Describes early methods of mining and reducing ores and their results; Spanish search for the precious metals and the Mexican miner and his work. Illustrated. 20c.

7827—MEXICO—Present Condition of Mining in Mexico. F. W. Smith. (Eng. and Min. Journ., Oct. 3, 1908; 1 1/3 pp.) The fall in the prices of metal has greatly affected prosperity, but it has stimulated increased effort to reduce costs of production. 20c.

7828—MINE FIRES—Sulphur Dioxide as [illegible] Sept., 1908; 3 pp.) Describes the use of [illegible] data concerning the cost, preparation, ef[illegible]

[illegible]

tion of Mineral Waters in 1907. Samuel Sanford. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 38 [illegible] features in the industry together with other [illegible]

[illegible] Describes methods of mining, timbering, breaking the ore, transportation and haulage. Illustrated. 20c.

[illegible] Metallurgy. (Aust. Min. Stand., Aug. 19, [illegible] Philippines. 40c.

7834—PHILIPPINES—Metallic Mineral Resources of the Philippines. Maurice Good[illegible] the Bureau of Science, Manila, 1908, giving [illegible] opments of gold, copper, silver, lead, iron and tin. 20c.

[illegible] Below the Water Line. A. G. Knight. (Pow[illegible] used by the author for laying a pipe under [illegible]

7836—PRODUCTION—The Production of Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1907. H. D. McCaskey. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 22 pp.) Describes the production and principal features in the industries together with other statistical data of interest.

7837—PROFESSIONAL ETHICS for the Mining Engineer. J. H. Hammond. (Eng. and Min. Journ., Oct. 10, 1908; 2 1/3 pp.) Discusses the relations of the mining engineer to his clients and to the public, and his duty to himself in these different relations. Paper read before the Am. Inst. Min. Engrs., Oct., 1908. 20c.

7838—RAND LABOR—The Chinese on the Rand. T. Lane Carter. (Bi-Monthly Bull., A. I. M. E., Sept., 1908; 24½ pp.) A discussion of labor conditions in South Africa by one who has had an intimate knowledge of the subject for many years. Describes the conditions under which the coolies live and their efficiency as workmen. Illustrated.

7839—RESCUE WORK—The Alpha Shaft Disaster. W. S. Larsh. (Mines and Minerals, [illegible] entombed miners when the Alpha shaft of the Giroux Cons. Mines Co. caved in, giving [illegible] ployed for securing the upper part of the shaft which was still intact, and sinking through the debris. 20c.

7840—ROPE INSPECTION—Winke zur systematischen Ausführung der bergbehördlichen Bestimmungen für die Sicherheit der [illegible] scribes appliances and methods for inspecting. [illegible]

7841—SHAFT SINKING—Das Abteufen [illegible] plant and the method of sinking this shaft [illegible]

7842—SINKING—A WINZE—[illegible] Holes. G. C. McFarlane. (Eng. and Min. [illegible] rapid method of sinking a winze so as to make an air connection with a railroad tun[illegible] compared with other methods. Illustrated. [illegible]

[illegible] (Eng. and Min. Journ., Oct. 10, 1908; 2 3 [illegible]

[illegible] Can. Min. [illegible] and in som[illegible] trated.

ORE DRESSING

[illegible] herd von Card. O. Pütz. (Zeit. f. B. H. u. Salinenw., Band 56, 3 heft, 1908; 6 pp.) De[illegible] Card concentrating table.

[illegible] and Met., [illegible] the const[illegible] treatment [illegible]

[illegible] coal. 40c.

[illegible] apparatus used. [illegible]

METALLURGY—GENERAL

[illegible] des Alliages. M. [illegible]

[illegible]

tion der Zink-Kupfer-Nickel-Legierungen. V. E. Tafel. (Metallurgie, June 22 and July 22, 1908; 28 pp.) An experimental study into the physical and thermal properties of copper nickel, zinc copper and zinc nickel alloys. 60c.

7859—CONVEYING MATERIALS—The Elements of Chemical Engineering.—III. (Chem. Engr., Sept., 1908; 10 pp.) This instalment deals with the methods of conveying liquids in various kinds of pipes. There are also tables giving data on pressure. Illustrated. 40c.

7860—COOLING CURVES—On Methods of Obtaining Cooling Curves. G. K. Burgess. (Electrochem and Met. Ind., Oct., 1908; 2½ pp.) Conclusion of article previously indexed. Discusses direct and inverse rate curves, rapid cooling and characteristics of cooling curves. Illustrated. 40c.

7861—DIRECT REDUCTION—Ueber Kupfer- und Silberverluste beim direkten Prozess der Kupfergewinnung (Reaktionsschmelzen.) W. Stahl. (Metallurgie, June 22, 1908; 2½ pp.) Experimental data on the recovery of copper and silver by the direct reduction process instituted by H. M. Howe in 1877. 60c.

7862—ELECTROLYTIC REDUCTION—Studien über die Darstellung von Legierungen nitridbilender Metalle. E. Beck. (Metallurgie, Sept. 8, 1908; 18 pp.) Describes a series of tests on the reduction of the oxides of certain metals in various kinds of electric furnaces, with conclusions as to the commercial value of the processes. 40c.

7863—ELECTRO-METALLURGY and Electric Furnaces. F. Louvrier. (Min. Journ., Aug. 22, 1908; 1 p.) Historical classification of electric furnaces, electric furnaces compared, electric manufacture of thermo alloys, electro metallurgy of iron and steel, comparison of electric refinery furnaces and comparison of electric reduction furnaces. 40c.

7864—FURNACE EXPLOSIONS—Die Explosionen beim Stürzen der Gichten im Hochofen. W. van Vloten. (Stahl u. Eisen, July 15, 1908; 2½ pp.) An explanation of the explosions that sometimes occur in the upper part of a blast furnace. 40c.

7865—FURNACE LININGS—Use of Basic Refractory Brick in Metallurgy. F. T. Havard. (Eng. and Min. Journ., Oct. 24, 1908; 2¼ pp.) Describes the sources and cost of magnesite and chromite and the advantages and disadvantages of employing these minerals for furnace linings. 20c.

7866—OPTICAL METALLOGRAPHY—Ueber mikrographische Zementuntersuchung R. E. Stern. (Chem. Zeit., Sept. 12, 1908; 1½ pp.) Discusses several practical advantages to be gained by a more general use of the microscope in metallurgy. 40c.

7867—PRICE OF ORES—Recherche de la Teneur en Zinc ou en Plomb Correspondante à la Valeur Maxima d'un Minerai Calaminaire ou d'une Galena. L. Henrotin (Associazione Mineraria Sarda, Iglesias, 1908; 16 pp.) An interesting discussion, from the mathematical standpoint, of the usual ore-buying formulas.

7868—SMELTER CASES—Disposal of Gases at Selby, California. James C. Bennett. (Eng. and Min. Journ., Sept. 26, 1908; 1 p.) Describes a method of drawing off gases from the tapping floors by lowering hoods over the matte and slag pots, and using an exhaust fan. Illustrated. 20c.

MINING AND METALLURGICAL MACHINERY

7869—AIR COMPRESSION at High Altitudes. S. B. Redfield. (Power and Engr., Oct. 6, 1908; 3 1/3 pp.) Tells why more air is required to do a given amount of work at high altitudes and gives simple methods of calculating the pressure needed to compress the air. Illustrated by diagrams. 20c.

7870—AIR COMPRESSOR—McFarlane Hydraulic Air Compressor. (Eng. and Min. Journ., Oct. 10, 1908; 2/3 p.) Describes a new air compressor of the direct acting pulsating type which effects an economy of water and energy by adapting the pressure of the water to that of the air to be compressed. Illustrated. 20c.

7871—BELT CONVEYERS—Performance of Belt Conveyers. Edwin J. Haddock. (Journ. Am. Soc. Mech. Engrs., Sept., 1908; 15 pp.) Describes a series of experiments to determine (1) the effect of changing the diameter of the driving pulley; (2) the effect of different arcs of contact; (3) the effect of initial tensions on the tractive force; (4) the relative value of rubber-faced vs. iron-faced pulleys. Illustrated.

7872—CHAINS—Borsigketten und Kenterschäkel. M. Krause. (Stahl u. Eisen, Sept. 23, 1908; 8½ pp.) Results of an extended series of tests on the breaking strength of chains of various kinds and sizes. 40c.

7873—CONVEYING OF MATERIALS. (Journ. Am. Soc. Mech. Engrs., Sept., 1908; 31 pp.) Discussion on five papers which were previously read before the Society. Further information is given upon cableways, ore unloaders, belts for handling salt and chemicals and certain mechanical features used in connection with conveyers. Illustrated.

7874—DRILLS—Air Drills and Their Efficiency. Samuel K. Patterson. (Min. and Sci. Press, Oct. 3, 1908; 1 1/3 pp.) Describes some of the characteristic features of air drills of various makes and discusses the pressures under which they operate. 20c.

7875—ELECTRIC FURNACE—A Convenient Carbon Resistance Furnace. A. Coggeshall and A. V. Bleininger. (Trans. Am. Ceramic Soc., Vol. X, 1908; 6½ pp.) Discusses the advantages of carbon resistance and describes a furnace constructed by the authors. Illustrated.

7876—ELECTRIC MOTORS—Direct-Current Motors in Mining Service. W. B. Clarke. (Mines and Minerals, Oct., 1908; 2 pp.) Discusses dangers arising from, and causes of, "induction-kick" or discharge of the shunt-field windings, and suggests methods of avoiding them. 20c.

7877—ELECTRIC POWER—Employing Electric Power in Joplin District—II. Doss Brittain. (Min. Wld., July 25, 1908; 2 pp.) Continuation of article previously indexed. 20c.

7878—FUEL CONSUMPTION—The Scientific Control of Fuel Consumption. Henry E. Armstrong. (Iron and Steel Inst., Sept., 1908; 15 pp.) Discusses the enormous waste of fuel which is going on daily and pleads for greater economy and the introduction of methods which are potentially of higher efficiency.

7879—GAS PRODUCER—Bituminous Producer Plants. E. A. Harvey. (Journ. Am. Soc. Mech. Engrs., Oct., 1908; 24 pp.) Gives a detailed description of the use of producers, generating producer gas without any attempt to burn the heavy hydrocarbons or tars in the gas generators, the hydrocarbons being removed from the gas by a mechanical cleaning process.

7880—GAS PRODUCER—Loss of Fuel Weight in a Freshly Charged Producer. N. T. Harrington. (Journ. Am. Soc. Mech. Engrs., Oct., 1908; 4½ pp.) Describes a test to determine relation between coal fired and that actually consumed during the first few hours of operation, after completely filling the producer with a new charge of coal. Illustrated

7881—GAS PRODUCER PRACTICE—Further Experiments Upon Gas Producer Practice. William A. Bone and Richard V. Wheeler. (Iron and Steel Inst., Sept., 1908; 30 pp.) Demonstrates how, with still lower steam saturation of temperatures, a most effective combination of rapid rate of gasification with high thermal efficiency can be continuously maintained over long periods of time.

7882—GASOLENE LOCOMOTIVES—La Locomotive a Benzine. S. F. Perin. (Pub. de l'Association des Ing. de l'Ecole des Mines de Mons, T. II, 1908; 57 pp. Describes the construction and operation of a great variety of gasolene locomotives suitable for underground use.

7883—HAULAGE—Construction of Haulage Mechanism so as to Preserve Ropes and Chains. E. Heckel. (Coll. Guard., July 17, 1908; 1¼ pp.) Describes the construction of rope and the proper use of a rope to increase its life. Illustrated. Translation from *Stahl und Eisen.* 45c.

7884—HOISTING—The Notholm-Eigemann Safety Apparatus for Winding Engines. (Iron and Coal Tr. Rev., Aug. 28, 1908; 1½ pp.) Describes the safety apparatus used in connection with the main winding engine at No. 1 pit of the Zollverein colliery, Germany. This device claims to unite in itself all the advantages of the safety appliances already in existence and to avoid their defects. Illustrated. 40c.

7885—HOISTING ROPE—Untersuchung der Bruchenden eines im Betriebe gerissenen Drahtseiles. E. Heyn and O. Bauer. (Stahl u. Eisen, Aug. 26, 1908; 2 pp.) A microscopical study of the broken ends of the wires in a hoisting rope. 40c.

7886—MICROSCOPE—Note on a Workshop Microscope. J. E. Stead. (Iron and Steel Inst., Sept., 1908; 7 pp.) Describes a simple microscope of low power suitable for the use of foundry foremen and assistants in steel and engineering establishments. Illustrated.

7887—MINE SAMPLING DEVICES. H. E. Hooper. (Inst. Min. and Met., Oct. 15, 1908; 2 pp.) Describes a sampling chair and a catching bag which have been found useful in mine sampling. Illustrated.

7888—MINE TELEPHONE and Its Advantages. (Eng. and Min. Journ., Oct. 10, 1908; 1½ pp.) Discusses the method of installation and the conditions under which telephones are used in mines. Illustrated. 20c.

7889—MIXING MACHINERY—Oskar Nagel. (Electrochem. and Met. Ind., Oct., 1908; 3 pp.) One of the series of articles on apparatus used in the chemical industry. This article describes mixing machinery and agitators. Illustrated. 40c.

7890—OIL BURNING APPARATUS—Petroleum as a Fuel. M. W. Campbell. (Power and Engr., Sept. 22, 1908; 1¼ pp.) Describes several burners and furnaces for using petroleum. Illustrated. 20c.

7891 — PUMPING PLANT — An Up-to-Date Pumping Plant in North China. A. S. Cross. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 p.) Description of the Chinese Engineering and Mining Company's Plant recently installed at the Tongshan mine. This is the pioneer's station of its kind in the Far East. Illustrated. 40c.

7892—RESCUE APPARATUS—The Anaconda Protective Hood. R. N. Bell. (Eng. and Min. Journ., Oct. 10, 1908; 1½ pp.) Describes a simple home-made device used in the Anaconda mines at Butte, Mont. for fighting underground fires and poisonous gases. Illustrated. 20c.

ANALYTICAL CHEMISTRY

7893—ALLOYS—The Valuation of Engineering Alloys—II. Richard K. Meade. (Chem. Engr., Sept., 1908; 5½ pp.) Describes methods of analysis for alloys of Sb, Sn, Pb, Bi, Cd, and Zn, in fusible metals, solders, etc.; analysis of Cu, Sn, Pb, Zn, Fe, Al, Mn and P in brass and bronze; and the analysis of alloys of Ni, Zn, Cu and Fe. 40c.

7894—ASSAY CRUCIBLES—Tests of Assay Crucibles, with Notes on the Types of Clays Suited to Their Manufacture. Edward Orton, Jr., and H. B. Henderson. (Trans. Am. Ceramic Soc., Vol. X, 1908; 31½ pp.) This article is the result of an investigation to test the commercial value of two clays for crucible manufacture. Contains much valuable data and many tables. Illustrated.

7895—ASSAYING—Behavior of Tellurium in Assaying. S. W. Smith. (Inst. of Min. and Met., May, 1908; 14 pp.) Discusses the behavior of tellurium during pot fusion, scorification and cupellation.

7896—ASSAYING—Methods of Making Crucible Assay Calculation. Robert B. Brinsmade. (Min. Wld., Oct. 3, 1908; 1½ pp.) Describes the classes of ores suitable for crucible assay and the charges used when using different fluxes. Gives the solution of two practical problems to explain simplicity of calculations. 20c.

7897—C. P. IRON—Chemisch reines Eisenoxyd als Urtitersubstanz für die Eisenbestimmung in salzsaurer Lösung. L. Brandt. (Chem. Zeit., Aug. 26, 29 and Sept. 3, 1908; 5 pp.) Discusses the preparation of chemically pure iron for use as a standard in iron titrations. 80c.

7898—CHROMIC AND VANADIC ACIDS—Iodometric Estimation of Chromic and Vanadic Acids in the Presence of One Another. Graham Edgar. (Am. Journ. Sci., Oct., 1908; 3½ pp. Describes a method devised by the author which gave very close results. 60c.

7899—QUANTITATIVE SEPARATION of Tin From Manganese, Iron and Chromium by Electrolysis. M. N. Puschin. (Journ. Franklin Inst., Oct., 1908; 10 pp.) Translation from *Journal de la Société Physico-Chemique Russe*, XXXVIII, page 764. A detailed description is given of the methods used, the conditions under which the tests were made and the results obtained. 60c.

MATERIALS OF CONSTRUCTION

7900—CONCRETE—Useful Tables for Estimating the Cost of Concrete and for Designing Reinforced Concrete Beams and Slabs. (Eng.-Con., Aug. 26, 1908; 1 p.) Contains tables of cost and crushing strength of concrete mixtures compiled from reliable data. 20c.

7901—PORTLAND CEMENT—Effect of Fine Grinding on the Properties of Portland Cement. I. A. Williams. (Trans. Am. Ceramic Soc., Vol. X, 1908; 14½ pp.) Discusses the time of setting, tensile strength, soundness, etc., with cement ground to pass various measures. Illustrated by curves.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, NOVEMBER 14, 1908. NO. 20.

Carbon and the Properties of Cast Iron

The Difference in the Properties of Cast Iron Shown to Be Due to the Distribution of Its Carbon between the Graphitic and Combined States

BY HENRY M. HOWE*

The object of the present paper is to explain in simple terms how it comes about that the remarkable difference between the properties of different kinds of cast iron are due chiefly to the distribution of its carbon between the graphitic and the combined states. Cast iron may, indeed, be said to be rather a class or group of different substances than a single substance. The hard, brittle, white cast iron of chilled stamp shoes, of the tread of car wheels, and of crusher jaws, has little in common with the soft, impact-resisting gray iron of machinery castings, save that both are fusible, and both rich in carbon. In most of their properties they are strikingly unlike. The great differences between them are due essentially to the fact that in the white iron the carbon is nearly all combined, whereas in the gray it is nearly all in the state of graphite.[1]

The matter is really extremely simple, if we will only take the pains to set up a few clear mental pictures.

First, let us conceive of gray cast iron as really composed of two wholly distinct substances, fine sheetlets of graphite, wholly nonmetallic, weak, and soft, which, as a skeleton, are incased within a matrix which is the truly metallic part of the cast iron, somewhat as sand is incased in concrete. This conception of metallic matrix and the skeleton of graphite inclosed within it is essential to a clear understanding of the subject.

The next conception to be grasped is that the combined carbon is combined with this metallic matrix, and that it influences the properties of the matrix in exactly the way in which the properties of steel are influenced by its carbon content. Let us, therefore, refresh our memory as to the reason for this influence of carbon on steel. To understand this we must regard steel as a mixture or conglomerate or concrete of the two wholly distinct substances, pure iron, or as it is often called "ferrite," which is like copper in most respects except color and magnetism, and the extremely hard, brittle iron carbide called cementite, Fe_3C. If we leave out of account the hardened steel of tools, springs, etc., then all the carbon of our common steel exists in the form of this intensely hard and brittle cementite, in fine microscopic particles.

The reason why the properties of steel change as its carbon content increases is that this increase implies the increase of the proportion of this glass-hard cementite which the metal contains. In the dead-soft steel used for lap-welded tubing and for cold-driven rivets, there is as little carbon as practicable, say, 0.06 per cent., and as a consequence the metal consists almost solely of the extremely soft, ductile ferrite. As the carbon content increases, the proportion of this cementite increases at the rate of 1.50 per cent. for each 0.10 per cent. of carbon. Rail steel of, say, 0.50 per cent. of carbon is much harder than rivet steel, essentially because the presence of this 0.5 per cent. of carbon implies the presence of 7.5 per cent. of this hard, brittle cementite. Die steel of 2 per cent. of carbon is still harder, because it contains no less than 30 per cent. of this cementite, mechanically mixed with 70 per cent. of ferrite.

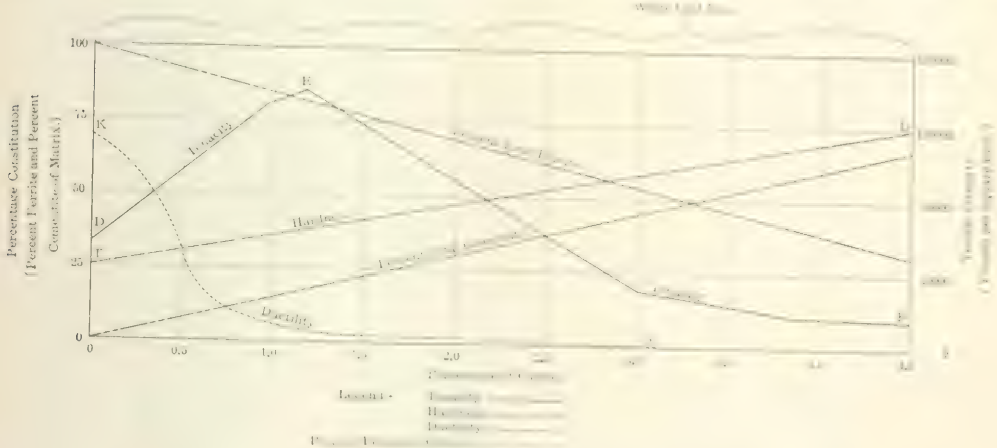


FIG. 1

[illegible] Line Between Steel and Cast Iron

The properties of such a series of steels are represented roughly in Fig. 1, together with the proportions of the ferrite and the cementite present, which are the causes of those properties. This diagram includes with steel white cast iron, for a simple reason. When the proportion of combined carbon rises above about 2.2 per cent., the metal is no longer called steel, but white cast iron, though there is an ill-defined intermediate part which is often spoken of as semi-steel. But it is evident that the series of white cast irons containing from 2.2 per cent. to, say, 4 per cent. of combined carbon and no graphite, is nothing whatsoever but a prolongation of the series of steels containing combined carbon all the way from zero to 2.2 per cent. The two series are in fact a single unbroken series, to the two divisions of which different names are assigned, just as Ninth avenue in New York changes abruptly into Columbus avenue at an imaginary line at Fifty-ninth street, but without change of direction, shape, size, or quality; and as, legally speaking, the minor changes abruptly into the major at the stroke of the midnight clock which ushers in his 21st birthday

---

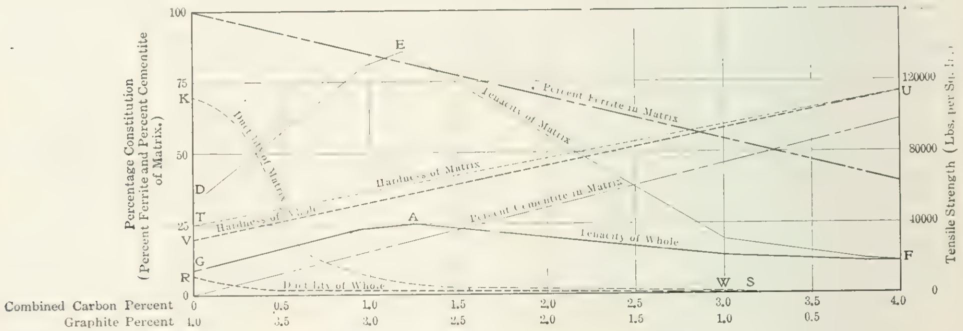
*Professor of metallurgy, School of Mines, Columbia University.

[1] The explanation here offered of the influence of the condition of carbon on hardness, strength and ductility, has been given in my previous writings. I add to it here a like explanation of the influence of the carbon-condition on porosity and on expansion in solidifying, and give concrete examples.

With this diagram before us, we get a rational explanation of the way in which the properties of this series, steel—white cast iron, change as the carbon content increases progressively from zero to, say, 4 per cent.

Name of matrix	Low carbon steel	Medium carbon steel	High carbon steel	White cast iron

Name of the cast iron *i.e.*, of the whole	Very open gray or very graphitic cast iron	Close gray cast iron	Mottled cast iron	White cast iron



Strength	Weak	Strongest		Weak
Ductility	Least brittle			Most brittle
Hardness	Softest	Soft	Harder	Hardest

Because of its					
strength and ductility	the iron is suited to uses in which it will have to undergo or resist	shock	moderate shock, the iron suited to most engineering purposes		no shock unless metal is strongly supported
hardness		much machining in preparation, but little abrasion in use	moderate machining in preparation, not excessive abrasion in use		no machining in preparation, much abrasion in use

FIG. 2

Hardening Effect of Inclosed Cementite

That the metal should grow progressively harder and harder (*T U*, Fig. 1), and less and less ductile (*K S*) as the carbon content increases, and as with the carbon content the proportion of this hard and brittle cementite increases, is, of course, perfectly natural. The influence of the carbon content on the tensile strength though somewhat less simple, is still readily understood. As the carbon content increases from zero up to about 1.25 per cent. (*D E*), the tensile strength increases pretty regularly, which is but natural. But with farther increase of carbon content the strength in turn decreases (*E F*). The tendency of the soft, pliable, copper-like pure iron or ferrite is to flow under tensile stress, as a bar of putty would flow or draw out if its ends are pulled apart. If we mix sheets of mica in with the putty, we can readily understand that this mica should oppose the flowing of the putty under our pull, and so should strengthen it. But this mica has simultaneously another and opposite effect, that of breaking up continuity, and thereby lessening the power of our bar of putty to resist our attempt to pull its ends apart, or in short lessening the tensile strength of the putty. We can readily understand that it should be true that, whereas a slight admixture of mica might strengthen the putty by resisting its tendency to flow, yet a larger quantity should weaken it because the degree to which it would break up the continuity of the putty would outweigh its strengthening effect due to its opposing the tendency to flow. In short, it is easy to understand that a little mica should strengthen the putty, but that much should weaken it.

In the same way it is easy to understand that a moderate quantity of microscopic sheets of cementite should strengthen steel by opposing its tendency to flow under tensile stress, yet that a larger proportion should in turn weaken it by breaking up the continuity of the mass of ferrite in which it is imbedded. We could not, indeed, prophesy beforehand that the carbon content at which the strengthening effect begins to be outweighed by the weakening effect should be 1.25 per cent., i.e., that this is the carbon content which gives the greatest tensile strength. But when we learn that this is the case, it need not surprise us. We can understand that it should be true, which is the main thing.

Now let us try to apply this conception to the case of cast iron, to see how we may explain by it the changes in the properties which take place as the carbon changes from the graphitic to the combined state. Let us recognize that graphite-bearing cast iron is a conglomerate in the second degree, consisting of a skeleton of graphite incased in a metallic matrix, which itself is a conglomerate of ferrite and cementite. We have, therefore, to consider the changes, first in the quantity of the graphitic skeleton, and second in the properties of the incasing metallic or steel matrix.

Changes in the Properties of Cast Iron

To fix our ideas let us conceive a series of cast irons all with the same total carbon content, say 4 per cent. Let us assume at one end of our series an ultra gray cast iron with its carbon all in the state of graphite, and at the other end a pure white iron with its carbon all combined, i.e., in the state of cementite, of which it would, therefore, contain $4 \times 15 = 60$ per cent. As we pass from the gray cast-iron end of the series toward the other or white cast-iron end, there is a progressive transfer of the carbon from the graphitic to the combined state. The point for us to recognize here is that this transfer has two distinct aspects, first lessening the quantity of graphite present, second, increasing the carbon content of the metallic matrix in which that graphite is inclosed.

Let us take first ultra gray cast iron with no combined carbon at all, or better, only 0.06 per cent. of combined carbon. It is evidently a conglomerate which consists, first, of 3.94 per cent. of graphite, and, second, of a metallic matrix in which that graphite is incased. This matrix contains only this 0.06 per cent. of carbon, and is, therefore, nothing but iron containing $0.06 \times 15 = 0.90$ per cent. of cementite, and contaminated with whatever phosphorus, sulphur or silicon is present. It is, therefore, the equivalent of a dead soft, ultra low-carbon steel, rendered impure by these foreign elements. Recognize clearly that this matrix in its very nature is absolutely identical with such steel. It consists essentially of a mechanical mixture of much ferrite and very little cementite, usually impure indeed, but still such a mixture, and nothing more or less than such a mixture. Such steel consists of such a mixture, and thus the steel and the matrix of our cast iron are absolutely identical, except only for such differences in purity as may happen to exist between impure steels and impure cast irons.

Let us take as our next step a cast iron in which 0.25 per cent. of the carbon has passed from the graphitic to the combined state. Here there is still 3.75 per cent. of graphite, and the matrix, which contains this 0.25 per cent. of combined carbon, is essentially a boiler-plate steel, because slagless iron containing 0.25 per cent. of combined carbon is boiler-plate steel. This cast iron, then, differs from the first in two ways. First, it contains less graphite, and on this account should be stronger, because graphite, by breaking up the continuity of the mass as a whole, certainly ought to weaken it. Second, its matrix is stronger than that of our first cast iron, because it is a boiler-plate steel, which is notoriously stronger than dead soft rivet or skelp steel, or because it is notorious that steel is greatly strengthened by increasing its carbon content from 0.06 to 0.25 per cent.

Let us take as our next step a cast iron which contains 3.5 per cent. of graphite and 0.5 per cent. of combined carbon. This cast iron then is a conglomerate consisting first of 3.5 per cent. of graphite, and second of a metallic matrix containing about 0.50 per cent. of carbon. But this matrix is evidently equivalent to a rail steel, because iron containing 0.50 per cent. of combined carbon is rail steel. This cast iron then should be stronger than the preceding for two reasons which act cumulatively. First, it has less of the continuity-breaking graphite; second, its matrix is stronger, because it contains 0.50 per cent. of carbon instead of 0.25 per cent.

Weakening Effect of Graphite Skeleton

By like reasoning this two-fold strengthening of the cast iron as a whole by the decrease of the weakening graphite skeleton, and by the simultaneous strengthening of the steel which constitutes the metallic matrix, should continue till the carbon content of the steel matrix reaches 1.25 per cent., *DE*, of Fig. 1. The line *GA*, Fig. 2, is a first attempt to represent this strengthening. But when the transfer of carbon from the graphite skeleton to the steel matrix continues past this point, the strength of the matrix begins to decrease (*EF* of Fig. 1), so that now the strengthening effect of the decrease of graphite is resisted by the weakening effect of the increasing carbon content of the steel matrix.

Fig. 2 gives an attempt to show the effects of these simultaneous changes in the continuity of the skeleton and the properties of the matrix. *DEF*, reproduced from Fig. 1 gives the tensile strength of the matrix, and *GAF* sketches that of the cast iron as a whole, the gap between these two lines at any given vertical line representing the weakening effect of the graphitic skeleton. Now, as the combined carbon content increases progressively from 1.25 to 4 per cent., and as with it the graphite skeleton decreases from 2.75 per cent. of the whole mass to zero, we may conjecture that this decrease, by lessening the discontinuity of the mass, progres- [illegible] strength of the metallic matrix and that of the mass as a whole. In other words, if the reason why the cast iron as a whole is weaker than its own matrix, is that it is weakened by the graphitic skeleton, then the less of this skeleton there is the less should be this weakening effect, and the less should be the difference between the strength of matrix and that of cast iron as a whole.

The line *AF* thus sketched gives us only a first approximation to the truth, because, strictly speaking, the weakening effect of the graphite is not proportionate to its mass, but rather to the degree of continuity of the skeleton, which the graphite forms. Now, though the continuity of the skeleton decreases in a general way as the percentage of graphite decreases, yet it is not necessarily true that the two should decrease in one and the same proportion. Indeed, from *G* to *A* the gap increases as the percentage of graphite decreases. This is a matter of actual observation. We know that there is no such increase in the strength of cast iron as would be implied by making this gap decrease, as the graphite decreases from 4 to 2.75 per cent. A reason for this increase in the width of the gap from *G* to *A* is at hand in the well known fact that, as the carbon-content of steel increases from 0 to 1.25 per cent., with it increases the injury which any nick or flaw causes. The little holes in the steel matrix which the presence of these little sheets of graphite implies, naturally should weaken that matrix much in the same way as that in which any nick or dent does.

The two lines, of course, meet at *F*, which represents 4 per cent. white cast iron, the right-hand member of both series.

Hardness, [illegible]

The hardness of the left-hand member of the cast-iron series, the ultra gray cast iron with practically no combined carbon, should be a little less than that of the very low-carbon steel of which its matrix consists, because the graphite skeleton which it contains is itself softer than that steel. The gap *TV* between these lines at their beginning is intended to represent this difference in hardness, but only qualitatively. As, passing to the right, the quantity of the soft graphite decreases, this gap should diminish progressively, of course, becoming zero at the right-hand end of the series, because white cast iron with 4 per cent. of combined carbon and no graphite is common to both series.

In the same way the ductility of the left-hand member of the cast-iron series, the ultra gray cast iron, should be much less than that of the ultra low-carbon steel *A*, of which its matrix consists, because of the lack of continuity which this graphite skeleton causes. The gap between the ductility line *K S* of the matrix and that of the cast iron as a whole, *R S*, should decrease as, passing to the right, the quantity of graphite decreases, because the less graphite there is the less should it break up the continuity, and the less, therefore, should it decrease the ductility.

But we may go still farther. The presence and quantity of the graphite skeleton explain not only the variations in strength, hardness, and ductility of the various grades of cast iron as we have now seen, but also the variations in porosity and in the permanent expansion in solidifying. If the skeleton which the graphite forms is nearly continuous, then the junctions between it and the matrix within which it is inclosed form a path of low resistance, along which fluids under high pressure can pass. Hence, cast iron for radiators and for hydraulic cylinders, which should be gas-tight and water-tight, should have but little graphite, and we may believe that it ought to be cast under such conditions that its solidification should not be extremely slow, because the slower the freezing the more clearly continuous would the skeleton be.

The very act of birth of so bulky a substance as graphite within the solidifying cast iron naturally should make the metal expand suddenly and markedly as it solidifies, and so it does. The late experiments of Heyn and Bauer[2], and of Goerens and Gutowsky[3], show that this generation of graphite takes place at and immediately after the passage from the molten to the solid state. Hence, ornamental castings, and others which must needs reproduce the details of the mold faithfully, should contain much graphite, so that they may expand much in solidifying, and their passage from the molten to the solid state should not be hurried, so that the formation of graphite may have time to take place.

MEANS OF CONTROLLING THE DISTRIBUTION OF THE CARBON BETWEEN ITS TWO STATES, THE GRAPHITE SKELETON AND THE CEMENTITE OF THE MATRIX

This distribution is controlled chiefly by the percentage of silicon which the cast iron is given, because the presence of silicon favors the formation of graphite. But beyond this, rapid cooling, the presence of sulphur, and in most cases that of manganese, oppose the formation of graphite. Hence in thin and, therefore, rapidly cooling castings, and in those which contain more sulphur than usual, the silicon content should be higher than in thicker castings and in those which contain less sulphur. Thus there is usually between 1.50 and 2.25 per cent. of silicon in *thick machinery castings*, whereas there may be as much as 3 or even 3.40 per cent. of silicon in *thin castings*, and in *ornamental* ones, the metal for which must generate much graphite so that it may expand much in solidifying and thus may fill every crevice of the mold. *Steam radiators*, and the *cylinders of hydraulic presses*, a very important duty of which is to prevent their fluid contents from leaking through, should have but little graphite. Hence they may well contain as little as 1.75 per cent. of silicon, or even as 1 per cent. in case impenetrability is of such importance that, in order to get it, some sacrifice of softness and consequent ease of machining must be endured.

Cast-iron railroad car wheels must have an intensely hard rim or tread, in order to resist the abrasion of the brake-shoe and rail, but their bodies must not be brittle, lest they break under the great shocks to which these heavily loaded wheels are exposed. Hence cast iron for these wheels is given such an intermediate percentage of silicon that the tendencies toward the formation of graphite on one hand and of cementite on the other are pretty evenly balanced, or, say, between 0.50 and 0.80 per cent. of silicon. Then in the tread of the wheel the carbon is forced into the cementite state by "chilling," i.e., suddenly cooling the tread by making that part of the mold against which the tread rests of cold cast iron. The carbon in the body of the wheel, on the other hand, is led to pass in large part into the state of graphite by the slow cooling of that part of the wheel, caused by making the body of the mold of sand.

Properties Sought.	Example of Use.	DISTRIBUTION OF CARBON.		Color of Iron.
		Cementite.	Graphite.	
Resistance to shock	Machinery	Little		Very gray.
Softness, easy machining	Machinery	Little		Very gray.
Sharpness of detail, expansion in solidifying	Ornaments		Much	Very gray.
Fluidity (phosphorus)	Pipes	Little		Very grag.
Strength	Car-wheel centers	Moderate		Close gray.
Imperviousness	Hyc. cyls. radiators.		Very little	Very close gray.
Hardness	Tread of car wheels	Much		Nearly white.

INFLUENCE OF SULPHUR

Besides its effect in making the carbon pass into the state of cementite instead of graphite, and thus making the castings hard and brittle, an effect which is usually unwelcome, sulphur makes the iron red-short, i.e., brittle at a red heat, so that it is liable to be torn apart by the stresses which arise because the cooling and contraction of the thicker and inner parts of the casting lag behind those of the thinner and outer parts. It also makes the molten metal sluggish, so that it does not run freely in its molds, and it has no virtues to compensate for these evils. Hence the sulphur present is, except in a few rare cases, that which in spite of us has crept in or stayed in. In case of castings which are to be machined, and hence must be relatively soft, the sulphur should not exceed 0.12 per cent., and in case of thin castings, the metal for which must needs be very fluid, the sulphur should not exceed 0.05 per cent.

INFLUENCE OF MANGANESE

Besides habitually (though indeed not always) opposing the formation of graphite, and thus tending to make the cast iron hard, manganese counteracts the red-shortness which sulphur tends to cause, by forming with that sulphur the relatively harmless sulphide of manganese, instead of the harmful sulphide of iron. On this account the percentage of manganese ought to increase with that of sulphur. The better classes of castings usually contain between 0.40 and 0.70 per cent. of manganese, and cast-iron railroad car wheels often contain between 0.15 and 0.30 per cent. But it is possible to use a considerably larger percentage of manganese, and good gray-iron castings have been made with even 2.20 per cent. of it.

INFLUENCE OF PHOSPHORUS

Phosphorus has the great merit of making the molten metal fluid, but, of course, the great defect of making the cold metal brittle under shock, though this latter effect is much less marked in cast iron than in steel. Thus, whereas steel rails cannot contain more than 0.10 per cent. of phosphorus, and are much better for having very much less, say, 0.08, or better, 0.05 per cent., yet castings which are not exposed to shock may have as much as 1.40 per cent. of this element, if they need great fluidity. Even in gas and water mains, the failure of which may lead to serious consequences, the phosphorus content may rise to 1 per cent. Machinery castings, especially those exposed to moderate shock, should be freer from phosphorus; but even they may contain as much as 0.50 per cent of it. If much sulphur or manganese is present, then the brittleness which they cause by leading to the formation of cementite aggravates the brittleness caused by phosphorus, and calls for a corresponding reduction in the permissible phosphorus content.

The accompanying table gives in a condensed form some of the results of this discussion. In particular, the third and fourth columns show to what feature of the constitution of the several kinds of cast iron the several properties given in the first column are due.

---

[2] *Stahl und Eisen*, 1907, p. 1565.

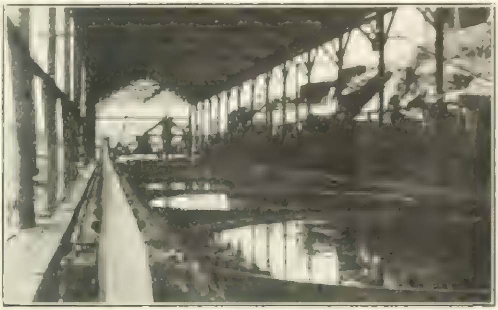
[3] *Metallurgie*, 1908, p. 137.

Cyanide Mills, Guanajuato Development Co.—I

The Nayal Mill Shows the Possibilities of Cyaniding Silver Ores on a Small Scale; the San Prospero Mill Has Two Unique Features

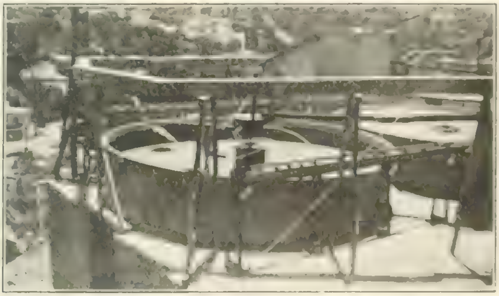
BY CLAUDE T. RICE

SAN PRÓSPERO MILL



SAND TANKS, SAN PROSPERO MILL

SLIME AGITATION TANKS, SAN PROSPERO MILL



[illegible]

The Guanajuato Development Company, operating mines and mills at Guanajuato, Mexico, is a large holding company. The Nayal, San Próspero, Peregrina and Pinguico mills, which are described in this article, belong to subsidiary companies of the Guanajuato Development Company. The Nayal and San Próspero mills are treating mainly custom ore, while the other two mills treat only company ore. The Nayal mill is interesting as showing what can be accomplished in a small mill treating silver ore. The others are worthy of study because of different details in the mechanical treatment of the ore.

The feature of the Pinguico mill is the immense *planilla*, or concrete table used for roughly concentrating the slime. It is an improvement on the canvas tables, for with these, after the fiber becomes worn, the efficiency of the canvas tables decreases considerably while the efficiency of the cement table, which is as great as that of a canvas table provided the sur- [illegible] constant. At the Peregrina and San Próspero mills the bucket elevators used to return the pulp from the tube mills to the classifiers are run by a belt from an extension of the discharge neck of the tube mill.

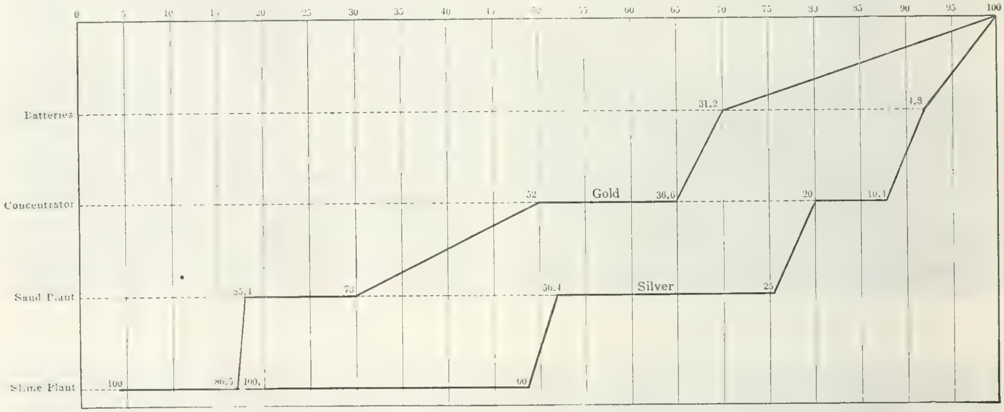
At the San Próspero mill, in order to remove any slime that may still be in the sand going to the sand tanks a revolving lawn-sprinkler is mounted below the sand distributor. This throws jets of solution upon the sand and aids considerably in removing the last slime. At the Pinguico mill it has been found that air agitation in flat-bottomed tanks is not as efficient as mechanical agitation. Consequently a combination mechanical, air agitation of the slime is to be used, the air being retained mainly because a good aëration of the pulp is necessary for high extraction on silver ores.

The curves showing the amount of silver dissolved by the cyanide solution as the pulp goes through the plant and the [illegible] are very interesting. These were worked out by John S. Butler, assistant general superintendent of the Guanajuato Development Company. I must also thank Mr. Butler for kindly going over my article in order to insure its accuracy and for also adding considerable additional information. At the end of the article will be found a table giving in detail the cost of cyanidation at these mills. The costs have been [illegible] E. Palmer took charge of operations. It shows in a striking manner how much costs depend upon the amount of ore treated by the plant. For this table, and permission to publish it, I thank Mr Palmer, who is now consulting engineer in charge of operation for the Guanajuato Development Company.

In judging the cyanide practice at Guanajuato it must be remembered that much of the cyanidation of silver ores has been learned through the treatment of the ores at Guanajuato. Therefore, the mills have not been built for complete sliming of the ore, although the better and quicker extraction on the slime indicate that complete sliming is best for silver ores.

Cyanide men, at least those in Mexico, will be glad to learn that the Guanajuato Development Company is soon to begin to cyanide its concentrates. This plant at the San Próspero mill is almost completed, and will soon be in operation. These rich silver concentrates will be completely slimed. The pulp will be agitated in small Pachuca tanks, and then filtered before being discharged. The plant is small, having a monthly capacity of about 30 tons of concentrates, but it is notable because it is one of the few for cyaniding concentrates and the first for treating by cyanidation a silver concentrate.

At present, after the concentrates are sacked at the mill, the cost of transporting and smelting the concentrates and of marketing the bullion amounts to 12 to 15 per cent. of the gross value of these high-grade silver concentrates. Most of this cost is for smelting, so again the cyanide process has to thank the smelters for extending its domain.



CURVES SHOWING RATE OF SOLUTION OF GOLD AND SILVER IN SAN PRÓSPERO MILL WHILE CRUSHING IN CYANIDE SOLUTION
(Figures on curves are in per cent. of total gold or silver extracted.)

The Naval Mill

The Naval mill is treating custom ores entirely. It was originally a pan-amalgamation mill, but when purchased by the Guanajuato Development Company it was remodelled so as to treat the ore by cyanidation.

The mill is equipped with 20 stamps crushing in solution titrating 0.1 per cent. KCN; on the batteries according to the nature of the ore being crushed either 30- or 40-mesh screens are used. The tonnage treated, therefore, varies from 40 to 60 tons per day, of which from 30 to 40 per cent. is crushed to slime. Ten of these stamps weigh 1050 lb. and ten 850 pounds each; they make from 98 to 102 drops, 7 in. high, per minute.

This pulp is concentrated on four Wilfley tables and the middlings from the tables are reconcentrated on another Wilfley table. The tailings from the tables are raised by either an elevator or a 4-in. Butters pump to two cone classifiers which separate the pulp into sand and slime.

The slime passes to the *planillas*, 5 ft. wide and 15 ft. long, having a grade of 1 in. to the foot; six of these have a riffled cement surface, and two a canvas surface. The slime tailings from the *planillas* go to two settling tanks, 18½x9 ft. deep, the pulp being admitted behind a curtain of cocoa-matting plaited between two pieces of canvas, which extend to within 2 ft. of the bottom of the tank. From the bottom of this settling or thickening tank, a continuous flow of slime is taken through three 3-in. pipes, reduced to ¾ in. orifice, which extend along the bottom to a center line through the tank. On account of the banking-up into cones on the bottom, some slime gives trouble in this type of thickener, but this can be obviated by using more discharge pipes.

The overflowing solution from these thickeners is returned to the mill solution, but the slime pulp is taken to one of 12 slime tanks having the same dimensions as the thickeners, and holding 8 tons of dry slime, since a dilution of 10 to 1 is used during agitation. Some of these flat-bottom tanks are agitated by means of three 3-in. vertical pipes placed in the bottom, and into which compressed air blows through a ¾-in. pipe tapered to a 1/16-in. outlet. Others of these flat bottom tanks are agitated by means of compressed air passing through a hose and a ¾-in. pipe, tapered to a ⅛-in. outlet, which is moved about on the bottom occasionally so as to thoroughly agitate the pulp.

The total length of agitation is 30 hours, and a solution titrating from 0.12 to 0.2 per cent. (average approximately 0.14 per cent.) KCN is used. The slime is given 6 to 7 washes of weak solution; then finally the slime is given a water wash, this being returned to the mill solution. The decanted solution is run to a tank having a sand-filter bottom and then to the weak-solution zinc-boxes. The whole slime treatment lasts approximately 125 hours.

Sand Treatment at Naval Mill

The sand is collected in a tank 9x10 ft. deep having a side overflow built up by slats as the tank is filled; the overflowing slime is sent to the *planillas*, while the sand after draining is charged by car at a cost of 8 centavos per ton into one of the 17 sand treatment tanks, 15x5 ft. deep, holding about 32 tons of dry sand. There the sand is given a treatment lasting 16 days, consisting of 24 washes with strong solution, titrating 0.4 KCN, and 4 washes with water. The tanks are discharged through doors in the bottom, and the tailings are trammed to the dump for 10 centavos per ton.

The strong solution is sent to the strong-solution zinc-boxes and the water washes to the weak-solution boxes after passing through the respective head tanks, which have sand-filter bottoms. About 110 tons of strong solution are used per charge of sand, and 150 tons of weak solution per charge of slime.

In the zinc room there are two strong and two weak-solution zinc-boxes having five compartments 2½x3 ft. in area, holding roughly 7 cu.ft. of zinc each. In cleaning up, the shorts that will not pass a 40-mesh screen are returned to the first two compartments of the strong solution zinc-boxes where they are placed loose in trays suspended above the zinc shavings. Bullion 920 fine is obtained.

With this small equipment an extraction of 76 per cent. is made on silver and 94 per cent. on the gold. The cyanide consumption is 1019 grams per ton, the lead acetate consumption 228 grams per ton of ore crushed; it takes 94 h.p. to run the mill. The cost of milling and cyaniding in this small mill is 5 pesos per ton of ore crushed, being only about 1.85 pesos per ton more than the cheapest cost in the district.

THE SAN PRÓSPERO MILL

The San Próspero, or as it is often called the San Matias mill, is treating not only ore from the San Próspero mine, but also custom ore. The mill has been in continuous operation since November, 1906. At present it is treating 150 tons of ore a day, the stamps duty being 3.7 tons in 24 hours. The purchased ore is sampled as it is dumped into the crusher bins, and the samples quartered down by hand on the sampling *patio*, the sample being recrushed in a small crusher. The mill is built on a slide-hill, sloping 24 deg., and after entering the bins, the ore is handled entirely by machinery or gravity. The mill is run by electric power, the three-phase, 60-cycle, 15,000-volt current being transformed to 440 volts.

The ore from the crusher bin feeds by gravity to a No. 3 McCully gyratory crusher, which breaks the ore so as to pass 1¼-in. ring. This ore is then conveyed by a 16-in. Robins belt conveyer to a cross belt over the 370-ton battery bin, into which the ore is dumped by means of a Robins movable tripper. Each conveyer belt is operated by a 3-h.p. Westinghouse motor.

The ore is fed by belt-driven Challenge feeders of the Davis type to 40 stamps, weighing 1050 lb. each, and making 104 drops 6½ in. high per min. The crushing is done in cyanide solution, titrating 0.1 to 0.15 per cent. KCN. The sills of the mill bin butt up against the battery posts, which are held against these sills and the upper braces by means of bolts anchored into masonry behind the bins; the battery posts of Oregon pine stand in cast-iron shoes, which are secured by anchor bolts to the concrete mortar blocks. "El Oro" solid stamp guides are used; the cams are fastened to the cam shaft by Blanton keys. The mortars, weighing 7500 lb., are anchored by 1½-in. bolts directly to the concrete mortar-blocks.

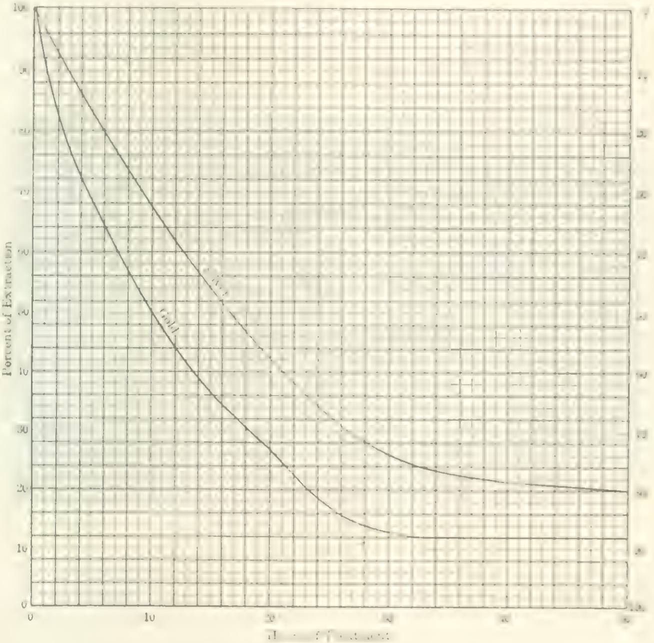
The stamps are run in units of 20, each unit being driven by a 50-h.p. motor, and each 10 stamps by a separate belt from the unit line shaft. Owing to the fact that there is only one tube mill now in operation, 30-mesh Tyler rolled-slot screens are used on the batteries. The stamps drop in the order, 1, 3, 5, 2, 4, prevalent in the district; about seven tons of solution are used per ton of ore crushed.

The pulp from the batteries goes to eight No. 3 Wilfley tables, one table being provided for treating the product of each five stamps. Each 10 stamps feed to a dewatering cone which thickens the pulp and eliminates a certain amount of slime before concentration. The slime overflow goes direct to the cement table. This cement table is 72 ft. wide and 27 ft. long (in the direction of flow); it has a grade of ⅛ in. per ft., and is divided into 16 sections. On this a rough concentration of the slimed sulphides is made; this concentrate is subsequently cleaned on a vanner. The tailings from the cement table go directly to the slime plant, but the tailings from the vanner are sent to the sand classifiers above the sand-collecting tanks.

[illegible] TUBE MILL

The cement table concentrates the ore about 2600 to 1, saving about 3 per cent. of the total value of the ore; the Wilfley tables concentrate the ore 230 to 1, and about 24 per cent. of the total ore value is saved on them. The tailings from the Wilfley tables go to two thickening cones, 30x36 in. deep, from which the underflow, thickened [illegible] 3 parts of water to 2 parts of sand, feeds to a tube mill 14x5 ft. diameter, revolving at 29 r.p.m., and driven by a 35-h.p. motor. Lumps of hard ore and Danish pebbles are used for crushing; the mill is lined with cast-iron liners. About 60 to 70 kg. of pebbles and 1000 kg. of hard ore are fed to the mill each day; the ore and pebbles for grinding are fed at frequent intervals without stopping the mill through an extension of [illegible] at the Peregrina mill. The pulp discharged from the tube mill is raised by a bucket elevator, driven from a pulley fastened to the rear trunnion of the tube mill, to the thickening cone above the tube mill, the coarse sand, of course, returning to the tube mill. This is the first time that bucket elevators have been driven from the extension of the tube-mill trunnion, but the mode of drive works very satisfactorily and is very convenient.

The overflow from the thickening cone goes to two separating cones, one 8x8 ft. deep, and the other 7x8 ft.; the underflow from the first goes to three 30-in. cones and the underflow from the second large cone goes to another 30-in. cone.; thus, the pulp is separated into sand and slime.



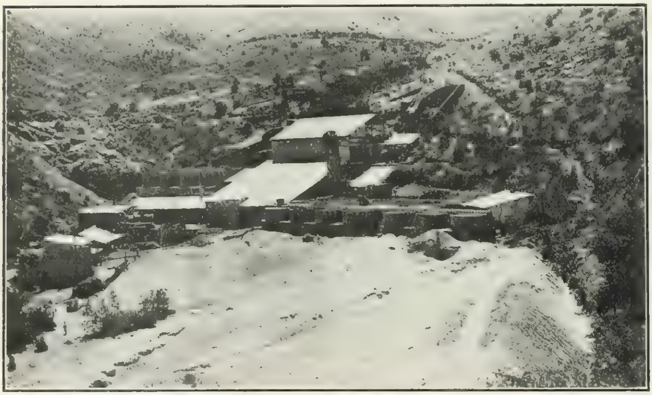
CURVES SHOWING RAPIDITY OF SOLUTION IN [illegible]
[illegible] MILL

[illegible] MILL

The sand from these cones goes first to one of two collecting tanks, 28x6 ft. deep. These have a central slat overflow, and [illegible] Blaisdell distributer. On top of the central slat-box is an ordinary lawn sprinkler [illegible] throws a stream of solution onto the sand and washes through the slat-box any slime that may have passed the cones. By raising or lowering the arms of the sprinkler the distance that the water is thrown can be regulated. The overflow-[illegible] to the separating cones. After the central slat-box has been pulled out, a Blaisdell excavator and distributer system is used for transferring the sand to one of the eight sand-treatment tanks having the same dimensions as the collecting tanks. The residues are discharged by the Blaisdell excavator onto a Robins belt conveyer and taken to the dump.

As 60 per cent. of the ore crushed is sand, it takes 38 hours to fill a collecting tank holding about 127 tons of dry sand. The tank is allowed to drain about 12 hours; transferring consumes about 2½ hours. Then the treatment, which lasts from eight to nine days, begins.

The first 30 washes of 10 tons each titrate from 0.45 to 0.5 KCN. It takes about 3½ to 4 hours for each wash to pass through the charge. Then 17 to 18 washes (10 tons each) of solution titrating from 0.1 to 0.15 KCN are used; and finally 6 or 8 water washes are given to each tank. The strong washes go to the strong-solution head tank above the zinc-boxes, but the weak washes and the water washes go to the weak-solution head tanks; these tanks have sand-filter bottoms.



THE NAYAL MILL

Sizing tests on the sand gives the following percentages by weight: On 40 mesh, 3; 40 to 60 mesh, 37; 60 to 100 mesh, 21; 100 to 150 mesh, 23; 150 to 200 mesh, 6; through 200 mesh, 10.

Slime Treatment at San Próspero Mill

The slime overflow from the cone separators goes to two slime thickeners, 26x12 ft. deep. The feed enters these through a box extending 6 ft. into the tank so that clear solution overflows as the settler fills. The thickened slime underflow goes to one of six agitation tanks (same size as the thickeners) where the 96-hour slime treatment with solution titrating 0.12 to 0.16 per cent. KCN begins. The first agitation lasts 12 hours; settling 10 hours; decantation, 2 hours. Then the pulp is given five agitations; the first lasts 6 hours and the others 4 hours, these agitation periods being separated by settling-decanting periods lasting 10 hours. At the end of this treatment the tank is filled with water, and the charge transferred to the masonry tanks above the Butters filter.

The slime tanks are agitated both by worm-driven agitation arms, carrying air pipes from which air escapes through short jets, and by a 6-in. centrifugal pump, taking the pulp from the bottom and discharging it at the top of the tank. The agitator arms make 1½ r.p.m.; one 6-in. pump is installed for every two tanks.

The Butters filter, having 60 standard-size frames, works under a vacuum of from 20 to 22 in., and a cake from 0.6 to 1 in. thick is formed. The cycle of operation for treating five tons of slime is: Filling, 5 min.; making cake, 40; returning slime pulp, 15; filling with water, 5; washing cake, 30; returning waste water, 15; discharging cake, 10 min.; total, two hours.

The cost per ton for filtering, when a five-ton charge is treated and a 1-in. cake is formed, is: Labor, 9 centavos; acid, 5; power, 17; repairs, 3; total cost per ton, 34 centavos. This cost is based on a consumption of 25 horsepower.

All the washes from the agitation tanks and from the Butters filters are sent to two sand filters that feed to the weak-solution zinc-boxes.

In the precipitation room there are two strong-solution and five weak-solution zinc-boxes, each having five compartments, 36x36x36 in., with bottoms sloping toward the launder placed below each box. The screens are placed 6 in. above the bottom of the boxes so that 30 in. are available for zinc shavings. The flow of solution through the weak-solution boxes is regulated to 5 or 6 tons per hour, while the flow through the strong-solution boxes is 2½ tons per hour.

The precipitate is washed through an 80-mesh screen; the short zinc is put back on top of the zinc shavings in the first compartment of the strong-solution boxes and allowed to accumulate until there is too large an accumulation of short zinc; then it is treated with acid.

The precipitate goes through the screen to a sump, and then is charged by a Snow pump to a 24-in. Shriver filter-press. In this the cake is dried by hot air; the cake is fluxed loose in No. 300 crucibles and melted, there being four furnaces. The first bullion bars are remelted, and clean bars 905 fine are obtained. Clean-ups are made four times a month.

Aldrich "Allentown" triplex pumps are used throughout the mill. An 8x9-in. pump returns the mill solution from the mill-solution sump tank to the mill-solution tank, a 7x9-in. pump returns the weak solution, and a 5x5-in. pump the strong solution, all three pumps being in duplicate.

Consumption of Chemicals

The capacity of the mill-solution tank is 354 tons, and both the weak-solution tank and the strong-solution tank hold 90 tons each. Fresh water is added only as washes to the slime and sand charges, and sodium cyanide is added in the sump tanks. The strength of the weak solution and the mill solution is regulated by pumping from this supply so that an absolute regulation of this strength is obtained. The consumption of cyanide is 0.8 kg. per ton of ore milled and the zinc used amounts to 0.37 kg. per ton. About 0.07 kg. lead acetate is added per ton to keep the solution from fouling.

Curves accompanying this article show the rate at which the solution dissolves the gold and silver during the treatment. The figures on the curves, showing the amount of metals dissolved at different points in the mill treatment, indicate the percentage of the actual gold or silver recovery that has already been dissolved by the time that those points in the mill treatment have been reached.

Mexican Dynamite Concession

According to a new agreement made between the Mexican Government and the Mexican National Dynamite and Explosive Company, the time for the operation of the syndicate is extended for 25 years from March, 1908, or until 1933, instead of until 1917, as agreed upon in the contract of 1905. During this time the Government guarantees not to grant a similar concession to other individuals, nor to set aside the special tax on the article in favor of any producer, manufacturer, or importer, whether native or foreign, of any dynamite or other explosive the base of which is nitroglycerin or other similar explosive substance.

Principles of Machine Sampling

The Elements Which Govern the Operation of Automatic Samplers; Inherent Defects and Possible Methods for Remedying Their Faults

BY JOHN A. CHURCH*

There has been discussion enough on the subject of continuous sampling by machines to disclose the elements which control the work, but before taking them up it is proper to come to an agreement upon what may be accepted as really good sampling; and in this connection it will be well to republish Paul Johnson's tables of his comparative work (Eng. and Min. Journ., April 12, 1902), for they are probably not within reach of the present readers of the Journal.

PAUL JOHNSON'S COMPARATIVE SAMPLING (THE JOURNAL, APRIL 12, 1902).

Sample.	Lot No.	Tons.	Cu Per Cent. Wet.	Dif in Lb.	Au. Oz.	Ag. Oz.
a	1	32	6 6	4	0.04	1.00
b	1	32	6 4		0 03	1.25
a	2	65	6.10		0.12	1 80
b	2	65	6.15	1	0 12	1 70
a	3	110	3.85	1	0.01	2.17
b	3	110	3 80		0.01	2.20
a	4	150	1.70	0	0.145	0 34
b	4	150	1.70		0.150	0 33
a	5	27	1.70	0	0 52	1 30
b	5	27	1 68		0 48	1 39
a	6	32	0.90		0.15	0 41
b	6	32	0.93	0	0 11	0.42
a	7	60	0 88		0.20	0 45
b	7	60	0.90	0	0.18	0 44
a	8	17	0.00		0.74	5.60
b	8	17	0 00		0.72	5 62
a	9	30	0.00		0.36	2 00
b	9	30	0.00		0.31	1 90
a	10	110	0.00		0 29	9 70
b	10	110	0.00		0.27	9 60
a	11	17	0.00		0 04	25 70
b	11	17	0.00		0.04	26 40

ANALYSES OF THE ORES SAMPLED.

Lot No.	Insoluble, Per Cent.	Silica, Per Cent.	Iron Oxide, Per Cent.	Lime, Per Cent.	Sulphur, Per Cent.
1	51.6	32.6	14.8	4.1	10 9
2	54.2	52.0	12.6	3.8	tr.
3	37.4	29.5	16.7	17.8	6.4
4	42.1	38.0	23.2	13.1	2.4
5	50.1	37.5	19.3	3.4	12.0
6	30.4	33.1	26.5	tr.	18.6
7	34.7	29.6	26.7	tr.	18 3
8	90.2	89.5	3.3	tr.	1.2
9	93.0	91.7	2.3	tr.	0.7
10	84.5	82.1	4.2	..	3.3
11	63.7	63.1	10.1	tr.	11 6

I presume that No. 6 should read 36.4 insoluble, but I give it as printed.

Undoubtedly this is remarkably good work; and the fun of it is that Johnson had not one of the improvements that Vezin, Argall and I advocate and even present as necessary. His mill, however, has one of the essentials to good work which I pointed out in my first article and which compensates largely for the absence of special devices. There is haphazard feed all the way down to the last crusher, where there is an apron; but the mill, being built to utilize a low elevation, is remarkably compact, as is shown by the accompanying illustration which represents a cross-section of the mill and the arrangement of the machines. The first and second crushers and first and second samplers are grouped into one unit, and the machines are set closely together with small drop between them. The second cut is elevated to the top of the mill and falls (apparently about 10 ft.) to the second group of third and fourth crushers and samplers, which are grouped together so closely that the whole system appears to have a hight of not more than 15 or 16 ft. (no scale is given). This compact arrangement counteracts the tendency to acceleration.

With this mill Mr. Johnson resampled the lots of ore given by number. There are only three of them that can be considered instructive, for the only way to escape the effects of assay errors is to test ores that have enough metal to make the assay error unimportant in proportion. The lots 1 to 3 with 6.6, 6.10 and 3.85 per cent. copper are the only ones in the series that satisfy this requirement. The differences in the two samplings of these lots were four, one and one pound copper per ton.

ELEMENTS OF SAMPLING

I am glad to have Mr. Mathewson's correction of my calculations on his resampling data, and wish on my part to correct an impression which I get from both of his letters, that I am criticizing somebody's machine in comparison with somebody's else. I think your readers will not be able to find in my writings any such preference or disapproval. I have purposely avoided any word that might be taken as criticism of any one of the sampling machines, for my object has been to ascertain the principles that underlie their use, and what I have written applies to all of them.

Before a proper sampler can be built, it is necessary to determine the elements of its use, the weight of cut, speed in the sampling circle, and frequency. If engineers come to an agreement on these things which they do not appear to have done yet, any of the sampling machines can be altered to satisfy the conditions imposed. In fact this is done now. Any engineer who has views upon these subjects has only to inform the makers and he will find them very willing to make such changes in size of scoop and driving pulley as he desires.

The columns of the Journal bear me out in saying that sampling mills are built now with a frequency unknown even five years ago. I think they will be much more common five years hence, and that the mining business is on the eve of a general introduction of machine sampling in all important installations. At present the work done is so irregular that I feel it is high time the whole engineering profession should consider the question and determine what can be done to improve the work. I am contributing my mite only because no one else has come forward to discuss these important questions.

NEED OF MORE DATA

In expressing the obligations of the profession to Messrs. Mathewson and Johnson for publishing data of their work I spoke with honest thanks. It is necessary to know the present state of the art if we are to improve it, and I doubt if sound improvement can come from the closely guarded results of tests in any one established [illegible] every mill in the country would make a series of comparative resamplings, and publish the results. The worse they are the more good can be done by giving them to the profession for consideration. Mr. Mathewson says that both the mills he used had all the improvements I referred to, and out of 13 resamplings there were five that gave such differences as 8, 11, 8.6, 12.6 and 18.6 lb. copper per ton. The reassay reduces the 8 lb. to 5.6 lb., and the 11 lb. to 9.2 lb., no reassay of the others being given. It is noticeable that all the reassays are lower than the *B* series, except one which is 0.02 per cent. higher; while all the *B* resamplings are lower than the *A* series except two, and while the reassay altered the figures of these two they still left them higher in *B* than in *A*; from which I conclude that the difference in the two series of samplings are real. My observation of sampling mills has convinced me that this is at least fair average work of mills as designed and operated at present. Still I do not consider it satisfactory, and I believe that careful consideration of the principles which govern the work will give us a system of sampling that will be fair and satisfactory. The object of this present writing is to discuss the elements that affect the taking of a sample, but first it is necessary to consider the maximum variation that can be allowed

[illegible] VARIATION

[illegible] sampling process can be expected to work with perfection, but I think an allowed variation of 5 lb. metal per ton of ore is not below a proper and attainable standard. On the contrary, as mills some- [illegible] out how they do it, and to make this better work the uniform practice; and this is the burden of the last article with which I shall trouble you. Five pounds per ton is 12.5, 8.33 and 6.25 per cent. on ores containing 2, 3 and 4 per cent. metal which form such a large part of our present output.

---

*Mining engineer, 15 William street, New York.

Quantity Needed for Fair Sampling

Taking the ore as sent to the mill, without regard to the mode of selecting it, the first question is what proportion to take for the first cut. Brunton has shown that this depends primarily on the size of the largest fragments. One example of crushing to 2½ in. in a gyratory machine gave the following sizes and proportions.

	Per Cent.
On 2½ in	3.0
2½ to 2	5.3
2 to 1½	24.2
1½ to 1	35.0
1 to ¾	9.9
¾ to ½	8.4
½ to ¼	6.3
¼ to ⅛	3.2
Through ⅛	4.7

Brunton calculated that a lot composed entirely of 2½-in. size should contain not less than 300 tons for accurate sampling and by his table the greatest quantity required for any of the above sizes is 36 tons (for 24.2 per cent. of 2 in.) Therefore a 40-ton lot breaking in about the above proportions should give a fair sample of any size it contains.

Number of Cuts and Crushings

Most mills make four cuts and crushings in preparing a sample for the sample grinder, after which the treatment of the small quantity of finely ground ore depends upon local conditions, whether the ore contains "metallics," etc. Sometimes only three are made, or even two. The higher number is commendable.

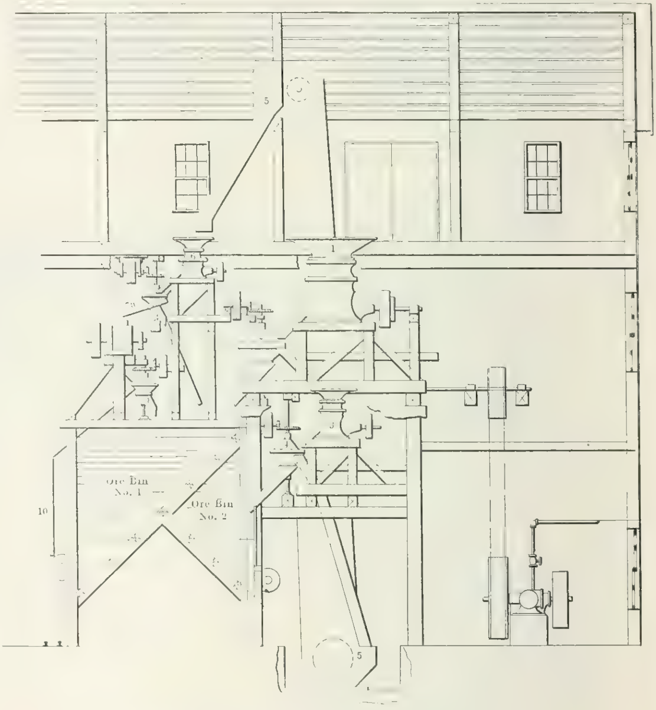
Size of First Cut

The great importance of the size of the first cut has been emphasized by Argall who recommends 25 per cent., with which recommendation I agree though with reluctance. Sampling is a greater or less burden in proportion to the percentage of the first cut. At present I think it should not be less than 20 per cent., but, if we understood the work so well that we could trust it thoroughly, I do not see why 10 per cent. should not be enough. All above that seems to me margin to cover our deficiencies.

The size of the subsequent cuts is less important, for Brunton figured that if 2½ in. required a sample quantity of 300 tons, 1 in. requires only 18 tons, and ¾ in. 8.5 tons, to give the same degree of accuracy. Engineers have not been willing to embody these conclusions in their plans, though they are mathematically correct, and usually make the second cut 10 per cent. and often 15 per cent. In subsequent cuts the ore is so fine that the proportion taken is mainly directed to getting the weight of final sample desired. After reaching the sample grinder the system of quartering is followed usually.

Recrushing

Practically 2½-in. material is the coarsest ore that should be sampled, and when one-half the ore is above that size the lot will give in crushing about 8 per cent. that will go through a ¼-in. ring. In a 400-ton mill the first cut gives 80 tons for recrushing, about 20 tons of which will be fines. A 15-per cent. second cut from this will take three tons of fine and nine tons of coarse ore, all of which will enter the fines in the next crushing, so that the whole quantity of fines made will be 29 tons, or 7.25 per cent. on 400 tons. Eighty tons allows good sampling to be done on 1½-in. material; and when sampling blast-furnace ore, where fines are to be avoided, I should not hesitate to break to 1½ in. in the second crushing. The succeeding reductions will have to be about in the ratio one to five instead of the usual ratio one to four in order to bring the last reduction down to 1/16 in.; but this is not seriously objectionable.



SAMPLING MILL, BRITISH COLUMBIA COPPER COMPANY

(1) No. 5 Gates Crusher. (2) No. 1 Johnson Sampler. (3) No. 2 Gates Crusher. (4) No. 2 Johnson Sampler. (5) Bucket Elevator. (6) No. 0 Gates Crusher. (7) No. 3 Johnson Sampler. (8) Reliance Rolls. (9) No. 3 Johnson Sampler. (10) Rocking Spout.

Weight of the Cut

The weight, especially the first cut, is another very important question. In my last letter I pointed out that Johnson stands almost alone in advocating a very low speed, 70 ft. a minute, of the scoop; and his success indicates that he may have hit upon a valuable principle. The great variations in our present practice which variations of speed produce will be seen by comparing the amount of ore passing the machines while taking the first cut, on an ore supply of 400 tons in eight hours.

This is supposed to be on a 2½-in. ore. The only result of increasing the size of the cut that I can see is to increase the probability of getting into the cut ore fragments that started together. Your correspondents think this is of no importance, and if the ore were mixed thoroughly I should agree with them; but in continuous progressive sampling I still think that means should be taken to secure this result and that success in this particular will increase the accuracy of sampling. Compact arrangement and large cut at low speed are the only elements making for good sampling that I can discover in the most successful test on record.

Frequency

If a large cut is really so important the frequency must be low and I think the

Vezin sampler with its speed of [illegible] should be run with only one scoop which would give 9600 cuts in 8 hours. Each cut would take 8.3 lb. out of 83.3 lb. run. With a sampling diameter of 38 in. the circumference is 119 in. and a scoop for 20 per cent. cut would be 23.9 in. wide. We shall see presently what effect this would have on the sample. But is it necessary to use machines as large as 38 in. diameter in the sampling circle? I see no objection to using Vezin's smaller machine with 31 in. diameter on 2½-in. ore. A 20 per cent. scoop would then be 19.5 in. wide.

Speed of Cut

Continuous sampling deals with very small time spaces as the accompanying comparison of the way the different machines work shows.

The data taken for the Johnson machines are mere guesses, as I have no blueprints of them; but they cannot be far enough from the truth to destroy the striking comparison in the time of cut. "The time of cut 1" in the table is the time in which the whole scoop passes any one point in its circle. "Time of cut 2" is the time required to pass completely a spout 8 in., 6 in. and 4 in. wide, respectively, for the different sizes of ore and machine; in other words, the whole time from the instant when the near side of the scoop comes under the spout to the instant when the far side passes away from the spout. Taking only the largest machines and first cut the times of the entire passage are 0.50, 0.96, 0.84 and 1.42 sec. for 4 to 12 lb. of ore to enter the cut. The spout widths I take are only two-thirds the usual widths.

It is well known that all sampling machines are subject to a uniform source of error. As the near side of the scoop passes under the area of the spout ore of 2-in. size cannot fall into the sample until the edge of the scoop has passed 2 in. beyond the edge of the spout, but fine ore is going into the sample all the time. This selective sampling is repeated as the scoop leaves the spout. If the scoop is 12 in. and the spout 8 in. wide this selective sampling continues for one-fifth of the time for all ore of 2 in. and above, which is at least one-fifth of the whole. The peculiarity is that this is a cumulative effect and never alternates from plus to minus. If the coarse ore is of poorer quality than the fine the sample is too rich and *vice versa*. This defect is inherent in all automatic sampling machines.

[illegible]

It is evident that the design of machines must embody whatever principles are accepted [illegible] belief is that the weight of the first cut has greater importance than has been suspected, for the reason that the inherent defect of automatic sampling is felt most severely in the treatment of coarse ore. If the whole path of the scoop is 20 in (12-in. scoop, 8-in. spout) and there is selective sampling for 4 in. this cause of discrepancy lasts for 20 per cent. of the cut, and if the lot contains 20 per cent. of 2-in. ore and larger, in a lot of 400 tons there is 80 tons that will not be fairly represented in the sample.

I think the first effort of millmen should be directed to reducing this error. It can be done by using one large scoop where two smaller are used now. The width of a single scoop for a 20-per cent. cut is large on the large machines, being 29.4 in. in the Simplex, 26.4 in the Snyder, and 23.8 in. for the Vezin and Johnson. Is there any objection to such large scoops? This brings us to the question of size of machines. If the medium size is used the width of scoop will be 18.8 in., 14.4 in. and 19.4 in. These seem to be practicable sizes. My judgment is that these sizes are large enough for 2½-in. ore, and that the task of ascertaining the effect of a heavy cut will not be difficult.

Speed and frequency are correlations of weight. Assuming an eight-hour day and 400 tons, we have 1667 lb. a minute. If 15 r.p.m. is thought to be sufficient, a 20-per cent. cut would have a weight of 22.2 lb. which appears to be a good weight to begin on.

Mixing

I have explained sufficiently in my first article my reasons for believing that a sampler should never be empty at one time and flooded at another. The problem [illegible] so that it will be sampled as well as if it had been stopped, mixed and resampled as a new stock of ore is important; and the more I see of sampling results the more convinced I am that the cause of discrepancies, apart from the one spoken of under "Speed of Cut," is to be found in this part of the work. The three methods suggested for correcting the trouble are Vezin's mixer, shaking spouts and compact arrangement of the machines. The first two are practically the same. I do not know of any addition to this list for mills that have to sample various ores. A mill that has only one ore to work on can put in small bins after each crusher but they would require too much cleaning up to allow frequent changes of ore.

It is evident that this error can be [illegible] coarse and fine separately, and perhaps this may be found necessary in the first cut

Conclusions

This discussion has not lessened but increased the conviction reached by years of observation that the present state of sampling by machines is unsatisfactory. Large sums change hands every year on the results given by these mills and these sums are on the increase, but how many of the mills can be trusted to do their work closer than 10 lb. gain or loss per ton of ore? I notice a prevalent feeling that the case can hardly be as bad as I have shown it in a country where every branch of mining is studied so well as in America, and that the subject must be better understood than my letters suggest. But who understands it? The plans of new mills that I have seen show such diversity that no accepted basis of design can be discerned.

The only remedy for the existing diversities in design is experiment. There have been hundreds of tests made in American sampling mills but they have been mostly for the purpose of comparing machines, or the end results of machine and hand sampling. I cannot say that none of them has been directed to trying out methods of work, but this important branch of the subject seems to have been comparatively neglected. Who, for instance, can tell us as the result of careful and thorough trials which will give the most trustworthy and accurate results, a 10-lb. cut taken 12,000 times or a 15-lb. cut taken 8000 times? This and the other elements of the problem are the true field for experiment, and until it is undertaken the seller and buyer of ore must be in a state of uncertainty whether they are paying for and getting paid for 10 lb. of metal too much or too little.

SPEEDS OF SAMPLING MACHINES. 10 PER CENT. CUT IN EACH SCOOP

Johnson	1 scoop	7 cuts × 180	[illegible]	[illegible]	[illegible]	[illegible]
Johnson	2 scoops	11 cuts × 180	[illegible]	[illegible]		[illegible]
Snyder	2 scoops	20 cuts × 180	[illegible]	[illegible]		[illegible]
Simplex	2 scoops	22 cuts × 180	[illegible]	[illegible]		[illegible]
Vezin	2 scoops	10 cuts × 180	[illegible]	[illegible]		[illegible]

Machine	Speed Per Second, Inch.	Sample Circle, Inch.	Width 1 Scoop 10 Per Cent. Cut, In.	Time of Cut, Seconds. 1	Time of Cut, Seconds. 2
Simplex 64 in.	[illegible]	[illegible]	[illegible]	[illegible]	0.84
Simplex 44 in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Simplex 28 in	[illegible]	[illegible]	[illegible]	[illegible]	0.44
Snyder 60 in	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Snyder 42 in	17	[illegible]	[illegible]	[illegible]	[illegible]
Snyder 27 in	11	[illegible]	[illegible]	[illegible]	0.76
Vezin No. 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vezin No. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Johnson No. 1	11	[illegible]	11.9	[illegible]	[illegible]
Johnson No. 2	[illegible]	[illegible]	9.7	0.67	[illegible]
Johnson No. 3	10.6	[illegible]	5.3	0.50	[illegible]

Kafirs on the Rand in South Africa are paid 1c. per inch for hand drilling in hard rock, with a bonus for drilling more than a certain footage per shift. Practically all hand drilling is single hand.

Growth of the Cananea Copper Smelting Works

By Charles F. Shelby*

The accompanying illustrations show some of the changes which have taken place at the smelting plant of the Cananea Consolidated Copper Company at Cananea, Sonora, Mexico, during the last few years. The original plant included two blast furnaces of which the first unit went into blast in the summer of 1899. In February, 1907, the plant had grown to eight furnaces, the largest being 210 in. at the tuyeres. The eighth furnace was practically the same as those in use at Anaconda before the large Mathewson furnaces were installed.

One of the illustrations shows the condition of the converter department in July, 1906, immediately after the riots when labor was scarce and inefficient, and the company was doing its best to maintain its regular output of copper under these trying circumstances.

The eight new furnaces which have been installed upon the site of the old furnaces during the last year are shown in two of the illustrations. The view of the feed floor shows the new method of charging which eliminates hand labor almost entirely. This installation is giving entire satisfaction.

The remodeled converter department is the subject of the two remaining illustrations. Here are five stands and 20 shells. All the machinery is electrically operated. The view of the single converter shows a number of new and interesting features.

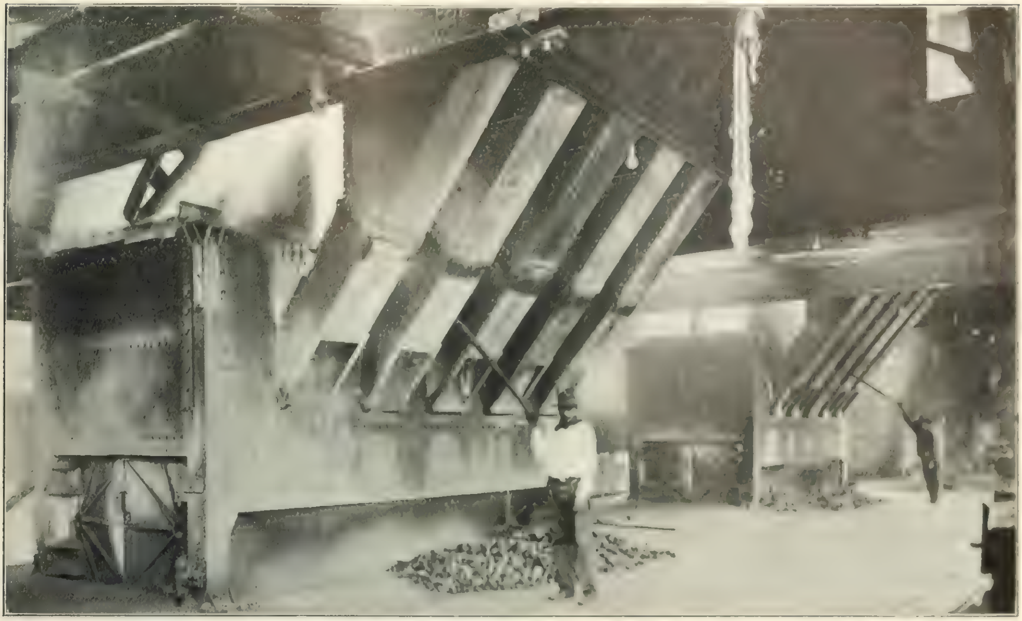
ORIGINAL PLANT, CANANEA CONSOLIDATED COPPER COMPANY, CANANEA, MEXICO

CONVERTER DEPARTMENT IN JULY, 1906, JUST AFTER THE RIOTS, WHEN LABOR WAS SCARCE AND INEFFICIENT

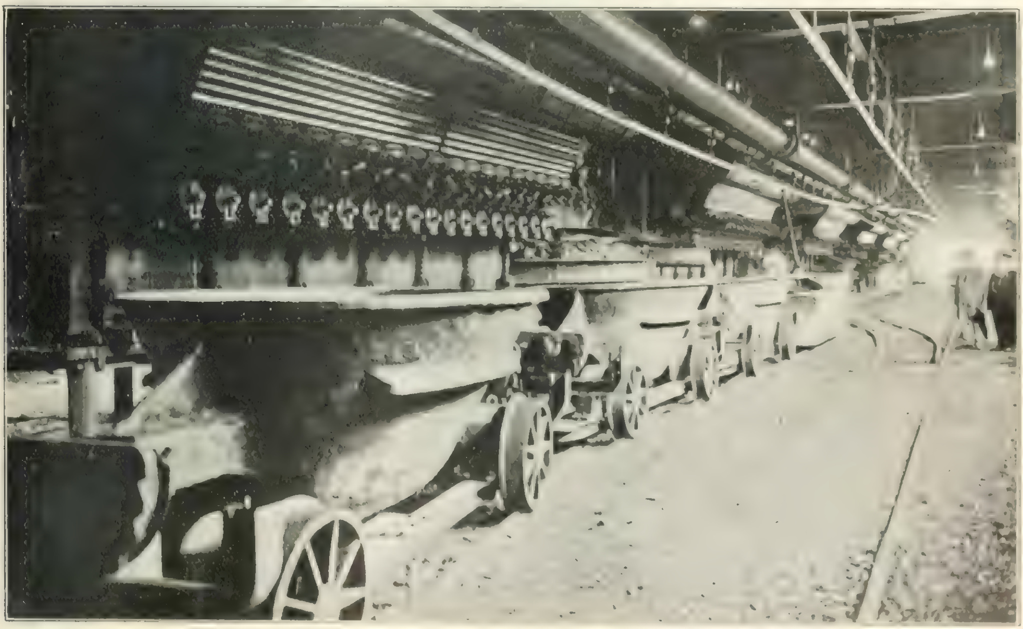
The Carmichael-Bradford process, with improvements and modifications, is now being used more largely by the Broken Hill Proprietary Company, and with more advantageous results. The benefits from this process result from its being cheaper to work, while the loss of lead is reduced as compared with the ordinary method of roasting lead ore before smelting.

---

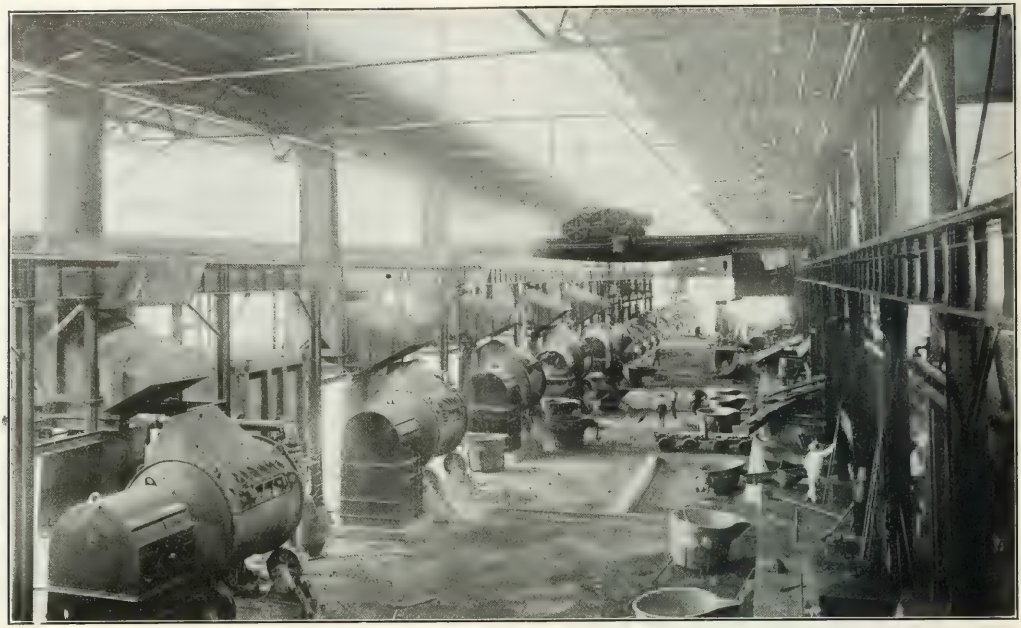
*Superintendent, reduction division, Cananea Consolidated Copper Company, Cananea, Mexico.



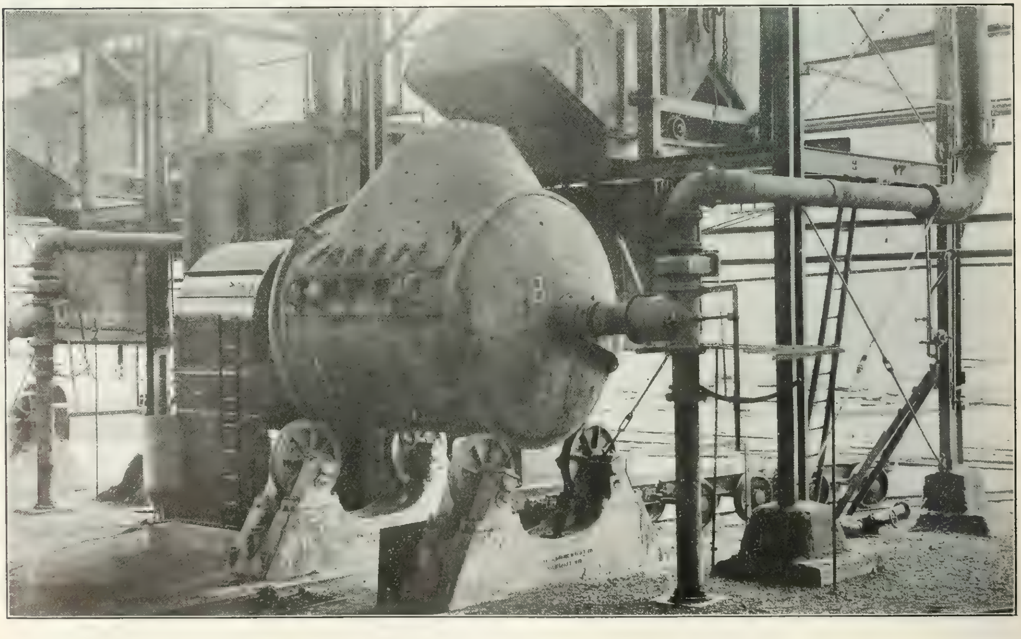
THE NEW FURNACES FROM THE FEED FLOOR, SHOWING FEEDING DEVICE WHICH ELIMINATES HAND LABOR.



SLAG SIDE OF THE EIGHT NEW FURNACES ERECTED ON THE SITE OF THE OLD [illegible]



REMODELED CONVERTER DEPARTMENT, INCLUDING FIVE STANDS AND TWENTY SHELLS, ALL ELECTRICALLY DRIVEN



ONE OF THE NEW CONVERTERS, SHOWING SEVERAL NOVEL FEATURES

Cobar Gold and Copper Field, New South Wales

Oxidized Gold Ores near the Surface Become Refractory and Copper-Bearing with Depth, Presenting Difficulties in Treatment

BY GERARD W. WILLIAMS*

The gold and copper mines of the Cobar district are situated along a north-south line that extends from the township of Cobar to a point about four miles south. The country rock of the district is composed of Silurian slates dipping at an angle that varies from 65 deg. to almost vertical. The ore-shoots occur in a wide lode channel, fairly well defined on the western side, but merging gradually into normal slates on the east. The shoots themselves are usually clearly separated from the western wall, but on the eastern side the ore becomes poor and the shoot becomes indistinguishable from the altered slates forming the ore channel.

There are no fissure veins in the district, the ore-shoot being more or less well defined zones of mineral impregnation in the line of crushed country which forms the ore channel. Speaking generally, from the outcrop of the lodes down to water level, 250 feet, the oxidized ores are schistose in character, and as all copper has been leached out, all mines in this district commenced as gold mines. At present the oxidized ores are almost exhausted, and the gold-mining companies have to consider the treatment of the unoxidized ores, which contain from 0.5 to 1 per cent. copper as chalcopyrite. Throughout the district there appears to be a general increase in the proportion of silica in the orebody in depth. This is noticeably the case in the Cobar gold mine, which adjoins the Great Cobar copper mine and in the Chesney mine. In these mines the percentage of silica ranges from 65 to 80 per cent.

Great Cobar Copper Mine

The Great Cobar mine, the largest copper mine on the mainland of Australia, is situated at the northern end of the field. There are three well marked shoots of ore in the mine. On the 850-ft. level the size of these shoots is 135 ft. long by 28 ft. wide in the south chute, 485x52 ft. in the central chute and 345x38 ft. in the north chute. The mine is developed to 1050 ft., but the management displays considerable reticence in the matter of divulging to the public the results of development on the bottom level. In this respect the Great Cobar is unique, for it is the only big mine in Australia that is not open to inspection by a competent engineer.

The Great Cobar owns the Chesney mine and the ore from the two mines is smelted in the proportion of three parts Cobar to one part Chesney ore. The following is the percentage composition of the ore from the two mines and the composite ore as smelted.

	Great Cobar	Chesney Ore	Mixed Ore
Silica	[illegible]	62.0	[illegible]
Iron	[illegible]	16.0	[illegible]
Sulphur	[illegible]	[illegible]	[illegible]
Alumina	7.2	9.4	8.0

The recoveries average 2.5 per cent. copper; 1.1 dwt., gold and 8 dwt. silver per ton of 2240 lb. No working costs are published.

There are three furnaces, 14 ft x 3 ft. 4 in., 15 ft. x 3 ft. 6 in., and 17 ft. x 3 ft. 8 in. at the tuyeres. The furnaces carry from 11 to 12 ft. of charge above the tuyeres and have a capacity of about 4500 tons per week. The first matte averages 24 per cent. copper and this is returned to the furnaces and concentrated up to 40 per cent. This appears to be the economic limit, for with mattes of higher copper value the slag losses become heavy. The mattes are shipped for treatment to the company treatment works at Lithgow, 370 miles distant. The consumption of coke is about 9 per cent. ore smelted. The present output averages 380 tons copper per month from 15,700 tons of ore. A large new smelting plant now in course of erection was described in the **JOURNAL** [illegible].

The Lithgow plant contains 17 reverberatory furnaces, four of which are used for refining. The electrolytic plant comprises six four-pole dynamos, delivering 1200 amp. at 60 volt, one small 600-amp. 25-volt dynamo and one lighting dynamo for 200 lamps. The six dynamos have a capacity of 150 tons electrolytic copper per week. The temperature of the electrolyte is maintained at 120 deg. F., and in composition varies from 9 to 11 per cent. sulphuric acid and 11 to 14 per cent. copper sulphate. The mud, which carries the gold and silver and about 25 per cent. of copper, is boiled with strong sulphuric acid and after the copper is reduced to about 0.5 per cent. the dried mud is fused with carbonate of soda and nitre. The doré bullion is parted subsequently.

DARLING RIVER BETWEEN BROKEN HILL AND COBAR

COBAR, NEW SOUTH WALES, AUSTRALIA

Gold Mines

The two gold mines in the district are the Cobar gold mine and the Occidental gold mine. In both cases the mines have had little trouble in treating the oxidized ore, which is easily crushed and cyanides well; but the unoxidized ore contains about 1 per cent. copper and 18 dwt. of gold, and has so far proved untreatable. Since the ores average fully 75 per cent. silica and since basic ores, except in the Great Cobar mine, are not found in the district, it will not be possible to smelt; experiments are now being conducted in regard to concentration. The Cobar gold mine erected three Elmore units, but they have thus far not proved a success. The mine is at present closed down. The battery comprises 100 head of 950-lb. Californian stamps.

---

*Mining engineer, Melbourne, Australia

At the Occidental mine the battery consists of forty 800-lb. stamps and twenty 670-lb. stamps. A duty of 2.75 tons is maintained through a 200-mesh punched screen with 85 drops per minute, 8-in. drop and flush discharge. The mill works at surprisingly low costs, considering its antique design and methods, milling costs being 55c. per ton of 2000 lb. The sands and slimes average 2 dwt. 18 grains and the residues 16 grains. The slimes are treated by the Moore filter press which does extremely good work. Slime treatment costs 80c., including 12c. royalty. The sand treatment cost 70c. per ton. The total costs average $2.25; the value of the ore averages $3.84 per ton.

The Cobar district is one of the oldest mining camps in the State, the big mine having been pegged in 1869. The Great Cobar has turned out about 65,000 tons of copper to date, but has been frequently closed down since it was first opened up as a gold mine in 1870. The district is situated about 460 miles from Sydney in the midst of drought-stricken red-soil plains which support but scanty timber. The whole country, from Cobar to Broken Hill and thence through the South Australian "back country" and across the central deserts to the Westralian goldfields, is desert arid country. The rainfall varies from 10 in. to nothing at all and evaporation from shallow dams averages 8 ft. per annum. Before the coming of the rabbit plague the Cobar-Broken Hill country was a great grazing center, but the rabbit has eaten out the very grass roots, killed the young scrub by eating off the bark and left the country almost desert.

Absence of permanent water forms the chief drawback to prospecting. The mineral wealth of the country lying back toward the center of the continent is unquestionable, but with water holes hundreds of miles apart, and uncertain at that, prospecting is a distinctly hazardous occupation. Small parties of men inadequately provided with camels simply court disaster if they venture into the interior.

GREAT COBAR COPPER MINE

GREAT COBAR SMELTERIES

Transvaal Mining Notes

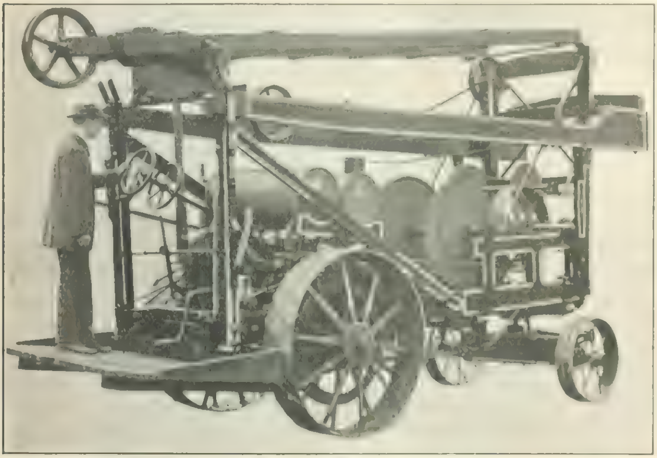
Special Correspondence

At the present moment the attitude of the Transvaal government is being definitely revealed in regard to divers problems of industrial regulation. The new gold law and the base metals bill have been frequently discussed, and it is clear that the main features of the Ministry's draft will stand in spite of real and weighty objections raised by the opposition. A publication of special importance to the Rand has appeared during the week in the report of a select committee formed to deliberate upon the eight-hours bill. It is clear that no objectionable regulations will be forced upon the mines in regard to hours of work, until the whole circumstances of the case have been investigated. The majority report contends that the bill enforcing the eight-hour maximum, would produce a dislocation of industry and business, for which no satisfactory reason has been adduced; and that the present conditions of employment in the Transvaal are such as not to call for remedial legislation. At the same time the unhealthy nature of underground work, even when the utmost precautions are taken to improve hygienic conditions is considered a factor prompting the institution of special inquiry into this issue of the question. The recommendation is made that investigations should be directed toward the following points: (1) As to the hours of work underground upon the different mines; (2) as to whether the large body of underground employees desire any change, and if so, in what direction; (3) how far such limitation as is proposed by the bill could be made practicable; (4) as to the advisability of working two shifts in the day, the remaining period being utilized for the purpose of blasting and cleaning the mines; (5) to what extent the whole question is governed by the use of native labor, and whether it is practicable or economical to apply a limitation of hours of work to the colored laborer. The native appears as a complicating feature in the case, for the labor leaders are strong in their demands that no limitation should be applied to the whites unless affecting the blacks, who might otherwise gain in value in those fields of work where competition may be held to exist. No humanitarian arguments can be advanced in favor of an eight-hour shift for the native, whose spells of continuous service are generally so brief. As for the true wish of the underground worker, for whom a reduction of time would necessarily involve a reduction of wages, it is morally certain that the great majority would oppose the restriction. The contractors would certainly speak for the perpetuation of present conditions, while the advantage to be gained by the day's-pay miner would not be sufficient compensation for the reduction of pay. His hardest work in the day comes at the beginning of the shift, when he has to see that his stope, hanging and faces are safe, and to get his boys to work to best advantage, and at the end, when he is signing tickets, charging up his holes, and blasting. Cut down his time and the reduction only affects the intermediate period of comparative idleness, while the worries of the rush at start and finish of the shift would be more acute than before. The labor leaders have approached the government by deputation in regard to several matters of reform of this character, and while evincing diplomatic sympathy, the ministerial powers are clearly not to be moved to any revolutionary legislation precipitately.

During the six months ended Dec. 31, 1907, there were 100 fatal and 287 non-fatal accidents in the coal mines of Illinois. Of the men killed 51 were miners.

Keystone Gasolene-driven Drills

The traction-drilling machine, shown in the accompanying illustration, embodies a new application of gasolene drive to churn drilling, which the manufacturers, the Keystone Driller Company, Beaver Falls, Penn., believe to approach as nearly as possible the almost ideal conditions found in the steam-driven machine. The steam engine possesses several advantages as the prime mover for drilling: it can be reversed at will to run in either direction; it is capable of the finest adjustment of speed to suit the drop of the drill and the depth of the well; and the volume of power remains almost constant, under command of the throttle, at any required speed. To meet these conditions with a gasolene motor, at the same time retaining the advantages of the internal-combustion engine, requires the production of an entirely new type of engine, or the development of an unusually effective method of transmission and control. In this machine a graduated, reversible, friction-transmission device is employed, the motor running at constant speed in one direction.



KEYSTONE NO. 3 TRACTION, [illegible] DRILLER

The transmission device consists of a combination friction-driving disk and flywheel on the motor and a driven wheel, which may be shifted on the transverse transmission shaft, to engage any part of the face of the friction disk. The transverse shaft has hardened-steel ball bearings, and bears a belt pulley for driving the drilling mechanism at one end and at the other the traction-driving gear. The friction disk on the flywheel of the engine has a hardwood filling, inserted "on the end grain," and arranged to wear down 2 in. before requiring renewal. The driven wheel is arranged to slide entirely across the face of the driving disk, and in that way a speed graduation from "high-speed ahead" through zero to "high-speed reverse," is obtained by shifting the wheel from right to left. The position of the driven wheel is controlled by a lever and hand wheel at each end of the machine.

The engine employed is of the two-cylinder opposed type, fitted with fly-ball throttling ignition, battery and magneto. The machine carries two 40-gal. galvanized-iron tanks placed directly above the motor, one for gasolene and the other for cooling water; 40 gal. of gasolene is sufficient to run the engine under ordinary load for 30 hours.

To supply blast for the forge used in dressing drill bits, a rotary blower is supplied with the machine. It is driven from a friction contact with the flywheel of the engine. The air is carried to a forge upon the ground by means of a length of blast pipe.

The machines, like the steam drillers made by the same firm, are supplied either with or without traction mechanism. On the traction type, hand levers run to the driver's seat at the rear of the machine. The machine as a whole weighs about 2000 lb. less than the steam machine of the same capacity, and since there is very little fuel and water to carry, the traction machine is more convenient than the corresponding steam driller.

The drilling mechanism and the arrangements for handling the derrick and the drill and sand pump lines are the same as those of the well known steam type. All the tools, derrick, etc., are carried upon the machine. Provision is also made for attaching a trailer or tender wagon in which may be carried fuel and water for several days, additional equipment of pipe, camping outfit, provisions, etc. The tractive force is sufficient to haul several trailers.

An Important Rhodesian Mine

[illegible]

[illegible] est quartz mine in Rhodesia, the shaft having reached 2300 ft. An interim report for the half-year ending June 30, 1908, just issued, is, on the whole, of an encouraging nature. The ore reserves have been increased since Dec. 31, 1907, from 106,155 tons averaging 11.1 dwt. to 122,408 tons averaging 12.29 dwt. The company originally worked two mines, but the Globe mine has been abandoned, and all ore now comes from the Phœnix mine. There is a mill of 40 stamps with sands and slimes cyanide plant. For the six months 37,546 tons were milled at a cost of $6.46, a reduction in working costs of 27.7c. per ton having been made as compared with the figures of 1907. Included in working costs is in both periods a charge of $0.06 per ton for mine development redemption. The gross profit for the six months, excluding depreciation and London office expenses, was £28,475. Since the commencement of milling operations in 1900 the mines have produced gold to the value of £1,394,650, from which a gross profit—exclusive of head office expenses and depreciation—of £591,919 has been realized.

Some trouble has been met with in the treatment of the ore, owing to increasing quantities of antimony, which has the effect of increasing the consumption of cyanide and chemicals and gives a poorer extraction. To meet this difficulty a sorting plant is being put up, by the use of which it is hoped that the extraction may be improved, and that the antimony may be turned to account.

The vein at the bottom of the mine is disturbed by a dike, and there appears to be some uncertainty whether the values will continue in depth. On this important point the following paragraph from the consulting engineer's report may be quoted: "Development during the six months under review must be considered encouraging, as although the 13th and 14th levels gave average results, the 15th levels shows substantial improvement; this, however, is somewhat discounted by the more recent results at the 16th level, as although the first work gave great encouragement, both laterally and in depth, the drive north is, for the time being, disappointing, and it will take some months' prospecting to prove the effect of the dike met with in the shaft, although the reef appears to be going down."

The dividend for the year 1907 was 3s. 6d. per share on an issued capital of £200,000 in £1 shares. For the current year two interim dividends of 1s. each have been declared. The new sorting plant is expected to be in working order before the end of the year.

The Rare Metals, II—Columbium

By Charles Baskerville*

Columbium, or niobium, is a rare acid-forming element which resembles tantalum, with which it is associated. Its minerals are abundant in pegmatite veins.

COLUMBIUM MINERALS.

	Columbic Acid Content
Columbite (niobite), iron columbate	26–78%
Manganocolumbite, manganiferous columbite	30–57%
Tantalite, iron tantalate	3–40%
Stibiotantalite, antimony tantalo-columbate (?)	7–8%
Yttrotantalite, a tantalo-columbate of yttrium, iron, etc	12–13%
Pyrochlore, chiefly a columbate of the cerium metals	47–58%
Fergusonite, essentially a metacolumbate of yttrium, etc	14–46%
Hatchettolite, a tantalo-columbate of uranium	30%
Samarskite, a tantalo-columbate of yttrium, uranium, etc	37–56%
Wöhlerite, a silico-zirconate of columbium, calcium, etc	11–15%
Branzilite, a new mineral accompanying monazite, etc	
Yttroilmenite, a variety of yttrotantalite	12%
Nohlite, a variety of samarskite	50–51%
Vietinghofite, a ferruginous variety of samarskite	51%
Hielmite, a stannotantalate and columbate of yttrium, etc	4–17%
Euxenite, a columbate and titanate of yttrium, etc	18–35%
Aeschynite, a columbate and titanate of the cerium metals	32–33%
Polymignite, a columbate and titanate of the cerium metals	12%
Polycrase, a columbate and titanate of yttrium, etc	19–25%
Arrhenite, a heterogeneous decomposition-product	2–3%
Blomstrandite, a tantalo-columbate of uranium, etc	....
Rogersite, a columbate of yttrium, etc	18–20%
Koppite, a pyrocolumbate of cerium, calcium, etc	62%
Haddamite, a mineral related to microlite	....
Perowskite, calcium titanate	
Pyrrite, or pyrrhite, a columbate related to pyrochlore	....
Sipylite, chiefly a columbate of erbium	47%
Tapiolite, a tantalate and columbate of iron	11%
Microlite, essentially a calcium pyrotantalate	7–8%
Skogbölite, a nearly pure iron tantalate	3–40%
Mossite, a tantalo-columbate of iron	41%
Annerödite, a pyrocolumbate of uranium and yttrium	48%
Lavenite, a silicate, tantalate, and zirconate of manganese, etc	0–5%
Dysanalyte, a titano-columbate of calcium and iron	0–23%
Eucolite, a complex silicate of uncertain composition	0–4%

The important columbiferous minerals are columbite, pyrochlore, fergusonite, and hatchettolite. Columbium is used in the manufacture of filaments for incandescent lamps and mantles for incandescent gas lights. Except for a small amount used in experimental investigations, all the columbium minerals are exported.

There is no strong demand for columbium at present.

Columbite

Columbite occurs in iron-black, grayish and brownish black, short prismatic crystals; also in groups of parallel crystals, and massive. Columbite grades into tantalite, and the iron and manganese contents vary widely. Tin and tungsten are present but generally in small amount. It is found in Maine, New Hampshire, Massachusetts, Connecticut, New York, Virginia, North Carolina, Colorado, South Dakota and California. Columbite is a brittle mineral, having a hardness of 6, and a specific gravity of 5.3-7.3. Its luster is generally submetallic, but may be very brilliant. The streak is dark red to black.

Columbite is infusible before the blowpipe, and is insoluble in acids. When the finely powdered mineral is decomposed by fusion with caustic potash, and treated with hydrochloric and sulphuric acids, it gives a blue color upon the addition of metallic zinc; this color is more permanent than that produced by tantalite (q.v.). The variety of columbite from Haddam, Conn., is decomposed in part when the pulverized mineral is evaporated to dryness with strong sulphuric acid; its color is rendered lighter, and a strong blue color results from boiling it with hydrochloric acid and metallic zinc.

Columbite dissolves in borax to a bead colored by iron; this bead may be made opaque by flaming after saturation. With salt of phosphorus, columbite behaves like tantalite free from tungstic acid. With soda and niter it gives a manganese reaction.

Pyrochlore

Pyrochlore is generally found in octahedrons, but also in irregular grains embedded in elaeolite-syenite. Its color is brown, dark reddish or black, and the luster is vitreous. The specific gravity is about 4.3, and the hardness is 5-5.5. It is brittle, and the fracture is conchoidal. The streak is light brown. Pyrochlore is found in Norway, and near Miask in the Urals; it is said to occur in syenite on Pike's Peak, Colorado. Before the blowpipe, pyrochlore is infusible, but assumes a yellow color and colors the flame reddish yellow. When ignited, it glows like gadolinite. With borax and salts of phosphorus it gives a light green bead in both the oxidizing and the reducing flames; this bead becomes colorless on cooling. It is decomposed by concentrated sulphuric acid. All varieties are decomposed by fusing with potassium disulphate. Most varieties are sufficiently decomposed by hydrochloric acid to give a blue color when the concentrated solution is boiled with tin; this color disappears upon dilution of the solution.

Hatchettolite

This mineral occurs associated with samarskite in the mica mines of Mitchell county, N. C. It is found in octahedrons of a yellowish brown color and resinous luster. The hardness is 5, and the specific gravity is 4.77-4.90. It is brittle, and the fracture is subconchoidal.

In its pyrognostic deportment, hatchettolite resembles pyrochlore. However, it contains from 15 to 16 per cent. UO_3, and may thus be distinguished from pyrochlore.

Fergusonite

Fergusonite occurs at Rockport, Mass., in granite, associated with zircon near Storeville, South Carolina, and associated with cyrtolite, thorogummite, and magnetite in Llano county, Texas. It also occurs in Burke county, Rutherford county and Mitchell county, North Carolina, and on the allanite of Amelia Court House, Virginia. It is a brittle mineral, having a brownish black color, and externally dull luster. The hardness is 5.5-6, and the specific gravity is 5.8. Its streak is pale brown.

Fergusonite is infusible before the blowpipe, but on charcoal its color changes to a pale yellow. It dissolves with difficulty in borax, giving a yellow bead while hot, the insoluble portion being white; the saturated bead is yellowish red, and may be rendered opaque by flaming. It is slowly dissolved by salt of phosphorus, and gives a yellow bead in the oxidizing flame and a colorless bead in the reducing flame. It is decomposed by soda, leaving a red colored slag. A white residue results from the evaporation with sulphuric acid; when treated with hydrochloric acid and metallic zinc, this residue yields a bluish green color.

---

*Professor of chemistry, College of the City of New York.

The Policy of the American Smelting and Refining Company

There having been much discussion recently in the press of Colorado respecting the attitude of the American Smelting and Refining Company, Franklin Guiterman, general manager of the Colorado department of that company, addressed a letter to the public, explaining the position of the company, an important part of which is the admission that the company has lent its influence to the maintenance of the price of lead and has aided in creating better prices for that metal. Omitting certain parts relating solely to local politics, Mr. Guiterman's letter is as follows:

Treatment Given the Producers

Much has been said as to the enormous dividends paid by the American Smelting and Refining Company in the carrying on of its business and the argument has been made that the paying of such dividends carries with it the just conclusion that the mining operators have not been fairly dealt with by the company and that in order to pay such dividends extortionate smelting charges have been and continue to be levied. Leaving out of consideration entirely the relationship of the American Smelting and Refining Company to ore producers in States other than Colorado, the pertinent question presents itself, how has this company treated the Colorado ore producers, and to what extent is it entitled to their respect and confidence?

Mining Districts of Colorado

Primarily it may be stated that since

the discovery of Cripple Creek, prospecting in Colorado has practically ceased and the mining of ores in this State has been confined to the camps which were in existence when Cripple Creek was discovered. The camps which produce ore in this State may be tabulated as follows: The Leadville district; Aspen district; Cripple Creek district; Creede district; Rico district; San Juan district; the Park, Clear Creek, Gilpin and Boulder county districts.

In point of tonnage of smelting ore produced these districts would rank in the following order: Leadville, San Juan, Aspen, Cripple Creek, Creede, the monthly tonnages from the other districts having fallen to relatively small quantities.

With the exception of the Cripple Creek district, the ores produced are mainly silver bearing, associated with lead to some extent and with copper to a much less one. It will be recognized, therefore, that with a drop of about 17c. per oz. in the price of silver, the value of the argentiferous ores produced in Colorado has been most unfavorably affected. So much so in fact that a tremendous curtailment in the tonnage output necessarily resulted. Coincident with this heavy decline in the price of silver, came a very great one in the prices of lead and copper, and while the amounts of these metals associated with the silver are not so very large, nevertheless the depreciation in the quotation of these metals has brought a material addition to the great burden the ore producers were already sustaining.

Price of Lead

The American Smelting and Refining Company, large as it is, is and has been utterly without influence on the quotation applying to silver, copper and zinc. It has, as the greatest producer of lead in the United States, lent its sustaining influence to the maintenance of lead prices and to the extent which the company has been able to aid in the creation of better prices for lead, the lead producers of the United States have shared the benefit. The quotations which are sent out as governing the price of lead by the American Smelting and Refining Company are taken from the record of actual sales from week to week as made by the company, and this record is open to the inspection of any ore shipper having business with the company.

The policy of the company with respect to the mining operators in Colorado has been one of consistent reduction in ore treatment charges as fast as improvements were introduced, which in the lowering of operating costs permitted such reductions to be made. In the policy which has actuated the company the salient principle has always been borne in mind to lend aid to such portion of the ore production which absolutely demanded it and to apply treatment charges on such other portions of the ore production which so far from hampering the output would on the contrary stimulate it to its utmost.

[illegible]

The smelting of ore is a peculiar business and differs in its characteristics from any other industrial business in the country. The industry is one which calls continually for a chemical adjustment of the ore charge and involves at the same time commercial considerations of greatest moment. In nearly every other industrial enterprise the technical execution of the work is referred to the handling of a single raw product or a number of graded raw products very similar in their specific character. In the smelting of precious metal ores, however, most complex problems continually present themselves. For the successful carrying out of the industry it is necessary to deal with a great variety of products and the necessity arises of so regulating the business that the mining output of many sections and districts under extreme fluctuating conditions can be currently taken care of.

In the consideration of the many intricate questions which are continually confronting the custom smelter, that is, one which does not mine but purchases all of its ores from mines owned by others, the company is obligated to take notice of individual ore outputs which it is necessary to secure for the perfection of the general smelting mixture. If it so happens that such outputs cannot be produced under normal treatment charges which might be generally applicable, it becomes necessary to give special inducements to bring out the product, and so it happens that it is not possible in the carrying on of the smelting business to make smelting charges which are regulated by hard and fast rules. On the contrary, it has been and always will be necessary to make such charges as will permit the greatest production of ores from all districts in order that the mining business may be stimulated to its highest degree and the maximum output obtained.

Works Must Be Operated at Nearly Full Capacity

With the curtailment or cessation of ore production which brings with it concurrently an enforced reduction in smelting operations, smelting expenses quickly rise and the ability of the smelting com- [illegible] producer is quickly restricted.

In the carrying out of this policy uninterruptedly, the basis of calculation has been the operation of all the works of the company under full capacity. Furthermore, the company has not hesitated in the reduction of treatment charges to anticipate the benefits which it was expected would be realized by the introduction of improvements in which large sums have been expended and to give the same in largest measure to the ore producer.

[illegible] tion in the State have brought about a [illegible] met up to the present. The iron sul- [illegible] quantity and which have always commanded the very lowest treatment charges on account of their fluxing character, have steadily declined in value. The silicious ores which are necessary to the smelting of the iron sulphides, have steadily grown less and less in their production although treatment charges have continually been reduced in order to promote the output. Lead ores from Colorado have become [illegible] the smelting of the tonnages which are now available at least 70 per cent. of the necessary lead has to be brought in from outside districts.

Without a very close study and consequent familiarity with these complex conditions, it is not possible for anyone to pass a correct or just judgment on the situation. The ridiculous cry of persons who are unfamiliar with the business, and others who have so little knowledge of it as to formulate weird statistics, that the chief object of the American Smelting and Refining Company is to crush mines out of existence, thereby closing down its own works, seems to be too silly to call for comment. So also may the asinine charges that the American Smelting and Refining Company conducts its business in a dishonest way be dismissed from the consideration of all decent people.

[illegible]

[illegible] business, the company has installed the most perfect apparatus and paraphernalia known in the art of smelting for the correct determination and valuation of ore received by it. The weighing and sampling are conducted under the most rigid methods which make for acuracy, and at all times are the works and methods of the company open to the most searching scrutiny of the ore shippers or representatives who may be delegated by them to look after their interests.

The company is in no wise interested in any public or private samplers, and in giving the concerns the greatest latitude [illegible] its account, it puts them on exactly the [illegible] with shippers who send ores direct to the smelters.

If the ore schedules which are offered [illegible] to the layman, it may be said that they are the result of the evolution from schedules which were introduced in Colorado over a generation ago. To the man, however, who is continually selling ore, and who can easily figure out the resultant value in applying the schedules to his own ore, the rates are not mysterious. The question finally resolves itself into one of net payment for the metals contained in the ore, and the net value of the ore to the producer after all charges have been met. If the rate is such as will enable him to produce at profit, the ore will be mined. Otherwise it is sure to remain in the ground.

The American Smelting and Refining Company has no monoply in its business. It has no secret processes nor has it a monopoly of the technical and business talent which is necessary to successfully conduct its enterprises. It has no privileges in the matter of secret railway rates, and has constantly exerted its efforts with the railways for the obtaining of minimum freight charges, the benefit of which, when secured, has been given to the ore producer.

The company has been charged with the new crime of employing brains in the conduct of its business. It pleads guilty to this accusation, but in doing so claims that it should and does have a keen recognition of the fact that being entirely dependent on the prosperity of the mining industry, it certainly cannot thrive in its downfall.

The Magnesite Industry of Greece

By F. Meijnan*

There are at present three companies operating magnesite quarries on the island of Euboea. One small company is working a deposit at Hermione on the island of Nauplia. This company exports only crude mineral and has not erected kilns. The Euboea deposits are worked (1) by the Anglo-Greek Company, Ltd., with officers in London, England, the quarries being situated near Limny, on the west coast of the island; (2) by the Société de Travaux Publics et Communaux, Athens, with quarries near Manthoudi on the east coast; (3) by the Société Hellénique de Mines de Magnésite, with offices at Athens, Greece, and Amsterdam, Holland, the quarries being near Pily, on the east coast.

Methods of Working

The Anglo-Greek company mines by open-cut and transports its output, consisting of about 100 tons per day, by a 75-km. aërial tramway, to the port of St. John, near Limny. The product is exported partly as crude mineral and partly as calcined magnesite. The calcining is done in modern bituminous-fired kilns at the company's works in St. John.

The deposits of the Société de Travaux are opened by galleries about 650 m. long. The quarries are connected with the port of Kymassi, near Manthoudi, by a railroad about 2 km. long, over which the daily output of 75 tons is shipped. This product is partly calcined in a modern lignite-fired kiln which works automatically with continuous fire.

The Société Hellénique works its quarries by galleries, and ships the product to Pily by an overhead tramway about 3 km. long. The production amounts to 60 tons per day. Calcining is done in small, open kilns, but an automatic kiln is being built.

Analysis of Magnesite

An average analysis of the magnesite from the three quarries gives $MgCO_3$, 95 per cent.; CaO, 1 to 2 per cent.; SiO_2, 0.5 to 2 per cent.; and some combined water. A complete analysis of crude mineral from the mines of the Société Hellénique is as follows: MgO, 46.28 per cent.; CaO, 0.41; FeO, 0.03; Al_2O_3, 0.07; SiO_2, 2.27; CO_2, 49.85; H_2SO_4, 0.02; P_2O_4, trace; combined H_2O, 1.15.

The price for crude magnesite for 1908-9 is 18 to 20 fr. ($3.47@3.86) per ton in bulk, and for calcines, 72 to 75 fr. ($13.90@14.48) in bags, both f.o.b. steamers at Grecian ports.

A serious attempt is being made to increase the use of magnesite, either deadburned or in the form of bricks, in the steel industry.

Sylvanite, New Mexico

By G. A. Martin*

The latest mining excitement is found in the new camp of Sylvanite, New Mexico. The district is in a barren region in the Big Hatchet mountains in Grant county, in the southwestern part of the Territory. It is 117 miles west of El Paso and is 17 miles from the nearest point on El Paso & Southwestern railroad.

The Ores of Sylvanite

Samples of the ores have been assayed in El Paso, Arizona and Colorado, and all have carried high values. Some have run as high as 216 to 300 oz. of gold to the ton, with considerable silver. There has been much controversy as to the character of the ore, but the assayers and experts generally have come to the conclusion that it is not sylvanite, although they admit that it is very rich. At first the ore was declared to be sylvanite, similar to the ores of the Cripple Creek district, but A. W. Houck, of El Paso, differed from this conclusion, and he has now been sustained by such men as F. C. Earle, manager of the El Paso smelter of the American Smelting and Refining Company; O. A. Critchett, John A. Rice and several other experts of wide experience. Mr. Earle says that he tested the ore for tellurium and ascertained that it contained tellurium but that it gives a strong bismuth reaction. The metal which he tested is of a white substance and he is satisfied that it contains gold, tellurium and bismuth, but he is not yet able to name the mineral. He is inclined to think that it is a telluride of bismuth, carrying gold and that, since tellurium and gold have a strong affinity, part of the gold may be combined chemically and part may be free even within the structure of the telluride of bismuth. Both John A. Rice and O. A. Critchett declare that the ore is not sylvanite, but a tradymite or telluride of bismuth.

Reaching the Camp

As already stated, the camp is 17 miles from a railroad, the nearest station being Hachita on El Paso & Southwestern railroad. The trail from this point to Slyvanite can hardly be called a road, and would not be traversed except that it leads to the promised wealth at the gold camp. Thus far all the vehicles in that sparsely settled country have been pressed into service to haul passengers into the camp, and it has been impossible to get any freighting done. Supplies are piled up at the station of Hachita—food and bedding—while miners, prospectors and other inhabitants of the camp suffer from want of food and shiver in the cold at night.

Two automobiles were brought overland from Douglas, Arizona, over 100 miles, and put into the passenger-carrying business. Their owners were operating on the streets of Douglas, but when the gold excitement broke out, they set out across the desert and are now hauling passengers at $5 a head between Hachita and Sylvanite and making more money in a day than they made in a month in Douglas in ordinary traffic. The transportation situation, however, will not be relieved entirely, if the new camp is all that is expected of it, until a branch can be built from the main line of the railroad. Officials of the road have been investigating the situation with the idea of relieving it as soon as the wealth of the camp is definitely determined.

Discovery and Rush to the Camp

The first discovery of gold-bearing ore was made by Sol. Camp, a prospector and old-time Cripple Creek miner. The news spread rapidly, and within 10 days nearly 1000 people had reached the place. There has been much suffering, as the newcomers found no shelter available, and little or nothing to eat, except what they brought with them. Some were thoughtful enough to take some bedding and supplies with them, but others who neglected this and hoped to buy their way, suffered for their folly. The man with money and the man without are on an equal footing in this new camp and each goes hungry if the teamster happens to get a load of passengers at the station and brings them back at $5 a head, instead of the potatoes, flour and bacon for which he left in the morning.

The camp, while made up as all new camps are of men from all sections of the country, men of all characters, inclinations and callings, is far above the average in the matter of good order, notwithstanding many of the men are hungry half the time, and this is accounted for by the fact that no saloons have been opened. A New Mexico law prevents the opening of a new saloon for a certain period before and after an election and this effectually prevented the sale of liquor in the camp. The owners of the townsite are going to make an effort to keep it out forever and have at least one western mining town without a saloon. Gambling is prohibited entirely by the laws of New Mexico and there is no card playing at Sylvanite.

---

*Société Hellénique de Mines de Magnésite, Athènes, Greece.

*El Paso, Texas.

PRESENT CONDITIONS AT THE CAMP

The townsite has been laid out and all the tents, assay offices, general stores resturants, hotels, and other buildings, none of which is more substantial than wooden sides with a tent covering, are being built on the streets in regular formation, and not helter-skelter as is generally the case in such new towns.

Several tent structures have been erected as "hotels" and accommodate many of the weary inhabitants of the camp, but they are insufficient to give sleeping and boarding accommodations to all the population, even if the food could be secured. And on several occasions the high winds that sweep the dusty plains have laid low these temporary homes, and the occupants have been forced to spend the night with the sky for a covering and snow falling in their faces.

A general store has been established and it is able to dispose of its stock as fast as it can be brought in—everything from a potato to a prospector's pick or a zinc bucket selling at once and having several bidders. The only worry of the men operating the store is that they cannot import their stock as fast as they can sell it.

The camp is full of people anxious to make money while the excitement is at its hight. Carpenters are getting $25 a day and sign painters get almost any price they ask for painting signs. An adventurous newspaper man, Newton Trenham, has gone into the camp with a press and a case of type and is issuing the ***Sylvanite Sun***. His advertising columns contain the cards of the "business men" of the new town. Already there are two lawyers busy preparing legal papers in the town of Sylvanite, and a doctor and a dentist have set up offices in tents.

It is a conglomerate collection of men from all parts of the world—wealthy men, poor men, men whose past is closed, men who have made and lost fortunes in mines and hope at least to recoup their losses in this new camp, men who are merely after day labor at the big wages that always prevail in a new camp, and men who are there to live by their wits, or buy their way for small sums into fortunes, all helping to form the cosmopolitan population. While many of the newcomers are men with money, anxious to take bonds, leases and options on properties already staked out, there are others who are flocking in without a cent, hoping to strike it rich in some new locality, or failing, to get work as day laborers in the mines of others more fortunate. Owing to the inaccessibility of the camp, however, and the consequent difficulty in getting freight from the railroad, there are no tools with which to work and the men arriving without money are in sore straits and will become a burden upon the camp if they are not sent out. The railroad has issued a circular warning people to keep away, unless they are well supplied with money.

INCIDENTS OF THE CAMP

There is no water at Sylvanite. Several miles away there are several springs, but the discharge of water is small and is at present barely sufficient to supply the needs of the camp for cooking and drinking purposes; it is transported on burros and sold at $1 a gallon. Fuel is even harder to get than water and most of it is coal, brought 17 miles on muleback from the railroad.

While all the claims for miles around the location of the new town have been taken up, the rush of the gold hunters is not slackening. It is not possible now to obtain claims except by purchase.

The new camp has led to many unique occupations for people anxious to make money. Mrs. Laura B. Parker has become a stage driver, hauling passengers between Hachita and the camp, and has also opened a restaurant in the camp. Hers is one of the places where there is always sufficient food for as many as her cook can serve, for on her regular trips to and from the train, she hauls her provisions. She purchased her outfit in El Paso and went to the scene of the excitement in the early stages of the camp, spending her last cent for her venture

FUTURE OF THE CAMP

That experts have every faith in the camp is best shown by the manner in which capitalists are putting money into it. As an example: J. M. Cunningham, of the Bank of Bisbee, has taken an option on six claims for $60,000 and has paid down $6000 to bind the deal. He was offered $100,000 for the same properties on the same terms in an hour after he had taken the option, but refused. Other such transfers are being made daily, and an official of the United States land office has set up an office in a temporary structure in the new town, to handle the papers, and is working night and day.

The discover, Sol. Camp, followed placer workings in the valley below, where claims were staked out years ago. He worked at these placers some time before prospecting in the mountains. So far as indications go at present, some rich mines may be found, but most of those who go to the camp will leave it poorer than when they went in. Everything is still too new to venture predictions as to future permanence.

Electric Furnaces in Germany

A report from United States Consul Thomas H. Norton, of Chemnitz, says that hitherto electric furnaces in Germany have been used chiefly for the treatment of small quantities, but now leading works are beginning to employ them on an extensive scale for handling large quantities of metal. At the close of 1907 one of the most important steel works in the Empire engaged in the production of cast steel for gears, as well as of the softer varieties of malleable cast steel for automobile construction and for minor machine parts, decided to replace its battery of crucible furnaces by a large electric furnace. The main cause for the change was the desire to lessen the cost of fusion, while not lowering the quality of the steel, but improving it, if possible.

The old equipment consisted of 32 furnaces, each containing 6 crucibles, with a capacity of 77 lb. They are replaced by a single electric furnace of 250 h.p., capable of holding a charge of a metric ton. A duplicate furnace is likewise installed and kept as a reserve for emergencies.

Electricity is supplied from the large works of a company near Cologne, which furnishes a three-phase current of 5200 volts to quite a large territory near the Rhine for both power and illumination. Alterations in the current intensity are so slight that connection is made directly, without the interposition of a regulator, between the furnace and the transforming station. At the latter a three-phase rotary current, reduced to a tension of 110 volts, is supplied.

The production of cast steel in this furnace has been carried on since the beginning of 1908 without interruption, and with such success that the results are well worth attention.

The main product of the furnace has been cast steel, containing about 0.06 per cent. phosphorus, 0.03 per cent. sulphur, and from 0.08 to 0.18 per cent. carbon. Occasionally charges of tool steel have been cast, containing from 0.7 to 1.3 per cent. of carbon, with and without the addition of nickel, chromium, or tungsten. The material employed is ordinarily cuttings, turnings, and other wrought-iron scrap, costing from $14.28 to $15.47 per metric ton. A fusion, including the refining, lasts about five hours and involves a consumption of about 900 kilowatt hours for 1 metric ton of cast steel. The entire [illegible] When the furnace is kept in continual use the magnesite lining lasts for about 70 operations, or 20 to 25 days. A stoppage of five days is required for each renewal, but during this period the reserve furnace is [illegible]

The Cost of Longwall in England

Details and Dimensions of the System. Division of Labor, and Wages Paid. Method of Shooting down Stone and Loading out Coal

BY GEORGE R. DIXON

In the JOURNAL of June 6, I described some features in the longwall system of working coal. At the close of my article I said that longwall coal-cutting machines of both the disk and the bar types are used to a great extent, and also face conveyers. The benefits a manager hopes to derive from the introduction of coal-cutting machinery are understood by readers of the JOURNAL, so it is only necessary to state that the important items are: Increased output per person, and decreased cost per ton of coal produced.

On a further introduction of machinery in the shape of face conveyers, one looks for the above benefits to be accentuated. Mine owners and managers are shy in publishing data with regard to working costs. This is, I suppose, natural. In the first place, it is hardly likely that a man will spend money in experimenting, and then publish broadcast the information thus dearly bought. Again, this information may get into the hands of the officials of the miner's union, when it would be used in a way that, to say the least, would not be beneficial to the colliery owner.

Information from one mine manager to another may be given in a brief way. I say beware of such information. Incomplete information is worse than none. I ask mine superintendents if they have not often had to show managers where they were deceiving themselves.

In all branches of mining, careful abstracting of costs is essential. In coal mining, comparison between different methods of working must be done carefully, and with due appreciation of all the influencing factors. Every phase of a question cannot be reduced to figures. Great caution must be exercised before pronouncing a new method an improvement on the old, especially if the new method involves the laying out of a large sum of money on machinery. We all know that failing of the mining engineer, which demands that a scheme shall be an engineering success, without consideration for the pockets of the owners. The reply as to whether the application of, say, coal-cutting machines pays, "Well, we started with one, and we now have 10," may be all right, but I should be inclined to treat it with suspicion.

I have had considerable experience in machine mining, and I propose putting forward some considerations, which I hope will help some readers of the JOURNAL. Obviously I cannot publish actual working costs. I propose treating the subject in such a way that I can be checked in my calculations by men of experience.

In this article I will explain the division of labor in longwall working practiced in the north of England. A knowledge thus gained will perhaps help to appreciate the differences brought about by the introduction of mechanical coal cutters, which I will describe in a second article. In a third article I will describe face conveyers combined with coal-cutting machines.

AVERAGE PAY OF MINERS

In this article I propose dealing only with the work in the face of three districts. The total breadth of coal is 400 yd. The thickness of the seam is 2 ft. 10 in. The price per ton for hewing and filling on this longwall face is 62c. In whole places, or places out of the influence of the roof weighting, 68c. per ton is paid.

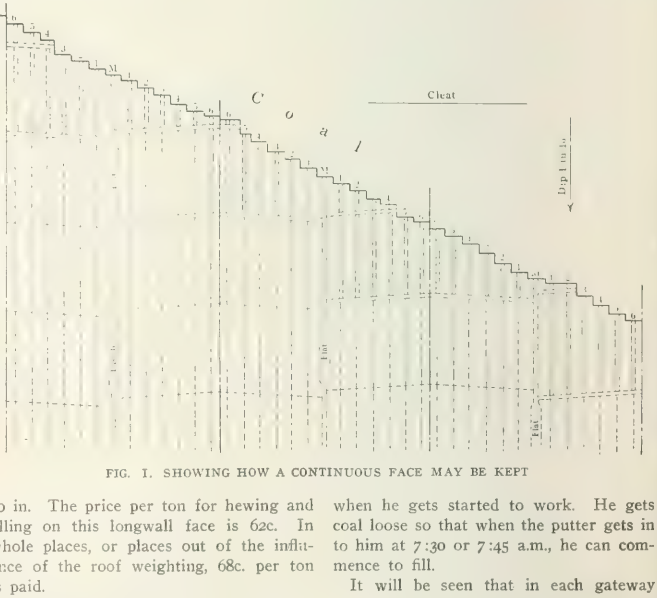


FIG. 1. SHOWING HOW A CONTINUOUS FACE MAY BE KEPT

There are 13 gateways in each district, or 39 gateways in all. To make provision for accidents, let us allow a spare place on each side of the district, or in any one shift we will only have men in 11 gateways. There will then be 33 gateways going out of the total 39. Two hewers can be placed in each gateway, and there will be two shifts of hewers each day. Therefore, 132 hewers can be placed in the 400-yd. breadth. Twelve or thirteen per cent. of these hewers will be absent for various reasons. Let us reckon on getting an average of 115 at work. We will allow $1.92 per shift as the average wage. Remember that they are paid at the rate of 62c. per ton. The average tons per man must, therefore, be 3.1.

The output will, therefore, be about 350 tons per day. A cubic yard of coal in place equals about 19 cwt.; 350 tons of coal, therefore, equals $\frac{350 \times 20}{19}$, or 368.4 cu.yd. The coal is 2 ft. 10 in., or 0.94 yd. high, and the length of face 400 yd. The area of coal being attacked, therefore (in section), is $400 \times 0.94 = 376$ sq.yd. The average advance of the face in each day equals $\frac{368.4}{376}$, or 0.98 yard.

The fore-shift hewer goes in at 3:30 a.m.; but it will be after 4 o'clock when he gets started to work. He gets coal loose so that when the putter gets in to him at 7:30 or 7:45 a.m., he can commence to fill.

It will be seen that in each gateway there is a loose end and that thus there are always two free faces of coal. The hewer must make a third free face by hewing out some part of the seam, or if circumstances are favorable by hewing out the stone above or below the seam.

METHOD OF WORKING

It is evident from Fig. 2 that the coal face is at right angles to the car road in the center of the gateway. Some managers would insist on this. It will be noticed that such a face forms an angle with the mean face line, with the result that the loose end gets nipped and the coal is easy to work. Most miners, if left to themselves, would accentuate this condition by keeping their 10-yd. face in such a shape that the angle between the direction of the car road and their face would be less than a right angle.

Referring again to Fig. 2 it will be obvious that the coal from the sides of the 10-yd. gateway must be cast to the center with a shovel, before it can be put in the car. This works against the production of a high percentage of large sized coal.

SHOOTING DOWN THE STONE

On referring to Fig. 3, it will be seen that the top stone in the car road is not shot down right up to the coal. If some stone is not taken down before the hewer drives further, his difficulties in getting his coal filled will be increased. In justice to the hewer, who is paid on the coal filled away, some regulation must be made to protect him from these difficulties. The work of shooting down the stone, and putting in the packs at the sides of the car roads is usually bargain work. The men engaged at it being paid a price per lineal yard.

If these men fail to keep the face of the stone canch within a specified distance from the coal face, they must pay a fine to the hewer. The fine is applied for each day the hewer works under the unfair conditions.

One such scale is as follows:

Should the distance be [illegible] ft.	The fine is [illegible]
Should the distance exceed 8 ft.	[illegible]
Should the distance exceed 11 ft.	[illegible]

Again the canch men, when pillaring the stone, may build it too close to the coal for the convenient working by the hewer. In this case, also, a fine is resorted to. If the pack is built nearer to the coal than 4 ft. 6 in., the stonemen are fined [illegible]

With regard to the process of putting, or collecting the loaded cars and taking them to the haulage landing, I figure 60 cars per putter a fair average under good conditions, each of the cars containing 9 cwt. of coal. The total number of full cars to be put to the flat would be,

$$\frac{350 \times 20}{9} = 778.$$

The number of putters required would be

$$\frac{778}{60} = 13.$$

SUPERVISION IN THE DAY SHIFT.

The man in charge of the district is called a "deputy." He inspects the places before the men go in, in the morning. He is responsible for the ventilation and safe timbering of the working places, and generally has charge of all hands in his district, subject to the direction of the overman; being in fact the overman's "deputy." There is a deputy for each shift of hewers for each district.

In the 400-yd. face under consideration, the number of deputies required will be 6. The work of shooting down the stone in [illegible]

[illegible] engaged in the work; first are the stonemen who place and fire shots, and second are the stonemen who rid and pack, with and under the direction of the first class [illegible]

The pit ceases drawing water at 5 p.m. and all day-shift men come to bank. At 6 p.m. the first class stonemen descend into the mine. They set all breaking-off timber that is required, drill shot holes, and shoot down the stone. The second class stonemen follow, going down at 8 p.m. They proceed to rid the shots, packing the stone under the canch, at either side of the car road, which is thus extended.

[illegible]

It is very important when this is being done that props, set as supports for the protection of the hewers, should not be built in. They should be knocked out. If they are allowed to remain, when the coal face has advanced, and the weight of the roof comes to them, they will be broken and will push the pack out into the car road. Moreover the even settlement of the roof will be impossible, and the stone over the car road will be broken, and become [illegible] comes down evenly on the packs, all supports [illegible] some distance back from the face, without any danger of falling [illegible]

The top stone is shot down so that a 6-ft. plank may be set against the roof; this is so arranged that the [illegible] down is packed, so that the distance between [illegible] comes on. The hight is soon reduced to 4 ft. and the width between packs to 5 ft.

As the average rate of advance of the [illegible] stone to be shot down in the gateways each night can easily be calculated. One yard in each of 39 gateways equals 39 lin.yd., or 117 ft.; the thickness is 2 ft. 8 in., or 2.67 ft.; the width in each gateway [illegible]

[illegible]

A cross-heading will cut the gateways off every 50 yd. The yards cut in this cross-heading will be the total length of face, 400 yd., less the added width of the 39 gateways, 78 yd., or 322 yd. Allow 8 yd. additional length, as the cross-headings make a slight angle with the mothergates; this insures a total to cut of 330 yd., or 990 lineal feet.

The cross-headings will be shot 6 ft. higher than the gateways, so the stone canch will be 3 ft. 2 in. thick, or 3.16 ft. The total cubic feet of stone shot down in the cross-headings will amount to 990 × 6 × 3.16, or 18,770 cu.ft. This work is spread over the time required to advance the face 50 yd. It is, therefore, proper to charge one day with $\frac{18,770}{50}$, or 376 cu.ft., as the rate of face advance is 1 yd. per day. The total cubic feet of stone to be shot down each day is 1874 × 376, or 2250. My experience in this class of work shows that 75 cu.ft. can be got down and [illegible] number of men required equals $\frac{2250}{75}$, or 30. Making the necessary allowance for lost time, 35 men would have to be placed, 11 in each of the three districts. Thirty men attending work each night would follow the canches, and of these, 18 would be first-class stonemen, and 12 would be second-class stonemen.

[illegible] COAL.

[illegible] used as an ordinary gateway. Soon, like the rest, it is only from 4 ft. to 4 ft. 6 in. [illegible] and width required. Where a single car [illegible] high and 7 ft. wide. Where double car [illegible] 6 in. high and 10 ft. wide. Single and [illegible] shown on Fig. 1. On each mothergate, a [illegible]

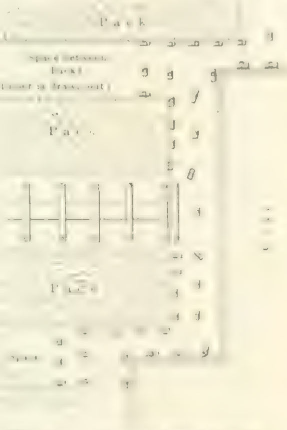


FIG. 2. [illegible]

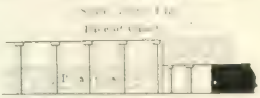


FIG. 3. LONGITUDINAL SECTION OF A GATEWAY

stone shot down by the back canchmen, to the place where it will be stowed.

A chargeman is appointed to each district to see that the canch work is done properly, and to generally fulfil the same function that the deputy performs in the day shift. He will have the assistance of a third-class stoneman to do repair work on the face roads, or other labor that is required.

SUPERVISION

Suppose the colliery to be producing 1000 tons a day, and costing for underground supervision $9.60. The cost on the face under consideration yielding 350 tons would be, $\frac{40 \times 350}{100}$, or $1.96. We can now arrive at the cost per ton:

COST OF MINING.

Supervision	$3.36
115 hewers, 350 tons at 62c	219.70
13 putters at $1.38	18.12
6 deputies at $1.68	10.20
3 chargemen at $1.44	4.32
3 3d class stonemen at $1.08	3.24
18 1st class stonemen at $1.92	34.98
12 2d class stonemen at $1.32	14.70
12 back canch stonemen at $1.92	11.64
3 stone putters at $1.20	3.60
179 shifts equal	$323.86

or equal 350 tons at $0.7437 per ton; also, tons per shift in the face equal $\frac{350}{179}$ or 1.95.

The conditions I have in mind are a sound bottom and a good, shale roof. The shot holes in the stone are drilled by twist drills worked by hand. The explosive used is compressed gunpowder, about 4/5 lb. per cubic yard of stone. The conditions as here found are favorable to the introduction of coal-cutting machines.

Use of Electricity in Australian Collieries

BY A. SELWYN BROWN*

Australian colliery proprietors during the past several years have largely increased their power plants in the mines. In many of the larger collieries electricity has taken the place of compressed air as a motive power. The operators now use electric power in pumping, ventilating, hauling and coal-cutting plants. The mines, however, are to a large extent dry, dusty and gaseous, and much trouble has been experienced with the electrical instalments. Every mine using electric power underground possesses interesting records of accidents and minor explosions caused either directly or indirectly by defects in the electrical plants.

On Oct. 1, 1906, an explosion occurred in the Hebburn colliery at Newcastle, N. S. W., which, investigations showed, was caused by a blowout of the trailing cable. As a result of that accident, the mines department framed a more stringent set of rules regulating the use of electricity in coal mines than it had hitherto enforced. In August, 1907, another blowout occurred in the same mine and caused an explosion. Owing to a long series of minor accidents, explosions and pyrotechnic displays around the electric conductors and machinery in this colliery, the miners abandoned work after the explosion in August and petitioned the New South Wales government to compel the owners of the mine to take adequate precautions to secure the safety of the men engaged in underground operations. Many similar complaints regarding the dangerous condition of the electrical plants in other collieries had been received from the miners, so the Government appointed a commission comprising Jno. L. Murray, of the Supreme Court, and engineers representing the Government, and the miners and colliery proprietors' unions, to thoroughly investigate the circumstances of the employment of elecricity in coal mines and make suggestions relative to the prevention of accidents through defective installations.

A COMMISSION TO INVESTIGATE CONDITIONS

The commission commenced its investigations last October. Its work was thorough. All the principal coal-mining districts were visited and a large amount of evidence and statistics bearing upon the use, benefits and dangers of electric plants was collected and collated. In addition to its sittings in the courts in the various coal-mining districts visited with the purpose of collecting evidence from mining officials and miners, the members of the commission carried out many valuable experiments and tested a number of electric coal-mining plants at the Government's electrical power plant and laboratories at Ultimo, Sydney, and at several of the mines.

The commission forwarded to the Government an interim report early in January. In this it was stated that the value of electricity for mining purposes could not be doubted, but its use is accompanied by serious dangers when carelessly employed underground in coal mines. These dangers, however, can be greatly minimized by adequate precaution if properly used by the mine officials.

The commission found that 33 collieries in New South Wales have complete electrical equipments, with a total capacity in electric output amounting to 2176 kw., or 2917 h.p. These mines employ 1482 electric lamps on the surface and 800 electric lamps underground. Sixteen collieries employ electric coal-cutting machines and about 70 such machines are now in use. Nineteen collieries use electric pumping plants underground and employ 10 electrically driven ventilating fans in the workings.

These plants are all of the low-pressure type that is so popular in Europe and the commission recommends the Government to prohibit the use of any other type.

The principal dangers arising from the operation of the plants were found to be chiefly: (1) shocks, (2) explosions, (3) fire in the workings. The experiments carried out by the commission plainly showed that for portable motors, in connection with which shocks are most likely to be received, only low-pressure currents should be used.

The most probable causes of shocks were found to be:

(1) Leakage, rendering machine bases, covers, or cable armorings "alive," so that any persons touching them receive shocks; and (2) the leaving of "live" portions of the circuit exposed where they are accessible generally to persons who are not acquainted with the electrical risks. Both these matters received the special consideration of the committee which drafted the British rules, and numerous provisions were made guarding against either contingency. During the inspections and inquiries made by the commission many illustrations of the necessity for such precautions were met with.

One of the most frequent causes of shocks from leakage was the lack of proper testing and repair of the trailing cables, in consequence of which the armoring of the moist outer covering would become "alive," and the men whose duty it is to handle these cables would receive shocks. In one mine the proper maintenance of the cable insulation was so entirely disregarded that on a trailing cable which was actually in service during the commission visit, there were a number of places where the insulation and covering were completely broken through, leaving the bare conductor easily visible. The commission considered it advisable to draft a number of new rules relative to the use and regular testing of trailing cables.

Shocks from "live" metal intentionally left exposed are most frequent in connection with low-pressure systems, owing to an exaggerated idea of the harmlessness of the shock. Switches with their conducting parts entirely exposed were found in the main roadways; also in the traveling-roads of one naked-light mine visited, long lengths of cable were seen from which the covering had entirely rotted off, leaving the bare "live" conductor in a position and at a hight where the employees were quite likely to come into contact with it. One of the worst features of such practices is the disrespect for the electrical risks engendered in the minds of general employees who are uninformed in these matters.

The members of the commission gave the matter prominence, as they found a disinclination in some quarters to admit the necessity for guarding bare metal carrying low pressure, and the tendency to practical joking with conductors of low pressure has unfortunately been in evidence more than once.

In carrying on the researches, the British commission's 1904 report, and several American, German and French reports on the employment of electricity in coal mines were consulted. The British rules dealing with the causes of fire in coal seams and workings, however, were not found to be sufficiently stringent. Fires are caused chiefly by the overheating of the electric conductors, leaking of currents, fusing of arcs and sparking.

---

*Mining engineer, New York City.

MEDIUM VOLTAGE IS DANGEROUS IN WET MINES

In drawing up its rules the British commission stated that in regard to the restriction of currents employed underground, it considered that at the working face, a reasonable limit would be a medium pressure, not in any case to exceed 650 volts. But in the rest of the mine, if proper precautions are taken, we have no reason to think there would be undue danger in much higher voltages. As for danger from shock, it is in a wet mine nearly as great with a medium voltage as a high one, and bad apparatus is capable, even at low voltages, of causing fires or exploding gas. When once, however, the apparatus is of excellent quality, well installed and completely protected, there seems no reason to apprehend undue danger either in mines or factories from the use of high voltages, and we do not see why in the United Kingdom any more stringent limits should be imposed than have been found necessary on the Continent."

The New South Wales commission, however, has recommended stringent restrictions relative to the strength of currents employed in dangerous working faces. The representatives of the miners' unions on the commission were strongly insistent in their advocacy of the necessity in restricting the voltage used in coal-cutting machines.

ADVISABILITY OF ELECTRIC CONDUCTORS IN RETURN AIRWAYS

Much attention was given to the discussion of the advisability of placing the electric conductors in the return airways in collieries. But the miners generally opposed this on the grounds that a large amount of the gas evolved in the workings was carried away through these airways and consequently defective conductors would be a continual menace to the safety of the men. The members of the commission could not arrive at a proper solution of this question and it was left open.

In the matter of providing against the presence of gas where portable motors are used at the face for coal-cutting and other purposes, the commission states it has carried the precautionary measures to even greater length than is required by the codes of rules employed in other countries. The rules provide for the frequent examination of all machines at the working faces during the time that the electric power is used for undercutting, with an absolute requirement for the immediate stoppage of the machines and the shutting off of the current in the event of gas being discovered during such examination. This regulation insures that even if the apparatus is accidentally damaged, its use will be so well governed under the conditions the commission has laid down that miners can work with coal-cutting machines at the different collieries where the commission saw them installed, with every reasonable sense of security and safety.

The commission quotes liberally from the British commission's report, issued in 1904, and adds that it agrees entirely with the salient features of that commission's conclusions. Although the rules the commission proposes include numerous departures from the British, it is mainly in precision of detail, as the investigation furnished ample evidence that definiteness in rules is essential to the prevention of bad work

RESULTS OF THE INVESTIGATION

As a result of its investigations, the commission decided to recommend that the New South Wales Department of Mines adopt a much more stringent set of rules than those now in force. Such rules were drafted by the commission and embodied in its report.

The commission was unanimous in its recommendations that the mine electricians and their assistants should be required to pass an examination which would be something more than of a high academic character, and the opinion is expressed that the present mines electricians can pass this examination. It furthermore recommended that the services of a consulting electrical engineer be secured by the Mines Department, so that inspectors may have the benefit of his advice should necessity arise.

The commission's recommendations agree in most respects, with those made by the Department of Mines' colliery inspectors while engaged in their official duties. It is, therefore, most probable that the regulations for the use of electricity in coal mines, so carefully drafted by the commission, will be adopted by the Government *in toto*. The proper enforcement of the regulations will, doubtless, obviate many of the evils hitherto arising in mines using electric plants underground, and restore public confidence. When such confidence is restored, a great impetus will be given to the employment of electrical plants in Australian coal mines

---

Illumination in Mines

BY LUCIUS W. MAYER[*]

The use of acetylene underground has met with favor throughout all the European mining districts. Tallow candles and oil are still used to a great extent in working places, but the modern form of acetylene gas lamp is largely used by officials.

At Mechernich, Germany, arc lamps without glass globes are used underground, and the result has been favorable. The condition of walls and roof is constantly under clear surveillance. A single lamp illuminates a large area in an efficient manner, and the conditions are much like working on the surface. The cost for operating the arc lamp at Mechernich is given as 24c. per 24 hours.

SMOKY LAMPS OBJECTIONABLE

Not alone is it desirable to obviate the use of a smoky material in underground lighting, but the efficiency of the men may be increased, in view of the better light conditions under which they work, to say nothing of the incessant intermissions during working hours, to fill the present form of lamp.

In addition to the acetylene lamps used for carrying in the hand, a large stationary model is made by manufacturers, and may be hung at any point; such lamps weigh about 8 lb., and have a rated lighting effect of 50 c.p.; one charge of acetylene affords 14 to 16 hours' light.

All these lamps work on the same principle, and consist of a lower carbide holder containing no joints, but pressed out of one piece of sheet steel or brass. On this lower vessel is fixed the burner. The upper vessel, the water reservoir, is clamped over the lower vessel, the carbide reservoir, by means of a bridle. The degree of light to be emitted from the burner is regulated by the speed of admission of water from the upper to the lower reservoir.

Carbide cost in England is given at 1/16 penny per hour. In France, the figures given me at Carmaux for consumption in this form of lamp is ½ lb. carbide for 10 hours' burning, the carbide costing 13.5c. per kg. This figures about 6.36c per pound of carbide, or 0.03c. per hour. Carbide in England, yielding 4.9 cu.ft. of gas per pound of calcium carbide sells for 11.1c. per lb., and in hundredweight lots at 7.09c. per pound.

In England the supply of carbide is imported from Norway, and being very imflammable when coming in contact with water, the steamship and railroad lines hesitate to carry it.

Carbide rated to give 5 ft. of gas is supplied all over the United States by the Union Carbide Company, costing 9c. per lb. in 10-lb. lots, and 5c. per lb. in 100-lb lots. It is claimed that there is no difficulty with the railroads here in the transportation of this material.

In using these acetylene lamps, they should be cleaned each time they are used, which does not amount to more than seeing that the aperture which permits the water to the carbide reservoir is kept open. The evolution of unconsumed gas when not ignited at the burner is very disagreeable, and it will be found well, when turning off the water supply, to keep the gas lit until it ceases to be evolved; in short, to allow itself to burn out

---

[*] Mining engineer, Room 617, 71 Broadway, New York City.

Colliery Notes

The cost of washing coal in England, varies from 4 to 8c. per ton; the washed coal is exhanced in value from 12 to 14c. per ton.

Many miners do much to foul the air in coal mines by burning a cheap quality of oil in their lamps. Much harm is also accomplished by adding coal oil to the sperm or lard oil generally used.

Methane (marsh gas), although generally associated with coal measures, may occur in dangerous quantities in any geological strata. Jets of this gas have been found in iron, silver, lead and salt mines.

Naked lights in a mine may continue burning brightly in an atmosphere that is fatal to life; on the other hand, lights may be completely extinguished in an atmosphere where no immediate danger exists.

An air current at a temperature of 62 deg. F., fully saturated with moisture, requires approximately 7 per cent. more heat units (B.t.u.) than dry air to reach a temperature of 1213 deg. F., which is the point of ignition of firedamp.

Gas rises more rapidly in an atmosphere free from humidity, as is demonstrated by the ascent of chimney smoke on a cold, crisp morning; likewise do gases rise to the roof of the mine and accumulate there in a dry atmosphere.

Investigation shows that boring by rigid iron rods is only practicable to a depth of about 1000 ft.; it is common practice in boring holes only this deep, by the percussion method with rigid rods, to make use of some kind of "free-fall," by which the jar to the column of rods is limited.

A gaseous or dangerous mine atmosphere affects animals more quickly than men. A mouse is affected in about one-twentieth of the time required to produce the same effect on a man. For this reason a mouse carried in a cage serves as an index of the dangerous qualities of a suspected mine atmosphere.

When a fiery mine remains idle a day or two, even though the ventilating current is continued as usual, the dangerous gases soon stratify and accumulate near the roof of rooms and entries. When the mines are working, the travel of men and trips causes the air currents and the gases to thoroughly mix so that no stratification occurs.

The reports of investigation committees in this country, in Australia and in Europe, show that the consensus of opinion favors 650 volts as the maximum current employed for electrical transmission underground, through exposed cables. Any current at a potential of more than 650 volts should be carried by means of a completely insulated cable.

The more cold air forced through a mine in the winter, the drier will the workings become; the more air forced into a mine in the summer, the more moisture will be deposited. In mines with slate roofs, the greatest difficulty in supporting the top occurs during the summer months when the greater humidity in the air causes the slate to slack and drop off.

A ventilating current of 200,000 cu.ft. per min. upon entering a mine and cooling 5 deg. in temperature would deposit in the mine about 2500 gal. of water each 24 hours. This increase in the relative humidity of the ventilating current in summer months is the strongest argument advanced by those who claim that explosions are more likely to occur in winter than in summer.

The Kingston Coal Company has decided upon a system of education, which will enable all of its foreign employees to secure a working knowledge of the English language. A course of study has been devised and competent instructors employed. It is the intention of the company to familiarize the newcomer with the English language by the shortest possible method. The expense incurred through this educational work will be borne by the company.

One of the greatest fuel experts, the late Sir William Siemens, expressed his opinion on the utilization of fuels in the following words: "I am bold enough to go so far as to say that raw coal should not be used as fuel for any purpose whatever, and the first step toward the judicious and economic production of heat is the gas retort or gas producer, in which coal is converted either entirely into gas, or into gas and coke, as is the usage at our ordinary gas works."

In boring a deep well in Galicia, Austria, the time occupied in drawing up and letting down the rods when it was necessary to clean out the hole was recorded by Nelson Boyd as follows:

	Minutes
Drawing rod,	25
Letting down the sand pump by means of the rod	14
Drawing up the sand pump	24
Changing the chisel	3
Letting down the chisel	14
Connecting the feed	5
Total	85

It has been found advisable at many coal washeries to introduce among the coal, a mineral having a specific gravity slightly less than the heavier dirt particles and slightly greater than the coal; this mineral acts as a filter through which the shale will pass and on the top of which the coal will remain, thus insuring a more perfect separation. Feldspar is an excellent mineral for this purpose, and suitable particles of this substance are placed in the sieves of the jiggers.

The British Colliery Commission, in their report dealing with mine explosions, point out that when mines are sprayed to settle and dampen dust, the excessive humidity in the air injuriously affects the health of the miner. The temperature of many of the English mines ranges from 90 to 95 deg. F., while in this country our mines have an average temperature of 70 to 75 deg. The affect of humidity in the air on our miners would not be anything like as injurious as to the men working in the deeper English mines.

According to Mr. Redmayne, the cost of boring through the coal measurres in the north of England is usually about 30c. per ft. for the first 30 ft., with an increase of 30c. per ft. for every additional 30 ft.; thus if C equals the cost of the bore-hole; a equals the price of the first step; b equals increase in price for each additional step; and n equals number of steps; then by arithmetical progression:

$$C = \frac{n}{2} \left\{ 2a + (n - 1) b \right\},$$

or considering that the bore-hole is 300 ft. deep—

$$C = \frac{10}{2} \left\{ \$9 \times 2 + (10 - 1) \$9 \right\} = \$495.$$

Recent investigations by Carl Scholtz may be summarized as follows: 1. Explosions occur more frequently in the colder months of the year; the colder the winter the more frequent the explosions. If a certain district has extremely cold weather and other sections of the country are comparatively warm, the latter sections are freer from explosions. 2. Mining fields located in higher altitudes are more productive of explosions than those at lower elevations. 3. The hydrometric condition of the atmosphere has the greatest effect upon the cause of explosions. Mr. Scholz says further: "Every practical mining man knows that the majority of explosions take place between Nov. 1 and March 15. Every mine examiner instinctively feels danger when he enters the mine on a cold, crisp morning."

In prospecting coal seams by boring, the preservation of the cores and the correct description of the strata passed through ranks of considerable importance. The recording of all fossils met with is also desirable, as such records may, in many cases, afford the only true index to the deposits. The most satisfactory method of keeping the cores so that they can be readily examined at intervals is to place them in a shanty built of galvanized iron. At several localities in both Europe and America, when the borings are deep, this house is built about 100 ft. in length, and of sufficient width to allow the cores to be arranged on the ground in a single tier, each length of 100 ft. being separated from the next by match-boarding. The depths from which the cores are obtained should be inserted on them at frequent intervals by means of labels, affixed by some adhesive not effected by damp.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
[illegible]
505 Pearl St., New York.
London Office: 6 Bouverie Street, [illegible]
[illegible]

Subscription, payable in [illegible] of 52 numbers, [illegible] States, Mexico, Cuba, [illegible] Philippines, $6.50 [illegible]

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings [illegible]

Notice to discontinue [illegible] York office [illegible]

Advertising copy [illegible] by Thursday, a week before date [illegible]

For sale by all news dealers [illegible]

Entered at New York Post Office [illegible] the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1908, *was* 52,800 *copies.*

Nov. 7	12,500
Nov. 14	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
The American Smelting and Refining Company. 969
The Copper Market 969
Low Prices Do Not Always Restrict Production 970
Pittsburg Coal Trade and Prices........ 970
*Carbon and the Properties of Cast Iron *Henry M. Howe* 943
*Cyanide Mills, Guanajuato Development Co. I. *Claude T. Rice* 947
Mexican Dynamite Concession. 950
*Principles of Machine Sampling *John A. Church* 951
*Growth of the Cananea Copper Furnace *Chas. F. Shelby* 954
*Cobar Gold and Copper Field, New South Wales *Gerard W. Williams* 955
Transvaal Mining Notes. *Special Correspondence* 958
*Keystone Gasolene-driven Drills 959
An Important Rhodesian Mine *Special Correspondence* 959
The Rare Metals—II. Columbium *Charles Baskerville* 960
The Policy of the American Smelting and Refining Company 960
The Magnesite Industry of Greece. *F. [illegible]* 962
Sylvanite, New Mexico........*G. A. Martin* 962
Electric Furnaces in Germany 963
*The Cost of Longwall in England *George R. [illegible]* 964
Use of Electricity in Australian Collieries. *A. Selwyn-Brown* 966
Illumination in Mines 967
Colliery Notes 968
Correspondence:
Loading Blast Holes *J. K. H[illegible]* 971
Electrolytic Chlorine in Chlorination Mills. *[illegible]* 971
Nevada Consolidated Copper Company [illegible]
Mineral Production of India in 1907 972
*Kerr Lake Mining Company 973
Further Flotation Process Litigation 973
Personals, Obituaries, Societies and Technical Schools 974
Special Correspondence 975
Mining News 978
Markets, etc. 983
*Illustrated.

The American Smelting and Refining Company

In the recent political campaign in Colorado the policy of the American Smelting and Refining Company received [illegible] was nonsensical. However, there was sufficient of rational character to lead Mr. Guiterman, general manager of the Colorado department of the company, to make an official reply, the substance of which, insofar as it concerns matters of interest to our readers, is published elsewhere in this issue. The chief interest in Mr. Guiterman's letter, in our opinion, is the admission that the smelting company has exercised its influence to elevate the price for lead. He does not assert specifically that the company has succeeded in keeping it at a level above that which otherwise would have existed, but the inference is strong that such is the opinion of his company. Obviously, no one can reduce to a numerical statement what might have been if something had not happened, but it is the common opinion of economic students that during the regime of the American Smelting and Refining Company the price for lead has been higher than it would have been if that company had not exercised a successful dominion in the market for a series of years. This was to the great advantage both of the smelting company and the producers of lead ore, and correspondingly, at the expense of the consumers of lead products.

With respect to the relations between the smelting company and the ore producers of Colorado in general, Mr. Guiterman summarizes the situation in a lucid way, but his arguments would be more convincing if they were supported by figures. It is a pity that the management of the company cannot make up its mind to be more frank, both with its customers and its stockholders. The stockholders are informed of large profits, but do not know how they are derived and what is the prospect for their continuance, while the customers, i.e., the producers of ore, look upon the same large profits as being to a more or less extent extorted from their pockets.

The chief part of the business of the American Smelting and Refining Company is the smelting of ore. The conditions which make for an increase in the ore supply tend to increase the profits of the company. The company has never [illegible] any other specific information respecting its business, its annual reports being confined to generalities.

We appreciate the difficulties wrapped around the disclosure of details of its business, and its proper reluctance to disclose the results of speculations in the metals, etc., that might be to the advantage of its competitors, but nevertheless it might be able to give information satisfactory to many interests without in any way injuring its own. Of course, the charge that the smelting company is throttling the mining industry is absurd. Such a policy would be simply hari-kari. Any well advised concern going into the general smelting business expects to realize a profit of $1.50 to $2 per ton of ore smelted; at any lower figure the business would not be attractive, taking all the chances into consideration. The average profit to the American Smelting and Refining Company is probably somewhat higher. In certain districts, like Utah, where there is keen competition, it is probably less; also in districts like Colorado, where it is necessary to be content with a comparatively small profit in order to stimulate the necessary production of ore; in other districts, like Mexico, the ore producers are probably caused to suffer all of the burden that they can bear, especially if they produce the kind of ore that is in excess supply. It is the ability to average these conditions; viz., large profits in one district against small profits in another that contributes largely to the wonderful earning [illegible]

The Copper Market

The brilliant rise in copper during the last week has excited great enthusiasm and has led to an old-fashioned boom in the market for the copper stocks. The rise in the value of the metal appears to be legitimate, although assisted by more or less manipulation. The sales of copper during the latter half of October were very large, and most of the producers claim to have sold their expected output for the remainder of the year. However, these claims must be taken with some grains of salt. There has been during the last six months remarkable success in enveloping with mystery the matter of the unsold stock of copper. It is hard to believe that on Oct. 1, say, there was really no unsold stock of copper in view of what was known to be on hand at the beginning of the year, the slackness of business during much of the first nine months, and the large production. There have been, of course, the regular transactions which go on right along, and there have been some periods of very large sales as in October, but about 100,000,000 lb. per month, or 4,000,000 lb. each business day, must be sold in order to dispose of the production.

The current revival in business reported from many quarters is largely the result of improvement in sentiment, restoration of confidence, since the election. Undoubtedly many orders for goods were held back until after the election, and then came upon the market with a rush. There is no ground for the belief that the actual improvement in business has been in any such ratio, or that we are going to regain quickly the boom that disappeared in 1907. Consequently, we are likely to see a recession in the prices for the metals when the present flush of excitement wears off. Nevertheless, it can be clearly recognized that the improvement in industrial conditions, noticed several months ago, is gaining steadily, although still slowly, and there is reason to expect that in 1909 business will recover its normal activity. An encouraging feature of the present situation is the buying of metals by large manufacturers in anticipation of good business with consumers sooner or later in the coming year.

Low Prices Do Not Always Restrict Production

The recent low prices for some of the metals have brought about conditions that lead to doubt respecting the advantage of modern improvements. It was always expected that a price for zinc ore of under $40 would enormously restrict the production of the Joplin district, but although throughout 1908 the price has been a good deal below that figure, the production has not been greatly restricted, although a large proportion of the important mines and mills has been idle. The explanation is that the production has been kept up by miners who have been working in the old diggings on their own account, and evidently have been able at least to make a living at present prices.

A similar report comes from Malaya, where instead of the decreased output of tin, confidently expected at the beginning of the year, the production has on the contrary been steadily increasing. The decline in the value of tin compelled many of the capitalized European companies, and also many of the large Chinese operators, to suspend production. Here also the explanation is that the miners have gone to work in the old diggings on their own account.

Both in southwestern Missouri and in Malaya mining conditions are exceptional, but nevertheless it is something of a joke that individuals can work by hand where companies are unable to conduct operations upon a large scale. It indicates for one thing how much more efficient is labor when engaged on its own account, and also no doubt the willingness under that condition to be content with smaller earnings.

Pittsburg Coal Trade and Prices

The coal trade of the Pittsburg district this year has shown a falling off of from 25 to 30 per cent. from that of 1907, as nearly as can be ascertained from railroad and other shipping reports. In the river trade, which takes an important part of the coal production of the district, the decrease has been greater, owing to the long drought which has resulted in a stoppage of navigation through a period longer than most rivermen can remember. There has been no "coal-boat rise" in the Ohio since spring, and the territory dependent usually upon Pittsburg river coal has been obliged to draw its supplies by rail from West Virginia, Kentucky and Indiana mines, and in some cases from Alabama. Notwithstanding this loss in demand, our Pittsburg reports have shown that the larger producers have been maintaining prices for coal on the basis of $1.15 per ton for run-of-mine all through the season. This requires explanation.

The contract price for Pittsburg coal depends in large degree on the Lake trade. Prices for the grades shipped up the Lakes are established early in the year, the contracts being usually made in February and March. From that time they are maintained on all contract coal, for the reason that if they are permitted to break, it would be necessary to rebill the coal previously shipped at season price; this would demoralize the market and result in serious losses, besides alienating customers and making trouble when the time for closing contracts for the next season arrives.

An additional reason for holding up contract prices is the effect which a drop would have in Buffalo and other distant markets, in which Pittsburg coal has an advantage in its superior quality and in the insistence of many customers on a supply of this grade, which they prefer from long use and custom. In these markets Pittsburg coal establishes the price for all other grades except Indiana block and a few specially prepared grades. The competition in these markets is very sharp, and a break in Pittsburg prices might have disastrous results.

At the same time it cannot be denied that the Pittsburg market has felt the decline in demand, and the results have been shown in spot sales, though not in contract shipments. Slack coal has sold at very low prices, and sales of run-of-mine for prompt shipments have been made down to $1 and even less. The large shippers have done their best to maintain contract prices, but they have not been able to resist competition on spot orders. The largest producer in the district, which has shown a heavy loss in traffic this year, is urgently endeavoring to secure new business, and is said to be making low rates to get it where possible.

This will explain the apparent steadiness of Pittsburg prices in the face of adverse conditions. Some increase in demand is apparent, but it is very slow so far. A sharper increase for the rail trade and heavy rains for the river trade are needed to revive the market.

IT IS SAID THAT the American Smelting and Refining Company has not achieved the success with the Huntington-Heberlein process which the metallurgists of the smelteries at Tarnowitz, Braubach, Ems, Pertusola, and elsewhere in Europe claim to have obtained. This is probably because the European works treat a larger proportion of lead concentrate and a smaller proportion of silicious ores than has been attempted in this country. At Broken Hill, New South Wales, the process seems to have been an unqualified success. In a recent address, Mr. Delprat, general manager of the Proprietary Company, remarked that out of the 13 furnaces at Port Pirie required 10 years ago to produce 1000 tons of lead per week, at present nine are sufficient to produce 2000 tons, this remarkable progress being due to improvements in roasting, smelting and refining.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Loading Blast Holes

In discussing the loading of holes in the JOURNAL of Nov. 7, 1908, a contributor signing himself "Tom" takes exception to an editorial in the JOURNAL of Oct. 17, 1908, regarding the proper place for the primer in a dynamite charge. Mr. Tom states that if, in a round of holes in a drift, the primer is placed in the top of the hole, there is the certainty of missed holes resulting either from a nearby hole breaking out the collar of another hole and carrying away the primer, or from flying rocks tearing the fuse out of the hole. With this opinion I disagree. The first of these causes is the least important, for if the round of holes in a drift is drilled properly there is little likelihood of the cutting off of a hole; still it is worthy of discussion. While I have known of several blasted-off collars of holes being found in which there still was dynamite, I have yet to learn of one in which there was a detonator in that portion of the charge. In fact, I think that it would be impossible for this to occur, owing to the greater sensitiveness to shock of the detonator. Anyway I am of the opinion that if enough of the collar of any properly loaded hole, whether in a drift, or for that matter in a stope, was "cut off" so that the primer was carried away, the force of this explosion would also cut off or tear out the fuse, were it placed even in the very bottom of the hole; worse still, possibly it might only damage the fuse, and a "hang fire" might result. Anyway I would prefer to go back to a missed hole when the primer is in the top of the hole than in the bottom, for I always feel safer around a missed hole after I have pulled the fuse and cap out of it.

In regard to the possibility of flying rocks jerking the fuse out of a hole, I think that Mr. Tom is unduly apprehensive. All fuse should be coiled up close to the collar of the hole, not only in order to protect the fuse from being struck by flying rocks, but so as to avoid a mistake in the order of spitting the holes. The fuse should not be spit one from another, but from a notched piece of fuse, as otherwise too much fuse is left dangling about. A miner should not entirely rely upon the cutting of the fuse for the proper order of exploding; he must always be prepared to respit a fuse; that takes some time, and if the holes were spit out of their proper order it might spoil the order of the holes' exploding. If the fuse is properly coiled up, there is little danger of flying rock hitting the fuse. Anyway I think that more missed holes are attributed to flying rocks than is warranted. Eight inches of soft tamping on top of the dynamite ought to hold a fuse in the charge. At the Franklin Furnace zinc mines, New Jersey, soft dirt, or fine rock tamping, inclosed in a paper cartridge, is, or at least was, used in tamping the holes. That is, in my opinion, good practice.

The effect of the explosive is considerably lessened if there is any air space intervening between the walls of the hole and the explosive, or in the explosive itself. One great trouble with putting the primer at the bottom of the charge is that when the primer is so placed miners are apt not to consolidate the dynamite sufficiently in the hole, especially in a cold stope where in winter the dynamite often becomes half-frozen before it can be got into a hole. Besides, during the consolidation of the dynamite the fuse is subject to injury by the tamping stick. This injury is liable to cause either a misfire, or worse still, a "hang fire." In my opinion the cause of hang fire in blasting is due not so frequently to defect inherent in the fuse as to dampness and two other causes—injury of the fuse by the tamping stick and burning the end of a fuse that has failed to spit, instead of again splitting the fuse and spitting the powder train. When the primer is placed on top the dynamite is more apt to be properly consolidated and the fuse less liable to be injured.

Finally the position that Mr. Tom has taken reminds me of a Swedish miner who worked in a Western mine. He was so afraid that a flying rock would jerk out a fuse that, after tamping a stick of dynamite in the bottom of the hole, he always put the primer in fuse-end first, taking this chance of breaking the cold fuse with such a sharp bend just "because you would have to jerk out the whole charge to get that fuse." I, for one, am disinclined to take the extra chances of misfire, especialy in wet holes, the extra trouble in loading and the other disadvantages attending the placing of the primer near the bottom of the hole just because there may be a little less danger of a flying rock jerking out the fuse.

In closing, Mr. Tom calls attention to the fact that most miners put the primer near the bottom of the charge. True, and most miners also think that the force of an explosion is greater in one direction than another. The point is that most miners [illegible] do it. Mining is no trade. There is no [illegible] miner does any particular detail is generally the result of habit, not of planning. Therefore, in my opinion, the way that most of them do a certain thing indicates little more than that miners as class follow the leader. One of the great misfortunes of mining is that now, owing to the greater complexity of mining problems, it is rare that the prospector or the working miner works himself higher than a foreman. Now many mines are run by college men who, not having worked as miners themselves, do not appreciate how little miners really know about their "trade." As a result, too many mining men assume that the way that most miners do a thing must be the right way to do it, especially if it is a little more inconvenient. Another trouble is that most men managing and superintending mines think that the smaller details of the work in the stopes and drifts are not worthy of study and discussion, assuming that miners have already worked out the details of their trade. Indeed, owing to this assumption that the miners know enough to take charge of themselves, the men in charge of mines do not inspect the working places carefully, and accidents at mines, which are due mainly to falls of ground, are as frequent as in the past.

In closing I must say that I am glad that Mr. Tom believes in discussing the practical details of mining, and I hope that others will join in. Many a miner has been killed by drilling into a missed hole or walking back on a hang-fire. The most probable causes of these seem to me to be a subject worthy of discussion; will not some others give their opinions? For my part I think it not only safer, but better mining to put the primer on top of the charge.

[illegible]

Scranton, Penn., Nov. 9, 1908

Electrolytic Chlorine in Chlorination Mills

In "Questions and Answers," in the JOURNAL of October 24, p. 824, the answer to an inquiry concerning gold chlorination is as follows:

"It has frequently been proposed to employ chlorine generated by the electrolytic decomposition of common salt * * * but in spite of this estimated economy, the electro-chlorination process has not yet come into use."

Permit me to call attention to the fact that at the Goldfield Cl Mill, Goldfield, Nev., this process has been in successful commercial operation for some time, and is now treating Mohawk ores of the Goldfield Consolidated Mining Company, concentrates from the Combination mill and concentrate tailings from the Kinkhead mill, besides certain other ores of the camp.

Several references to this mill have appeared from time to time in the columns of the JOURNAL, but these were written before the plant was in operation, and at a time when, because of the absolute newness of a number of its features, there was widespread doubt in Goldfield as to whether the plant ever would result in profit to its owners. These doubts are now dispelled.

FERDINAND H. GRASER.
Philadelphia, Penn., Nov. 4, 1908.

Nevada Consolidated Copper Company

Following is an abstract of the report of Pope Yeatman, consulting engineer, of this company, presented at the recent annual meeting:

Prospecting has been done on the Eureka section and over 5,500,000 tons of an average grade have been developed. This increases the amount of ore blocked out from 14,432,962 tons to fully 20,000,000 tons. The possibilities for a very large increase of tonnage are very great; not only through a considerable extension of the present developed orebodies and partially prospected areas, but also in large areas not yet touched, which give similar indications of promise to those shown in the developed area. The prospecting carried on has been of such a nature as to also greatly increase what might be called "Possible Ore Reserves." Drilling is now being continued and further ore is being rapidly developed. In the Ruth section, one drill hole, in ore, is so placed as to prove a continuation of the rich Ruth orebody for a considerable distance. Drilling is to be continued on this ground also.

Work with the steam shovels was resumed on the stripping of the overburden the latter part of March and has been continued since. In the latter part of May, regular operations were commenced in mining the Eureka deposit with the steam shovel, and enough work has since been done to show the value of this method of working the Eureka deposit. Up to Nov. 1, 185,277 tons of sulphide ore have been mined. The total yardage up to Nov. 1 for stripping is 427,244.

STEPTOE VALLEY S. & M. COMPANY

During the latter part of 1907 work on erection was considerably curtailed, but the force was increased in January, 1908, and very materially so in April of the same year, since which time construction has been carried on vigorously. The concentrator, designed for the treatment of 4000 tons of ore per day, is now completed with the exception of the sixth section, which should be placed in commission in December. The capacity of the plant has been proved to be equal to or greater than originally estimated, and the results obtained, though capable of improvement, may be considered satisfactory. The plant is now being operated with two sections on Cumberland-Ely ore and three sections on Nevada Consolidated ore. The sixth section will be used for Nevada Consolidated ore.

Ten McDougall roasters have been erected and four are now under construction. Two reverberatories have been built and both have been proved to be satisfactory. The output has been large, and it has been found that no special coals are required, but successful operations have been carried on with the ordinary coals of Wyoming and Utah. Natural draft is sufficient. The first furnace was charged on June 22. The stacks and flues have been tried out and have proved eminently successful. The blast furnace is now under construction and should be completed by the end of the year. The converter plant of three stands was blown in July 9, and since then all three stands have been in operation at different times.

Owing to the increased development of ore the board has authorized the increase of the plant for the treatment of Nevada Consolidated ore. Additions are now under way and should be completed by April next. The additions consist of increasing two units of the concentrator by 15 to 20 per cent. and adding a fourth unit with a capacity of 15 to 20 per cent. more than the old single units; two McDougall roasters; one reverberatory furnace; one stand of converters. It is now recommended that still another unit be added to the concentrator for the handling of Nevada Consolidated ores.

Mineral Production of India in 1907

Of the ores produced in India in 1907 gold was by far the most valuable. Of the 556,488 oz. produced 535,085 oz. came from the Province of Mysore; 13,383 oz. from Hyderabad; 4017 from Dharwar; 3838 from Burma; and 165 from the other provinces of India. The Central Provinces produced 686,572 long tons of manganese ore and Madras 151,890 tons; the other Provinces produced 59,883 tons. Of the total iron ore produced (67,667 tons) the Barakar Iron Works consumed 65,524 tons. In addition to the above there was produced 7274 tons of chromite in Baluchistan and 79 tons of tin ore in South Burma. The production of ores and of gold is summarized in the accompanying table:

PRODUCTION OF ORES AND OF GOLD IN INDIA IN 1907.

Substance.	Unit	Quantity	Value.
Chromite	Lg T	7,274	£ 9,699
Iron ore	Lg T	67,667	13,381
Manganese ore	Lg T	898,345	403,528
Tin ore	Lg T.	79	11,882
Gold	Oz Troy	556,488	2,133,691

The production of coal in India was greater, in 1907, than in any previous year and ranked first among the country's mineral resources. Bengal produced 9,993,348 long tons (£2,208,091) the other Provinces contributing 1,153,991 tons. Petroleum was produced principally in Burma which is credited with 148,888,002 gal. out of a total of 152,045,677 gal. Salt was produced in India to the amount of 1,192,992 tons of which 123,092 tons came from the rock-salt quarries in the Punjab and Kohat districts. Saltpeter was obtained mostly in Behar. Alum is manufactured, from pyritous shale, in the Mianwali district; a small quantity of alum is made together with the sulphates of copper and iron near Khetri, State of Jaipur, Rajputana.

GEMS AND PRECIOUS STONES

India has always been noted for its rubies and jadeite and in 1907-08 the exports of jade by sea and land amounted to 4897 long tons, all obtained from the Myitkyina district, upper Burma. All the rubies and spinels were obtained in Burma but sapphires to the value of £3144 were produced in Kashmir. The accompanying table gives data of production of coal, minerals and gems in India in 1907:

PRODUCTION OF COAL, GEMS AND OTHER MINERALS IN INDIA IN 1907.

Substance.	Unit.	Quantity.	Value.
Coal	Lg. T.	11,147,339	£2,609,726
Alum	Lg. T.	276	2,500
Amber	Lg. T.	2	385
Borax	Lg. T.	*367	*10,002
Diamonds.	Carats	628	2,784
Garnet	Lg. T.	5	759
Graphite	Lg. T.	2,433	7,387
Jadeite	Lg. T.	†4,897	†74,509
Magnesite	Lg. T.	186	37
Marble	Lg. T.	2,571	1,494
Mica	Lg. T.	†1,946	†228,161
Petroleum	Imp. Gal.	152,045,677	610,015
Rubies	Carats	282,030	93,428
Spinel	Carats	30,974	890
Sapphires	Carats	327,213	3,940
Salt.	Lg. T.	1,192,992	433,744
Potassium nitrate	Lg. T.	*17,879	*274,679
Steatite	Lg. T.	8	201
Tourmaline.	Lb.	20	293

*Exports in 1907.
†Exports in 1907-08.

There were also produced amber, garnet, graphite, magnesite, mica and steatite.

The weight of a close-link chain is about three times the weight of the bar (of equal length) from which it was made.

Kerr Lake Mining Company

The property of the Kerr Lake Mining Company consists of 40 acres in Lot 3, Concession IV; 12 acres adjoining on the north and forming part of Kerr lake and a strip to the southwest containing 4.96 acres. The property is in Coleman Town-

NO. 7 SHAFT, POWER HOUSE AND [illegible]

ship, Cobalt district. The report is for the year ending Aug. 31, 1908.

There are five payable veins, the most important of which are Nos. 3 and 7. Shafts have been sunk on these last veins to depths of 325 ft. and 180 ft., respectively. Development consists of 3000 ft. of drifting; 1350 ft. of crosscutting, and 1125 ft. of sinking and raising; total, 5475 ft. In addition there have been done about 1000 ft. of diamond drilling. The ore is stated to be high-grade at 300 ft. from the surface on No. 3 vein, and No. 7 vein shows high-grade ore at 100 ft., but lower in value at the 130-ft. level. It is believed that this vein will improve at greater depth under the lake.

PRODUCTION AND COSTS

In the year ended Aug. 31, 1908, there were 528 tons of high-grade ore mined and smelted. The silver content was 1,473,712 oz., valued at $787,555, or 2791 oz. per ton. Because the ore occurs in narrow seams, the cost of mining (including development) was high, being $[illegible] per ton, but owing to the high silver content the cost of producing an ounce of silver compares favorably with other mines at Cobalt. A summary of costs is given in the accompanying table:

COST OF PRODUCING SILVER

Item	Cost.	Cost per Oz.
Production and development	$[illegible]	$[illegible]
Shipping, smelting, etc.	[illegible]	[illegible]
General expense	[illegible]	[illegible]
Construction and machinery	[illegible]	[illegible]
Total	$[illegible]	$[illegible]

[illegible] Nos. 3 and 7, the former [illegible] the latter [illegible]

The equipment on the property consists of four shafts with ore-sorting and crushing facilities at No. 3 and No. 7 veins; [illegible]

[illegible]

for 125 men; cooking and eating house. The men employed averaged 100 per day.

The treasurer's report states that $740,430 was received from the sale of ore, and that $110,772 is due from the smelters. Total, $857,208 in 1908, against $347,855 in 1907, and $170,717 in 1906. Dividends [illegible] $100,000, respectively.

Further Flotation Process Litigation

[illegible] tion Syndicate vs. Webster, Ballot et al., [illegible] sought to recover damages from the de- [illegible] erals Separation, Ltd., for an alleged nonfulfilment of contract. This action involved the ownership of the oil-gas flotation process, but had no bearing on the validity of patents. In the trial court the defendants (directors of Minerals Separation, Ltd.) won, but the British Ore Concentration Syndicate, Ltd. (the Elmore interests), appealed, and the appeal court sent the case back to the lower court for retrial on the ground of insufficient evidence taken at the first hearing. On Oct. 22, 1908, this case came up for this second trial before Judge Parker in the High Court of Chancery, London. After five days' trial the plaintiffs withdrew their case, the clause in the contract on which suit was brought was stricken out, any imputations which might have [illegible] costs.

During the half-year ending May 31, 1908, there was raised from the under- [illegible] during the previous year.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

A. M. Bilharz, of Flat River, Mo., is in Guerrero, Mexico.

Martin Schwerin, of New York, was recently in San Francisco.

F. Lawrence, of Australia, is in Mexico examining mining properties.

Zebina Lane has returned to Australia, after a long stay in California.

Frank A. Losh, of San Francisco, is examining mines in Oaxaca, Mexico.

Cortlandt E. Palmer has removed his offices to No. 71 Broadway, New York.

Lane C. Gilliam has returned to Los Angeles, Cal., from a prolonged trip to Alaska.

Wilfrid B. Wainewright, of Los Angeles, Cal., is now in New York on mining business.

J. R. Finlay, of New York, has gone West on professional business, expecting to return about the end of November.

Henry F. Lefevre has completed an examination of the Big Halstead mine in Plumas county, Cal., for himself and associates.

M. B. Washington has taken charge of the construction of the new cyanide mill for the Navidad Mining Company, at Oaxaca, Mexico.

A. H. Woodward, general manager of the Woodward Iron Company, has returned to Birmingham, Ala., after two months spent abroad.

S. E. Bretherton, of San Francisco, has returned from a trip North to the coast range where he has been engaged on professional work.

Dwight A. Jones, of New York, president of the San Vicente Mining Company, is visiting the company's properties in the State of Guerrero, Mexico.

George Gordon Crawford, president of the Tennessee Coal, Iron and Railroad Company, has returned to Birmingham, Ala., after a month spent in the North.

Hiram W. Hixon sailed from Philadelphia for London, Nov. 7, accompanied by his wife and daughter and Miss W. A. Heywood. His address in London will be 4 Broad Street place.

J. J. Jordan has been appointed assistant superintendent of the Blue Creek division of the Tennessee Coal, Iron and Railroad Company, with office at Johns, Ala. He has been master mechanic for some time past.

James G. Ross, of Montreal, has been commissioned by the Provincial Government of Quebec to investigate the mining methods of Austria, Turkey, Greece, Rhodesia, New Caledonia and Japan, including the systems in operation for the administration of mineral lands.

Robert Mond, son of Dr. Ludwig Mond was in Toronto recently on his return to England after a visit to the Sudbury nickel district of Ontario, in connection with important experiments in progress there under Dominion government auspices with a view to the electrical treatment of the nickel-copper ores.

Professor Dorsey A. Lyon, who has been for several years head of the department of metallurgy, at Stanford University, has now become permanent manager of the iron smelting plant at Heroult, on the Pitt river, in Shasta county, California. He has been experimenting for some years with electric furnaces and has devised a process for smelting iron by electricity. In his new position he will be enabled to make extensive investigation in the direction indicated.

Obituary

Henry A. Butters died in Berkeley, Cal., Oct. 26, aged 58 years. He was born in Haverhill, Mass., and went to California when a boy. After several years spent in mining there, he went to Leadville, Colo., where he remained for several years. Later he turned his attention to electric work, and about 1890 went to South Africa, where he built the Johannesburg tramway system. He returned to California in 1895 and organized the Northern Electric Company.

R. Lee France died in Chicago, Nov. 2 aged 69 years. He was born in Washington, and after serving in the War became a civil engineer. He received his training under Benjamin H. Latrobe, the most eminent of the older generation of engineers, and rose to be his assistant in the building of the Pittsburg & Connellsville Railroad. He was one of the first to appreciate the future importance of the Connellsville coke district, and aided materially in its early development. Later he settled in Chicago and entered the coal business. He was largely interested in opening the Fairmont and Quinnimont coal districts in West Virginia, and later mines in the eastern district of Kentucky.

J. D. Crabbe, who died in Springfield, Ill., Oct. 13, aged 60 years, was one of the oldest coal operators in Illinois. He was long general superintendent of a part of the property of the Consolidated Coal Company, of St. Louis, and was general sales agent for the Consolidated at one time. He was then general manager of the Madison Coal Corporation, being succeeded by A. J. Moorehead when he became identified with the Mount Olive & Staunton Coal Company. He was with this latter company when the Staunton mine was opened. He then became receiver of the Litchfield mine; after this property was sold to the Illinois Collieries Company he retired from active business.

William Carkeek died at his home in Los Angeles, Cal., Oct. 21. He had suffered in recent years from a complication of diseases, the principal trouble being asthma. Mr. Carkeek was born in Cornwall, England, in 1856. He became a resident of this country in 1877, engaging in mine and mill work in Colorado and Idaho. There were four brothers in the family and all of them were engaged in the milling of ores throughout their lives, their field of work being Colorado, Idaho and Montana. In 1883 William Carkeek became superintendent of the concentrator for the Colorado Mining Company, of Butte, Montana. He remained with this company for 19 years, and became a recognized authority on practical concentration. His health failed in 1902. It is the opinion of many that his lungs became paralyzed from inhaling small particles of mineral. He sought Lower California and then Arizona for relief. While in Arizona, in 1903, he still maintained strength enough to design and erect the Shannon Copper Company's concentrator. His wife accompanied him through Arizona, and in 1904 they took up their residence in Los Angeles. Mrs. Carkeek still survives him. Mr. Carkeek, having passed a busy life, his sickness worried him.. In 1907 he resolved to make a trip to Montana to see if it were not possible to recover in a colder climate. This trip proved disastrous, only hastening his death.

Societies and Technical Schools

Western University of Pennsylvania—Dr. M. E. Wadsworth, dean of the School of Mines, at Pittsburg, has adopted a system, original with himself, of granting provisional credits for work at actual mining done during the summer vacations; these credits to be made absolute upon presentation of a thesis, or a report, of all work done. This will enable a student to graduate in three years, instead of four.

Scranton Miners' Institute—The first winter session was held in the Young Men's Christian Association building, Scranton, Penn., Nov. 9, Mine Inspector Hubert Johnson presiding. John Hale, the oldest mine foreman in the Lackawanna valley, read a paper on the formation of coal, which was an interesting exposition of the geological progression of the formation of coal from the vegetation of the Carboniferous age to the time in which it became what we know it to be. After Mr. Hale's paper, there was an interesting and practical discussion on the question, "Does it pay to flush mines for the purpose of robbing pillars?" A number of members joined in the discussion.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Salt Lake City, Denver, Butte and Goldfield

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 7—In pursuance of the order made by Judge Deitrich of the United States Circuit Court last week, the Indiana Gold Dredging Company at Oroville, has commenced the cutting of a canal 50 ft. wide on the bottom, through the tailings and rock piles thrown up by the stacker of the dredge, just below the town. It was thought by the court that this cut through the tailings pile would be sufficient outlet to prevent the Feather river backing up into the city and doing damage during the flood season. If this proves to be insufficient the cut will have to be made larger, or the dredge will have to stop work. The Pennsylvania Dredging Company at the same place has at last landlocked its dredge and the injunction obtained against it by the Anti-Débris Association has been dissolved in consequence.

The first furnace of the Balaklala Copper smelter at Coram, Shasta county, was blown in on Oct. 20, making the fifth copper smelter in the county. The others are the Mammoth at Kennett, the Bully Hill at Winthrop, Mountain Copper at Keswick and Afterthought at Ingot. The new smelter has a capacity of about 1500 tons of ore daily. There are three blast furnaces and a reverberatory. The 16,000-ft. aërial tramway has also been put in operation, bringing ore from the Balaklala and Trinity mines to the smelter. About 200 men are employed at the smelting plant of the company aside from those engaged in mining. In addition to the furnaces there are converters and three McDougal roasters at the plant.

Judge Gray, of the Superior Court at Oroville, Butte county, has denied the application of L. A. Churchman for the appointment of a receiver for the P. B. Steiffer Mining Company. The complainant alleged fraud in the manipulation of the stocks of the company by its president and secretary who had been indicated by the grand jury. The judge denied the motion on the ground that enough facts had not been presented to substantiate the allegations of fraud. The troubles of the company appear to be due to differences between factions of the stockholders, some backing up the Steiffers and others opposing them. A great deal of stock in the corporation has been sold in different parts of the State. The mine is supposed to be on the old Perschbacker channel, on the Magalia ridge, in Butte county.

The Crœsus Gold Mining and Milling Company, operating the old Plumbago mine near Alleghany, Sierra county, is installing one of the most complete electric power plants for mining purposes in the State. With this new power plant the lower adit now 4000 ft. long, will be extended an additional 5000 ft., bringing it out on the Kanaka creek slope. Mason W. Mather is manager of this company. In the vicinity of the same town after driving for two years on a 1400-ft. tunnel on the Tightner mine, it has been completed and the same rich streak of ore found that exists on the upper levels

Goldfield, Nevada

Nov. 3—The most important event of the week is the entrance of Samuel Newhouse, of Salt Lake, into Nevada mining through the purchase of the Silver Peak Valcalda mines at Blair. This property has been under development for several years by the vendors who acquired it when only a prospect. The 10-stamp mill on the property has been treating 30 tons per day and has paid for the further development of the mine.

The J. C. McCormack Company, of Goldfield, has opened up a high-grade mine at Clifford. The mine shipped ore three years ago, and shipments have been made occasionally since then; in all 400 tons have been shipped. This ore was hauled nearly 60 miles. A dispute between the owners hampered development and clouded the title which has just been cleared. Present shipments under the new management are running from $335 to $659 per ton for 50-ton lots, and it is probable that enough ore will be extracted to make the final payments on the property in December.

The presence of high-graders was again brought vividly to mind last week by the arrest in Tonopah of four men as they came off shift at the MacNamara mine where two recent strikes of high-grade ore have been made. One of the men arrested was vice-president of the Tonopah Miners' Union. Ore worth several dollars a pound was found on these men and in their dinner buckets; later a search of their cabins revealed a wagon-load of rich ore.

An echo of the earlier bonanza leasing days on the Mohawk claim comes from Carson City where the suit brought by the Mohawk Mining company against the Francis Mohawk company was taken on appeal. The plaintiff asks damages in the sum of $125,000. By stipulation the hearing of the appeal has been deferred.

The Lucky Boy mine near Hawthorne has been forcibly seized and is being held with shotguns by the former owners who claimed that J. T. Hubbard has failed to make the second payment for the purchasers, amounting to $30,000. Mr. Hubbard is one of the directors of the Goldfield Consolidated; he claims that the payment was made through a local bank. All parties concerned are now in Goldfield to find the money and call off the gun men.

Work in the Bulls and Bears property will soon begin and a long fight will be ended. Owing to rascality on the part of the man in charge the money sent by the foreign corporation for annual labor in 1904 was squandered and an insufficient amount of work done. The ground is in one of the most promising prospecting areas in the Goldfield camp, and it was promptly relocated by "jumpers." When the former owners applied for patent on their ten claims the "jumpers" adversed it. In order to clear the title the former owners have given 100,000 shares of stock and have deeded outright three of the claims to the adverse claimants. The Norcross shaft is at present 125 ft. deep; the work of sinking it to the 1000-ft. level will soon begin.

Salt Lake City

Nov. 5—More than $15,000,000 worth of mining stocks were sold on the Salt Lake Stock and Mining exchange during the ten months ending Oct. 31, which is nearly $1,000,000 in excess of the total business transacted during the year 1907. Salt Lake City has been steadily growing in importance as a mining-share market center for a number of years until now the local exchange is regarded as being one of the most progressive organizations of the kind in the United States. Not long ago, in recognition of this, Samuel Newhouse presented the association with a valuable piece of real estate, the only consideration being that a creditable exchange building be erected thereon. The exchange management agreed to this and the preliminary steps have been taken to carry out the contract. Plans have been drawn for the new structure, which it is estimated, will cost at least $100,000.

It has been announced that the Harriman railroad management will build a branch line into the Yerington copper district in Nevada; this branch will leave the main line of the Nevada & California railroad near Wabuska, about 40 miles from Hazen. The Nevada Douglas Copper Company is advancing the funds required to build the line as far as its mines, [illegible] but the money will be returned in the shape of freights. The Nevada Douglas mine has been extensively developed and engineers have estimated that there are several million tons of ore, blocked out ready for extraction, that will average 6 per cent. copper and a very large tonnage that will assay considerably higher. With the completion of the railroad it is proposed to erect an independent smelter, and, while the matter has not been altogether settled, it is possible that the Mason Valley Copper Company, operating in the same district, will join in the smelter enterprise. A spur of the railroad will be run to the Mason Valley properties also. The Nevada Douglas Company is controlled by Salt Lake and Boston parties with Walter C. Orem, of Salt Lake, as general manager.

The directors of the Utah Copper Company will meet soon in order to declare the last quarterly dividend for the year which will be paid in December. During September the company produced approximately 4,250,000 lb. of copper; the October output is said to have been approximately the same.

The Bullion-Beck mine has been involved in litigation at various times which finally resulted in the discoverer of the property not only losing all his interests in it, but also a fortune which was eaten up by lawyer's fees. John Beck was at one time a familiar character in Utah mining affairs, but after once losing his prestige, it could not be regained. It is the intention of the United States company to explore the mine from the lower workings of the Centennial-Eureka mine, which it has owned for a good many years and which has supplied the bulk of its Utah earnings.

The Fink furnace, for which Edward Fink, the inventor, is making great claims will be tested on a commercial scale at Garfield in the near future. The attention of Samuel Newhouse was called to the furnace some months ago and after his engineers had investigated, concluded that it was worth while to spend some money on it. Accordingly, Mr. Fink was instructed to build a furnace that would treat 100 tons of ore a day. The Boston Consolidated Mining Company, of which Mr. Newhouse is president, granted permission to use a portion of its premises as the site for the new plant; so the plant will be built there. The equipment has arrived and will be installed immediately. It is thought that the furnace will be blown-in about Dec. 1. Mr. Fink claims that the furnace is able to treat all classes of ore. The inventor will be in charge of the construction and operation of the plant through the demonstration stages.

While there is nothing revolutionary in the Fink process, it is a development in metallurgy. The inventor claims that a better utilization of the heat units is accomplished through his device which consists of two revolving reverberatory furnaces and a central fire-box and a cluster of air pipes installed between these furnaces. Each of the twin furnaces, for what is designed to be a 100-ton plant is only 9 ft. long. These revolve slowly during the heating process, thus constantly exposing new surface where the heat blown-in is most intense. The heat goes in at the outer end of one of the furnaces, is conducted entirely around the charge, and then passes into the other furnace. While this accomplishes greater utilization of the heat, it reaches a higher point in the first furnace than in the second; on this account the reversal of the process is provided for.

It is claimed for this new arrangement of an old process that it is a furnace and converter combined; that it will produce blister copper with one melting. It is further claimed that no coke is required, as coal or slacked coal will suffice to bring the desired results. Owing to this, the inventor declares that the cost of the fuel will be cut in two. The commercial possibilities of the furnace, however, are yet to be worked out.

Butte

Nov. 5—With the gradual advance in the price of copper the outlook for increased activity in the camp has brightened materially. There are a number of leasers and small independent properties which will be able to resume operations when the price of the metal reaches 15c., but which have been closed down for the past year or more.

Word has been received in Butte that the Butte & Superior Copper Company has won its suit in Duluth against John McAlpine. The suit was brought some time ago to enforce the payment of $2000, alleged to have been due from McAlpine on his stock subscription. McAlpine refused payment on the ground that the property held by the company had been misrepresented to him and was in fact valueless, and that his subscription had been obtained by means of the false statements of the promoters. The suit has been watched with much interest here and its outcome is practically a vindication of the company's claims as to its property.

The president of the Raven Mining Company has issued a circular letter to stockholders, apprising them of the work done on the company's property from June 1, 1907, to Sept. 11, 1908. It states that during that period the shaft was sunk from the 700- to the 1127-ft. mark and that a total of 5000 ft. of crosscuts and drifts were run. Leasers working on the property have paid the company royalties to the extent of $2771, in addition to doing much development work, which would otherwise have been an expense to the company.

Indianapolis

Nov. 9—The State mine inspector's force is now making the final visit to the mines of the State to be covered in the annual report. They are having less trouble with both miners and operators as to violations of the law than ever before. At the beginning of the year there were many prosecutions until operators and miners learned that the old lax methods due to the lack of a sufficient force under the inspector were not to continue. While the inspector opposed the amendment to the law by which the permitted size of the bit in the drill is enlarged, the amendment did not restore the old dangerous conditions, as many supposed. Under the old law the miner drilled a foot or more beyond the line where the machine had cut the coal, thus lodging powder charges in the face of the coal. There were frequent instances of the shots being forced out of the hole instead of breaking the coal. The new law prohibits drilling ahead.

The Indiana Railroad Commission has been advised that a water famine prevails in the mining districts of southwestern Indiana to the extent that water must be hauled in large tank cars from Terre Haute, Vincennes, Evansville and the Wabash river. The railroads have filed an application with the commission for a water rate. A rate on water is not included in the regular tariffs, as it was not thought that it would ever become necessary to ship in quantities such a commodity as water. The railroad commissioners say they realize that just at this time there should be no impediment to the operation of coal mines and the question of rates for hauling it on the cars will receive prompt attention. It is thought a rate of $4 a car will be made.

Toronto

Nov. 5—J. A. Macoun, of the Geological Survey of Canada, has returned from a trip over the line of the Canadian Northern railway from Edmonton to the Pas, in the course of which he examined a number of extensive peat beds and secured samples. These will be scientifically tested in the laboratory at Ottawa to ascertain their economic value, and the results will be widely published in the expectation that capital will be attracted for the development of this source of fuel supply.

Last week the "Cobalt Silver Special," a train comprising 13 cars loaded with ore, left Cobalt direct for the plant of the American Smelting and Refining Company at Denver, Colo. The combined weight of the ore was about 400 tons, and the train was decorated with large streamers indicating the mines supplying the shipment. These were La Rose, four cars; Kerr Lake, O'Brien and Temiskaming & Hudson Bay, two cars each; and Crown Reserve, Temiskaming and Chambers-Ferland, one car each.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Official announcement is made that the Alabama Consolidated Coal and Iron Company will expend something like $1,500,000 on improvements and development on the property in this State, the work to be taken up at once.

The Tennessee Coal, Iron and Railroad Company is collecting common labor for construction work, to be used, it is understood, in the new development of the steel works at Ensley, as proposed by President Crawford. Other manufacturing concerns in this district have planned considerable construction work, and much labor will be employed steadily for some time to come.

Jefferson County

Dr. C. B. Crowe, president of the Yolande Coal and Coke Company, has purchased property at North Birmingham in close proximity to the foundry of the Dimmick Pipe Company, and will erect a large battery of coke ovens. The gas from the ovens will be used for steam purposes. Coke-drawing machinery will be used.

Walker County

Pratt Consolidated Coal Company—This company, G. B. McCormack president, is now the largest commercial company in the State. It has recently taken over the Victor mine at Dora, owned by the Walker County Coal Company.

Arizona

Imperial—The second furnace at the smelting works has been blown in. Two more furnaces will be built in 1909. Ore shipments to the smeltery in October averaged about 380 tons per day.

Gila County

Mallory Shaft—Sulphides have been struck in the west drift. The importance of the strike has not yet been determined.

Gem—The vein holds up well, both as to size and as to the grade of the ore. Shipments to the smelter amount to two and three cars a week.

Superior & Boston—About 50 tons of ore are daily shipped to the El Paso smelter.

Great Eastern—The east drift on the 480-ft. level is still in ore, although it is not of as high grade as formerly.

Arkansas

[illegible]

[illegible] Mining Company—The new company has bought the property of the Reynolds Mining Company near Yellville, and will start work on it soon. The headquarters are at Kansas City, Mo.; C. H. Rudolph is president, and C. Callahan treasurer.

California

[illegible]

[illegible] at Amador City, E. H. Harrington, superintendent, has declared a dividend of 3c. per share.

Delucchi & Garibaldi—At this claim near Volcano, formerly known as the Boardman, a pay-streak of gravel has been encountered.

[illegible]

Bills Brothers—At this claim on the Blue Lead, five miles from Oroville machinery has been installed and active operations begun.

Blue Lead—In this property near Bangor, superintendent Lambert in crosscutting has found good pay gravel.

Phoenix Group—In this group, five miles from Hurleton, where the ledge was recently encountered rich ore is being taken out.

Fresno County

Big Sampson—At this mine, near Dunlap, the machinery has been installed and negotiations are under way for purchasing other mines.

[illegible]

Asbestos—Williams, Bryant & Stevenson, of Eureka, have located five asbestos claims at Soldiers Grove on the divide between Mad river and Van Duzen river, [illegible]

Inyo County

[illegible] Big Pine, rich ore has been found in an old abandoned shaft in the main tunnel of the property.

[illegible] Wilson manager, has cleaned up $14,000 in 22 days' run at the mill. The output from the mine is increasing.

[illegible]

Hart—H. E. Miner and J. F. Robinson have taken a five-year lease on this mine and will commence work at once. It was formerly a producer.

[illegible]

[illegible] tain, between Adin and Canby, a five-stamp mill is being erected.

Mono County

Parrott—The mine at Lundy, owned by Jasper Parrott, has been sold to a company which is surveying for a 2300-ft tunnel.

[illegible]

[illegible] Maryland, Grass Valley, the shaft is being enlarged to two-compartment size, and machinery will soon be installed.

Lecompton—In this mine at Nevada City, Samuel Colt, superintendent, some valuable ore is being mined. The men are at work sinking the shaft and running drifts.

St. Gothard—This company, operating the Delhi mine has declared a 5c. dividend amounting to $5000. Hamilton Eddie is superintendent.

[illegible]

Beckwith—The copper and gold claims north of this place are to be actively developed to determine the exact values.

Gold Stripe—This property, owned by F. J. Standart, of Greenville, and Mrs. C. O. Hamilton, of Auburn, has been bonded to W. R. Wharton, of Los Angeles. Some 3000 ft. of development work has been done on the property.

San Bernardino County

[illegible] company has leased for five years all its properties to H. B. Slater of Riverside. He pays a 5-per cent. royalty on ore extracted.

San Diego County

[illegible] took over the holdings of this company at Dulzura, has erected a new five-stamp mill at that camp.

Shasta County

Balaklala—Mine and smelter are prac- [illegible] tramway, which it will take 30 days to repair.

Tom White Channel—This rich old channel which was lost years ago has been again found by Russell Brothers, half a mile south of the town of Igo. The owners kept the find a secret until they had bought up considerable ground adjoining their claim.

SIERRA COUNTY

American Mining and Development Company—This company, which is working the Snowden Hill mine, has completed its two-mile ditch and reservoir and laid in supplies for the winter. The tunnel being driven to the gravel channel is in very hard bedrock.

SISKIYOU COUNTY

Allen Sovy & Co.—This company, which is developing a quartz mine on Taylor creek, has struck a bunch of high-grade ore.

Diamond Group—In these claims on China gulch a new ledge carrying high-grade ore has been discovered.

TRINITY COUNTY

Globe—This property above Dedrick is now equipped with an electrically driven 10-stamp mill. Tunnels are being driven on the mine.

Trinity Gold and Timber Company—For this company at Minersville, W. V. Whipple manager, a lot of machinery has been ordered. This property was formerly owned by F. Beaudry.

TUOLUMNE COUNTY

App—At this mine, owned by the Rawhide Mining Company, the shaft is to be sunk below the 1300 level. A new foundation has been put under the hoisting plant.

McCormick & McPherson—At this mine near Jacksonville, Frank McPherson, superintendent, arrangements are being made for more machinery and a mill. The small mill will be enlarged to 20 stamps. High-grade ore is being mined.

YUBA COUNTY

Brandy City—At these mines, nine miles from Camptonville, a new stamp mill is to be erected to crush the cemented gravel.

Bessie A.—At this mine, Browns Valley, J. C. Campbell manager, they have installed a new compressor, and will shortly start up the stamp mill.

Colorado

TELLER COUNTY—CRIPPLE CREEK

The work on the drainage tunnel was advanced 287 ft. during October. The total distance driven up to Nov. 1 was 3811 ft. The water encountered in the portal heading gave a maximum flow of 300 gal. a minute, and exhausted itself after a week's flow. At the Intermediate shaft the work of cutting out the station at the tunnel level was completed, the compressor from the portal heading was installed and about 25 ft. of ground was broken in each of the two headings.

LAKE COUNTY—LEADVILLE

Adelaide—This property, Adelaide park, is being operated by Andy Dyatt and associates and shipping 50 tons weekly of a good grade of sulphides from the bottom of the old shaft. At the 300-ft. level drifts were run northeast and southwest, opening a good body of lead ore and when the ground is opened shipments will be started.

Big Six—Considerable improvement has taken place in this property, as the latest development work shows the orebody in place and shipments are averaging 30 tons daily; the ore runs well in gold.

Dinero Tunnel—The work of cutting across the vein to reach the hanging wall is still in progress. The bulk of the mineral opened so far, with the exception of several high-grade streaks, is low grade and will be treated by mill; but there is a considerable quantity that will bear shipping direct to the smelter.

Gallagher—This old property, North Iron, is again in commission, a lease having been secured by several Leadville men. The old shaft is being cleaned out and repaired, and when this is completed work will be carried on in the lower workings, where heavy shipments of rich ore were taken when the property was last worked; the lessees propose to continue the drifts from the levels into virgin territory. A new shaft will also be sunk 200 ft. south of the main wagon road to catch the extension of the orebody to the north.

Graham Park—Within the last month there has been considerable activity displayed in this section of the district and a number of old shafts have resumed work. From the old Iron mine the lessees are shipping 40 tons weekly, and the last returns from the smelter show 84 oz. silver and 24 per cent. lead. The Iron Hat is shipping two carloads per week of a good grade of iron and lead. On the south end of the Iron mine a new shaft is being sunk by lessees.

Penn—The lessees on this property, Breece hill, are doing very well and the property is shipping 200 tons daily. Frank Lanphier on No. 3 shaft is shipping an average of 300 tons a month of high-grade iron; other leasers are sending out silicious ores in addition to the iron.

TELLER COUNTY—CRIPPLE CREEK

Bonnie Nell—At this mine, on Raven hill, the shaft is to be retimbered and new machinery installed. The property is to be thoroughly explored and developed.

Morning Glory—The Union Leasing Company is now operating this mine, and is making regular shipments. Some high-grade ore has been encountered.

Old Gold—Brentlinger & Co., lessees on this mine, recently struck a 2-ft. vein of good milling ore in a part of the mine supposed to be barren. A trial shipment from this vein has been made.

Florida

POLK COUNTY

Tampa Fertilizer Company—This company has completed its manufacturing plant at Tampa, and is now starting mining operations on a phosphate deposit which it owns near Fort Meade. J. J. Singleton is manager of the company.

Georgia

LUMPKIN COUNTY

A movement is reported to consolidate some of the old mines near Dahlonega, with a view to operating on a larger scale than heretofore. Several plans of this kind in the past have had no success.

Indiana

BARTHOLOMEW COUNTY

At the depth of 50 ft. a vein of coal has been discovered on the John Ott farm. The drilling was continued and the vein proved to be about 25 ft. thick. Experts have pronounced it good coal. Local prospectors are of the opinion that a large mine is awaiting development. This is the first coal discovered in this county.

CLAY COUNTY

Crawford—President Golden, of the Block Coal district union will close down No. 10 mine of this company near Brazil. This will throw about 150 men out of employment. Mr. Golden says the company has been violating the joint agreement for some time, and has ignored all warnings from the district officers. The company insists that the fault is with the men.

GREENE COUNTY

The vein of coal discovered a week ago while drilling for water in the northwest part of the county has been investigated by capitalists of Bloomfield, and found to be of excellent quality. The vein is 9 ft. thick and only 130 ft. below the surface. Other holes will be drilled to discover the extent of the field, before sinking a shaft.

Louisiana

Petroleum production reported in October was 452,100 bbl., an increase of 14,300 bbl. over September. Shipments by rail for the month were 215,792 bbl.; pipe-line, 136,995; total, 352,787 bbl. To this should be added about 60,000 bbl. for refining and field consumption. There were 20 new wells completed in October, 14 yielding oil and one gas, while five were dry. On Oct. 31 there were 39 new wells in progress.

Michigan

COPPER

Ojibway—In cutting the plat at the first, or 500-ft. level of No. 1 shaft a well-defined lode was disclosed and when penetrated was found to be 20 ft. wide and heavily charged with copper throughout. The footwall has been in evidence throughout the sinking of the shaft in the form of a small calcite seam carrying some copper. It was believed to be but a small off-shoot from the working lode; but from the character of the formation now opened it is thought to be the Kearsarge lode, which has either split or deflected. Crosscutting is now under way and definite information soon will be obtained. Sinking has been resumed in the shaft. At No. 2 shaft a crosscut is being driven to cut the lode and is nearing the approximated point of intersection.

Lake—The new air compressor is ready to go into commission and sinking will be resumed in the shaft, which is bottomed just below the second level, 300 ft. from surface. Drifting continues to the south from the first level, 300 ft. from the shaft and both ways from the second level. The formation at the second level has changed and now conforms with the general strike of the lodes in this vicinity. Because the lode as opened at the first level was slightly deflected it was thought by many to be a "freak" formation or pocket. The new hoisting engine is being rapidly assembled and when ready to go into commission a 3½-ton skip will be installed. Several additional buildings are to be added. The railroad has been completed to within a short distance of the shaft.

North Lake—This company has not yet succeeded in reaching bedrock with the sand pipe it is putting down prior to beginning diamond-drill operations; the pipe is now down over 350 ft. A second outfit will soon be installed and the ground will be thoroughly explored in this manner during the winter; with the information thus obtained ground will, in all probability, be broken early in the spring for shaft sinking.

Isle Royale—The new shaft on the Baltic lode is down about 25 ft. in the formation and encouraging copper ground is in evidence.

Franklin—The drifts from the 23d level of No. 1 shaft of the Franklin Jr. are entering good ground on the Pewabic lode. The shaft is down to the 24th level and a crosscut from that level to the lode will soon be started. It is also planned to drive a crosscut to intercept the conglomerate formation and ascertain its value at depth. It is locally believed that the old Franklin property will be taken over by the Quincy company and operations confined to the Franklin Jr. workings.

Ahmeek—Work on the stamp mill that this company is erecting on the shore of Torch lake is progressing rapidly and the foundations are about ready for the structural steel. The concrete collars of the two new shafts have been completed and sinking is going on rapidly.

Hancock—Sinking has been temporarily suspended at a depth of about 1300 ft. at No. 2 shaft, where a large station is being cut, preparatory to driving a large working crosscut to connect with the 13th level of No. 1 shaft. It is planned to use No. 2 shaft, which has five compartments, as the main working shaft, all rock tributary to No. 1 shaft to be trammed and hoisted through this shaft. Drifting on the West Hancock lode at the 11th and 13th levels continues with gratifying results. At the 13th level an extension of the crosscut revealed another lode highly mineralized about 100 ft. from the west lode.

Keweenaw—At the 11th level of the Medora shaft the drift to the west has encountered a highly mineralized fissure vein containing considerable mass and barrel copper; drifting on this fissure has been started and its extent fully determined. At the 13th level the west drift is being pushed in order to show this vein at greater depth. The Phoenix mill is handling about 100 tons daily and a much better showing is being made than heretofore.

IRON

[illegible] Mining Company—All the iron ore mined at the company's mines at Iron Mountain will be hoisted from the new Ludington shaft. A greater efficiency can thus be obtained than by keeping the Hamilton and Chapin shafts in service. It is the intention of the company to sink these last shafts to greater depths.

Missouri

ZINC-LEAD DISTRICT

The supply of natural gas in the district is very poor at the present time, and many mines have gone back to using coal.

All Round the Clock Mining Company—This company has been incorporated at Joplin with a capital stock of $50,000. C. L. Woods & Co., of Cambridge, Mass., are the principal stockholders. O. E. Marshall, of Joplin, is also a stockholder.

A. B. C. Mining Company—This company, at Joplin, has been incorporated. A. B. Cole, of St. Louis, Robert F. Campbell and Mary S. Campbell, of Joplin, are the stockholders. Mr. Campbell is manager of the John Jackson land in Joplin.

John Jackson—Wilson, Robertson & Register have made a rich strike on the John Jackson land north of the famous John Jackson mine. Three drill holes found from 20 to 60 ft. of ore. W. H. Wilson, of Joplin, has charge of the operations.

Montana

BUTTE DISTRICT

British Butte—The hull and framework of the new gold dredge is entirely completed and all the machinery is on the ground. The management expects to have the dredge in operation within six weeks. No trouble is anticipated in keeping the dredge at work throughout the winter since the water which is to be used comes from the mine and is of sufficiently high temperature to keep it from freezing. Another storage dam has been built, making four in all. Water from an adjoining shaft will be used in the new dam.

[illegible]—Thirty thousand shares of treasury stock were recently sold to the large stockholders of the company at $1 per share without commissions. This additional capital will be used in sinking the shaft from the 1200- to the 1500-ft. level.

[illegible]—The shaft is down 365 ft., at which point a drift has been run 13 ft. Sinking has been temporarily discontinued. Drifting will be carried on at the 200- and 300-ft. levels.

[illegible]—About [illegible] tons of ore are being mined daily, of which 200 tons is second class and the balance first class. The new concentrator is giving entire satisfaction.

Tuolumne—The newly ordered surface equipment, consisting of five carloads of machinery, has arrived on the ground.

East Butte—President [illegible] left for Boston a few days ago after outlining the plans for development work. It has been decided to crosscut and drift on the 400-, 800- and 900-ft. levels.

JEFFERSON COUNTY

Boston & Corbin—Two new 150-h.p. boilers have been ordered.

New Jersey

SUSSEX COUNTY

The work of drilling to determine a supposed deposit of zinc ore has been started on the Rude farm, near Hamburg. This is about three miles from the New Jersey Zinc Company's mine at Franklin Furnace.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Owing to the refusal of one of the purchasing companies to give out figures because of an objection on the part of one of the producers, it is impossible to give the usual tabulated statement of the Goldfield production this week. This producer is supposed to be the Daisy, which is conducting a systematic campaign of mystery.

Red Hills Mining and Leasing Company—All damage occasioned by the recent fire which burned down the hoist, house and blacksmith shop has been repaired and underground development work has been resumed.

Florence Consolidated—This company, operating a lease in the Florence property, has taken a lease on the new Broken Hills bonanza at Clifford, in Nye county. A 15-h.p. gasolene hoist and a complete equipment of tools has been shipped to the new lease.

Gold Bar Fraction Mining Company—A contract has been let at $26.50 per foot to sink 250 ft. of shaft on the Gold Bar

Fraction; the contractor must furnish everything.

Daisy Florence—Mitchell & Fairfield have taken over the Daisy lease on the Florence. It adjoins the Engineers lease on the north and east. They will prospect the portion of the mine adjoining that claim and will also drive toward the Florence Annex, which had ore of a medium grade up to the line between the two leases.

Goldfield Merger—The shaft being sunk east of the St. Ives is now 540 ft. deep.

Adams Goldfield—Work on company account is to be resumed at this property, which lies north of Columbia mountain.

Engineers Lease—Since ore was struck four months ago, this lease has shipped $1,100,000 worth of ore and paid $360,000 in dividends. The lease expires on Nov. 8. Work of cleaning up has begun and the dumps are being sorted.

Victor Leasing and Mining Company—The oreshoot has been found again and ore is being broken on the 300-ft. level. The difficulty in locating the oreshoot was due to the flattening of the vein below the 250-ft. level.

Little Florence—Now that the treasury has been replenished by the settlement of the Florence-Little Florence litigation, work has been renewed on the lease on the Combination Fraction. The shaft is now 450 ft. deep. The new 40-h.p. gasolene hoist and the air compressor have been installed and are ready for work.

Florence Wheeler—On this lease, formerly that of the Florence Mining and Leasing Company, ore has been found at a depth of 240 ft. in a raise from the 300-ft. level. Two shifts have started on the 400-ft. level driving a crosscut for the Florence Consolidated vein.

Red Hills Mining and Leasing Company—The shop and hoist-house that burned has been rebuilt, and development work has been resumed.

Mohawk Ledge—The shaft is now down 685 ft., which makes it one of the deepest in the camp. The formation is changing and every indication points to the early encountering of the Kalfus oreshoot.

Crackerjack — Mitchell and Fairfield have what is probably the most favorable terms of any lease granted in Goldfield. The lease runs for three years with the usual conditions and the further stipulation that if a 10-stamp mill is built during that period an extension of three years will be granted. The maximum royalty is 20 per cent., and the royalty on milling ore is 15 per cent. A vein has been found at a depth of 75 ft.; ore from it assays $20 per ton. The formation is more or less broken, which is true of all the country round about Columbia mountain, on the northerly slope of which the Crackerjack is located.

Florence Goldfield—A 100-h.p. hoist has been installed at the main shaft.

Florence Consolidated — A five-drill compressor and a 30-h.p. electric hoist have been installed on this lease.

Goldfield Consolidated—The new mill on Columbia mountain is being closed in. The steel work is finished for all except the last three aisles. All the grinding and crushing machinery is installed and practically ready to run. Work on the concentrating and cyaniding departments is dragging. Foundations are being put in for the refinery. A station is being cut at a depth of 630 ft. on the Jumbo to connect with the main shaft on the Mohawk, which is down 600 ft. When this is done, work of sinking to cut the main Mohawk vein will be continued. It is estimated that this will be intersected between the 925- and 1000-ft. levels.

Esmeralda County—Silver Peak

Silver Peak Valcalda—The O'Meara brothers have sold to the Samuel Newhouse interests of Salt Lake, the Silver Peak Valcalda mine, which adjoins the Pittsburg-Silver Peak property. The Valcalda is developed to a depth of 450 ft., and is equipped with a 10-stamp mine. The ore reserves are said to justify even now the building of a 200-ton mill, plans for which are being prepared. The ore averages $15 per ton.

Esmeralda County—Hornsilver

Lime Point—L. H. Rogers and associates, of Goldfield, are contemplating the erection of a mill at their Lime Point property near Hornsilver.

Humboldt County—Seven Troughs

Kindergarten—After a shutdown lasting six weeks, due to a broken cam shaft the Kindergarten mill has resumed operations. It is now running on 100 tons of ore assaying $90 per ton that came from the Kindergarten mine.

Esmeralda County—Rawhide

Rawhide Tarantula—The Tarantula shaft is 120 ft. deep. Ore has been cut in a drift on the 85-ft. level. A hoisting plant will be installed.

Rawhide Coalition Mines—This company is contemplating the erection of a stamp-mill and cyanide plant. J. B. Fleming, who designed the 600-ton mill for the Goldfield Consolidated, has reported to the management on conditions and milling necessities. He recommends a 100-stamp mill built in units of 20 stamps each. Work on the first two units will be started soon.

Lincoln County—Crescent

Crescent Turquoise—Tiffany & Company of New York will re-open the turquoise mines at Old Crescent camp, which have not been operated for several months. The gems are mined within 15 ft. of the surface.

Storey County—Comstock

The production of the Comstock lode for the past week amounted to 414 tons valued at $15,000, besides 694 tons of second-class ore, which was sent to the Kinkead mill and to the Butters plant for treatment. The Ophir produced the largest part of the first-class ore which averaged between $40 and $42 per ton. The Consolidated Virginia produced 30 tons valued at $900 per ton.

Nye County—Tonopah

The ore production for the week was 5315 tons of an estimated value (shipping ore valued at $60 per ton and milling ore at $25 per ton) of $134,450. The Tonopah Mining Company mined 3200 tons; Belmont, 650 tons; Montana Tonopah, 620 tons; Midway, 100 tons; MacNamara, 350 tons; West End, 100 tons; Jim Butler, 250 tons; Tonopah Extension, 45 tons.

Belmont—The new vein, where it is crosscutted from the east drift on the 100-ft. level driven from the winze on the 1000-ft. level, is 38 ft. wide. Most of this width is milling ore; one sample representing a width of 6 ft. assayed $19 per ton. A crosscut from the west side of this winze has cut the same vein, and on this side also the vein contains ore of good milling grade.

Montana Tonopah—Drilling with the Calyx drill began this week, but was stopped owing to a break in the machinery, after a hole 5 ft. deep had been drilled. Drilling will be resumed as soon as repairs can be made. The mine treated during the week 941 tons of ore, 322 of which came from the MacNamara.

Tonopah Extension—The north and south crosscuts on the 400-ft. level were advanced during the week, but no ore has been found as yet. Both these crosscuts are being run in virgin ground. At present the only development work being done on the 600-ft. level consists of sinking a winze on the vein found in the west drift. The principal prospecting work in the mine is being done on the 770-ft. level, where a long crosscut is being run toward the north in order to get under the winze which is being sunk from the 600-ft. level.

Jim Butler—On the 200-ft. level, work has been started on a new vein a few feet south of the one now being stoped. The vein shows 4 ft. of milling ore. The sinking of the Stone Cabin shaft has been discontinued for the present, as it has reached the proper depth for the cutting of a station at the 700-ft. level.

Tonopah Mining Company—Last week, 427 ft. of new ground was broken. The drill-hole in the Red Plume shaft was advanced 19 ft. so that now it is 344 ft. below the 500-ft. level.

Nye County—Manhattan

Rose-Nash Lease—After taking out from this lease on the Union No. 4 claim a large amount of valuable ore, work was stopped some time ago. Recently when water was taken from these workings for placer operations on the Big Chief, the Rose-Nash people decided to sweep the old stopes. While doing this it was discovered that the vein, instead of pinching out, had simply changed its dip to about 45 deg. They now have a vein 4 ft. wide averaging $42 per ton.

Nye County—Clifford

Broken Hills Mine—The returns from the first shipment of ore since the property was acquired by the J. C. McCormack Company, of Goldfield, show that the ore is worth $335 per ton as it assays 9.27 oz. gold and 293.44 oz. silver. The second shipment has been loaded on the cars at Tonopah; the mine assays indicate that this shipment will be of higher grade than the first one. Four 8-horse and two 6-horse teams are hauling the ore from Clifford to Tonopah. It is then shipped by rail to the mills at Millers. The wagon haul costs $20 per ton.

Nye County—Bullfrog

Montgomery Shoshone—Arrangements are being made to increase the capacity and equipment of the Shoshone mill by the addition of both a 6-ft. Chilean mill and a tube mill; the tube mill is for regrinding the concentrates which will be treated in the cyanide plant, thus eliminating the freight and smelting charges.

White Pine County

Nevada Consolidated Copper Company—At the annual meeting S. W. Eccles, James Phillips, Jr., W. Hinkle Smith, F. W. Hills, Charles Hayden, C. Hartman Kahn, W. B. Thompson, J. K. MacGowan, Willard S. Morse, John N. Steele and W. E. Bennett were elected directors. James Phillips, Jr., president of the company, says that when the fifth unit is completed the annual production of copper will be 70,000,000 lb. blister copper. He stated that in January, 1909, the monthly output will be approximately 3,000,000 lb. Pope Yeatman recommends that another unit be added to the mill and smelter.

New Mexico

Socorro County

Mogollon Mountains—The only mining company paying dividends is the Ernestine Mining Company, but others are doing development work and opening up sufficient ore to justify the erection of a mill—quite an expense as the mines are far from the railroad. The properties of the Socorro Mines Company, and the Deadwood, Enterprise and Cooney mines are working and have considerable ore developed. At the Confidence mine considerable ore has been developed, but this mine is at present shut down. The Socorro Mines Company and the Enterprise Company are building mills. The Deadwood Company plans to build a mill this fall. As yet there is no custom mill in the district.

Texas

Petroleum production in the Southeast district in October, according to the figures collected by the *Oil Investors' Journal*, was 943,740 bbl. Shipments by rail for the month were 509,546 bbl.; by sea, 272,091; total, 781,637 bbl. This does not include refining or local consumption. There were 49 new wells completed in October, 43 finding oil, while six were dry holes. On Oct. 31 there were 95 new wells under drill.

[illegible]

A syndicate, represented by Dr. A. L. Lyons, of Liberty, has been engaged for some time in boring for sulphur on a tract of land near Liberty. A number of holes have been drilled, and it is said that the results indicate a large deposit of sulphur at a depth of about 300 ft. Arrangements are being made to open and develop this deposit.

Utah

[illegible]

Tintic Ore Shipments—Shipments for the week ending Nov. 5, amounted to 99 carloads. The Beck Tunnel shipped 2 cars; Colorado, 22; Bullion Beck, 3; Centennial Eureka, 40; Eagle & Blue Bell, 4; Uncle Sam Consolidated, 6; Yankee Consolidated, 3; Sioux Consolidated, 8; May Day, 2; Mammoth, 4; Eureka Hill, 2; Utah Consolidated (Tintic), 2.

Tintic Smeltery—One lead furnace is in commission at this plant, but the second one will likely be blown in within the next few days.

Sioux Consolidated—Conditions in this property are very encouraging; the management gives asurance that they are such as to justify an increase in the dividend this month, and again next month.

Utah Nevada Development Company—The 100-ton concentrating mill in the west Tintic district is ready for operation. Leslie L. Savage, of Salt Lake, is the manager.

Salt Lake County

Boston Consolidated—The copper production in October was 1,200,000 lb. The mill is now treating about 1500 tons of ore per day.

Utah Apex—This company is preparing to install a concentrating mill with capacity to treat 500 tons of ore a day. Robert S. Oliver, of Bingham Cañon is manager

Summit County

Park City Ore Shipments—Shipments for the week ending Nov. 5 amounted to [illegible] tons. The Daly-Judge shipped [illegible] tons; Silver King Coalition, 748; Daly-West, 575 tons.

Park City Ore Shipments—The output [illegible] West, 575; Daly-Judge, 290.

Grasselli Chemical Company—The zinc concentrator at Park City owned by this corporation is running again after having been enlarged and improved. Mid-[illegible] treated.

[illegible]

[illegible] operating on Lion Hill, in the Mercur district, [illegible] from the portal of the adit through which the mine is being developed. Some samples assayed 1500 oz. silver per ton.

Utah County

[illegible] American Fork district, the adit run to intercept the orebody exposed in the upper workings has reached the objective point 500 ft. below the upper workings.

West Virginia

Kanawha County

East Bank Coal Company—This company has been organized to develop a tract of coal land near East Bank. Edward Clark is president; S. I. Johnson, East Bank, treasurer.

Marion County

Haywood Coal Company—Pittsburg coal operators have bought the stock of this company and intend to reorganize it and enlarge the plant. E. F. Gwynn Pittsburg, Penn., is president; Seymour McIntyre, Fairmont, W. Va., vice-president.

McDowell County

Buchanan Coal Company—This company has been organized to open a coal mine near Yukon. Its incorporators include L. C. Anderson, D. J. F. Strother and Louis Wilmore, all of Welch, W. Va.; George W Mullins, Ward, W. Va., and associates.

[illegible]

[illegible]—This company has been organized to open coal mines near Evanwood. The capital stock is $1,600,000, and the company is said to have secured control of 24,000 acres of land. Among the incorporators are Edward S. Jones, of Scranton, Penn., and T. W. Raine, of Evanwood

---

Wisconsin

Zinc-lead District

[illegible] by drill on its land east of the Baxter.

[illegible] crew of men this new producer is shipping a car of concentrates weekly, averaging 57 per cent. zinc; the present force will be doubled during the coming month and the output of the mine doubled.

Cuba City—The Wisconsin Supreme Court has reversed the decision of the Circuit Court in the case of Trego against the Roosevelt Mining Company, whereby the Roosevelt company is relieved of indebtedness obligation for the Trego roaster; this roasting apparatus proved a failure and the Roosevelt Mining Company refused to make settlement on the grounds of breach of contract.

Dall—The new shaft has been sunk to the clay bed and a 12-ft. breast of high-grade jack is being opened up; 1000 ft. of tramway will connect this shaft with the mill. The company paid its second monthly dividend of 5 per cent. on Oct. 26.

Henrietta—This company is installing two new boilers and a compound condensing Prescott pump of 8-in. suction; the main shaft will be sunk deeper and the lower ore run followed.

Highland—The Lampe estate, comprising two 80-acre tracts of mining land, was sold at sheriff's sale Oct. 26 on judgment of partition; one tract was bid in by Lampe brothers at $10,000; the other was bid in by the same parties at $27,000, the Mineral Point Zinc Company bidding $25,000. The Lakey 10-acre tract was purchased recently for $5000 by the Mineral Point Zinc Company.

Kroll—Frank H. Kroll has opened up a rich vein of jack on his land 1½ miles south of the village; a 50-ton mill will be erected.

Pittsburg—This company joined the list of producers this week by sending its first car of concentrates, assaying 47 per cent. zinc to the Electrostatic Separator at Platteville.

Wallace—Ore from this mine is being treated at the mill of the Milwaukee Mineral Company; 300 tons of concentrates, assaying 57 per cent. zinc, are held for better prices.

Canada

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending Oct. 31 were as follows: Crown Reserve, 127,000 lb.; Cobalt Central, 43,600; Chambers-Ferland, 60,440; City of Cobalt, 42,000; Drummond, 100,000; Kerr Lake, 184,050; La Rose, 386,330; Nipissing, 187,260; Nova Scotia, 55,400; O'Brien, 190,370; Right of Way, 81,840; Temiskaming, 63,000; Temiskaming & Hudson Bay, 185,160; total, 1,706,690 pounds.

Foster-Cobalt—A statement has been issued to the shareholders of the company that at the next annual meeting, Nov. 4, the directors will report an available cash surplus above liabilities approximating $38,000, the decrease as compared with the statement at last annual meeting being due to cost of development work and operation.

Temiskaming & Hudson Bay—Several new discoveries have recently been made on the south lots near the Silver Queen and Right of Way properties. The new vein lately found on the Little Nipissing has been picked up. A shaft will be put down on one of the new veins which varies from 6 to 18 in. in width, and promises well. The main shaft is down 200 ft., and a station is being cut for the fourth level. On the second level 600 ft. of drifting and crosscutting has been done, including work on the new Tretheway vein, which runs a considerable distance on the Hudson Bay property, averaging 4 in. of rich ore. A crosscut 400 ft. in length has been driven north to a rich vein, and an upraise made connecting with the surface.

Quebec

Diamond Graphite Company—J. J. and Harold Tonkin, of New York, are developing the company's graphite deposit six miles from Buckingham. A carload of machinery has arrived.

Mexico

Chihuahua

Parral Output—The production of the Parral camp for the week ending Oct. 30 was 7930 tons, as compared with 7950 tons for the preceding seven days. The smelting ore produced during these two weeks was, respectively, 2480 and 2560 tons. The October output was a little less than that of September.

Southern Mining Company—This concern is resuming mining operations on a larger scale at its Marguerita mine in the Ocampo district. The president, Warren Barnett, of Birmingham, is now directing operations, and announces that a 60-ton cyanide plant is to be installed shortly.

American Smelting and Refining Company—The ore shipments from the Chihuahua sampling works during October exceeded 13,000 tons, the entire tonnage going to the company's El Paso smeltery. Preparations are also being made for the early blowing in of a third furnace at the Chihuahua plant.

Pennsylvania-Mexican—This company was lately organized by Pittsburg men on the basis of the properties of the Sahuayacan Mining Company and the adjoining Santa Teresa mine situated in the Rayon district. George E. Howard remains general manager of the new company.

Julimes—A promising lead-silver district is being exploited in the vicinity of this place along the Conchos river in the eastern part of the State. A recent carlot shipment sent out by Charles Moffat, of Chihuahua, ran about 45 oz. silver and 60 per cent. lead. Some parts of the region were worked by Mexicans 15 years ago. As the region is now more accessible from the line of the Orient railroad, it is anticipated that several mines may be profitably worked.

Solis—A milling plant is being set up at this old property in the Otates section to the west of Chihuahua. The manager in charge is R. C. Harper, of San Francisco.

Guanajuato

Production—The shipments for the week ending Nov. 1 amounted to $115,000 in ores and concentrates and $180,000 in bullion, a falling off of $2000 as compared with the preceding week. The Dwight Furness Company shipped ores and concentrates to the amount of $82,000. Practically all of the ore shipped was sent to the Aguascalientes smelting works.

Jalisco

Magistral—This mine in the Ameca district has been extensively developed while under bond to James P. Harvey. Arrangements are being made for the erection of a reduction plant having a daily capacity of 100 tons.

Casados—This mine in the Hostotipaquillo district has been developed well below the old Spanish workings and rich ore has been found. Bids are being received on a 20-stamp mill, concentrators and a cyanide plant. W. R. Ramsdell is president of the Consolidated Mining Company which owns the Casados mines.

San Luis Potosi

Mazapil Copper Company—The Saltillo smelter of the company is erecting an additional furnace.

Sonora

Moctezuma—This company is about to quadruple its output after two years of development work. Mine and surface machinery have been installed, a railroad to connect the mines built, and concentrating and smelting apparatus set up. The company expects to increase its output during the next year to 30,000,000 lb. of copper.

San Antonio Copper Company—This company has been formed at Iron Mountain, Mich., to develop 2000 acres of mineral land near the village of San Antonio de la Huerta, district of Ures. There are nine mining claims, and development has been in progress for two years. The body of copper ore is opened by means of adits. The company has a capitalization of $2,500,000, and is a close corporation.

Territorio de Tepic

Certuchena y Anexas—These mines are reported to have been purchased in behalf of Epes Randolph and associates. J. P. Casey, of El Paso, will have charge of the property, and the plans include the installation of a hydroelectric plant to develop power for mining and milling. The property is only a few miles from the line of the new Southern Pacific extension.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 11—Coal trade in the West seems to have taken a turn for the better. While domestic sales are kept down by continued mild weather, a better demand for steam coal is manifest. Orders received by mines are on the increase, and operators feel encouraged. The exception is in the Pittsburg district, where matters are still dull.

The Seaboard bituminous market is still rather quiet, but there are some signs of a better demand. This is especially manifest in New England territory. The Coastwise trade is fairly active.

The anthracite trade has been held back by high temperatures. For the next month or so it will be essentially a weather market.

The coke trade is reviving and production increasing. This depends entirely upon the iron market, and larger coke shipments are the first sign of greater iron production.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 31, in short tons:

	1907	1908	Changes
Anthracite......	4,737,236	4,285,312	D. 451,924
Bituminous.....	32,925,455	27,854,121	D. 5,071,334
Coke...............	11,780,263	5,791,558	D. 5,988,705
Total..........	49,442,954	37,930,991	D. 11,511,963

The total decrease this year to date was 23.3 per cent.

Shipments of anthracite coal from Buffalo by Lake for the season to Nov. 1 were 2,865,585 tons in 1907, and 3,490,770 in 1908; increase, 625,985 tons.

Anthracite coal shipments in October were 5,977,497 long tons, being 766,450 tons more than in September, but 130,568 tons less than in October, 1907. For the 10 months ended Oct. 31 the shipments were, in long tons:

	1907	1908.	Changes
Reading	11,658,568	10,089,009	D. 1,569,559
Lehigh Valley .	9,648,455	9,007,476	D. 640,979
N. J. Central . .	7,209,362	6,945,430	D. 263,932
Lackawanna . .	8,625,262	8,245,273	D. 379,989
Del & Hudson	5,503,502	5,283,699	D. 219,803
Pennsylvania . .	5,142,168	4,941,169	D. 200,999
Erie.............	5,975,884	6,152,997	I. 177,113
N. Y., Ont & West	2,258,893	2,332,532	I. 73,639
Total...	56,022,394	52,997,685	D. 3,024,809

Only two companies—the Erie and the New York, Ontario & Western—show increases. The Reading had the largest decrease—13.5 per cent. The total decrease this year was 5.4 per cent.

Coal passing through Sault Ste. Marie canals, season to Nov. 1, short tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Total decrease this year was 14.7 per cent.

Coal receipts at Boston, 10 months ended Oct. 31, long tons; reported by Chamber of Commerce:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The foreign coal receipts are chiefly from Nova Scotia.

New York

[illegible]

Nov. 11—The tidewater market for both prepared and small steam sizes is again flat, after a short flurry of activity during the cold snap last week. All-rail trade, however, continues good and coal is in fair demand.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

These seems to be an improvement throughout all consuming territories, even in New York harbor. The demand is more real and factories show a disposition to take coal more readily. In New York harbor some dealers report a noticeable improvement, but others have not felt the increased demand. Coal companies selling their own product report better conditions than commission merchants. From the mines reports come that work is being increased and the mines are operating more days a week. Good grades of steam coal fetch $2.45@2.65 per ton in New York harbor. Transportation is good and cars are plentiful.

The better market is reflected in the Coastwise vessel trade. Vessels are scarce and in good demand. Freight rates are firm and higher than last week; the rates to the East on small vessels from New York harbor are the same as for large vessels from Philadelphia. The rates from the last-named point are as follows: To Boston, Salem and Portland, 70c.; Lynn, Newburyport and Bath, 75@80c.; Portsmouth, 75c.; Bangor, $1; Providence, New Bedford and the Sound, 60c. per ton.

Birmingham

Nov. 9—Coal production in Alabama is holding up well. The railroads are beginning to feel an improvement in all directions and their requirements will take up a large quantity of coal.

Coke is still in demand. All ovens are either in operation or being prepared for operation.

Chicago

[illegible] have caused the wholesale coal market to be depressed in the last week. In the absence of cold weather domestic coals do not increase sales. The old condition, from which Chicago has been reasonably free for the last year, of this market's receiving coal for which there was not a clear market elsewhere, seems to have returned. Prices on Eastern and Western coals alike have been generally cut in the last week.

Illinois and Indiana coals are weak as regards fine coals, and domestic coals are moving slowly. Lump and egg bring $1.80@2.65, the best grades being frequently sold 25c. under the highest named price; run-of-mine $1.65@1.85 on most sales and screenings have been down to 95c., with $1.45 obtained on the highest lots.

Smokeless run-of-mine has sold at greatly varying prices and is quoted now at $1@1.25 at the mines for Pocahontas and New River, making the local price $3.05@3.30, though selling frequently at 25c.@35c. less, and with some smokeless [illegible] the mines. Hocking has sold at 25c. in some cases under the circular price of $3.15 and Youghiogheny runs steadily on contracts at $3.15 for ¾-in. gas. Anthracite is selling fairly well in city and country.

Indianapolis

Nov. 9—That there is renewed activity at the principal mines is apparent. Already the iron industries are ordering coal and coke in large quantities and from many centers comes the report of preparation for more extensive operation of industrial plants. The car shortage predicted by December is already here with some of the roads. The coal-carrying roads are gathering in their empty cars to fill the demand. These roads expect to handle a large tonnage of Indiana coal during this and next month. Several mines that closed down recently are preparing to start up, and it is predicted that within a few weeks nearly every mine in the State will be in operation.

Pittsburg

Nov. 10—The railroad mines in the Pittsburg district are being operated at about 50 per cent. of capacity; all of the river mines are idle owing to low water. Fully 40,000,000 bushels of coal are loaded in the pools and harbor ready to go to Southern ports on the next rise in the rivers. Coal is still being shipped to the Northwest. The principal shipper from this district is the Pittsburg-Buffalo Company, which is operating all of its mines. Its product is being handled by the M. A. Hanna Company. Prices are still quoted on a basis of $1.15 a ton at the mine for mine-run coal. Slack has advanced, and the lowest quotation is 75c. per ton.

Connellsville Coke—Coke conditions continue to improve, and prices are firmer. It is not unlikely that a stiff advance will be ordered before Jan. 1. For furnace coke $2 is regarded as the minimum for both prompt shipment and on contract. On foundry coke less than $2.25 cannot be done for any delivery. One large producer is asking $2.50 for deliveries running through the entire year. A scarcity of water and shortage of workmen is interfering with production, but not sufficiently to prevent supplying the present demand. Last week fully 1200 foreigners who went home when the depression began last fall have returned to the region. The *Courier* gives production in both fields at 223,987 tons. The shipments were 7961 cars as follows: To Pittsburg district, 3095; to points west of Pittsburg, 4372; to points east of Connellsville, 494 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, nine months ended Sept. 30, long tons:

	1907.	1908.	Changes.
Anthracite	2,076,341	2,054,906	D. 21,635
Bituminous	7,742,602	6,574,777	D. 1,167,825
Total coal	9,819,143	8,629,683	D. 1,189,460
Coke	682,583	450,125	D. 232,458

Canada took this year 6,940,150 tons of coal, or 80 per cent. of the total. Coal furnished to steamships in foreign trade is not included above.

United States Coal Imports—Imports of coal and coke into the United States, nine months ended Sept. 30, long tons:

	1907.	1908.	Changes.
Anthracite	132	15,023	I. 14,891
Bituminous	1,514,156	1,142,956	D. 371,200
Total coal	1,514,288	1,157,979	D. 356,309
Coke	100,442	87,647	D. 12,795

Canada furnished this year 807,565 tons coal, and nearly all the coke; Australia, 297,559 tons coal. Imports are chiefly on the Pacific Coast.

Coal in Bosnia—Coal production in Bosnia—including Herzegovina—in 1907, was 621,000 metric tons, all brown coal, or lignite. The output has increased largely since the provinces have been under Austrian rule.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 31: Best Welsh steam, $3.66; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.24; seconds, $3.06; best small steam, $1.86; seconds, $1.56. All per long ton, f.o.b. shipping point.

Iron Trade Review

New York, Nov. 11—A revival in trade has apparently begun, though it is, perhaps, too soon yet to say how far it will go. At any rate, the waiting position, so long held, is disappearing, and there is a general disposition to place orders farther ahead.

In pig iron there has been a good deal of business done in lots of fair size, and some contracting for deliveries to go over the first quarter of 1909. This has stiffened prices and stopped concession. Southern pig is especially firm, the larger companies claiming that they are well supplied with orders. Sales include both foundry and basic pig.

In finished material structural steel has the call. Some large building contracts have been placed and others are coming forward. Several contracts for new cars are reported placed; otherwise the railroads are still buying little. The strength shown so far comes entirely from the general market.

Increased demand is reported for nails, wire and other small products, indicating an extension in smaller building operations and in general work.

Pig Iron Production—Reports from the blast furnaces on Nov. 1 show 200 coke and anthracite furnaces in blast, having an aggregate capacity of 362,700 tons weekly; an increase of 24,700 tons over Oct. 1. Taking the estimate of the *Iron Age,* and making allowance for the charcoal furnaces, the approximate production of pig iron in October was 1,578,500 long tons. For the 10 months ended Oct. 31 it was 12,529,500 tons. This includes the statement of the American Iron and Steel Association for the first half of the year.

Baltimore

Nov. 9—Imports for the week included 100 tons spiegeleisen, 1976 tons ferromanganese and 50 tons silicospiegel from England and Germany; 1921 tons cupreous pyrites from Spain, and 10,170 tons iron ore from Cuba.

Birmingham

Nov. 9—Southern manufacturers of pig iron are selling their product right along. Within the past week 50,000 tons of iron have been sold, delivery to be made during the first quarter of the coming year; prices for this iron were around $13 per ton, No. 2 foundry. It is stated that there has been no iron sold at $12.50. A number of inquiries have been coming in. Manufacturers in this district assert that they will be able to care for all the business that is offered. Quotations may improve in the next few days, though the producers oppose a jump in the market, believing that more will be gained through a steady improvement.

Cast-iron pipe makers are bidding on some large contracts, and it is stated that new orders are in hand now or in sight. More men are being given employment at the Ensley steel works of the Tennessee company and the production will increase right along.

The make of pig in this district will hardly be increased until after a good rainfall, there being a shortage of water noted. The Sloss-Sheffield company has one furnace ready for operation but water is needed in the orefields for washers.

Chicago

Nov. 19—Since election the iron market has shown increased strength in the number and size of orders for pig iron and in the sales of iron and steel products. There has, however, been no great change. Melters show an interest in possible deliveries for the first half of 1909, and are buying more freely iron for delivery in the first quarter. One large sale to an agricultural-implement manufacturing company has been supplemented by a number of sales ranging up to 500 tons; a few have gone higher. The average melter of pig iron is yet feeling his way.

Southern iron remains $12.50@13 Birmingham ($16.85@17.35 Chicago), with the higher price ruling. Northern is firm at $16.50@17, with the demand good at the higher figure. Higher prices are asked for delivery more than three months hence.

In iron and steel products the trade shows greater strength and firmness. Coke is in increasing demand and firm at $4.90 for best Connellsville.

Cleveland

Nov. 9—The movement of iron ore down the Lake in October was the largest for any month this season. Details are not yet reported, but the total was 5,099,110 tons, making a total of 21,730,070 tons to Nov. 1. The boats belonging to the big companies are nearly all in service still, and it is quite possible that there will be a big movement in November.

Philadelphia

Nov. 11—The feature of the market is the number of inquiries and orders for early delivery. A sudden interest has been developed in deliveries for next year. A hardening of prices has also taken place and concessions not to be had this week. The peculiar feature of the market is the buying for anticipated wants. There is no present purpose to advance prices openly, but buyers of No. 2X for next quarter's delivery find that $16.25 delivered is the inside limit. It is ascertained that some business from this territory has gone to Virginia and [illegible] and that more is in negotiation. Basic pig is strong.

Steel Billets—Small sales for early delivery were closed today.

Bars—A stronger turn is apparent, and store prices for spot delivery have been advanced 0.1c. Mill men have made no advances.

Sheets—A better business is reported, both at stores and mills.

Pipes and Tubes—The industries using tubes have turned the corner. Negotiations were opened this week for tubes to be delivered next year.

Merchant Steel—Merchant steel met with a sudden demand in a small way.

Plates—Inquiries are on the market and it is known that certain large buyers are willing to place contracts at an early day if certain prices are named.

Structural Material—New enterprises have suddenly opened up. Only small sales have been made to builders in this territory. Car builders, ship builders and bridge builders are all on the stir.

Steel Rails—The only orders are for light rails and for traction roads.

Scrap—Nearly all kinds of scrap are beginning to move better than for months.

Pittsburg

Nov. 10—The feature of the iron and steel markets this week is the stiff advance in pig-iron prices by the producers. In finished-steel lines there is an improvement in new business, but the bulk of the orders are for small tonnages. The largest tonnage booked by the Carnegie Steel Company calls for 18,000 tons of plates. This order came through the dissolving of the injunction in the New York courts against the T. A. Gillespie Company, of Pittsburg, which had been given the contract for laying a pipe line on Long Island for supplying the borough of Brooklyn with water from its new reservoir. The contract calls for 16 miles of 72-in. steel pipe. The Carnegie company also has taken a number of other orders for plates and shapes, and a little new business in steel rails is being placed. The railroads, however, have not come into the market for 1909 requirements. It is believed this business will be placed soon. There is no truth in the report widely circulated that the railmakers have agreed to cut the present price of $28 to $24 a ton. It is possible that, to induce the early placing of rail business, the producers may make some concessions from the schedule issued several months ago basing prices on the percentage of discard from the ingot. Production at [illegible] number of mills in this district has increased during the week. The American Sheet and Tin Plate Company has increased its active tinplate mills to 116 and sheet mills to 99. At the bi-monthly examination of the bar-iron sales sheets under the sliding scale of the Amalgamated association, the average of sales for September and October was found to be 1.30c., the same as at the last examination; the puddlers will continue to receive $5.25 a ton and the pay of the finishers also remains unchanged. The bi-monthly examination on sheets and tinplate will be made later in the week.

Pig Iron—Within the past few days prices of all grades of pig iron have been advanced $1 a ton, the latest advance being 50c. ordered today by the furnace interests. As told in the last report, the Massillon Iron and Steel Company had an inquiry in the market for 27,000 tons of Nos. 2, 3 and 4 foundry iron. Representatives of a number of furnaces went to Massillon on Wednesday and presented figures which were higher than on the day preceding the election. As a result the company decided to defer placing the contract. The Westinghouse Electric and Manufacturing Company was in the market for 12,000 tons of different grades of foundry iron, but brought only 5000 tons. Sales in the past few days were for lots ranging from 100 to 500 tons, and at prices prevailing before the advance of 50c. a ton today. One interest sold 500 tons of No. 2 foundry yesterday, part at $15.25 and part at $15.75. It is reported that a sale of standard bessemer was made today at $16, but the report is not generally credited. Pig-iron quotations for delivery the rest of this year and for the first quarter announced today are as follows: Bessemer, $15.50@16; malleable bessemer, $15.50; basic, $15; No. 2 foundry, $15.50@16; gray forge, $14.50; all f.o.b. Valley furnaces. These are merely quotations, and are not based on actual sales.

Steel—The market seems a trifle stronger for billets, but no important transactions are recorded. Both bessemer and open-hearth billets are quoted at $25; sheet-bars and tin-bars at $27.50, Pittsburg. Merchant-steel bars remain at 1.40c. and plates at 1.60 cents.

Sheets—There is but little change in the sheet trade. Prices are firm, all shading having been stopped. Black sheets are quoted at 2.50c., and galvanized at 3.55c. for No. 28 gage.

[illegible]—Prices [illegible] $40@40.50, Pittsburg.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the nine months ended Sept. 30, are valued by the Bureau of Statistics of the Department of Commerce and Labor at $146,230,407 in 1907, and [illegible] in 1908; a decrease of [illegible], or [illegible] per cent. Leading items of export, in long tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Structural steel	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Decreases [illegible] except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the nine months ended Sept. 30 were valued at $31,697,879 in 1907, and $14,923,195 in 1908; a decrease of $16,774,684, or 52.9 per cent. Leading items of imports, long tons:

	1907	1908	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Decreases are shown here in all the items except tinplates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the nine months ended Sept. 30 are reported as follows, in long tons:

	1907	1908	Changes
Exports	[illegible]	[illegible]	[illegible]
Imports	[illegible]	[illegible]	[illegible]

Of the imports this year 393,108 tons came from Cuba. Imports of manganese ore for the nine months, 142,120 long tons in 1907, and 134,240 in 1908; decrease, 7880 tons.

Foreign Iron Trade

German Pig Iron Production—The German Iron and Steel Union reports the pig-iron output of Germany in September at 928,729 metric tons, a decrease of 6716 tons from August. For the nine months ended Sept. 30 the total was, in metric tons:

	1907	1908	Changes
Foundry iron	[illegible]	[illegible]	I. [illegible]
Forge iron	[illegible]	[illegible]	D. [illegible]
Steel pig	[illegible]	[illegible]	D. [illegible]
Bessemer pig	[illegible]	[illegible]	D. [illegible]
Thomas basic pig	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

Steel pig includes spiegeleisen, ferromanganese, ferro-silicon and all similar alloys. The total decrease this year was 7.9 per cent.

German Iron Trade—Imports and exports of iron and steel in Germany, nine months ended Sept. 30, metric tons:

Imports:	1907	1908	Changes
[illegible]	[illegible]	[illegible]	D. [illegible]
Machinery	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]
Exports:			
[illegible]	[illegible]	[illegible]	[illegible]
Machinery	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

[illegible] push foreign trade

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 11.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold			
Sept. 1908..	$ 3,974,391	$ 4,695,894	Imp.$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Nov. 7: Gold, $125; silver, $768,335, to London and Paris. Imports: Gold, $191,442, from Cuba and South America; silver, $146,136, from Mexico and the West Indies.

Silver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
5	4.8600	49⅜	22 15/16	9	4.8588	49⅝	22 15/16
6	4.8590	50⅛	23⅛	10	4.8565	49⅞	23 1/16
7	4.8575	50	23⅛	11	4.8575	50⅜	23 5/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The silver market has been forced down by enormous speculative bear sales of futures. This has unsettled the market very materially; while on the other hand, speculative purchases of spot metal have tended to check the fall that, from the London point of view, seemed certain.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 29:

	1907.	1908.	Changes.
India.......	£9,899,954	£8,171,813	D. £1,728,141
China.......	99,850	516,400	I. 416,550
Straits......	625,950	164,885	D. 461,065
Total......	£10,625,754	£8,853,098	D. £1,772,656

Imports for the week, £5000 from Mexico and £190,000 from New York; £195,000 in all. Exports, £739,000 to India.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
5	14⅛ @14¼	13⅞ @14	62 13/16	30½	4.35 @4.40	4.90 @4.95	4.75 @4.80
6	14¼ @14½	14 @14⅛	63 11/16	30¾	4.35 @4.40	4.95 @5.00	4.80 @4.85
7	14¼ @14½	14 @14¼	....	30⅞	4.35 @4.40	4.95 @5.00	4.80 @4.85
9	14½ @14⅝	14¼ @14⅜	64⅞	31¼	4.35 @4.40	4.97½ @5.02½	4.82½ @4.87½
10	14½ @14¾	14¼ @14⅜	64 13/16	31	4.35 @4.40	5.00 @5.05	4.85 @4.90
11	14½ @14¾	14¼ @14⅜	64 13/16	30¾	4.35 @4.40	5.00 @5.05	4.85 @4.90

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The election of Mr. Taft was followed by an enormous buying movement in copper, both for domestic consumption and for export. Manufacturers in this country received large orders for finished material and came into the market for deliveries over the next four months. The demand that developed from Europe was surprisingly good in view of the large quantities of copper that Europe has absorbed during the last 12 months, and it appears that comparatively little of this copper has gone into stock as buyers have recently been in the market for early deliveries. The business done since Nov. 4 has apparently amounted in the aggregate to about 75,000,000 lb., in which both American and European manufacturers have participated, together with some speculative accounts. European manufacturers, as well as the American appear to have been awaiting the result of the election. The major part of the business was done previous to Nov. 9, since when there has been a relaxation, although quotations have risen under the buying by belated manufacturers. The Calumet & Hecla was a seller in the early part of the week, but since then appears to have withdrawn from the market for Lake, which has consequently been left to the outside producers, who toward the close realized as high as 14¾c. from domestic manufacturers for the fancy brands, while other brands were still obtainable at 14½c. Producers of electrolytic copper have been large sellers throughout the week, on an advancing scale of prices; but since Monday electrolytic has been freely offered, in million-pound quantities at 14⅜c., cash, and 14½c., delivered 30 days, which is the equivalent of 14⅜c. cash, while in some quarters offers have been made at a slightly lower price. For deliveries after the first of January the views of sellers appear to be somewhat higher. The market closes strong at 14½@14¾c. for Lake copper; 14¼@14⅜c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 13⅞@14⅛c., closing higher.

The London market for standard copper experienced a volume of business such as has not taken place in a long time. Orders poured in there from all over the world, and the market rapidly advanced, at one time touching £66 5s. for three months. Toward the end of the week there was a reaction, and the market closes at £64 11s. 3d. for spot, £65 10s. for three months.

Refined and manufactured sorts we quote: English tough, £68 10s.; best selected, £67 10s.@£68 10s.; strong sheets, £79 10s.@£80 10s.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

Tin—The London market during the past week, in sympathy with copper, has shown a good deal of strength and large transactions have taken place. At the beginning of this week quotations showed a maximum advance of almost £5, being cabled as £142 for spot, £143 10s. for three months. The close is easier at £139 5s. for spot, £140 17s. 6d. for three months.

Business in this market was satisfactory, and especially was more interest shown among consumers. At the close the market is quoted about 30¾ cents.

Lead—A fair business has been doing from day to day at last prices, and lead at New York continues to be quoted at 4.35 @4.40 cents.

The market for Spanish lead in London has considerably improved and closes at £13 17s. 6d. with English lead at £14 per ton.

Spelter—Has been strong and advancing, due not so much to a large demand, as to the fact that the stock of metal has been reduced and the price of ore is such that smelters have had to raise their price for the metal. Up to Saturday there were some substantial sales of the metal, but since then the market has been less active. At the close spelter at St. Louis is quoted 4.85@4.90c., New York at 5@5.05 cents.

The London market for spelter is also strong and advancing, good ordinaries being quoted at £21, specials £21 5s. per ton.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Negotiations to establish an international convention among the zinc smelters of Europe are still in progress.

Other Metals

Antimony—A good demand and considerable speculative interest have resulted in substantial sales. Quotations are 8¼c. for Cookson's, 8@8¼c. for Hallett's, and 7¾@8c. for ordinary brands.

Aluminum—The nominal price of the American producer is still 25½c. per lb., but high-grade foreign aluminum has been freely offered at 22½c. We quote 22½@25½c.

Quicksilver—In New York trade is fair, with no change in prices, $46@47 per flask being quoted. San Francisco, $44@45 for domestic orders, $42@43 for export. London, £8 10s. per flask.

Platinum—Business with jewelers continues good, and the electrical demand has taken a sharp, upward turn. Prices are higher, dealers quoting 23@23.50c. for ordinary platinum, 25.50@26c. for hard, and 18.50c. for scrap.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Imports and Exports of Metals

Exports and imports of metals in the United States for the nine months ended Sept. 30 are reported as follows, in the measures usual in the trade:

Metals.	Exports.	Imports.	Excess.
Copper, long tons	236,988	[illegible]	Exp. [illegible]
Copper, 1907 ...	130,510	[illegible]	Exp. [illegible]
Tin, long tons ...	183	[illegible]	Imp. [illegible]
Tin, 1907........	183	31,156	Imp. [illegible]
Lead, short tons.	54,659	[illegible]	Imp. [illegible]
Lead, 1907......	35,681	55,585	Imp. [illegible]
Spelter, sh. tons.	2,278	823	Exp. 1,455
Spelter, 1907....	393	1,316	Imp. 923
Nickel, lb.... ...	8,026,350	[illegible]	Imp. [illegible]
Nickel, 1907....	6,979,881	13,815,477	Imp. 6,835,596
Antimony, lb.....	....	5,786,121	Imp. 5,786,121
Antimony, 1907.	....	6,160,060	Imp. 6,160,060
Platinum, oz	... ...	[illegible]	Imp. [illegible]
Platinum, 1907.	.. ... .	57,588	Imp. [illegible]
Quicksilver, lb ..	185,089	....	Exp. [illegible]
Quicksilver, '07	345,297	....	Exp. [illegible]
Aluminum, value	$285,711	...	Exp. [illegible]
Aluminum, 1907	259,984	... ..	Exp. [illegible]
Ores, etc.:			
Zinc dross, lb ...	13,555,081	....	Exp. [illegible]
Zinc dross, '07.	16,520,771		Exp. [illegible]
Zinc ores, lg. tons	21,056	37,157	Imp. 16,101
Zinc ores, 1907.	[illegible]	....	
Antim'y ores, lb.	....	1,731,709	Imp. 1,731,709
Ant. ores, 1907	....	[illegible]	Imp. [illegible]

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include re-exports of foreign material. Zinc ores imported this year included 18,452 tons calamine and 18,705 tons other ores; not reported last year.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 7—This week $37 was the highest price paid for zinc ore on a basis of $36@37 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $54 per ton was paid.

Shipments, week ended Nov. 7:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	[illegible]		210,000
Benton........	[illegible]	120,500	
Harker	[illegible]		
Highland.	[illegible]	[illegible]	
Hazel Green	[illegible]		
Linden .	[illegible]		
Cuba City ...	[illegible]	[illegible]	
Livingston	[illegible]		
Days Siding	[illegible]		
Mineral Point	[illegible]		
Total.........	[illegible]	[illegible]	210,000
Year to Nov. 7	[illegible]	[illegible]	[illegible]

In addition to the above there was shipped to the Platteville Separating Company, 595,450 lb.; to the Joplin Separator Works, 333,900 lb.; to the Enterprise roaster, 255,000 lb. zinc concentrates.

Joplin, Mo., Nov. 7—The highest price paid for zinc blende was $40, the highest assay base price was $37.50 per ton of 60 per cent. zinc, ranging down to $36. Zinc silicate sold on a base price of $18 per ton of 40 per cent. zinc. The average price, all grades, was $32.84 per ton. The highest price paid for lead ore was $58, ranging down to $53 early in the week, and the average price, all grades, was $54.94 per ton.

Market conditions were stronger, and there were unverified reports of $38 base for zinc blende and $60 for lead ore. So far as could be learned these were merely the anticipations of producers. Buying has been unusually strong for three weeks, and a heavier shipment is reducing the stock on hand, now approximately 7000 tons. Nearly half this is old stock that has been held more than a year for higher prices.

SHIPMENTS, WEEK ENDED NOV. 7

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	10,135
[illegible]	[illegible]		9,513
[illegible]	[illegible]	105,730	
Duenweg...	[illegible]	83,190	7,567
Granby .	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	7,079
[illegible]	[illegible]		4,532
[illegible]	151,190	[illegible]	[illegible]
[illegible]	70,380		1,302
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	47,910		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

MONTHLY AVERAGE PRICES

	ZINC ORE				LEAD ORE.	
Month	Base Price		All Ores		All Ores	
	1907.	1908.	1907.	1908.	1907.	1908.
January	[illegible]	$37 60	$45 84	[illegible]	[illegible]	$46 [illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49 72
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49 [illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 47
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	34 55	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September .	[illegible]	[illegible]	[illegible] 11	34 44	[illegible]	54 59
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]		[illegible]		[illegible]	
December..	[illegible]		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible] Lead ore prices are the average for all ores sold.

Chemicals

[illegible], Nov. 11—The general [illegible] shows improvement along lines used for manufacturing purposes. Drug chemicals, not having suffered materially during the recent depression, are unchanged. A cut in the prices of bichromates, both potassium and sodium, was announced this week. The [illegible] at 8¾c. and sodium bichromate, 6½c. The former prices were 8⅝@9c. and 7⅛@7½c. per lb. respectively.

Copper Sulphate—The strength of the copper metal market has affected the sulphate market only in withdrawing cheap goods. Standard salt remains unchanged [illegible] to $4.90 for smaller lots.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Nov. 1 as follows, in long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Quantities afloat include all cargoes due to arrive at United States ports by Feb. 15 next

Phosphates—Paul C. Trenholm reports shipments of phosphate rock from Charleston, S. C., in October as follows: By sea to Richmond, Va., 500 tons; to Baltimore, 1101; by rail, 6222; total, 7823 long tons

Imports and Exports—The imports and exports of chemicals and raw materials in the United States nine months ended Sept. 30 were as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Potash salts, lb..	167,[illegible]	[illegible]	[illegible]
Soda salts, lb....	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Estimating sulphur contents of pyrites, the total sulphur imported was approximately 219,224 long tons.

Mining Stocks

New York, Nov. 11—The rise in the general stock market which set in last week continued for several days, with heavy sales, the Exchange being quite excited at times. On Nov. 9, however, there was a reaction, largely to profit taking by some large interests. The market stood up fairly well under this process, and stocks were freely absorbed. Apparently the reaction has nearly run its course today, and quotations are improving at the close. There are signs also of outside buying of many stocks. Utah Copper was especially active, making a high point at $53, with some loss at the close.

The Curb followed the lead of the Exchange quite closely. The copper stocks were in demand at higher prices, but with some loss today. Nevada Consolidated was the leader in activity, but North Butte and Miami also sold largely. The Nevada gold stocks revived from their recent inactivity and sold largely. Cobalt stocks were also in demand at higher prices.

The Granby Consolidated Mining Company has declared a quarterly dividend of $2 per share, payable in December. The last dividend was paid in June.

The advertising of Utah Copper Company [illegible] W. [illegible] he is still in possession of an option on stock in that company, given to him by the Guggenheims, when arrangements were made for the marketing of the Yukon Gold Company.

Boston, Nov. 10—The market has been strong and active most of the the week, with advancing prices. Offerings of stocks were readily taken up. Yesterday there was a halt in the advance, and some taking of profits; but the market showed no loss in volume of transactions, and no marked recession in prices. The trading has continued broad. The market is making a good record. The five days from Wednesday to Monday, inclusive, show 666,010 shares dealt in, with Saturday's total of 116,428 shares in two hours, a record for this year. Copper stocks, while active, had an easier tendency today; price changes were not pronounced, the market holding steady in most cases. Dealings included over 4000 Utah Copper, 2000 Utah Consolidated, 4500 Amalgamated, 3500 Butte Coalition, and 4000 North Butte, with numerous other active specialties.

Copper Range sold off 50c. to $82, rallying to $82.50 again; Utah Copper lost $1, to $50.75; Utah Consolidated lost $1, to 44.25, but recovered to $45.75; Calumet & Arizona dropped $2, to $125, but recovered $1 of the loss.

Quincy's December dividend is $1 per share, which compares with $1 in September, and $2 a year ago.

STOCK QUOTATIONS

NEW YORK Nov. 10

Name of Comp.	Clg.
Alaska Mine	[illegible]
Amalgamated	87⅜
Anaconda	52¼
Balaklala	‡2 1/16
British Col. Cop.	7
Butte & London	....
Butte Coalition	28½
Colonial Silver	11/16
Cum. Ely Mining	8
Davis Daly	3¾
Dominion Cop	1
Douglas Copper	3⅜
El Rayo	4⅜
Florence	4⅜
Foster Cobalt	.55
Furnace Creek	18
Giroux	4
Gold Hill	[illegible]
Goldfield Con.	6¼
Granby	107
Greene Gold	⅜
Greene G. & S	9
Greenw'r & D.Val.	‡ 75
Guanajuato	1¼
Guggen. Exp.	185
Hanapah	15
McKinley Dar.	1 20
Micmac	3¼
Mines Co. of Am.	1
Mitchell Mining	
Mont. Sho.C	⅞
Nev. Utah M. & S	3
Newhouse M. & S	5½
Nipissing Mines.	11
Old Hundred	1
Silver Queen	1 18
Stewart	11/16
Tennessee Cop'r.	44½
Tri-Bullion	1
Union Copper	⅞
Utah Apex	6
Utah Copper	50¾
Yukon Gold	4⅜

BOSTON Nov. 10

Name of Comp.	Clg.
Adventure	9½
Allouez	41
Am. Zinc	25
Arcadian	4¾
Arizona Com	36¾
Atlantic	18
Bingham	‡.30
Boston Con	17¼
Calumet & Ariz.	126¾
Calumet & Hecla.	695
Centennial	35½
Con. Mercur	.40
Copper Range	82½
Daly West	11
Franklin	15¼
Greene—Can	12¼
Isle Royal	23⅞
La Salle	15½
Mass	6¾
Michigan	15½
Mohawk	71
Nevada	20
North Butte	88¼
Old Colony	60
Old Dominion	57½
Osceola	125
Parrot	29
Quincy	99
Rhode Island	5⅛
Santa Fe	2¼
Shannon	18¾
Superior	29
Tamarack	87
Trinity	19
United Cop., com.	16¼
U. S. Oil	28
U. S. Smg. & Ref.	43¾
U.S.Sm. & Re.,pd.	46½
Utah Con	45
Victoria	5¾
Winona	7
Wolverine	154
Wyandotte	2¼

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	30
Am. Smelt. & Ref.	97⅜
Am. Sm. & Ref., pf.	108
Bethlehem Steel	25⅝
Colo. Fuel & Iron.	39¾
Federal M. & S.,pf.	88
Inter. Salt	14¾
National Lead	85½
National Lead, pf.	105⅝
Pittsburg Coal	12¼
Republic I. & S.	27¼
Republic I. & S.,pf.	97
Sloss-Sheffield	78¼
Standard Oil	630
U. S. Red. & Ref.	13¼
U. S. Steel	54¼
U. S. Steel, pf	112¼
Va. Car. Chem	38½

BOSTON CURB

Ahmeek	‡120
Black Mt	4
East Butte	8
Hancock Con	10½
Keweenaw	6⅞
Majestic	.74
Raven	.99
Shawmut	.10
Superior & Pitts.	‡14
Troy Man	‡.25

ST. LOUIS Oct. 31

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.04	.03
Center Cr'k	1.80	1.50
Cent. C. & C.	66.00	65.00
C.C. & C. pd.	76.00	74.00
Cent. Oil	110.00	100.00
Columbia	6.00	4.00
Con. Coal	21.00	19.00
Doe Run	125.00	110.00
Gra. Bimet.	.30	.25
St. Joe.	15.00	12.50

LONDON Nov. 11

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 1 3
Camp Bird	0 15 9
Esperanza	3 3 9
Tomboy	1 1 3
El Oro	1 5 0
Oroville	0 8 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 11.
Furnished by Weir Bros & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	27
Best & Belcher	.47
Caledonia	.17
Chollar	16
Comstock	‡.24
Con. Cal. & Va.	61
Crown Point	25
Exchequer	35
Gould & Curry	17
Hale & Norcross	43
Mexican	73
Ophir	1.87
Overman	15
Potosi	16
Savage	42
Sierra Nevada	.34
Union	29
Utah	04
Yellow Jacket	52
TONOPAH STOCKS	
Belmont	1.15
Extension	59
Golden Anchor	.01½
Jim Butler	.23
MacNamara	55
Midway	29
Montana	78
North Star	06
Tono'h Mine of N.	7 00
West End Con	51
GOLDFI'D STOCKS	
Adams	04
Atlanta	24
Booth	.35
Columbia Mt	20
Comb. Frac	1.34
Cracker Jack	05
Dia'dfield B. B. C.	.14
Goldfield Belmont	05
Goldfield Daisy	97
Great Bend	35
Jumbo Extension	.31
Katherine	...
Kendall	14
Lone Star	08
May Queen	.06
Oro	14
Red Hill	23
Roanoke	...
Sandstorm	24
Silver Pick	.14
St. Ives	24
Triangle	04
BULLFROG STOCKS	
Bullfrog Mining	‡.03
Bullfrog Nat. B.	‡.04
Gibraltar	03
Gold Bar	‡.03
Homestake King.	.14
Montgomery Mt.	‡.05
Mont. Shoshone C.	.87½
Original Bullfrog.	‡.01
Tramp Cons	15
MANHAT'N STOCKS	
Manhattan Cons.	‡.05
Manhat'n Dexter.	‡.03
Jumping Jack	‡.03
Stray Dog	‡.03
MISCELLANEOUS	
Golden Boulder	‡.05
Bonnie Clare	.08
Lee Gold Grotto	...
Nevada Hills	1.50
Nevada Smelting.	.87½
Pittsburgh S. Pk.	.97
Round Mt. Sphinx	.18

COLO. SPRINGS Nov. 7

Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	‡3½
Dante	6¼
Doctor Jack Pot	7
Elkton	65½
El Paso	48¼
Findlay	‡19½
Gold Dollar	8
Gold Sovereign	3½
Isabella	26⅞
Index	....
Jennie Sample	2¼
Jerry Johnson	‡3⅞
Mary McKinney	28
Pharmacist	‡3⅝
Portland	1.02
Un. Gold Mines	4
Vindicator	82
Work	8½

Assessments

Company.	Delinq.	Sale.	Amt.
Amador, Ida	Nov. 20	Dec. 19	$0.02
American Fork, Utah.	Oct. 28	Nov. 25	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Columbus Ext. Utah	Nov. 13	Nov. 25	0.01
Con Cal. & Va., Nev	Nov. 24	Dec 15	0.20
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Gould, Mont	Nov. 7	Dec. 7	0.05
Imlay, Utah	Nov. 11	Nov. 28	0.01
Liberty, Utah	Nov. 5	Dec. 2	0.03
Lucky Dutchman, Nev	Nov. 21	Dec. 12	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
Mountain Monarch, Cal.	Oct. 24	Nov. 24	0.05
N. Y. Bonanza, Utah	Nov. 5	Nov. 25	0.02
Overman, Nev	Dec. 2	Dec. 23	0.05
Penn. Con., Cal	Nov. 2	Nov. 25	0.10
Seg. Belcher & Mides, Nev.	Nov. 7	Nov. 28	0.03
Silver King Con., Utah	Nov. 4	Nov. 25	0.05
Utah-United, Utah	Nov. 10	Nov. 27	0.01
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	......	27.154	......
December	54.565	......	25.362	......
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November.	13.391	......	13.870	......	61.226	......
December.	13.163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87.007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year.	38.160	..

Prices are in cents per pound

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	......	4.775	......	21.438	.....
December	4.254	......	4.104	......	20.075	.....
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, NOVEMBER 21, 1908. NO. 21.

Metallurgical Practice at Hacienda de la Union

Barrel Amalgamation Is to Be Replaced by Cyaniding with Tank Agitation, the Same Improved Chilean Mills Being Used for Fine Grinding

BY FRANCISCO NARVAEZ*

The Hacienda de la Union in the [illegible] of Pachuca is a custom mill which treats 100 metric tons per day. The fact that in the last five years it has divided among its 3000 shareholders the sum of 730,000 pesos in dividends besides spending for new machinery 100,000 pesos, should lend interest to a brief description of our present system of treatment. Perhaps there may also be points of interest to the cyanider in Mexico, where this system is making rapid progress, as well as to those active in this process in other countries.

In the many articles which I have read in American journals referring to our systêm of amalgamation, commonly known as the "patio process," I have noticed that great prominence is given to the exotic or poetic features, superficial reference only being made to the chemical reactions; scarcely any attention is called to the all-important part that the grinding plays. The chemical reactions have been developed according to the natural, elementary principles of the science. The reactions which take place in pan and barrel amalgamation (the system used in this mill) are, in my opinion, entirely the same. The pan process is better adapted to relatively poor ore on account of its greater rapidity, the suppression of some secondary reactions, more nearly perfect contact with the reagents and a higher temperature. These conditions obtain more or less in each system; they are best realized in the barrels, in the pans to a less degree and in the patio but imperfectly.

The patio, pans and barrels all require fine grinding; the material must be as fine as that which in the cyanide process is called slime. Even though there are some pan-amalgamation mills where grinding is somewhat coarse, their results are not satisfactory except when the ore is free milling. In the old Hacienda de San Francisco built by M. P. Boss, the installation of regrinders proves that fine grinding is necessary to obtain the best results. It is well known that the primitive system of grinding ores in the arrastre for the patio process gives a very fine, almost impalpable product; although mechanically a poor grinder, yet I do not think that there can be found another machine which does such fine grinding as the old arrastre. The cost of the old system is, however, so high that it has been replaced by more economical machines, generally Chilean mills of which there are many makes and classes, each maker, as in the case of watches and pistols, claiming to have the best.

When treating ore by either of the amalgamation systems named which require fine grinding, or by an all-slime cyaniding system, it is necessary to have a mill which will give a sufficiently fine product. Although Chilean mills are well known, the following description may perhaps prevent the choice of a type that would give trouble.

The wheels of a Chilean mill in general are subject to two principal movements, one around their horizontal axes and the other around a vertical axis that lies be- [illegible]

The movement of the wheel around its horizontal axis serves to break the ore; and its efficiency depends upon the weight of the wheel and the time that the ore is subjected to the action of that weight; so that the greater the weight and the lower the velocity the greater the efficiency. The movement of the wheel around the vertical axis exerts a rubbing action on the ore owing to the fact that the part of the tire nearest the vertical axis has to travel in a given time a shorter distance than the outer part of the tire, thus making the interior part of the tire "kick back" the distance that the travel of the outer part exceeds that of the interior, and producing a pivoting motion with an imaginary pivot in the center of the tire. This action is more energetic as the wheel approaches the vertical axis and diminishes with increasing distance from this axis, for it is plain that if the radius of the die were enlarged infinitely the die would become a straight track upon which the wheels would only rotate.

This rubbing action is what slimes the ore, and its efficiency increases as the weight of the wheel is increased and diminishes as its velocity is decreased and its distance from the vertical axis is reduced, as demonstrated above. The natural conclusions to be derived from the arguments already stated are that a Chilean mill appropriate for sliming should have besides a simple mechanism little subject to breakage, heavy wheels and [illegible] speed. [illegible] the mill here described and illustrated will fill the

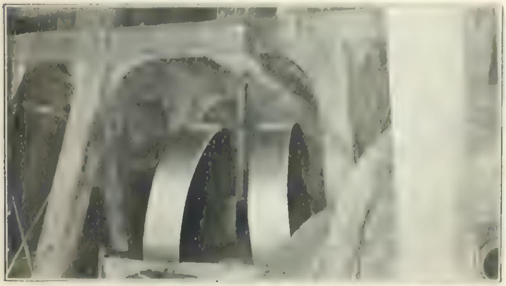


FIG. 1. OLD CHILEAN MILL

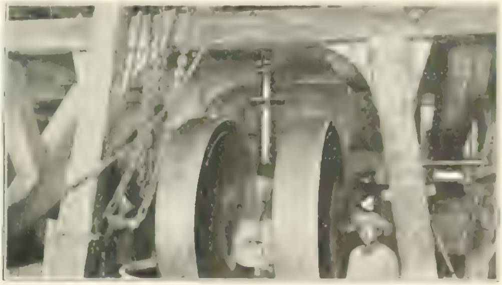


FIG. 2. IMPROVED CHILEAN MILL

---

*Manager, Hacienda de la Union, Pachuca, Mexico.

requirements I leave for my reader to judge from the work that it does.

In the mill shown in Figs. 1 and 3, the wheel is secured by its shaft *N* in its horizontal axis to the hub *M* by a vertical pin, *N* being fitted in a hole so that it has no play. The hub *M* has a square hole through which the vertical shaft passes allowing the wheels an independent vertical movement, the hub slipping down on the vertical shaft as the tires and die are worn. The vertical shaft terminates in a step bearing *G*. The wheels are 8 ft. in diameter; they have a 16-in. face and weigh about eight metric tons when the tires are new. The mill is fed ore 1½ in. in size from a feeder and discharges by means of an overflow 23 in. high on the opposite side from the feed of ore and water.

This mill has various defects. With such heavy wheels it will be easily understood that the pin *N* is not strong enough to prevent the development of too much play almost immediately, even though the hub be reinforced. As the ore falls on the outer circumference of the die of the mill the outside of the tire must crush it first, and owing to the play of the horizontal shaft in the hub, the wheel has a tendency to incline toward the center, a tendency which is more marked as the pin *N* wears. After a month or so the wheels take the position shown in the illustration, Fig. 1. This position does not permit total contact between tire and die, thus reducing the useful surface of the tire and the capacity of the mill. In this condition, also, the mill requires much more power, and a horizontal shaft frequently breaks causing a stoppage of two or three days. This mill has also the inconvenience of using conical gearing. As the step bearing wears down the gears, little by little, get out of mesh. Even though the mill is started by a clutch, there is great risk of breaking teeth in the pinion or crown wheel, the latter costing 300 pesos, to say nothing of the lost time.

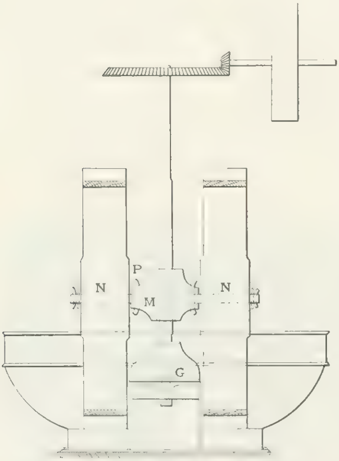


FIG. 3

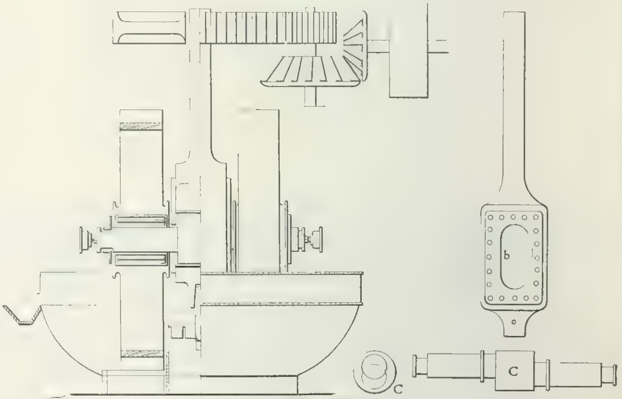


FIG. 4

The New Mill

All these troubles have been overcome in the mill shown in Figs. 2 and 4. The two wheels are joined by one 8-in. shaft upon which is formed an eccentric *C*. The shaft moves in a square box in the vertical shaft which is a bearing for the eccentric. This eccentric is secured in the vertical shaft by two plates bolted on the sides of the box *b*, which permits a vertical play for this bearing of about 14 in. The mill is driven by spur gear, and the gears have teeth of sufficient length to be always in mesh as the step wears. It will be easily understood that when the two wheels are joined together as in the mill, it is impossible for one to lean toward the center without making the other lean toward the outside; consequently, they remain vertical, the full surface of the tire works on the die, and the capacity of the mill does not diminish as in the case of the mill shown in Fig. 1.

At the Hacienda de la Union we use no screen with this mill but discharge by an overflow 23 in. above the die. As the wheels make only 10 r.p.m. the agitation is so slight that the pan of the mill acts as a classifier, permitting the heavier particles to sink and allowing only the fines to be discharged. The water facilitates the discharge; and my experience has been that the more water we use, the greater the capacity of the mill. We now use about ten of water to one of ore. This mill consumes 10 h.p. and its shafting requires 3 h.p. The accompanying table gives the average of more than 30 screen tests.

SCREEN ANALYSIS OF NEW CHILEAN MILL PRODUCT.

Original assay of ore, 1102 grams silver per metric ton.

	Per Cent. Ore.	Silver, Grams.	Per Cent. Ore Value.
Original assay of ore.	.....	1102	.....
Finer than 200 mesh.	80.0	1290	93 65
Between 200 and 150.	4.75	626	0.27
" 150 and 100.	13.45	385	0.47
" 100 and 80.	1.50	355	0.48
On 80.	0.41	346	0.01

Such grinding is practically sliming. It will be noticed that the coarse material assays much less than the fine, that passing 100 mesh carrying more than 94 per cent. of the value. This is to be expected for the ore carries mostly silver sulphide in anorthite gangue.

Cost and Capacity

This mill costs 15,000 pesos installed, its rather high price being one of its drawbacks, although we have worked one for 12 years, and aside from its wearing parts it looks as though it would last another equal period. In calculating the cost-per-ton-ground in this mill, we will charge the original cost of the mill off in 10 years, and as the tires of a mill always last, in good condition, two years (we have had them last two years and eight months) we will divide the expenses over 730 days. Including a 10-per cent. annual depreciation all costs for two years are as follows:

Mill	3,000.00 pesos.
Power, 10 h.p	3,433.92
Belt, 15 meters at 8 pesos	120.00
One peon at 2 pesos per day	1,360.00
Lubrication	156.00
Sundries	100.00
Total	8,269.92 pesos.

The mill grinds at least 15 tons of ore every 24 hours (it can be made to grind 20 tons per day) so that in 730 days it grinds 11,950 metric tons. Dividing 8,269.92 pesos by 11,950 tons, we have a cost per ton of 69 centavos or 35c. gold. To this cost must be added the breaking of the ore to 1.5 in., which is the best size of feed for this mill. The ore is ordinary quartz with about 25 per cent. fines, and has the usual hardness of quartz.

Present Method of Treatment

Under our present system of treatment the ore after being ground is run to settling tanks, and when the weather permits taken out and sun-dried in patios. When the weather is unfavorable, the pulp is dried in tube-driers after which it is sampled and weighed before treatment in the barrels. After drying it is elevated in cars to hoppers above the barrels where it is fed in five-ton charges. The barrels are first charged with a boiling solution of protochloride of copper and brine. After agitating three hours in this solution we add from one to two kilos of zinc shavings, according to the assay value of the ore. The silver, now converted from silver sulphide to silver chloride, is then precipitated by the zinc and amalgamated with the mercury which has been previously added in sufficient quantity. The results of this treatment are very satisfactory; we obtain from 90 to 95 per cent. of the silver from ores assaying 1000 to 1800 grams per ton. Our gold extraction is much lower, being only 45 to 50 per cent. in the amalgamation, with an additional small percentage obtained by a final concentration made in a very primitive way.

One of the great inconveniences of this system is the necessity of drying the charge before treatment in the barrels. This drying is necessary for two reasons, one physical and the other chemical. When the ore is not dried sufficiently, it forms compact lumps that are broken up with great difficulty by contact with the agitators in the barrel. The interior of the unbroken lumps has no contact with the chemicals, these being shut out by a covering of fine slime which makes the lumps impervious. As I said before, the chemical reaction is more active the higher the temperature. Now, in order that the mercury may become perfectly distributed, the ore under treatment must not have more than about 27 per cent. moisture; and in order that this boiling solution may heat the charge as much as possible, the ore should be as dry as possible. I have found that a choice of 5 to 6 per cent. moisture in the charge is the most advantageous practice.

I have not found an economical system of drying. What we use at present is a revolving tube with interior longitudinal blades. These take up the ore and allow it to fall as the tube revolves, while through the latter passes the flame of the drying fire. An inconvenience met in the use of this drier is the sticking of the slime to the sides, forming a lining which little by little hardens and impedes the good work of the drier. It also acts as a separator of sand and slime which causes difficulty in determining the moisture of the charge for treatment in the barrels. This drying of the pulp requires much handling, and costs about 1.80 pesos per ton, making the whole treatment cost from 13 to 14 pesos.

In view of these difficulties, to which has now been added the prolonged low price of silver which up to a certain point obliges us to lower our cost of treatment, we seriously considered the cyanide process which was giving good results at Guanajuato and was at that time being installed at the Hacienda de San Francisco, in Pachuca.

All-slime Cyanide Process

A series of experiments was made on a small scale using 400 grams of ore in flasks to decide on the proportion of solution to ore and on the strength of cyanide solution as well as its proper alkalinity. Later, seeing the advantages of the Brown tank agitation system we considered using it and experimented with lots of 50 kg. in a small experimental tank. We confirmed our bottle tests, and found that in 36 hours we could extract all that it was reasonable to expect. We did not need to consider replacing our grinding system, as its product was sufficiently fine and economical, the only change necessary being the changing of seven of the old type mills into the new type and the arrangement of a system of bins, elevators, etc. (the site of our plant being level), in order to place the ore cheaply in the mechanical feeders.

These points decided, we made a num- [illegible] new type mills of which the results are given in the accompanying table which shows the average results obtained during 20 tests which we made to obtain sufficient solution for precipitation tests as well as to give our employees practice in assaying solutions. The samples weighed 50 kg. and we used three parts of solution to one of slime, the solution carrying 0.10 per cent. of KCN and a protective alkalinity of 0.15 per cent. lime (determined by Clennel's method). We took samples every four hours, and observed that by replacing the lost cyanide each time our results were better, so we followed this practice in all the tests.

As will be observed, the ore of the tests represented in the table assayed 1200 grams silver and 5.4 grams gold per ton. We did not concentrate and still we extracted 90 per cent. of the silver and 94 per cent. of the gold, consuming 700 grams of cyanide (1.55 lb.) per ton of solution, or 4.65 lb. per ton of ore. The curve in Fig. 5 is a diagram of the results tabulated, showing the extraction of the [illegible] diagram of the variation proportional in the silver extraction, taken from the last column of the table. The first is a section of a parabola. This was to be expected since the ore is hard, compact and impermeable. The extraction will be proportional to the surface of the silver mineral exposed to the action of the solution. It will also be inversely proportional to the square of the varying diameters of the ore particles as they dissolve, so that the curve in Fig. 5 must be a parabola.

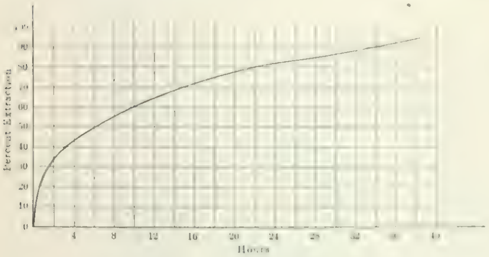


FIG. 5. DIAGRAM OF SILVER EXTRACTION

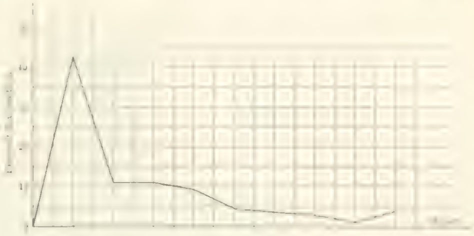


FIG. 6. PROPORTIONAL VARIATION IN SILVER EXTRACTION

[illegible]

It is curious to examine the second curve in which it is seen that in the first four hours in contact with the solution an extraction in excess of 40 per cent. is made, and that in the second and third period of four hours there is no more than an additional extraction of 10 per cent in each lapse of time. The extraction is, of course, much less in the succeeding intervals of four hours. This result also should be expected. If we consider the particles of mineral as spheres of very small diameter, these particles in the beginning present to the action of the solution a certain surface which we may call "active surface." Now, if we suppose that the particle is dissolved in superficial spherical layers, and if, as we have seen, 40 per cent. is dissolved in the first four hours, we must not expect to dissolve another 40 per cent. of the whole value in the second four hours, since the ore does not present, in this time, the same active surface to the action of the solution. If by any means it were possible to expose the same active surface during the second and succeeding periods, the curve of extraction would not be a parabola, but would be a straight line. Shall we ever be able to obtain a result like this?

As a result of the study of these results we decided to install an all-slime plant without interrupting the actual present operations which give us life. Taking part of an ore-drying patio, we are now building Brown agitation tanks, Moore vacuum filters and installing zinc precipitation equipment. We have reason to expect the best of results from this plant, and I give these data to the public with the hope that they are of interest, and that they may arouse some discussion from my worthy colleagues in the profession.

Transvaal Mining Notes

SPECIAL CORRESPONDENCE

In previous correspondence it was mentioned that two new producers were likely to appear upon the list in the Bantjes Consolidated and the Vogeltruis Consolidated Deep. Meetings have been held by the shareholders of both these financially allied companies and provision made for the prosecution of development operations, preparatory to milling. The former mine has not been touched since the war, while the latter was closed down—to await "better times" —in 1906. Orders have been put out for two batteries to serve these mills and, as a further indication of the recognition of the merits of heavy-stamp practice, they are to be equipped with stamps of 1650 to 1750 pounds.

The reader who learns of the rapid growth of the Rand industry today—of new mills commencing operations and others placed under construction—may well inquire about the unskilled-labor problem, which we were told was the great obstruction to Rand progress a little while ago; and of the Chinese repatriation, which was to constitute a final blow to full expansion. The abnormal influx of Kafir laborers, following exceptional circumstances, has for the time being placed the question out of the sphere of anxious concern and the fears of investors are discreetly not raised by its revival.

FAULTS AND LOSSES

The long list of favorable developments reported in mines extending from the far east to the far west of the Rand has provided good cause for the greater hopefulness now prevalent in all mining circles. There is scarcely a single mining interest without some new center of special promise. But a complete absence of disappointments could not be expected in a field of such wide activity. Because, therefore, the dropping away of the French Rand mine from the profit-makers has occasioned considerable comment, it is clear that features of a regretable nature are neither serious nor abundant. This mine, situated in the West Rand upon a greatly faulted section immediately beyond the great Witpoortje Fault, has paid dividends for 1906, 1907 and 1908, but has now fallen upon evil days. Substantial losses have been declared for July and August. The cause of this relapse can only be found in those vicissitudes of fortune to which even the best Rand mines are at times liable. An impoverishment of the average grade and a corresponding enrichment of perplexing faults are generally understood to be the features of recent development.

By the beginning of next year there will be over 9000 stamps in operation upon the field. With the Simmer Deep, Cinderella Deep, Knight Central and West Rand Consolidated mills nearing completion, one takes small risk in advancing this estimate. As all these new plants are equipped with tube mills the significance of the increase in number of heads dropped is greater than is at first apparent. The number of stamps at work on a property ceases to be a satisfactory basis for rough estimate of crushing capacity, as it was in pre-tube-mill days of 5- to 6-ton stamp duties. For instance, we may contrast the neighboring Luipaardsvlei Estate and French Rand mines, the former putting through over 17,000 tons per month with 60 stamps and tube mills, and the latter about 16,500 with 120 stamps. The new 60-stamp mill of the West Rand Consolidated, to be started in a week or two, should represent a crushing capacity almost equal to that of the Luipaardsvlei.

TIN MINES

A new alluvial tin proposition of payable value appears to have been opened up in Swaziland, near the producing area of Eckstein & Co's. venture. This is called the McCreedy. The tin occurs in hill deposits in ragged and sharp-edged aggregates, varying in size from a 1/16 in. to 1 in. or more. Arrangements are being made for the treatment of 800 to 1000 tons of dirt per day, and according to the estimate of the consulting engineer a yield of $120 per ton is to be expected. The experience of South African tin mining to date, however, has been unfortunate.

The report upon the results of the State tin-mine experiment has been published and the cost of the failure indicated by the showing that the ore produced (61½ tons) was worth £1947 and the cost of production £7000. In addition 200 tons of 5 per cent. ore were sold for £420 on condition that the purchaser installed a small treatment plant for use in the district.

NEW SHAFTS

The seven-compartment shaft of the South Rand, on the dip of the Crown Deep, is now well under way, and over 100 ft. has been made. At present buckets are being used, but sinking will shortly be performed with skips. Work will be directed by W. Sauer, who sank the Turf mines (unfinished) and Village Deep shafts and who is a steadfast supporter of skips in deep sinking.

Another sinking record has been established upon the Brakpan mines. During August no less than 261 ft. were sunk in No. 1 incline shaft, with six 3¼-in. Holman drills. This shaft measures 19x7 ft. from rock to rock. Even making full allowance for the good breaking qualities of the deep ground exploited and for the shallow dip of 13 deg. which allows the rock to be blasted clear of the face, this record is wonderful in the light of all previous Rand experience. Records both in vertical- and incline-shaft sinking have been established upon this property.

NEW MINES

Some little excitement has been caused by a remarkable development in the far West Rand upon the property of the South Randfontein Deep—which, as its name suggests, was considered a deep level of the Randfontein outcrop line. It has been found, however, that the Leader and West Reef worked by the Randfontein mines take a sharp turn eastward from Stubb's Randfontein into the property of the company mentioned. So far very little has been done to prove the new strike, but a favorable report upon the occurrence, based upon some high assay values, has been issued by the consulting engineers of the Newmann and Goerz groups, which are interested in the holding.

A company with the alluring title of the "New Rand, Ltd.," which holds extensive properties to the south of the Vaal river, and about 50 miles to the south of Johannesburg, has managed to obtain the funds for further prospecting its ground by diamond drilling. It is the opinion of the responsible engineers that the lower and upper Witwatersrand beds have already been located beneath the flat and comparatively recent sandstone and shale beds of the Karroo system and that it only remains for them to locate the Main Reef horizon (at the southern edge of the Sycline) by further boring in the light of evidence already obtained. The enterprise is a hazardous one in the extreme, but not without highly attractive features to those fully prepared for a daring geological gamble.

Improvements at the Oronogo Circle Mill No. 5

The Introduction of Equipment for Settling and Treating Fine Material Has Increased the Recovery by about 10 Per Cent

BY OTTO RUHL*

In addition to the ordinary chert or flint gangue found in the "sheet ground" belt in the Joplin district, there is in a number of mines a peculiar black secondary chert which, when occurring as the prevailing gangue matter, makes the concentration of the ores a problem of more than ordinary importance. It is to the solution of this problem that the milling practice of the Oronogo Circle Mill No. 5 brings some entirely new features.

The Oronogo Circle Mill No. 5 is operating upon a sheet orebody found at a depth of 212 ft. The ore carries a varying percentage of zinc blende running from 4 per cent to as high as 20 per cent, the usual daily run varying from 4 to 6 per cent. There is considerable free ore and also some blende which acts as the cementing agent of a blue flint breccia. However, the prevailing gangue is a hard, black chert, with which the blende is very intimately mixed. This mixture acts as the cementing substance to the brecciated blue and white chert and limestone, making a highly complex ore.

The specific gravity of the black secondary chert is much higher than that of ordinary blue or white chert. It is also tougher and fractures less easily. Some of the ore must be crushed extremely fine to effect the saving of a clean concentrate with little loss in the tailings. This crushing means a loss in fines unless a careful sizing of the ore and a complete settling of all the water used in the milling operations are accomplished. These two features distinguish the milling practice of this mill from that ordinarily found in the sheet-ore belt.

The mill was built to handle 300 tons of ore daily per [illegible]. It consists of three buildings, the main milling plant, tailings mill, and power house. The power equipment consists of four 150-h.p. high-pressure boilers which furnish power to two air compressors of a capacity each of 1,500 cu.ft. of free air per minute, and one 185-h.p. engine which drives the machinery in the main milling plant. In addition these boilers furnish steam for a 60-h.p. engine which drives the machinery of the tailing mill and also steam for the hoisting engine.

First Part of the Process

The ore on being hoisted from the shaft is dumped into a hopper holding 600 tons, or enough for two 10-hour shifts. An [illegible] from the hopper over a grizzly. The undersize goes directly to the dirt elevator while the oversize goes to a 24-in. Blake crusher. This reduces the ore until it is ready for the first set of 36-in. rolls. These crush the ore so that a large proportion of it will pass a ½-in. screen. From this set of rolls the ore goes to the dirt elevator which dumps into a separating box, half of the ore going to each of two trommel screens, 36x72 in., with ⅓-in. perforations. The oversize [illegible] to the second rolls, whence it is returned to the trommels.

Oronogo Circle Mill No. 5

The undersize goes to the rougher jig, which is a double jig consisting of two ordinary jigs built back to back. Each jig has four cells, each cell being 34x48 in. in size. The undersize from each trommel furnishes the ore for its corresponding jig. These roughers make four products: The hutch from the first two cells goes to a second jig called the "first cleaner;" the middlings, together with the hutch from the last two cells from each rougher go to a third set of rolls 24 in. in size, which is the introduction to what might be termed the second of chat mill;

---

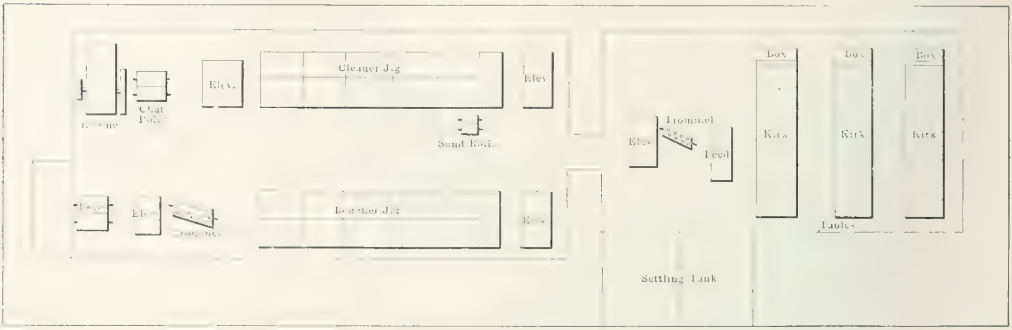
*Webb City, Mo.

the tails go to a settling box from which the overflow goes to a general settling tank for the fines for the first sludge mill; while the hutch goes to the tailing mill.

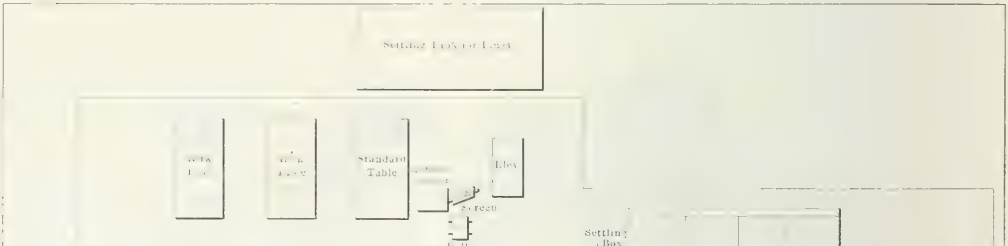
The cleaner jig has six 28x42-in. cells. This jig makes four products. The hutch from the first five cells is concentrate, and goes to the ore bins, the product of the first cell being lead and the other four blende. The tails go to the general settling tank of the first sludge mill, while the middlings and hutch from the last cell go to a third set of rolls.

Jigs and Settling Boxes

To this set of rolls, the first process in the chat mill, is fed the hutch from the last two cells of the double rougher and the hutch from the last cell of the cleaner, together with the middlings from both roughers and the cleaner. These are now crushed to pass a ⅜-in. screen, the oversize being returned to the rolls and the undersize passing to the third rougher jig. This jig has four 30x42-in. cells. The hutch from the first two cells goes to the second cleaner jig; the middlings and hutch from the last two cells are sent to a set of chat rolls and are returned over the same rougher jig. The tails go into a settling box, the hutch from which passes to the tailings mill and the overflow to the settling tank for the first sludge mill.



TAILINGS MILL, ORONOGO CIRCLE MILL NO. 5



GROUND PLAN, MAIN BUILDING, ORONOGO CIRCLE MILL NO. 5

The second cleaner jig has only five cells, each of which is 24x36 in. The hutch from the first four is blende concentrate, and is sent to the ore bins. The tailings enter a settling box from which the hutch, together with the hutch from the last cell of the cleaner is returned to the third rougher. The overflow from the settling box goes to the settling tank for the first sludge mill.

This settling tank consists of two compartments, the floor of each sloping toward the elevator boot leading to the table room. At the lowest point the sand is drawn off through a spigot. Each compartment is 13x35 ft., and each serves its turn as a settling tank and as a supply for the tables. The overflow from five sources goes into this general settling tank for the fines used in the first sludge mill. From this tank the sand is elevated and is passed over a 1½-mm. screen. The oversize goes to a set of sand rolls and returns to the elevator boot. The undersize passes into a hydraulic classifier from which the slimes are sent to a Standard table, while the coarser sands are sent to two Kirk tables. These tables make three products: clean blende, galena, and tailings.

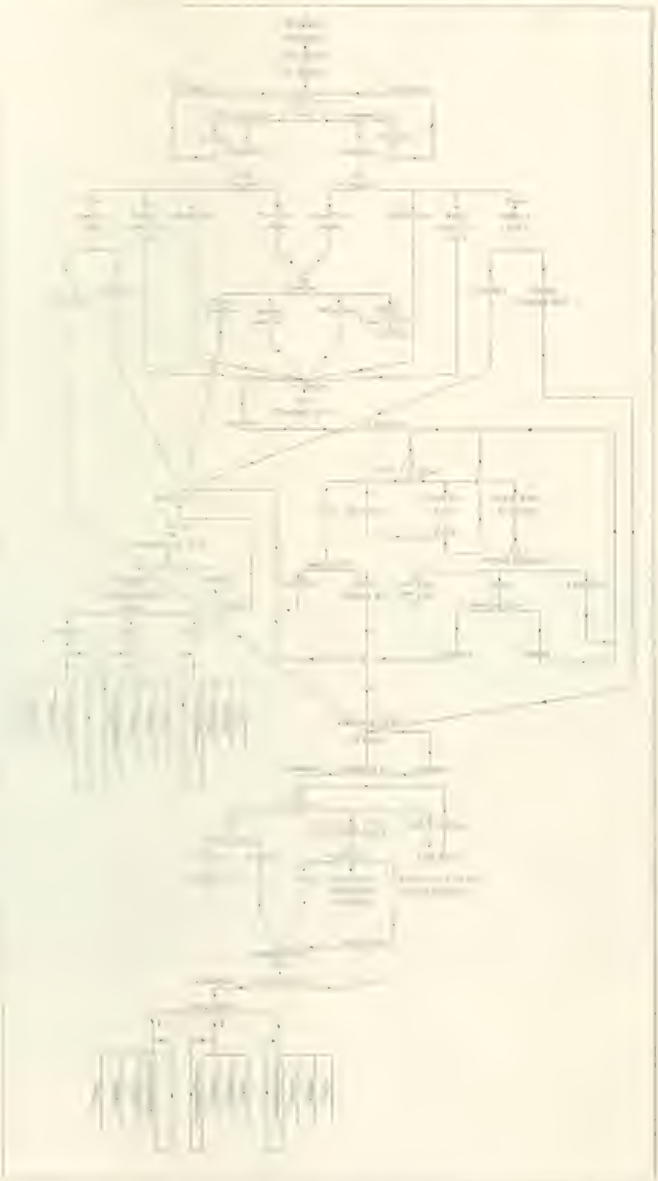
The Tailings Mill.

The tailings from the three rougher jigs of the main mill enter a tower and are flumed across to a tailings mill, in a separate building for further treatment. The tailings are passed through 24-in. rolls, reducing them so they will pass through a ¼-in. screen. The undersize goes to a rougher jig from which the hutch from the first three cells and all the middlings are sent to a cleaner jig, while the hutch from the last two cells goes to chat rolls and is returned over the rougher. The tails go to a settling box from which the hutch is drawn as final tailings, and are sent to the waste pile, while the overflow goes to still another settling tank for the second sludge mill.

From the cleaner jig of the tailings mill four products are made. The hutch from the first four cells goes to the ore bins. The tailings go directly to the settling tank of the sludge mill, while the hutch from the last cell and all the middlings go over a set of sand rolls and then to the settling tank. The sands and slimes from this settling tank are then elevated to the second sludge mill, which is a duplicate of the first sludge mill in all respects except that there is no hydraulic classifier, and the tables are all Kirk tables.

Relation of the Mill Departments

An analysis of this mill practice develops the fact that there are five separate concentrating plants utilized as one unit in handling this ore. There is a general plant analogous to the Joplin-type mill through which all the ore passes and which is designed to save only the free ore and that resulting from the crushing to [illegible]-in. size. There is a second mill analogous to the first which handles only the chats and middlings from the first mill, reducing them to ⅜-in. size. In these two mills the crushing produces a large quantity of fines, and in the tailings of the first cleaner a large amount of sandy ore is found, all of which is settled in one general settling tank for use in what may be termed the first sludge mill. The tailings of all the roughers on account of their size still contain some ore, and these are still further reduced in a tailings mill where the crushing brings the size down to ¼ in. To provide for the fines resulting from this process a second sludge mill is required.

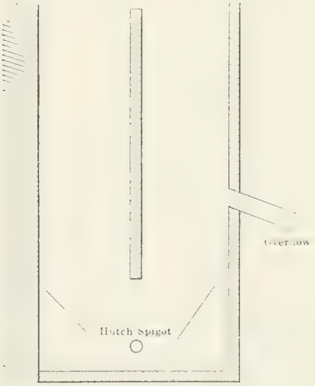


FLOW SHEET, [illegible]

This mill is the only one in the district utilizing the division of the mill into units, not only to increase capacity, but also to effect a better saving of the ores, by handling different sizes and kinds of ore in the different units.

The well known Cooley jigs are used throughout the mill. The settling devices adopted are a special feature of its construction. A settling box at the end of each rougher effects a separation of all sandy and float ores from the heavier tailings. This overflow is then settled in a general settling tank. The overflows from the cleaners are settled in the general settling tank, there being no separation of the coarse tailings from the fines, all being reduced to fines.

The exact saving made by each department of this milling practice is hard to estimate as the daily change in the character of the ore makes such an approximation unreliable. Some days when the percentage of free ores runs high, the first mill produces by far the greater quantity of concentrates, but on other days the that mill will be taxed heavily on account of the abundance of the peculiar black secondary chert in the mine run on those days. For the same reason the outputs of the tailings and sludge mills vary. However, the difference in the quantity of ore saved in the two sludge mills offers a good criterion of the relative savings of the two main divisions of the mill. The output of the second sludge mill is often less than half that of the first, owing to the thinness of the material by the time it reaches this last process. The final tailings from the rougher jig of the tailings mill still contain some blende, but the practice in vogue at this plant saves 87½ to 90 per cent. of all blende in the ore. This saving is made, too, in the face of the worst gangue conditions in the field. No mill in the Missouri-Kansas district exceeds this record, for the best practice hitherto known has done well to obtain 75 to 85 per cent. of the mineral content of the ores.



SETTLING BOX

Absorption of Gold Amalgam by Copper Plates

Edward Halse, in a paper read before the Institute of Mining and Metallurgy, discusses "accumulation," gradual formation of a hard scale of amalgam on the surface of a battery plate which can only be removed by the use of steel scrapers, by "burning," "sweating," "buckling," or other special means; and also "absorption," The amalgam that has actually been absorbed by, or has soaked into, the plate, and which, after the removal of all scale, can only be recovered by melting down the plate.

While in Colombia, South America, he carefully ascertained the amount of gold scale which had accumulated on three sets of electro-silvered apron plates during a period extending over six years. The plates were of copper ⅛ in. thick, electroplated, 1 oz. silver per square foot, the total area of each set of four plates being 93 sq.ft.

The ore milled consisted chiefly of quartz, with some free gold, which was rarely visible, and charged with from 1 to 5 per cent. of sulphides, namely gold-bearing pyrite, with some galena, which was highly auriferous and also silver-bearing, and argentiferous blende; calcite, chalcopyrite, arsenopyrite, marcasite and pyrrhotite were occasional ingredients. For a pyritic ore, it was unusually "free."

The four plates of the first set were taken up at the end of 26 months and "burnt." During that period 7915½ tons of pulp had passed over them, yielding an average of 18.82 dwt. of bullion, or 11.32 dwt. of fine gold, per ton; or 4462 tons of high-grade ore with an average yield of 32.6 dwt. of bullion, or 19.62 dwt. of fine gold; and 3453½ tons of tailings, with an average yield of 4.3 dwt. of bullion, or 2.58 dwt. of fine gold per 2000-lb. ton.

The gold scale from the four plates weighed 937 oz. and the average rate of accumulation was 2.36 dwt. of bullion, or 1.269 dwt. of fine gold per ton of ore milled.

The four plates of the second set were taken up at the end of a similar period, during which 3347 tons of pulp passed over them, yielding on an average 10.01 dwt. of bullion, or 6.02 dwt. of fine gold, also 1172 tons of tilings, with an average of 1.95 dwt. of fine gold, followed by 2175 tons of low-grade ore, with an average yield of 11.31 dwt. of bullion, or 6.80 dwt. of fine gold per ton.

The gold scale amounted to 568 oz., which is equal to an average rate of accumulation of 3.39 dwt., or 1.823 dwt. of fine gold per ton milled.

The four plates of the third set were allowed to run 24 months only. The ore crushed during that period amounted to 2869 tons of medium grade, yielding 18½ dwt. of bullion, or 11.13 dwt. of fine gold per ton. The gold scale from these plates weighed 553.68 oz., giving an average rate of accumulation of 3.85 dwt. of bullion, or 2.071 dwt. of fine gold per ton.

While working under normal conditions the average rate of accumulation of hard amalgam was found to be as much as 2 dwt. of fine gold per ton. The average fineness of the bullion (32 bars) obtained from the mill was Au 602; Ag 362; total 964. The average fineness of the scale (8 bars) was Au 538; Ag 429; total 967. Although there was a slight increase in the total fineness, as was to be expected, the gold-fineness of the scale was 64 less, and the silver-fineness 67 more, probably due to the silver originally on the plate.

In regard to the absorption of gold by copper plates, it was found that the plates in the Drum Lummon mill, Montana, retained, when the scale was removed, 8.96 oz. of gold. This corresponds to an average rate of absorption of about 0.288 gr. per ton and approximates to the returns from some other American mills.

On removing some old plates from the Sucre mill, Colombia, they were found to be only 1/16 in. thick. They were thoroughly saturated with mercury and very brittle. They had, also, a white fracture. After all the amalgam was scraped from them they were broken up and shipped to England to be melted. They yielded 4.243 oz. of fine gold. It is estimated that their rate of absorption of gold was under 1 gr. of fine gold per ton of ore milled.

It may be concluded that the absorption of gold by copper plates may generally be ignored by the mill-man in his estimates. The average rate rarely exceeds the fraction of a grain per ton milled. Where the gold is coarse it may be practically nil.

Iron Ore in Great Britain

The total iron mined in Great Britain in 1907, according to the amended returns, was 15,731,604 long tons. Ore imported was 7,641,934 tons, making a total of 23,373,538 tons. Exports were 21,877 tons, leaving a net balance of 23,351,661 tons. To this is added 576,856 tons of pyrites residue and 1,195,242 tons of forge and mill cinder, making a total of 25,123,759 of material for the furnaces. The pig iron made was 10,114,281 long tons, showing an average of 2.47 tons ore used for one ton of pig. The coal used for all purposes at the blast furnaces—including coal converted into coke—was 21,119,547 tons; an average of 2.09 tons of coal to one ton of pig iron.

Cyanide Mills, Guanajuato Development Co.—II

At Pinguico the Slime Is Concentrated on an Immense Cement Table; at Peregrina Slime in Discharging Washes away the Accumulated Sand

BY CLAUDE T. RICE

THE PINGUICO MILL

The Pinguico mill is treating 250 tons of ore per day, all of which comes from the Pinguico mine, but it is the intention to increase the capacity materially by replacing with a tube mill the Bryan mill now used for regrinding the middling from the concentrating tables. The Bryan mill will then be placed on the Chilean-mill floor to serve as a reserve in case of accident. The ore is wet and clayey, so that considerable trouble is experienced in handling it at the crushers and grizzlies, for the ore will not run over the grizzlies but must be raked over the bars in order to separate the fine and the coarse. There is now being installed a new ore bin with complete sampling plant, shaking grizzlies, a 24x15-in. Blake crusher, Vezin automatic samplers, disk pulverizers, small crushers and a return belt for distributing the ore in the bins. The mill is built on a side hill in several terraces, and was completed in November, 1907, being the newest mill in the district.

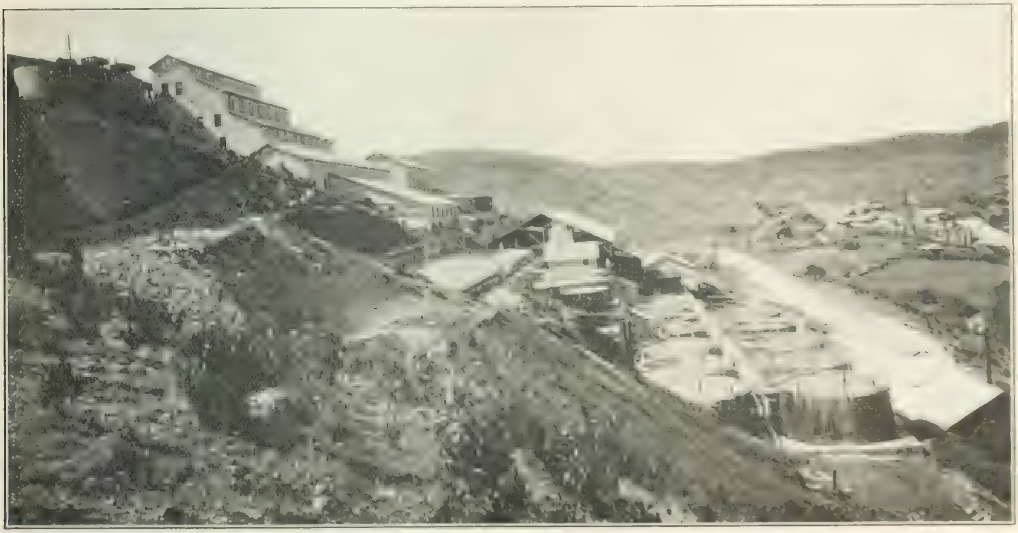
The ore is first broken in two 9x12-in. Blake crushers to 1½-in. size, and then goes to the 600-ton bin above the 40 stamps. The battery frames are of wood, with the sills and braces butted up against the mill bin, being held by long bolts [illegible] battery bins, vertical tension rods also helping to steady the battery frame.

The mortar blocks and foundations are built of cement and concrete placed on solid rock. The stamps weigh 1050 lb. and drop 104 times per minute through a hight of 6½ in. in an Allis-Chalmers No. 120 mortar. The stamps are arranged in units of 10, each run by separate belt, there being a line shaft driven by separate motor for each set of 20 stamps. On the batteries coarse screens are used, for the ore is reground in two Chilean and one Bryan mill. In order to keep the ore distributed evenly in the battery bin the two five-stamp batteries in front of the crushers crush through 2-mesh screens, the battery on each side through 4-mesh, and the two end batteries through 8-mesh screens. This practice is modified to suit conditions, according to the amount of ore in the bins, condition of treatment tanks, etc. Suspended Challenge feeders are used and crushing is done in cyanide solution titrating 0.2 per cent. KCN.

The pulp from the batteries goes to two 6-ft. Akron Chilean mills; these make 31 r.p.m., and crush through 30-mesh Tyler rolled-slot screens. The pulp then goes to two large spitzkasten.

[illegible]

The overflowing slime from the spitz-[illegible] long (in the direction of the flow) and 6 ft. wide, being divided into 29 sections and having a grade of 1½ in. per ft. This table was made by terracing the hillside and covering the terrace with a thin layer of concrete and then grouting the surface with a thin layer of clean cement. This cement surface was then roughened into riffles ⅜ in. deep and 1¾ in. wide. [illegible] 10 ft. have been placed slats 1 in. high in order to help retard the flow of the fine sand and slime if the table should receive a sudden, exceptionally heavy feed of pulp. The pulp is allowed to flow over the table until a good load of concentrate is caught in the riffles; then the flow is shut off from one section at a time, and the concentrate washed by means of a hose into a collecting box, which feeds to a 1½-in. Traylor sand pump that sends the pulp to a classifying cone. This cone [illegible] Wilfley tables and a side discharge, 12 in. above the bottom, to a Johnson table; the overflow returns to the Dorr classifier. The tailings from the cement table [illegible]


THE PINGUICO MILL

but the tailings from the Johnson table is returned to the Dorr classifiers.

The underflow from the two spitzkasten goes to 12 Wilfley tables. The middlings from these tables are recrushed through a 40-mesh, No. 36 wire screen in a Bryan mill making 27 r.p.m., and is reconcentrated on four Wilfley tables, on which only concentrates and tailings are made. The sand tailings from all the Wilfley tables then goes to two Dorr classifiers, where the pulp is finally separated into sand and slime, the slime going to the *planilla* or cement table, and the sand to the sand-leaching tanks.

Sand Treatment at Pinguico Mill

The sand is charged by means of Butters-Mein distributors into one of 14 sand tanks, each 29½ ft. diameter by 58 in. deep (charging depth), holding 110 tons of dry sand; previous to charging the tanks are filled with mill solution so as to completely separate any slime which may have passed the Dorr classifiers. The tanks take 20 hours to fill; they are then allowed to drain 6 hours; after that they are leveled off and solution run on them. Three washes, 8.5 tons each, of strong solution titrating 0.5 per cent. KCN are added, 4 hours draining being allowed after each of the first two washes. The first two washes are returned to the mill solution so as to increase the value of the head solution going to the zinc-boxes.

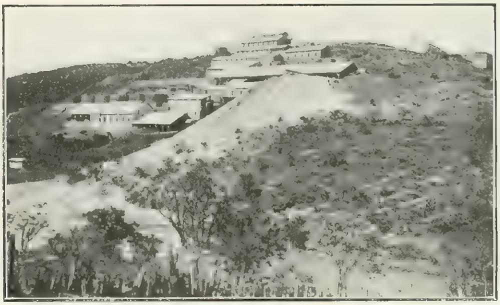
During the third wash 5 kg. of lead acetate are added, then the valves closed and the sand allowed to stand in solution for 12 hours. This wash is sent to the strong solution for precipitation. Next, washes, 8.5 tons each, of strong solution are added every 3 hours for 5 days, the sand being turned over once in the same tank during this time and all the washes sent to the strong-solution zinc-boxes. Then the charge is washed with weak solution, titrating 0.2 per cent. KCN for 72 hours; the outflowing weak solution is sent to the strong boxes for precipitation After this the tanks are washed with water for 12 hours, 6 tons being added every 2 hours. Finally the tank is allowed to drain 12 hours on night shift so that it can be discharged next day by sluicing or by shovel and conveyer belt.

Slime Treatment at Pinguico Mill

The slime is collected in one of three thickening tanks, 30x11½ ft. deep. The pulp enters through a central tube (shown in one of the accompanying illustrations) which extends 4 or 5 ft. down into the tank. A clear overflow is obtained which is returned to the mill, while the thickened slime is drawn off continuously at the bottom through three 3-in. pipes (the inlet orifice being reduced to ¾ in.) extending along the bottom to a center line through the tank.

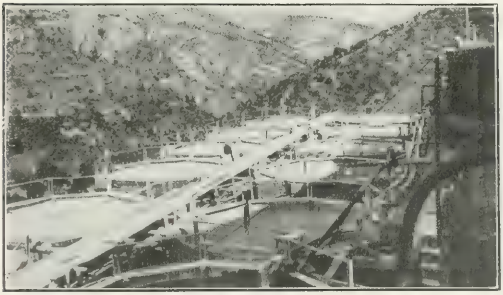
The thickened slime flows to one of two collecting tanks, also 30x11½ ft. deep, which hold about 40 tons of slime. The tank is charged for ten hours during which time sufficient slime is collected. At the end of this period 30 kg. of sodium cyanide and 20 kg. of lead acetate are added to the charge; after agitating for 6 hours the slime is transferred by a 6-in. centrifugal pump to one of the agitation tanks of the same size, where a further agitation of 24 hours is given by means of five air jets placed in the bottom of the tank. This agitation is also assisted by the use of a 6-in. centrifugal pump. This system of agitation, however, will soon be replaced, and agitation will be accomplished by means of agitating arms carrying an air pipe such as is used at the San Próspero mill. The tank is allowed to settle for 8 hours, and is then decanted in a period of 2 hours; the decanted solution goes to a series of three storage tanks through which it flows and from which it is finally decanted to the weak zinc-boxes.

The slime is next given three agitations each lasting 4 hours, with weak solution titrating 0.2 per cent. KCN; the intervening periods of settling and decantation last 12 hours. Sometimes all this treatment is given in one tank, but usually the pulp is transferred from one tank to another. The degree of dilution during each agitation is maintained at about six parts water to one part dry slime. At the end of the last decantation the pulp is trans-



PINGUICO MILL

CEMENT TABLES, PINGUICO MILL



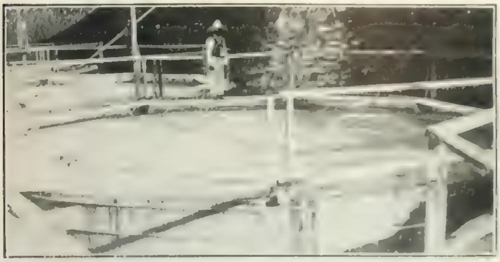
SLIME TANKS, PINGUICO MILL

SLIME COLLECTING TANKS, PINGUICO MILL

ferred to the tank feeding the Butters filter. The slime is given a treatment of about 100 hours, this varying somewhat according to tank capacity, but the total time of contact from the batteries to the filter inclusive is at least 120 hours.

On the Butters filter, containing 80 leaves, a 20-in. vacuum is used, and a cake 1 in. thick is formed. The cake, discharged by compressed air, contains 40 per cent. moisture. The filter solution is returned to the mill circulation. The air pressure used in discharging is 5 lb. per sq.in., for, if the pressure were greater, the sewing on the filter leaves would be broken. The leaves, which coat with lime rather quickly (within 7 to 10 days), are cleaned with a brush made of roots; this method of cleaning saves considerable acid. Ten leaves are cleaned daily. About 35 h.p is required to operate the Butters filter [illegible] Approximately 70 tons of slime are filtered each day, for only 8 cakes can be formed.

The cycle used in filtering requires three hours, divided as follows: Charging, 10 min.; forming cake, 50; pumping back pulp (with 6-in. pump), 20; charging water, 10; washing cake, 60; pumping back water, 20; discharging cake, 10 min.; total 3 hours.

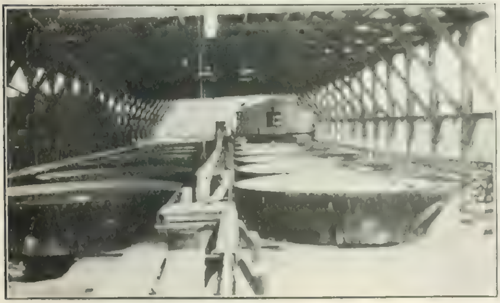


SLIME TANK IN AGITATION, PINGUICO MILL

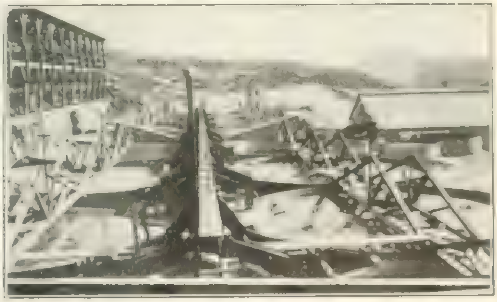
[illegible]

PEREGRINA MILL

[illegible]



SAND PLANT, PEREGRINA MILL



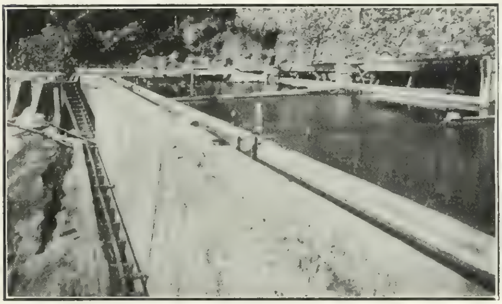
SLIME TANKS, PEREGRINA MILL

The Precipitation Room

The precipitation room contains 8 weak-solution and 4 strong-solution zinc-boxes, each having six compartments, and each compartment holding 75 kg. of zinc. About 1000 tons of weak solution and 500 tons of strong solution are precipitated each [illegible] arranged with cement launders between each pair of [illegible] quickly. It is said that all the zinc-boxes can be cleaned, and the precipitate melted into bullion in 24 hours; a clean-up is made twice a week. The precipitate is washed through 100-mesh screen to catch the short zinc; then it flows from the first sump tank to the second whence it is [illegible] frames, each 24 in. square, and making a 2-in. cake. The cakes are dried in pans and mixed loose with the flux. The charge is melted in graphite crucibles. The first bars are remelted and poured into bullion bars which are shipped. The short zinc is placed on screens and returned to the first two compartments of the strong-so[illegible] will not "cut" further it is treated with acid in a small agitation vat.

The mill is at present treating 250 tons of ore per day, about 40 per cent. of which, when crushed, becomes slime and 60 per cent. sand, but, as before mentioned, it is the intention of the company to install tube mills so as to give a larger percentage of slime and a finer sand product. The Dorr classifiers work admirably and make a very clean sand product. These have been working nine months and the repair bill is small, for the repairs consist mainly in replacing worn-out scrapers.

The extraction on silver is 92.7 per cent. and that on gold 88.8 per cent.; of this extraction 24.5 per cent. of the silver and 36.9 per cent. of the gold is obtained by concentration; the remainder is recovered in the cyanide plant.


SLIME COLLECTING TANKS, PEREGRINA MILL

SLIME COLLECTING TANKS, PEREGRINA MILL

WASHING AWAY SAND TAILINGS WITH SLIME DISCHARGE, PEREGRINA

MECHANICAL AGITATOR USED AT PEREGRINA MILL

The Peregrina Mill

The Peregrina mill, which began to run in 1906, was designed by Francis B. Hobson. It treats 400 tons of ore per day, most of which comes from the Peregrina mine, but considerable ore also comes from the Barreno and the San Francisco dumps. All ore is hauled by mules in 2-ton cars; that from the Barreno dump is trammed to an incline chute that conveys the ore to the crusher bins; that from the mine and the San Francisco dump is hauled directly to the crusher bins. The ore from the bins goes to grizzlies made of rails 1½ in. apart. The undersize goes directly to a Robins belt conveyer, while the oversize is crushed by two No. 4D Gates gyratory breakers to 2-in. size, and rejoins the undersize on the 16-in. Robins belt which passes up an angle of 17 deg., and then over the 1100-ton battery bins, into which the ore is dumped by a Robins tripper.

The ore is fed by suspended Challenge feeders to 100 stamps weighing 1100 lb. each and making 106 drops, 7 ft. high, per min. An Allis-Chalmers No. 120 mortar is used, and at present Tyler soft-iron 20-mesh No. 32 wire screens on the batteries. The stamps are arranged in units of 20, each 10 being driven by a belt from the line shaft that is run by a 50-h.p. motor. "El Oro" guides and Koppel steel dies and shoes are used. The battery frame is similar in design to the one used at the San Próspero and Pinguico mills; the order of drop is 1, 3, 5, 2, 4. The stamps crush in solution titrating 0.035 per cent. KCN, and about eight tons of mill solution are used per ton of ore crushed.

The pulp from each 10 stamps goes through a 3-in. pipe to a double 2-ft. classifier, which feeds a thickened pulp to the two Wilfley tables treating the pulp from 10 stamps. The tailings from the tables go to four 5-ft. pulp-thickening cones, each two of which take the pulp from one-half the Wilfley tables and feed a thickened underflow to an Allis-Chalmers tube mill. One tube mill is 22x5 ft., the other 26x5 ft. Both use Danish pebbles for grinders, and El Oro liners; both revolve at 27 r.p.m. About one ton of pebbles is fed once a week to each tube mill, the charge of pebbles filling the mills. The discharge from each tube mill is raised by a bucket elevator to a small cone and the coarse sand returns to the tube mill. These bucket elevators, as at the San Próspero mill, are run by a pulley, bolted to the rear trunnion of the tube mill.

The overflow from the cones feeding the tube mills goes to the separating cones, one 6-ft. and two 9-ft. cones, from which a slime overflow and a sand underflow is obtained.

Sand Treatment at Peregrina Mill

The sand is charged by a two-arm Blaisdell pulp distributer to one of two sand-collecting tanks 28x6 ft. deep, having a 6-in. filter bottom. The sand is transferred through a central opening in the bottom by Blaisdell machinery to one of the 18 sand-treatment tanks, the same size as the collecting tanks, arranged in two rows of nine each. The tanks are discharged by a Blaisdell excavator onto a belt conveyer, which takes the tailings to the dump.

It takes about 15 hours to fill a collecting tank; during collecting the overflowing slime is returned by a 4-in. centrifugal pump to the separating cones. After being filled, the collecting tanks are drained before being transferred to one of the treatment tanks, where, after 50

COST OF CYANIDING, GUANAJUATO DEVELOPMENT COMPANY'S MILLS

Mill	Period 1908.	Wet Tons Milled Per Month.	Crushing.			Concentration	Classifying.	Treatment.		Filtering and Precipitation	Pumping Solution	Water Supply.	Surface Expense	All Costs				
			Coarse	Fine	Regrind			Sand	Slime					Labor and Bosses	Supplies	Power	Miscellaneous	Grand Total.
Peregrina	Average of 4 months	12,356	$0.079	$0.395	$0.185	$0.061	$0.011	$0.346	$0.253	$0.180[1]	$0.067	$0.022	$0.020	$0.453	$0.748	$0.115	$0.005	$1.619
	Minimum monthly tonnage	11,324												0.485	0.910	0.125	[illegible]	1.825
	Maximum monthly tonnage	13,593												0.440	0.665	0.380		1.485
Pingüico	Average of 8 months	6,188	$0.075	$0.305	$0.235	$0.080	$0.020	$0.160	$0.105	$0.115	$0.050	$0.080	$0.040	$0.720	$1.046	[illegible]		[illegible]
	Minimum monthly tonnage	5,820												0.825	1.149	[illegible]		[illegible]
	Maximum monthly tonnage	6,168												0.675	[illegible]	[illegible]		[illegible]
San Prospero	Average of 7 months	4,014	$0.055	$0.340	$0.100	$0.050	$0.025	[illegible]	$0.360	$0.340	$0.065	$0.040	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Minimum monthly tonnage	5,820												[illegible]	[illegible]	[illegible]		[illegible]
	Maximum monthly tonnage	6,168												[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	Average of [illegible] months	1,347	$0.115	$0.600		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Minimum monthly tonnage	1,168												[illegible]	[illegible]	[illegible]		[illegible]
	Maximum monthly tonnage	1,477												[illegible]	[illegible]	[illegible]		[illegible]

[1] No filtering plant at this mill.

[illegible] the first wash of strong solution (stored in two 100-ton tanks), titrating 0.28 KCN, is run onto the sands. As soon as the solution begins to flow through the charge the valves are closed and the tank allowed to soak. At the end of 30 hours the valves are opened and the tank drained. Then 5 to 8 tons of strong solution are added every six hours. This leaching with strong solution is contin- [illegible] being discharged. The water washes go to the weak solution zinc boxes for precipitation, and the strong solution to the strong-solution boxes. In order to protect the strong solution from fouling 15 kg. of lead acetate are added each day to the strong-solution storage tank.

[illegible]

The slime, overflowing from the separating cones, goes to nine masonry tanks, about 3 m. deep and having a total capacity of 1050 cu.m., which act as storage tanks in case of accident as well as settlers. These tanks have slanting bottoms and discharge through a 6-in. pipe to a launder running between the slime treatment tanks. At the upper end of this main pipe, a connection is provided so that in case [illegible] out by water under high pressure. Each settling tank is charged by a drop pipe extending about one-half way to the bottom of the tank, and the pulp overflows from one compartment to another until finally clear solution overflows from the end compartment. The slime is run through all these settling compartments until one of them is filled, then the feed to that compartment is cut off, and the pulp is allowed to settle; and the solution is decanted. Finally the tank is sluiced out with weak solution, the pressure being applied by a 5x12-in. triplex pump.

The slime from the settlers goes to one of the 16 slime tanks, 36x12 ft. deep, arranged eight in a row with an agitator shaft running over the center of each row. Both shafts are driven by one 40-h.p. motor. The agitating device, as is shown in an accompanying illustration, consists of a central vertical shaft (driven by a worm and gear at ⅔ r.p.m.) and cross-arm (fastened to the shaft near the top) from which by means of eye-bolts and rods, two angle irons, one on each side, are flexibly suspended. An air-hose leads down to a tee in an air-pipe which is placed in the angle of the angle iron so as to be protected by it. From this air-pipe extend ⅜-in. nipples, 2 in. long, tapered to a 1/32-in. hole, through which compressed air blows.

These agitation tanks discharge at the bottom near one side into a cross canal that leads to a central canal running below and between the two rows of slime tanks. This permits the foundations to support the entire bottom of the tank. The slime [illegible] tanks, and carries them down the cañon [illegible] to cause bother in the future. This scheme works well for a good grade is available, and only occasionally, when there has been an unusually long time between the discharging of slime, is it necessary to use men to aid the water in starting the accumulated sand.

The slime tanks hold about 90 tons of dry slime per charge. Weak solution titrating 0.06 per cent. KCy is added to the slime in the tanks until the dilution is about 3 to 1; then 10 kg. of lead acetate and 25 kg. of sodium cyanide are thrown into the tank and the charge is agitated for 30 hours. The pulp is next allowed to settle for 12 hours, and is then decanted for about 2 hours through an ordinary swinging decanting pipe. Next, the charge is agitated for 10 hours, settled 12 hours, and decanted 2 hours. Six washes of weak solution are given to each charge, and finally one or more water washes. The water washes are pumped to the mill solution, and the weak-solution washes to the weak-solution zinc-boxes.

In the precipitation room there are 18 zinc-boxes, each having four 4x4x4-ft compartments. Six of these boxes are for strong solutions, two for mill solutions, and the rest for weak solutions, but at present only four boxes are used for the strong solution, and eight for the weak solution. About 440 tons of strong and 700 tons of weak solution are precipitated each day. The solutions are returned by Aldrich "Allentown" triplex pumps, all being in duplicate. The strong solution pumps are 9x10in., the weak solution pumps 14x10 in., and the mill solution pumps 11x10 inches.

There are four smelting furnaces; at present these are fired with coke, but in the near future these are to be replaced by furnaces burning oil. When making a clean-up the precipitate from the boxes is washed through 60- and 100-mesh screens so as to separate the short zinc. This short zinc is dumped on top of the zinc shavings in the first compartment of the strong-solution boxes. The precipitate is pumped from the sump to a 24-in., 30-frame Shriver filter press. The cakes are partially dried with air in the press and then in a wood-press. The precipitate is charged loose into the pots. The first bars are remelted to make the final bullion bars.

The slimes are not filtered at this mill, and experience has shown that the washing with the water in the tanks gives such good results that the small amount of solution left in the slime is so poor in metals that the installation of a filtering system will not pay.

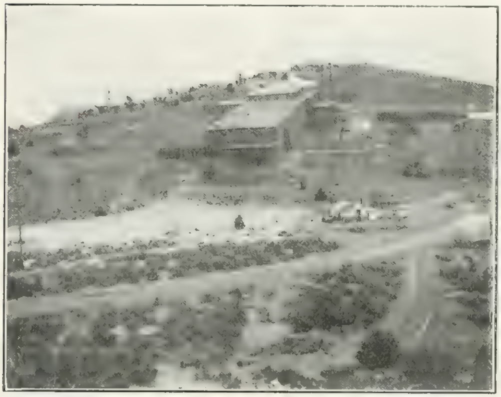
The itemized cost per metric ton wet (U. S. currency) at these different mills is shown in an accompanying table.

Manhattan, Nevada

SPECIAL CORRESPONDENCE

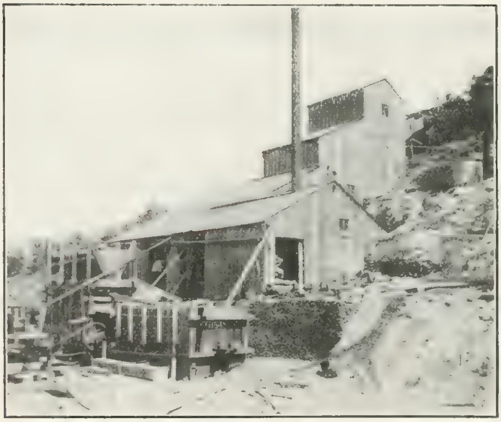
The renewed activity in the Manhattan district in both mining and milling is full of promise for that section of the country which had such a boom three years ago.

Manhattan is situated on the western slope of the mountains which border the Big Smoky valley on the east. It is 55 miles north of Tonopah, from which point runs the Government daily mail stage and two lines of automobiles which also run daily each way. The automobile makes the trip one way in about 1½ hours, and the fare is $15, or $25 for the round trip.



PETERSON MILL, MANHATTAN

MANHATTAN, NEVADA, LOOKING SOUTH



CANYON MILL, MANHATTAN

LEMON MILL, MANHATTAN

MINERAL BELTS

There are three distinct belts in the mining district. The southerly one is granite, which contains many large fissure veins with quartz filling. The ore found here has thus far been of low grade, but very little effective prospecting or development has ever been done. In this belt are several valuable springs and water rights which have been developed to some extent.

The middle belt is composed of flat-lying sedimentary rocks, consisting of slates, shales, schists and some limestone. This belt is the scene of the camp's mining activity at present. The producing zone is more than a mile in length. Besides the company work going on, many leases are at work, and together they keep four mills in constant operation.

North of this is a porphyry belt of which Bald Mountain is the backbone. Considerable development work is going on here in a very promising fracture zone. The veins are the results of faulting, and are filled with quartz. The value is wholly in gold which almost always occurs associated with brown hematite spotted through the matrix and evidently the source of the ore though subsequently oxidized. All the work here has thus far been done by tunneling with the double object of developing the veins and of gouging out enough ore to pay for development, with the usual results.

REDUCTION PLANTS

There are four operating mills in Manhattan, and one under construction. The latter is a five-stamp mill on the Wild Bill property in the Bald Mountain section. It will be driven by steam. The mine has sufficient ore to keep the mill busy for a considerable campaign. In the town itself are located the four operating mills.

The Cañon mill is a custom mill of 40 tons capacity, which crushes its ore in a 6-ft. Huntington mill, concentrates on two Overstrom tables and cyanides the slimes. The cyanide plant is equipped with V-box classifiers, rectangular agitation tanks with mechanical agitation and a small Butters filter. The plant is run by steam, and the fuel used is wood, of which there is a copious supply in the district.

A quarter of a mile farther down the cañon is the Veith mill, owned by a leaser and running exclusively on his ores. It has two stamps driven by a 12-h.p. gasolene engine. The ore is free milling, and the pulp, after passing over the plates, is put through an amalgamating pan and then discharged to the tailings dam.

The Peterson mill, which will treat the ores from the Sullivan properties, held under a five-year lease, is a modern well equipped mill of 40 tons capacity. It has 10 stamps, a tube mill, settling tanks, mechanical agitation tanks and a 40-frame Butters filter. Zinc-dust precipitation is used for the gold solution, and the sludge is put through a Merrill filter press which produces zinc cake carrying all the gold and a barren clarified solution of cyanide. Wood fuel is used and the plant is driven by a tandem compound McEwen high-speed engine.

The Manhattan Milling Company has acquired the Lemon mill which had a short and unhappy career, has remodeled it and made the first preliminary run. About $28,000 was recovered on the plates from 132 tons of ore with $2300 left in the tailings. These latter are now being cyanided. The equipment consists of a Blake crusher; 10 stamps; a Dorr classifier; five 50-ton sand tanks; three 30-ton and two 70-ton agitation tanks, where the pulp will be agitated by circulating pumps; and the regular zinc-box precipitation apparatus.

TRANSPORTATION

Manhattan has abundant water and timber. It could be readily connected by rail with the Tonopah & Goldfield railroad main line by a branch about 35 miles long. This would assist the development of the camp greatly.

Platinum at the Cracker Jack Mine, Douglas County, Oregon

By H. B. Pulsifer*

The Cracker Jack mine in Douglas county, Oregon, lies on a point of a range of hills known as Middle Creek ridge. On three sides the ground breaks precipitously to Cow Creek valley, about 600 ft. below. Most of the ground having a greater elevation than the mine lies to the east, but owing to the fact that the gravel bank is situated so high on the ridge a ditch 5½ miles long is necessary to supply the water for hydraulic operation; even with this length of ditch, owing to the small water-shed, the supply is available only during periods of rain.

The mine has been operated without marked success for at least nine seasons. Originally the property contained approximately 18 acres of gravel, but two-thirds of this area has been already worked. So far as known no systematic saving of the platinum had been made until the season just past.

During the Lewis & Clarke exposition samples of black sand from this mine were tested at the testing plant of the United States Geological Survey. The two samples from this mine were among the richest in platinum that were received; not only platinum but also osmium and iridium were present.

With special reference to determining the occurrence of these valuable metals the property was obtained by men from Kansas City early in 1907 and during the hydraulicking season of 1907-8 the mine was carefully operated to save both the gold and the platinum metals. As the shortness of the season precluded operations on more than small sections of the bank, the whole face of gravel was carefully and completely sampled; other samples were obtained from the tailings of former operations. The hydraulic equipment consisted of a small reservoir, supplied by about six miles of mountain ditch, and furnishing water to one giant under a head of 125 ft. through an 11-in. pipe.

METHOD OF SAVING THE PLATINUM

Last season was, in general, favorable for hydraulic mining in southern Oregon, yet this particular catchment area, lying so high in the mountains and not being especially favored locally, gave water fitfully and in scant amount. Only 8750 24-hr. miners' inches of water were available; with this nearly 14,000 cu.yd. of dirt were washed through the sluices. Unfortunately, the grade of the sluice boxes was becoming inconveniently flat, and caused much hand labor and delay.

The usual Hungarian riffles were used, some sheathed with iron, others not; pole riffles were used in one section of a 300-ft. cut. As no special provision could readily be made to gather the concentrate near the head riffles, grizzlies were placed at the mouth of the cut above the 300-ft. dump, and the fine material was led to one side through a supplementary sluice. The riffles in these boxes were kept in especially good order, care being taken that the riffles did not pack with the excessive amount of clay passing over them. The concentrate was removed and sacked at frequent intervals.

At the close of the season the concentrate, saved from all parts of the gravel bank during the whole period, amounted to about 10 tons. This was screened with plenty of water over a screen having ⅛-in. openings, the quicksilver and amalgam being caught in a trap directly beneath the screen.

[illegible]

After screening, the concentrate was twice jigged in a hand jig of large capacity. This reduced the material to about 1500 lb., leaving it rich in black sand. In the tailings was found a very fine black sand amounting to about 10 lb. per ton, yet this caused no appreciable loss of the metals, for on panning this fine sand it showed no colors and assayed only a trace in metals of the platinum group.

The 1500 lb. of medium sand were washed over a series of steep mercury troughs to remove the rusty gold and the last of the quicksilver; then it was passed through a very small jig having a 10x12-in. screen area. The concentrate after this treatment weighed 400 lb., being almost pure black sand; again the tailings panned free from platinum colors, while the hutch product showed abundant white grains.

As scaly gold is with great difficulty separated from such sand as this by panning, it was expected that it would be impractical to remove the platinum grains by simply panning with water. But, on the contrary, it was found that the rare metal grains settled readily; consequently, when the final concentrate had been panned twice it was quite free from platinum metals, and ½ oz. of clean white metallic grains had been obtained. The loss of gold, as observed and as followed with assays, was more considerable in proportion than the loss of rare metals.

Eighty-five samples from the gravel bank averaged 0.9 lb. of black sand per ton of dried material. These samples grouped into a few composite samples were assayed by Prof. Bugbee, of the Massachusetts Institute of Technology, and agreed closely with the results of the actual work.

Although this work only confirmed the previous estimate of the gold in the gravel, it showed that the samples sent to the United States Geological Survey must have been highly concentrated. It also demonstrated that a high saving of these rare metals can be made fairly easily.

The jigs used were of the simplest design, requiring but a few hours to construct from material that happened to be at hand. The operation of jigging required only a few hours. Where the rare metals occur as metallic grains in the gravel, by using sluice-boxes with false bottoms so that periodically the black sand can be removed quickly and completely, and then treating the black sand by means [illegible] been described, a recovery of more than 90 per cent. of the rare metals should be made at a very small cost.

The proper lubrication of machinery has an important bearing on the cost of producing a ton of coal or ore.

---

*817 Oak street, Kansas City, Mo.

Geographic Distribution of Lead and Zinc Deposits of the Mississippi Valley

By Charles R. Keyes[*]

From the usual descriptions of the lead and zinc regions of the Mississippi valleys the impression is gained that the distribution of the ore deposits is relatively limited, very local, and confined to a bare half-dozen indifferent areas known as districts. This conception is in many ways misleading, not only to the scientist, but to the seeker after new mines. Industrially the effects of a prevalence of such a notion are particularly unfortunate. Perhaps no one factor has contributed so largely as this one to placing limitations upon exploratory work and retarding the expansion of local mining generally.

Contrary to general opinion the ore deposits of the Ozark region are not limited to a few circumscribed areas. They extend far beyond the boundaries of the present recognized mining districts. It is probable that the orefields outside of the limited districts now operated will prove to be much more extensive than the fields already developed up to the present time.

The general tectonics of the Ozark uplift are of peculiar interest. For the present the features of the Dubuque lead and zinc district may be passed over; and consideration confined more particularly to the Ozark region of southern Missouri, northern Arkansas, southeastern Kansas and northeastern Oklahoma. In their direct genetic bearing upon ore deposition the larger features of the geologic structure have a significance that does not appear to have been made the most of during past exploration in the region.

The Ozark Uplift

In its simplest form the Ozark uplift, which is practically the only metal-mining region of the great Mississippi valley, may be regarded as a huge quaquaversal dome 400 miles long by 200 miles broad. The central portion rises 1400 ft. above the level of the plains country about the margins. It is a region that has been repeatedly upraised and planed off by erosion, until in the middle part only the oldest known rocks are exposed. The last complete planation, apparently down nearly to sea level, occurred during late Tertiary times. The present uplift is evidently the result of very recent and very rapid crustal movement, perhaps as fast as mountain building ever does take place. This is a feature that has been wholly overlooked in the many discussions of the ore deposits of the region. It appears to be one of the most important factors contributing to mineral concentration and ore deposition.

The lead and zinc deposits of Missouri and Arkansas are not scattered promiscuously throughout the Ozark uplift, but are confined to a well-defined belt of greater or less width which borders the basal margin of the dome and completely encircles it.

The productive mineral-bearing belt is rather sharply delimited on its outer border by the margin of the Coal Measures. Its inner border is somewhat more irregular owing to local peculiarities which need not be referred to in detail at this time. There are some unimportant deposits within the main ore ring in positions suggesting former locations of the belt, before the Coal Measures margin had moved so far as it is at present down the slope of the dome.

The character and position of the Ozark ore ring are most significant features bearing upon the genesis of the ore deposits. Were the Ozark dome a segment of a perfect sphere, the distribution of the ore materials at its base would be doubtless quite uniform. But the effects of crustal deformation have been unequal. In consequence of this the accumulation of the ore materials is also more or less unevenly disposed. At some points in the basal ring there have been localized extensive deposits of workable character. These are separated by barren tracts, or rather sections in which the orebodies are not, as yet at least, very important, or in which mining is carried on only in a small way.

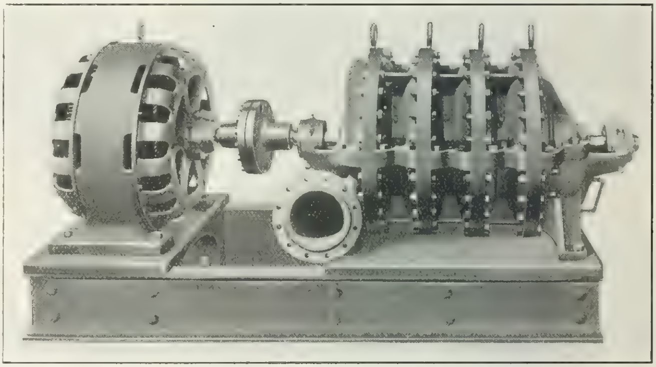


FIG. 1. FOUR-STAGE LEA DEGEN HIGH-DUTY TURBINE PUMP

Mining Districts

In the usual descriptions of the lead and zinc mines of the Ozark region it is customary to regard them as forming more or less isolated "camps." These are segregated, in Missouri for example, into three principal groups. The general recognition of these mining districts, according to accidental political boundaries rather than along geologic lines has entirely obscured whatever genetic relationships might possibly exist between the various orebodies of contiguous camps. The title, Southwestern district, for instance, has no further real significance than that of direction; it refers merely to a vaguely defined area lying somewhere in the southwestern part of the State of Missouri.

In a rough way mining men have come to recognize in the several districts tracts of more productive ground separated from one another by more or less broad strips of poorer country. Many miners, moreover, have associated the ore deposits with the present stream valleys. Thus far, also, all attempts of the scientists to associate the orebodies with lines of faulting have been unsuccessful. Nevertheless, there is discernible in the local distribution of mine developments certain definite lines along which orebodies are more abundant and closer together than along other lines. Miner, layman and scientist alike who have worked in this region are in accord with the idea that there must be some dependence of ore occurrence upon geologic structure, even if it take some of the refinements of investigation which the latter employ to determine what those relationships are. These structures which most influence the localization of the orebodies appear to be the syncline, trough, or, more broadly speaking, the basin.

A noteworthy and significant fact is that these synclines or troughs pitch radially down the slope of the great dome. At their lower ends the chief workable orebodies are found. The reason for this peculiar distribution of the ore deposits is not hard to seek. So prevalent is the presence of orebodies in the vicinity of the Coal Measures that many persons have associated the ore deposits directly with the reducing action of the carbonaceous shales. There really appears to be small ground for this deduction. A more critical examination into the relationships of location of the orebodies and the geologic structure clearly indicates that in nearly every instance the impervious shales have acted as a dam or barrier at the margin of the Coal Measures area, and have raised the local groundwater level. As a result empounding conditions are, as it were, produced which in turn impose well known conditions favorable to extensive ore deposition.

---

[*] Mining engineer, Des Moines, Iowa.

The phenomenon appears not to be uncommon. It has been recently described in connection with certain western lead and zinc deposits, notably those of Lake Valley and Magdalena in New Mexico and elsewhere. This seems to be a common, if not a general mode of ore localization in the vadose zone particularly where the rocks have undergone recent tilting. On the geological map of Missouri a band of 20 miles wide bordering the Ozark margin of the encircling Coal Measures contains over nine-tenths of the workable ore deposits.

The Lea-Degen Turbine Pump

The Lea-Degen high-duty turbine pump, built by the Lea Equipment Company, 136 Liberty street, New York, is designed for heads of from 7 to 1000 ft., or higher, with capacities ranging from 100 gal. to 30,000 gal. per minute. The general design of the pump consists essentially of shrouded pump-wheel runners mounted on the same shaft in a case. The case is so partitioned that the water is drawn from the source of supply and put under pressure by the first wheel and delivered to the suction chamber of the second wheel, this operation being repeated as many times as there are runners. In passing from the first to the second wheel the water passes through passages formed in the casing by means of ribs, or deflectors, which take the water from the first wheel in the direction in which it leaves such wheel, conveys it by an easy spiral path to the second wheel, and so on to each succeeding wheel.

The passages or nozzles from one stage to the other gradually increase in area in the direction of the flow of water, so that the velocity of the water imparted by the first wheel is gradually transferred in these passages into pressure and little, if any, energy is said to be lost through eddy currents in the passage of the water from one impeller to the next. The combined effect of giving the water the spiral direction in the passages, and at the same time gradually decreasing its velocity and transforming it into pressure, has much to do with the efficiency of this pump.

By means of bolted circumferential divisions of the case, provision is made for either using the suction and discharge end of a case together as a single-phase pump, or for adding as many intermediate sections as may be necessary to afford any desired pressure at any first speed. From this it will be seen that additional stages can be installed after a pump has been in operation without wasting any part of the original case.

The packing consists of right-angled cup leathers held in place by springs in such manner that they are tight under all conditions and allow the shaft to oscillate throughout any distance necessary. It is believed that the packing will not be affected by the wear of the shaft or sleeves. The leather cups are designed to be held against a flat collar on extended pump sleeves so they will counteract any wear of the cups or collars, while the shaft may be shifted at will in either direction, with the leathers following, without changing the location of the leather with relation to the shaft collar, thus making a practically water-tight joint. To insure the leathers seating against the collars before pressure is put on the pump, a spiral spring is used between each pair of cup leathers. Provision is also made for setting out the leather packing on the suction end of the shaft by the water pressure of the high side of the pump.

A ball thrust bearing, with adjustable collars, for shifting the shaft endwise to balance the end thrust of the pump runners, is placed on the outside of the main bearing at each end. The balancing is accomplished by means of variation in the width of the water space on both sides of the wheel between the rim of the wheel and the case. Both suction and discharge connections are placed below the center line of the pump, thus allowing the renewal of the top without breaking the water line, and at the same time they are in such shape as to give practically no obstruction to the easy flow of the water.

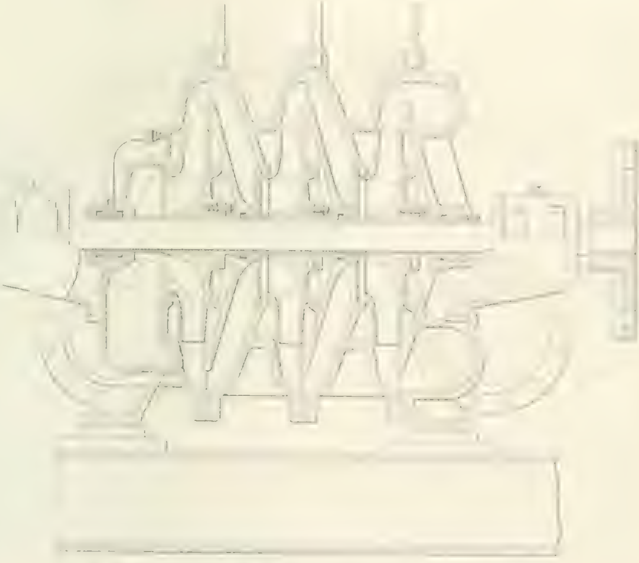


FIG. 2. SECTIONAL VIEW OF LEA-DEGEN [illegible]

The following show the results of a test under conditions of maximum efficiency, which was carried out by James E. Denton, professor of mechanical engineering, Stevens Institute of Technology: At 400 r.p.m. 77.7 per cent. efficiency with a capacity of 2296 gal. under 43.6-ft. lift. At 500 r.p.m., 77.6 per cent. efficiency with a capacity of 2794 gal. under 67.4-ft. lift. [illegible] ft. lift

[illegible] compact. A 10-in., four-stage, turbine pump, connected to induction motor, having capacity of 2400 gal. per minute to 568-ft. head, is 5 ft. 6½ in. long from end to end of main bearing, 3 ft. 9 in. in width from suction flange to delivery flange, and 3 ft. 3 in. in hight from top of bedplate to top of pump.

Ankylostomiasis

Ankylostomiasis is an intestinal disease due to the presence of a worm called *ankylostoma duodenale* in the upper intestine. This disease is not confined to miners but is common in tropical countries among laborers. Even field laborers suffer from it.

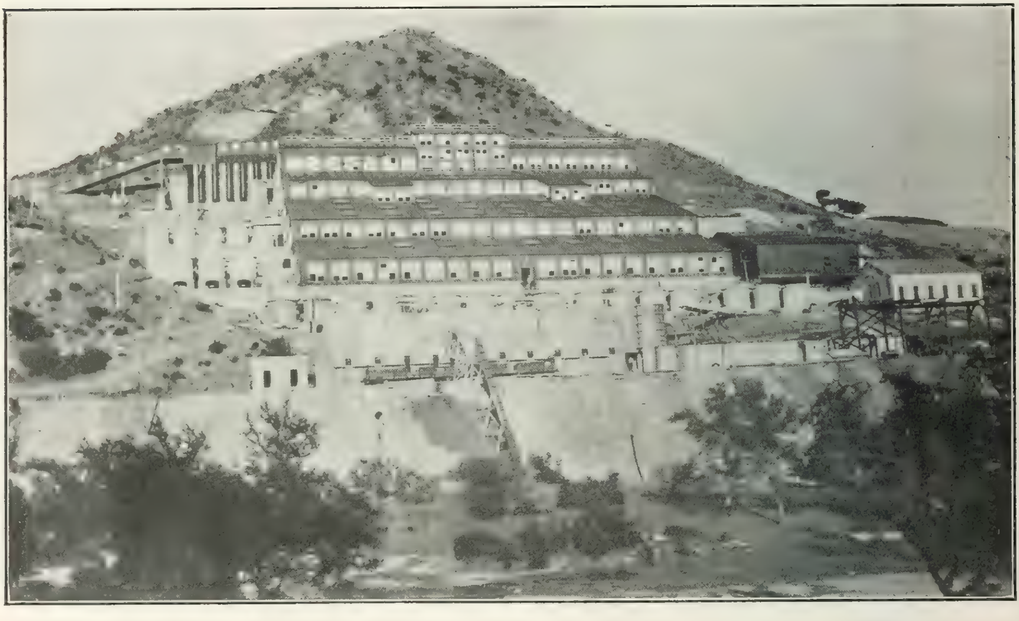
The disease may be contracted in the mines where in the damp, dirty conditions and the warm air underground this parasite rapidly increases in numbers, when once introduced. High temperature favors the development of the ova but the [illegible] 48 deg. F. The disease is acquired by miners while eating by swallowing the larva which get on the miners' hands, and by the worms passing through the skin causing a temporary eruption. The symptoms of the disease are quite similar to those of anaemia.

Las Chispas Mines, Sonora, Mexico

Rich Silver Veins of the Minas Pedrazzini Company. Their History, Geology and Operations. Mining and Ore Treatment. Ore Stealing

BY B. E. RUSSELL*

During the early eighties the Santa Maria Mining Company was operating a small gold-silver prospect a few miles south of Arizpe in the northern part of the State of Sonora, Mexico; but an inefficient management and an efficient corps of Mexican "high graders" contributed to its undoing; and after some years of effort marked by failures the company closed down, leaving in charge its clerk, an Italian-Swiss named John Pedrazzini. Taxes fell in arrears, as well as the wages of Mr. Pedrazzini, and finally the company turned over to him the property in lieu of the money due, and upon payment by him for the machinery on the ground. When the property thus fell to him he raised sufficient capital, on his representations to various Mexican merchants of Hermosillo, to undertake exploration work. During this period a tunnel was driven into the hill about 4000 ft., tapping the Las Chispas vein at a depth of about 600 ft. below the outcrop, and opening up the orebodies below the surface pockets. Early in 1907, the properties were incorporated under the name of the Pedrazzini Gold and Silver Mining Company, and E. L. Dufourcq, of New York, was retained as general manager and consulting engineer. At that time the real history and development of the property may be said to have commenced. Underground work has been pushed; much needed surface improvements have been made during the year that will reduce the cost of handling and treating the ore; and an efficient corps of employees has been recruited at the mines.



LAS CHISPAS MINES, MEXICO

Geology of the District

The geology of the district is complex, and only a careful and exhaustive study will reveal information of value to the student. The productive area is limited to a belt of rhyolite traversing the country in a general northerly and southerly direction and lying in almost horizontal beds, the lines of which are very plainly marked. This rhyolite is cut off on the surface by a flow of volcanic tuff, which marks the northern boundary of the developed area. At the contact with this flow the zone of the mineralization is less than a half mile wide; but to the south and east it gradually diverges, losing its identity in the andesites and limes of the section; although the continuation of this belt can be traced, in a general way, southerly along the Sonora river through the old camps of Los Gijos, Sta. Elena and others formerly worked by the *antiguos.* To the west, and lying between Las Chispas and the Sonora river, are beddings of a sedimentary deposition of the igneous rocks that have probably been eroded from the original cap-rock of the country. At the contact with the rhyolite these sedimentaries are in the form of conglomerates and lie at nearly the elevation of the top of the range. From here the country drops away rapidly in the direction of the river and the conglomerates lose their identity as such, giving way to a fine-grained sedimentation resembling kaolinized rhyolite or tuff.

Ore Occurrence

The ore occurrence is chiefly remarkable for the extreme richness and beauty of the high-grade *chispas,* or crystals of silver, from which the most fully developed property—Las Chispas—takes its name. This ore occurs in boulders, stringers and lenses in a series of 14 nearly parallel fissure veins in the rhyolite which follow the same general trend as the belt. The vein filling is a rhyolite breccia carrying the values in the cracks and seams which vary from the merest crack to 2 ft., or even 3 ft. in thickness. The values occur in the form of nearly all known silver ores, but those predominating are argentite, polybasite and stephanite, which in addition to their silver content carry approximately 1 oz. of gold to each 100 oz. in silver. The values in gold are considerably lower in the argentite ores and decrease with the increase of the silver content. The walls show very little kaolinization or other important alteration although the stringers of ore extend so far into them as to render it necessary to carry the stopes from 12 ft. to 18 ft. in width for considerable distances.

---

*Mining engineer, Nacozari, Sonora, Mex.

Development

Development work on the various properties belonging to the company has been confined to a comparatively small portion of the ground, although the management laid out and commenced a comprehensive system of work which was started during the past year, but was dropped with the fall in the price of silver. Prospect tunnels were started on the Dolores and San Miguel veins, but this work was stopped early in the year on account of the above-mentioned fall, and of the fact that they had not responded to development as soon as was expected. On El Dorado and Puertecitos veins tunnels are being driven to tap at depth the orebodies worked by the old company. On the Granaditis and El Carmen—the latter being the mine formerly held by the Santa Maria Mining Company—properties which lie at a considerable distance to the south of Las Chispas, sinking is now in progress, and the old workings are being caught up preparatory to resuming mining operations. At El Carmen the mill has been repaired, and it is expected to have it running on ore from the two mines not later than the first of the year. The main source of ore at the present time is in the territory opened up by the San Gotardo tunnel, which taps Las Chispas vein at a depth of about 600 ft. In this tunnel the workings are confined to the Chispas and William Tell veins, but it will be extended to tap the known orebodies of La Central and San Luis regions. As far as known the longest continuous shoot of ore at the present time is about 400 ft., with an average hight of about 250 ft. It has been the policy of the management to treat these shoots of ore as lying almost horizontal and more or less overlying each other in the veins; but in the face of a comparison of the conditions here and at El Tigre mine, where there is a marked similarity, it would seem that what are now considered separate orebodies will, after more development work has been done, be found to be practically continuous, although not connected up by the bonanza ore.

Operations and Results

A resumé of the operations at the property for the past year[1] show a development account considerably in excess of that of most mines of this size; but the large amount done on the ore—all but 655 ft. out of 3435 ft. of total new work—is somewhat out of the ordinary. Operations for the year were productive of 928 tons of first-class ore running about 565 oz. in silver and 4.2 oz. in gold; 4232 tons of second-class ore, of which 3286 tons carrying about $7 in gold and 50 oz. in silver were treated at the San Gotardo mill; and 955 oz. of picked sulphide of silver. The shipments aggregated about $430,000 in value, of which half was net profit, and on which dividends to the amount of $150,000 were paid. The ore reserves at the end of the year were estimated at $859,000 in value.

Treatment of the Ore

The second-class ore is treated by a combined concentration and pan-amalgamation process, by which from 70 to 75 per cent. of the values are saved and shipped as concentrates or bullion. The San Gotardo mill is equipped with rock breaker, 10 gravity stamps, two Wilfley tables and three amalgamating pans with two settlers. The water supply is sufficient only for 10 months in the year, but it has been found more economical to handle the small amount of second-class ore piled on the dump during the dry season twice than to install an expensive pumping plant. Owing to their isolated situation a small mill was installed at El Carmen to treat in a similar manner the ores from El Carmen and Granaditis mines.

Situation and Transportation

The mines are nearly at the top of the range between the Sonora and Yaqui river drainages, about two miles east of the Sonora river, and about 1000 ft. in elevation above it. The country is rugged, and the lack of transportation facilities has held back the entire district. All heavy freighting is done by wagon road to Cananea, some 75 miles north of the mines. The Mexican ore packers, however, prefer to take their trips out to Querobabi on the Sonora railroad some 90 miles to the west. The completion of the Nacozari branch of the Cananea, Yaqui River & Pacific railroad offers a possible solution of this problem. Surveys have been run, and bids are in for the construction of an aërial tramway [illegible] the east and connect at the terminal with a 20-mile wagon road to the railroad. This will materially reduce the present cost of freighting in and [illegible] pesos per ton as well as [illegible] to bring in the wood for boiler purposes.

Labor

The mine bosses are entirely Mexicans, as are the miners and laborers with the exception of a few Chinese and Japanese. Drilling is done both by machine and by hand, and is contracted as far as possible. The hand drillers are paid about 50c. per ft., and the machine runners from 4 to 5 pesos per day. Drifting and sinking is generally paid for by the foot and the contractors get from 12 to 40 pesos per ft. The prices range rather higher here than in neighboring camps, but the rock is generally tough, and many of the working places are very hot. Practically all of the rock broken in mining, which is done entirely on stulls, is taken directly to the surface, where it is screened and sorted on the *plania* by men and boys.

The first-class ore is double-sacked, sewed and sealed, then stored in the orehouse; while the second-class ore is either taken directly to the mill, or stored on the dump for future treatment.

Ore Stealing

The chief problem with which the management has had to contend thus far has been the dishonesty of the employees in the face of the extremely high-grade ore; and the difficulties of holding labor under the severe measures necessarily taken. All employees passing to and from the works are rigorously searched, and the underground laborers pass through a change-room. Even then a small proportion of the ore finds its way into the hands of the American and Mexican ore buyers. As a whole, the Mexican officials endeavor to put down this evil so far as possible, but convictions are few.

Amusing instances are related of the efforts of the tenderfoot to get rich quick buying this high-grade ore. A Cananea ore-purchasing company had its representative proceed with much secrecy to a secluded spot and bargain for a large lot of ore which he bought on sight. Unfortunately for their plans it proved to be from a mine in the immediate vicinity, and while similar in appearance, the supposed brittle silver was specular hematite. Others who have gone out to buy this ore under similar circumstances have had their money taken without being even presented with its useless equivalent. One well known character, who carried his purchases from the vicinity of the mines to Cananea in a water barrel set in the back of his wagon, stopped with some Chinamen in Arizpe, who substituted cobble stones for the ore and refilled the water barrel—as he found much to his chagrin on reaching home.

---

[1] The Engineering and Mining Journal, May 23, 1908, p. 1038.

The Scott Gasolene Rock Drill

A rock drill, operated entirely by gasolene has been designed by L. L. Scott, Joplin, Mo.

The complete drill, mounted on its tripod, is shown in Fig. 1. In general appearance it resembles an ordinary air drill. The machine operates on the two-cycle principle and the mixed air and gas is drawn in at the upper and lower ends of the drill, through ports on the top of the cylinder. A spark plug and timing device explode the charges alternately and these act on the inner faces of the pistons; an explosion occurs on each upstroke and on each down-stroke. The pistons are solid steel castings, the upper ends being connected to the crank-shaft through the connecting rod; the lower ends are connected by a swivel to the drill rod. The cushions are in the interior of the lower piston and the rotating mechanism is in the lower receiving chamber. Fig. 2 shows the crank-shaft, pistons, rotating device, chuck and drill steel. In this drill the explosion chambers are so arranged that the heat will not affect the rotating device or drill rod.

The rotation of the drill rod is independent of the piston. The steel is held by the usual form of U-bolt chuck, and the drill is fed by an ordinary feed screw. In the oiling system, the oil is mixed with the gasolene and the mixture is sucked in with each charge, thoroughly oiling every moving part of the machine. In the Scott drill the piston and rod momentum is taken up by useful work in compressing the charge. The crank-shaft, while extremely heavy, has practically no work to do, and simply acts as a guide to insure the proper opening of the ports.

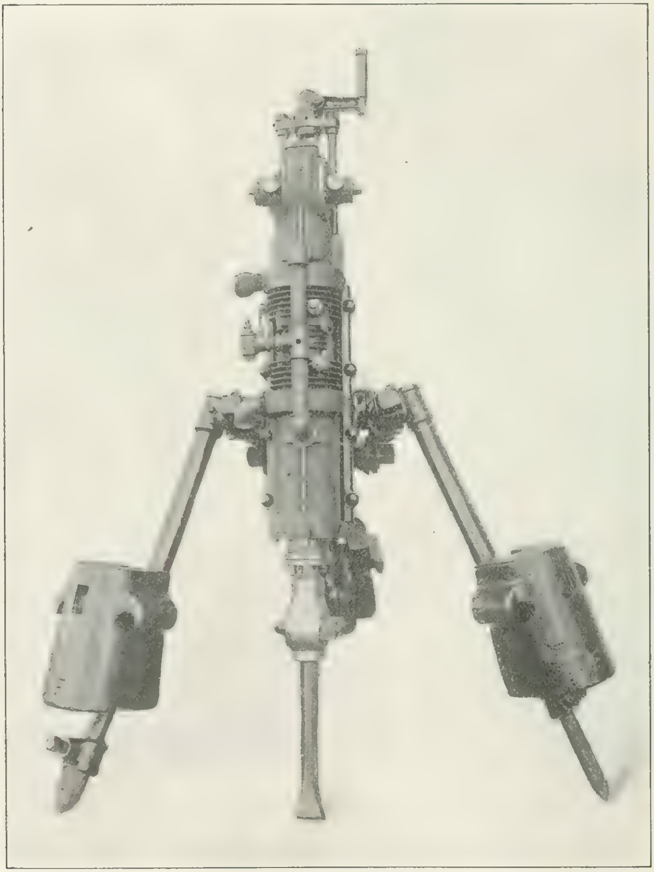


FIG. 1. COMPLETE DRILL WITH SELF-CONTAINED POWER PLANT

The Kafir in the mines of South Africa is, according to T. Lane Carter, a spasmodic worker, and never remains long enough at any class of work to become expert.

Rhodesian Mines

The gold output of Rhodesia for September is reported at 48,573 oz. fine; making a total for the nine months ended Sept. 30 of 454,600 oz. fine, or $9,396,582. For the corresponding period in 1907 the output was valued at $7,874,101; showing an increase this year of $1,522,481, or 19.3 per cent.

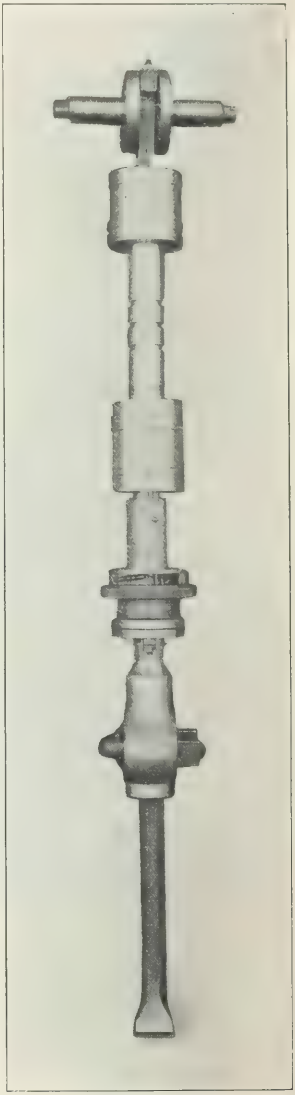


FIG. 2 CRANK-SHAFT, PISTONS, ROTATING DEVICE, CHUCK AND DRILL STEEL

Other production reported in September included 24,506 oz. silver, 39 tons lead, 10 tons copper, 2 tons wolframite, 6 tons scheelite, 1480 tons chrome ore, 3 tons of asbestos and 14,357 tons coal.

Device for Shaking Bags in Smelter Baghouse

Special Correspondence

Baghouses as ordinarily built for smelting works consist of a number of apartments provided with floors dividing each apartment into a bag room with a dust cellar below. The bags are usually of muslin or wool and are suspended in the bag rooms with their upper ends closed and their lower ends connected through the floor with the dust cellar. The dust-laden fume is conducted into this cellar under a pressure of approximately 1 in. of water and thence up through the lower ends of the bags and through the meshes of the cloth, the dust being filtered out during the passage. From the space surrounding the bags in the bag room the fumes are conducted by an outlet flue to a stack.

It is necessary to shake down the bags from time to time so that the dust adhering to the inside of the bags may drop to the floor of the dust cellars. Ordinarily these bags are shaken by a man who enters the bag room for the purpose, taking hold of the bags near the bottom and shaking them as vigorously as possible. The man who does this work must be well protected from the fumes. According to the general practice at present he wears a rubber suit, and over his head he bears a helmet carrying a supply of compressed air for respiration. These precautions are necessary to avoid injury from the large percentage of arsenic found in the fumes caught by the bags.

In order to avoid the necessity of entering the bag room with its attendant disagreeable features, H. E. Benedict, of the United States Smelting, Refining and Mining Company has invented a mechanical arrangement by means of which the bags may be shaken more efficiently than by hand from the outside without opening the room. The apparatus also permits the shaking of a large number of bags at one time, thus saving much time and labor. Furthermore a very efficient movement is given to the bags by shaking them at the top with a wavy motion which travels from the top to the bottom and frees the dust much more effectively than the motion imparted by a man on the floor; the bags being rigidly tied at the bottom, it is difficult to shake them well from a point near the bottom. The advantages gained by being able to shake efficiently a large number of bags at once without the necessity of entering the bag room are obvious.

Method of Operation

In ordinary practice the bags are tied to hooks suspended from beams laid across the roof trusses of the baghouse. In the new device a large number of shafts are carried across the baghouse on bearings placed on channel irons carried by the bottom chords of the roof trusses. Each shaft corresponds to a row of bags. Hanging downward are levers attached to the shafts, one lever for each bag. The end of the lever is provided with a loop in which the bag may be tied. Oscillation of the shafts causes the loop ends of the levers to move backward and forward with a wavy motion. This motion is imparted to each individual bag, traveling from top to bottom in a manner somewhat similar to that in which waves are caused to travel along a rope shaken at one end.

Several shafts are joined together by levers and links attached to the ends. By this means the oscillation of one shaft causes the oscillation of all the other shafts connected with it. One of any group of shafts is extended through the walls of the baghouse and provided with a hand lever on the projecting end. When it is desired to shake down the bags the attendant simply takes hold of the end of this lever and rocks it back and forth as in the operation of a shaking grate. This causes all the shafts in the group to oscillate inside the baghouse and the loop ends of the levers to move in the arc of a circle. Thus the group of bags attached to these levers and shafts are shaken simultaneously.

Advantages of the System

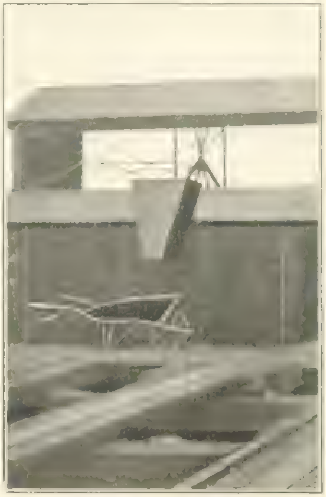
When this device was planned the primary object was to avoid the necessity [illegible] this purpose been accomplished, but a most remarkable increase in the efficiency of the baghouse as a whole has also been brought about by the use of the device. Before its introduction it was necessary to shut off the blast from the section of the baghouse when the bags were to be shaken down. This limited the capacity of the baghouse to a certain extent. With the new arrangement it is not necessary to shut off the blast at all, the bags being shaken from the outside. It is also possible to shake the bags much more frequently than before the abandonment of hand shaking.

The recording charts of baghouse pressures showed most graphically the effect of shaking the bags by the old method. Starting in with a supply of clean bags the pressure would be comparatively low, say ¾ in. of water; gradually this pressure would rise as the bags became more heavily laden with dust, making it more difficult to force the gases through the meshes, until finally the pressure reached the maximum capacity of the fan blowing the gases into the baghouse. If at this time the bags were shaken down the pressure would immediately drop, the fall being indicated by an almost vertical line on the recording charts. Naturally the freer the bags are kept from dust the greater the quantity of gas which can be forced through them. It is therefore readily seen that frequent shaking of the bags greatly increases the capacity of the baghouse and diminishes the required area of filtering surface for any given quantity of gas.

Letters patent upon this device have been granted to the United States Smelting, Refining and Mining Company, the assignees of Mr Benedict's rights.

A Hopper for Unloading Railway Cars

The accompanying engraving from a [illegible] ployed at the works of the United States Smelting Company, near Salt Lake City, Utah, for unloading gondola cars. No extensive description is required. The hopper is made of sheet iron, with a simple arrangement to hook upon the side of the car. It assists in unloading into a small car or a wheelbarrow, which may be placed under the hopper. The men working in the railway car shovel into the hopper, knowing that the material is bound to go just where it is intended to [illegible] prevented from flying off



[illegible]

[illegible] reach certain workings, but when cars are not being constantly run out of that work[illegible] Sept. 16, 1908) recommends bridging across the turn sheet by means of bars having lugs on the under side that fit into holes in the turn sheet. When the turn sheet is required the bridging bars can be removed.

Rapid Hoisting

In considering the statement of Tom Johnson, made in his paper, "Notes on Rand Mining," that 5000 tons of ore can be hoisted in 24 hours from deep mines through a shaft having two hoisting compartments, A. Richardson discusses (*Journ.* Chem. Met. and Min. Soc. of South Africa, July, 1908) the subject of rapid hoisting. The quantity of rock that can be hoisted through a shaft depends upon quick loading from large, well equipped skip-chutes, to which ore comes from several levels; fast winding with powerful engines; well maintained shafts, and expert hoisting engineers.

With regard to speed in hoisting Mr. Richardson stated that as far back as 1878 the California Gold and Silver Mining Company was hoisting from a depth of 2500 ft. in 45 sec., an average speed of 3333 ft. per min.; No. 3 Tamarack has done 4800 ft. in 1 min. 15 sec., or 3880 ft. per min., the maximum speed during the wind being over 5000 ft. per min.; this hoist has made 40 trips in 1 hour with 3 tons of ore per trip; the Calumet & Hecla has hoisted from a depth of 4900 ft. at an average speed of 3500 ft. per minute.

At Kimberley 4000 short tons have on several occasions been hoisted in a little over 11 hours from 1560 ft.; with this engine the acceleration period occupies 16 sec., the retardation period 13 sec., the maximum and constant speed period 13 sec., equivalent to 3770 ft. per min., the average speed being 2230 ft. per min. for a winding period of 42 sec.; the loading and dumping together occupy 5 sec., so that each trip takes 47 sec. Taking some of the leading British collieries, which show fast work under normal conditions, the following represent good practice: Dowlais Cardiff, 2220 ft. in 52 sec., an average winding speed of 2562 ft. per min.; Ashton Moss, 2850 ft. in 1 min. 25 sec., or 2010 ft. per min.; Lady Windsor, 1500 ft. in 35 sec., or 2571 ft. per min.; Bolsover, 1116 ft. in 28 sec., or 2388 ft. per min.; Denaby & Cadeby, 2289 ft. in 55 sec., or 2497 ft. per min.; Rhodes Rotherham, 1650 ft. in 45 sec., or 2358 ft. per min.; while at the Rosebridge colliery a maximum hoisting speed of 5100 ft. per min. has been recorded; such an excessive hoisting speed as this, however, does not represent sound work; for considerations of safety, it should not exceed 4000 ft. per min. From the above, and in view of regularity of output, an average hoisting speed of 3000 ft. per minute may be assumed to represent the best modern practice.

Now the time in seconds of each complete wind is:

$$\frac{\textit{depth of shaft in feet}}{\textit{speed of winding in feet per second}} + \textit{number of seconds occupied in loading and dumping.}$$

Assuming the last term to be 10 sec., the time of each complete wind from an average depth of 3000 ft. will then be 70 sec., giving 51.4 winds per hour, or an hourly output of 205.6 tons with four-ton skips. If this is maintained for 20 hours out of the 24, a very excellent performance, the output will be 4112 tons. With five-ton skips this figure would be 5140 tons. This estimate is on a very favorable basis, and outputs of such magnitude would be considered phenomenal in any part of the world. In South Wales, for instance, an output of 1000 tons through one shaft in a daily shift of 10 hours is considered good work, and 1500 tons exceptionally so, and this from depths which in only one or two instances exceed 2000 feet.

With regard to the balancing of the load, there is no doubt that a tail-rope is the most perfect method known, as conical drums will balance completely only when winding from one fixed depth; unfortunately the use of these balance ropes is attended with many disadvantages. With them independent trips in either compartment are impossible, and the changing of levels leads to much loss of time; the sump also has to be extended to accommodate the sheave and slide, and there is much extra weight thrown on the capping, and also on the safety catches should occasion ever arise for them to act. It is a dangerous device to install at depths greater than 2500 ft., because the swaying or whipping action of the rope tends to destroy the guides and timbering.

With regard to guides, the general opinion in England is that steel rails are the safest for fast winding from deep shafts with heavy loads. It is worth noting that in Germany the winding of men on rope guides is prohibited; their use also necessitates a skip which cannot turn over but must discharge through hinged doors, and a bend is out of the question.

As to the speed at which men are hoisted in shafts the following recent statement of W. H. Pickering in interesting: "Already there are instances where 80 men ride in the shaft at one time, and at a speed of 40 miles an hour." This means a speed of 3520 ft. per min., or 59 ft. per second.

Deep Gold Mines

Until recently the Morro Velho mine in Brazil, belonging to the St. John del Rey Mining Company was the deepest gold mine in the world, being 4264 ft. deep (*Min. Journ*, May 2, 1908). But now ore has been found in the Victoria Quartz Company's property at Bendigo, Australia, at a depth of 4504 ft., in a winze 250 ft. deep sunk from the 4254-ft. level. Apparently this ore is the cap of a saddle reef. The vein is 4 ft. wide, being quartz with a little pyrite in it and containing some visible gold. The shaft is 4300 ft. deep.

Steel Shaft Guides

C. O. Schmitt (*Journ.* Chem. Met. and Min. Soc. of South Africa, July, 1908), in discussing the paper on "Rand Mining," by Tom Johnson, suggests that in shafts sunk in rock that stands so well that close timbering is not required, much timber can be saved by using substantial steel guides and placing the sets at 8 ft. centers, instead of at 6 ft. or less.

Steel guides should be of T-section, similar to those put in at the Simmer Deep (Fig. 1), for the reason that this type of guide gives plenty of metal for wear, promising a comparatively long life. The wear on the guides should be reduced by using rollers on skips and cages instead of shoes as at present. Such rollers have been in use at the Robinson Deep mine for some time with conspicuous success. Steel guides of channel section (Fig. 2) do not seem to give the same life against wear as those of T-section, although they are stronger in the axis parallel to the base, thus rendering the shaft timbering more rigid. The weight of either type need not exceed 30 lb. per linear foot.

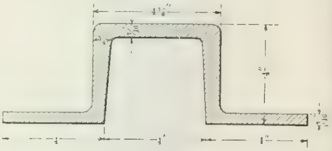


FIG. 1. STEEL GUIDE, CHANNEL-SECTIONS TYPE

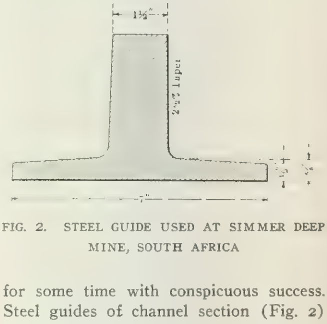


FIG. 2. STEEL GUIDE USED AT SIMMER DEEP MINE, SOUTH AFRICA

British Guiana Mines

Gold production for the nine months ended Sept. 30 is reported at 49,014 oz. bullion in 1907, and 48,769 oz. in 1908; a decrease of 245 oz. The bullion reported this year was equal to $863,516, or 41,786 oz. fine gold.

Exports of diamonds for the nine months were 3369 carats, valued at $26,274; an increase of 1584 carats over last year.

A heavy rail is an essential to good mine track.

Development of Electric Power in Coal Mines

By George E. Walsh*

The development of electricity in the anthracite coal mines as an efficient and economical power in recent times has been coextensive with refinements in the application of steam and compressed air, and the rivalry of these different powers has greatly stimulated improvements in nearly all kinds of mine hoisting, pumping, ventilating, drilling and machine operation. Coal mining in the anthracite and bituminous fields is rapidly becoming a mechanical proposition, and the engineer who solves the problems presented in any individual case must select electricity, steam, or compressed air according to the showing either one makes on the balance sheet of the company.

Some recent installations where coal breakers and pumping machinery are operated with electrical motors have demonstrated the economy and efficiency of the central-station idea. This, in fact, is the field in which electricity in the coal mines must make its greatest showing if it is to supersede steam and compressed air to any great extent. This is, moreover, possible with the big companies where a combination of many collieries permits the wide distribution of electric power from one large central station. With the collieries situated within a comparatively restricted area, it is thus possible to distribute the electric energy to them at relatively small cost.

Transmission of Electric Power

The question of economical transmission of electric power over considerable distances enters into the problem, but under modern methods of wiring mines and collieries from one central station, such loss is inconsiderable. On the other hand, the loss of steam power through long pipes by evaporation is apparent, and lengths upward of 1000 ft. prove quite wasteful. At the Hampton plant of the Delaware, Lackawanna & Western coal-mining department, near Scranton, Penn., a large boiler plant of 5000 h.p. has been in operation for some time, and more recently a 2000-h.p. plant was installed for generating electricity for mine purposes. This company operates 15 collieries around Scranton, and they are so situated that they offer excellent conditions for a test of the central-station idea. The electric power is transmitted from the Hampton station to the Bellevue colliery some two miles distant, and oil-cooled transformers step the line voltage from 2300 down to 104 volts. At present this colliery is supplied with steam power, but it will eventually be equipped entirely with electric power for the operation of all the machinery.

At the power house of the Bellevue mine, there is a slow-speed engine belted to a 100-kw., 275-volt, direct-current generator, and a 150-kw. rotary converter. Both of these will be replaced by better types as soon as the extension of the present plant has been accomplished. The new plant contemplates a 300-kw. six-phase rotary converter. This converter will receive the current from the Hampton power house, and furnish it to the various motors in and about the mines.

The electric power will be employed for driving mine pumps, mine hoists, ventilating fans, drills, breakers, and for lighting the buildings and shafts. It is estimated, when completed, that nearly 250 electric horsepower will be required to drive the drainage pumps of the mine, and altogether upward of 2000 h.p. for miscellaneous purposes. The mines will also be completely lighted by electricity, and a system of electric signaling will be installed between the different shafts and the engine house so as to afford complete protection against accidents.

Electrically Operated Breakers

The Lackawanna company has been one of the first to experiment with electrically operated breakers. For several years an experimental breaker has been installed at the lower end of the Wyoming valley. Individual motors are used for driving the different parts of the breaker, and the results have so far proved satisfactory. The complicated machinery required to operate a breaker by steam has always necessitated a certain amount of loss of energy and time. Indeed, the location of the gears, belts and shafts requires a nice designing to eliminate, so far as possible, loss of efficiency. The electric motors simplify the designing and make the operation of the different parts easy. One of the largest electrically operated breakers in the anthracite region was installed by the Delaware & Hudson company, and the saving obtained so far shows a considerable economy of operation. The saving is not only of fuel and time, but of operative labor. The elimination of workmen is one of the greatest gains that electricity makes. One man can generally do the work of two or three where machinery is operated by electricity. The perfect control of the machines by one guiding hand always produces higher and better results.

The Delaware & Hudson company has developed its collieries along the central-station idea to some extent, but the work is less extensive than that of the Lackawanna. Indeed, the latter has adopted every form of electrical device and machinery for improving output and lessening cost of work. While the Hampton central-power station transmits current to eight different collieries, and represents the best type of the central-station plan, it does not by any means indicate the full extent of the electrification of the company's mines. There are altogether 18 stations and collieries belonging to the Lackawanna company, operated by electricity, and these have been installed with a great variety of machinery and motors.

At the different collieries and stations there are 22 generators and five rotary converters. The former have a total capacity of nearly 5000 kw., and the combined capacity of the converters is upward of 860 kw. The power generated by the central station, or by the individual power houses scattered throughout the mining regions is carried to the different mines by high-tension wires, and the current stepped down for the individual motors. These latter range from 10 up to 200 h.p. Twenty-eight motors are used for operating 21 different hoists, which have a total capacity of 1915 h.p. Twenty-three motors of different sizes are required to drive the pumps of the different mines, and they consume a combined energy of 1571 h.p.

[illegible]

The Lackawanna company has been one of the foremost of the anthracite companies to adopt the electric locomotive for mine hauling, and for some time now it has been committed to this type of machine. The steam and compressed-air locomotives have gradually been withdrawn from the mines of the company, and today, 56 electric locomotives are doing the work. Nearly 4000 h.p. are required to operate these different engines, and their total capacity is enormous. Their earning power has amply demonstrated to the satisfaction of the company their value.

The number of smaller motors owned by the Lackawanna company for miscellaneous use in its mines range from those employed for driving small drills and electric fans up to the larger ones for running drainage pumps. Altogether there are nearly 25 of these smaller motors, and they have a total capacity of 318 h.p. The mines are lighted by thousands of lamps, and every part of the larger collieries is equipped with telegraph and telephone signal stations to simplify the work of communication.

The power stations of the modern central generating plants for the anthracite coal mines are important parts of the whole subject, for it is often here that the economy of utilizing power is to be obtained. At the Hampton station, the generating units are four 500-h.p. Curtis turbines. They run at 1800 r.p.m. with steam at a pressure of 150 lb. per square inch, superheated 200 deg. F. The turbines are direct connected to alternating-current generators of the three-phase, 60-cycle, 120-amp. type. They generate current at 2300 volts. This high-tension current is transmitted direct to the mines where it is handled by the different converters installed at the entrance to the collieries for that purpose.

---

*Mining engineer, New York City.

Steam is brought to the turbines by pipes from the boiler house located some 25 ft. distant. The equipment of the boiler station consists of fifteen 300-h.p. Babcock & Wilcox boilers operated at 125 lb. pressure. Automatic stokers and fuel economizers are installed to lessen the cost of operation and increase the working efficiency of the plant. A superheater is attached to each boiler so that the steam can be superheated to 200 and 245 deg. F. Steam is also supplied from this station to several of the collieries in the vicinity which still use steam engines for work. One line of steam goes direct to the turbines, and several others branch out to the different collieries. Some of these steam-pipe lines are nearly 2000 ft. long, and the loss of steam through evaporation and condensation has been so great in the past that the present plans were drawn up to reduce it. By the electric system this loss of energy is almost entirely eliminated.

The nearest station to the Hampton plant operated exclusively by electric power is the Sloan mine. This is a typical substation of the company's works, after which most of the others will be modeled in time. There is located at this mine a 200-kw. rotary converter which runs at 900 r.p.m. Three 75-k.w. oil-cooled transformers are also installed here which receive the 2200-volt current from the main line, and step it down to 104 volts. The rotary converter converts the alternating current at 60 cycles and 104 volts to a direct current of 275 volts. The current thus stepped down and converted into direct current is carried into the mines for driving the different motors.

Induction Motors Employed for First Time

At the Nanticoke power house of the Lackawanna company, about three miles from Wilkes Barre, even further improvements upon the Hampton station are contemplated. Three 500-kw. Curtis turbines are installed here also, and each turbine is direct-connected to a revolving field, three-phase, 60-cycle, 4150-volt alternator. The four-wire system is installed, and the plant in time will be extended to include five large turbines. Induction motors will be employed here for the first time in the anthracite field, both for operating the breakers and the mine machinery in the collieries. The four collieries which are to utilize the electric current are located from two to four miles from the power station. The current will be transmitted as in the other cases to the collieries without transformers, and at a voltage of 4150.

One of the important features of this new equipment will be the operation of mine pumps by induction motors. Thirty-, 60- and 90-h.p. induction motors will drive the pumps. One of the breakers to be driven by the power from this station will be equipped with a 50-h.p., 500-volt, direct-current motor for operating the car hoist, and 13 smaller motors for other parts of the work. At the Bliss colliery a 200-h.p. induction motor, operating at 440 volts, will drive the mine hoist, and another will drive a centrifugal pump with a capacity of 1000 gal. against a head of 100 ft. A 40-h.p. motor will drive this pump.

Induction Motors to Operate Breaker

At the Truesdale colliery, a large breaker has recently been built and equipped with electric power. Fifty induction motors will operate this breaker when complete. It is expected to represent the extreme advance in modern breakers, and everything to simplify the work and increase the output has been done. The final outcome of the equipment and operation will be a matter of interest to mine engineers all through the anthracite region.

The Eyesight of Coal Miners

Special Correspondence

The most practical and convenient method of detecting the gases in coal mines is by noticing the variation and coloration of the safety-lamp flame. This method which is universally employed, is simple and easily learned by the men. It, however, requires a good vision to use it accurately. But few superintendents recognize this fact, with the result that many colliery disasters are attributed to such neglect.

The president of the British Medical Association, Dr. Simeon Snell, has investigated the vision of British coal miners and reported the results of his observations at a recent meeting of the association in Sheffield, England.

Doctor Snell's investigations were carried out with the assistance of A. H. Stokes and other officials of the mines department. It was found that miners suffering from nystagmus and other visual complaints are quite unreliable as gas detectors.

A miner with nystagmus when looking at a safety lamp gets the impression that the object looked at is in motion. This is caused by the oscillations of the eyeball, and is due to the weariness of the elevators of the eyes caused by working in constrained positions in the mine.

Miners Failed to Detect the "Caps"

Forty-eight miners were tested in the ophthalmoscopic dark room in the Sheffield hospital. These men were brought from 13 different collieries and were examined with regard to their capacity to detect the "caps" of safety-lamp flames. All of these men failed to detect a "cap" until a dangerous amount of gas was present. One could not see a large "cap" at all. He said his lamp was "spinning too much;" another could not see a "cap" until he steadied his eyes. He then saw a 1-in. "cap." One who had nystagmus in a marked degree reeled like an intoxicated man when rising from the floor from the kneeling position he had assumed in reading the lamp. The lamp was full of gas before he detected a "cap."

The results of the experiments were so astonishing that members of the association now advocate the periodical medical examination of all officials whose duty it is to make the daily gas tests in coal mines. Each inspector should be tested for vision as carefully as locomotive drivers and signalmen. Gas tests with the safety lamp are almost useless unless the testor has good vision. It might be valuable if the question of vision would be investigated by the Accident in Mines Commission now sitting in Pennsylvania.

Coal in the Polar Region

The difficult proposition of mining coal in the far north is being undertaken by J. M. Longyear, of Marquette, Michigan, and other mining men. The coal beds are located in Spitzbergen, considerably to the north of Iceland and within a few hundred miles of the Pole itself. The scene of the mining operations is within a day's run of the bay where Dr. Andre soared into the air on his ill-fated ballooning expedition to the North Pole, and where more recently, Walter Wellman had for two seasons endeavored to make a start for a polar dash in a dirigible air-ship. It is in the land of the "midnight sun" and a region of constant ice.

Mr. Longyear's attention was first directed to the possibilities of the Spitzbergen coal deposits when on a trip to "No Man's Land" a few years ago. Although exploratory operations are by no means complete, the work so far accomplished shows that there are large coal beds which can be made to produce an enormous tonnage.

It has been determined that the product of the mines can be shipped during the open season to the European markets and disposed of in competition with other coals. The seams produce a fine steaming coal of high efficiency and of excellent physical structure.

When sinking a three-compartment shaft, put in the permanent partition between the manway and the hoisting compartment while sinking; the manway can then be used for ventilating purposes, it being used for the time being as the upcast. A fire basket hung in the shaft will heat the upcast current of air and promote ventilation.

Steam Winding Engines in English Coal Mines

By J. Hinton*

It is one of the ironies of industrial fate that just as a machine or process seems to have arrived at nearly practical or working perfection, it is often subjected to unrelenting competition by a new rival in the field, and after a hard fight in which it surpasses all previous performances, it sometimes gradually loses its hold and has to make way for the more modern equipment. Thus, after many improvements, the steam-winding engine is entering a fight with the electric-winding engine. Aa present the steam winder holds the field, and we may profitably note the principal characteristics of its modern form in England.

In most places, and particularly at collieries, very little attention was formerly paid to steam consumption. In the colliery districts it was held that with coal all around them, they surely had no need to worry about the small amount that the winder required; it was, therefore, thought to be unnecessary to seek for high efficiency. Such ideas are now changed, and it is recognized by English engineers that it is not only possible to attain efficiency far in excess of that secured in the old days, but also it pays to so economize.

High Efficiency Now Sought

Generally speaking, increases in efficiency due to improved methods of design or working are obtained as certain percentages of the original efficiency, in England. Thus, compounding reduces the steam consumption per horsepower-hour by a certain percentage of the original consumption and not by so many pounds of steam. Hence the saving in the actual weight of steam used or coal burned under the boiler is greater, the more wasteful the conditions under which the engine works. Further, all mines are not collieries, and even at a colliery coal has value. Colliery slack sells for 72c. per ton at the pit mouth, so it is evident that every ton of coal unnecessarily burned is 72c. thrown away.

Modern steam-winding engines have not developed into such a distinct type in England as the modern cotton-mill engine in Lancashire. It is, indeed, hardly to be expected that they should, since the conditions under which different winding engines have to work vary so much. In the first place, the price of fuel at mines varies within wider limits than in the case of cotton mills and this greatly influences the extent to which steam-saving devices can properly be incorporated in the design. Then again, the nature of the winding load varies; in some cases steady winds from great depths are the rule, while in other localities the winding is restricted within comparatively short limits of distance. In all cases the load on the engine is variable and in practically all cases the engine has to reverse. The conditions of working are unfavorable to high economy.

The Double-cylinder Simple Engine Gives Best Acceleration

The modern winder is usually a compound engine in England; rarely is the triple-expansion engine employed. This is not merely on economical grounds, but also because of the extra complication of valve gear, of by-pass steam pipes and the like, which are complicated enough in the ordinary English compound engine; further, the triple-expansion engine does not lend itself to a symmetrical design. Then, too, in the opinion of English colliery managers, the type of engine should depend upon the length of a wind between stops. In most winding engines, high acceleration of speed at starting is considered desirable. There can be no question that the double-cylinder simple engine gives the best acceleration; however, the comparative slowness of a compound or triple engine in getting away can be partly overcome and the method is regularly employed in England by feeding live steam at a somewhat reduced pressure direct from the boiler to the low-pressure cylinder. This, however, complicates the engines, necessitates increased strength in the low-pressure cylinder, and is even then not quite as rapid in its action as the double-cylinder simple engine. Also this admission of boiler steam to the low-pressure cylinder is obviously uneconomical, and if it is done frequently, as when the stops are frequent, all the increased economy of the compound, or the triple-expansion system is wiped out completely.

In England at the present time and in many other European and foreign countries, the tendency is strongly in favor of the cross-compound engine as giving the best all-round results under the usual winding conditions.

As an aid to economy, steam jackets are commonly fitted. If they are properly arranged so that the steam is not merely fed into the jacket space, but which is far more important, is continually being drained away, together with all entrained moisture and air, and if the jacket is as hot as possible, consequently not at reduced pressure, considerable economies are obtainable by the addition of jackets to the engine. Frequently also a reheater is placed in the steam receiver between the cylinders, but unless superheated steam is used for reheating, the reheater is not necessary.

Equally good, or even better, results can be obtained without it, provided that the entrained moisture in the receiver steam is drained away and is not allowed to enter the low-pressure cylinder. That is to say, the receiver between the high- and the low-pressure cylinders should be a steam separator rather than a reheater. The condensed steam should, of course, be returned to the boiler. It is doubtful, in the opinion of English mining experts, whether it pays to have a reheater, even when using highly superheated steam. It must be remembered that the reheater merely re-evaporates the moisture in the steam at the expense of steam (often at a reduced pressure) from the boiler. To do this is uneconomical for two reasons: First, condensed moisture in the steam gives a more efficient result, if when re-evaporated it is at full boiler pressure. In the case of receiver steam the pressure at which re-evaporation takes place is necessarily much below the boiler pressure; second, if the condensed steam be returned to the boiler and there evaporated, it receives its heat direct from the furnace.

In the alternative method of using a reheater, the heat of re-evaporation is received from the furnace through the medium of the boiler steam, obviously a thermally uneconomical process. It may be asked why it pays to employ jackets but not receivers. English engineers answer that the functions of the two are quite different. The jacket should keep the cylinder walls hot and dry so as to reduce condensation and leakage in the working steam due to its necessary fluctuations of temperature. The function (which, however, is incorrect) of the receiver is to evaporate condensed steam.

Most winding engines in England have a Corliss valve gear, usually of the Reynolds type, using a wristplate. The ordinary direct-driven gear is not so suitable. The gear has to be capable of giving a [illegible] ing to full stroke on the high-pressure cylinder and rather less on the low-pressure. In addition, some sort of link motion (usually the Stephenson) has to be provided to enable the engine to reverse. The reversing gear on all, except very small engines, is operated by a special steam cylinder with an oil-dashpot cylinder, and is under perfect control.

The whole of the variation of the power and speed of the engine is not, however, safely effected by the cutoff gear. Both cylinders are usually provided with throttle valves worked from the engine-man's platform. In many cases speed-limiting devices are fitted, and these cut off steam and apply the brakes whenever the speed exceeds a certain predetermined limit.

[illegible]

A parallel winding drum is most commonly employed, although a conical drum, or a combination of the two types, is fairly common in England. The object of the conical drum is to enable a higher initial acceleration in engine speed to be obtained. The drums are, of course, fitted with brakes controlled from the engine-man's platform. Frequently the drums are so arranged that by means of a special clutch they can be rotated somewhat on the shaft independent of the engine, thus allowing the relative positions of the cages on the two ropes (each having a separate strain), to be exactly adjusted.

---

*Mining engineer, Manchester, England.

A good deal has been written lately about the difficulty of preventing accidents due to overwinding with a steam engine under the more or less uncertain control of a man. There is, however, nothing to prevent devices being fitted which will cut off the steam and apply the drum brakes should overwinding occur, whatever the man may be doing. Such devices have indeed been often fitted, and in some cases are regularly used to control the engine. In others they are adjusted for emergency action alone.

The Modification of Illinois Coal by Low Temperature Distillation

In conjunction with the extensive experiments being carried on by the chemical department of the University of Illinois, Professor Parr and C. K. Francis have continued their research work on Illinois coals. The bulletin dealing with the work, and issued by the University Experiment Station, says:

"In the consumption of fuel for industrial purposes, two fundamental considerations must be kept in mind: First, there must be economy in the use of material; second, there must be regard for the comfort and health of the community. Modern practice has made marked advances in recent years in the observance of the first consideration. As might be expected, the initiative in any matter involving economy comes largely from the user, the impulse being the very natural one of self-interest. For results under the second consideration, obligatory measures, in the main, have predominated, the pressure coming from without by mandate rather than from within by preference, and advancement has been at a slower rate."

Results thus far Obtained

It is stated that the work is by no means complete but is of sufficient interest to warrant publication in its preliminary form. Aside from the gases evolved, the by-products have received but little attention.

"In the residual liquors, there seem to be no tarry compounds present but oils, phenols, ammonia, etc. Some quantitative results on the latter show as the highest result obtained from the wash liquors, about 11 per cent. of the total nitrogen present in the coal. In most instances, the yield was less than 1 per cent. This matter is receiving further attention.

"Concerning the coal residue, enough has already been developed to indicate that it would have a special value for domestic use and such industrial operations as require a smokeless fuel. While much of the volatile constituent remains, it has undergone a change which makes it not difficult to carry on combustion without the production of smoke. This fact is, perhaps, suggested by the rather close resemblance in composition to the so-called smokeless coals. Because of the great ease with which this material may be broken down, it would require, in all probability, to be subjected to the briquetting process.

"As a rule, finely pulverized coals in contact with oxygen either diluted as in the case of air or in the pure state, begin oxidation at a temperature between 120 and 135 deg. In some instances, however, this temperature of oxidation is higher, though in none of the tests did it exceed 155 degrees.

"The ignition temperature varies with the type of coal and to a certain extent also with the fineness of division. Finely divided bituminous coals ignite in oxygen at a temperature not far from 160 deg. Buckwheat sizes ignite at about 260 to 300 deg. Semi-bituminous coals ignite at about 200 deg. and anthracites at about 300 degrees."

A New Development in Hoisting

The best development of the Kœpe system of winding is that known as Whiting's method, which is especially adapted to hoisting from different levels. Instead of the single pulley, it has two which are set one in front of the other, the front pulley having a slight lead for the rope to clear itself. The two pulleys are coupled together by connecting rods, the back pulley is coupled to the engine. The winding rope from the cage passes over the shaft-head pulley and underneath the front driving pulley. After several turns around the two pulleys, it passes back to a tension bogie, then under a fixed pulley and over the shaft-head pulley to the other cage.

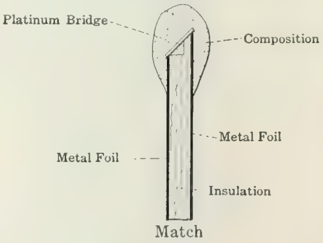
As the driving pulleys wear out rapidly, they are constructed with renewable rings. The bogie is capable of running backward or forward to facilitate hoisting from different levels. If the hoist is from one level, the bogie is dispensed with. The chief advantage of this system, aside from its adaptability to winding from different levels, is that overwinding is impossible, for as soon as the bottom cage has reached the bottom, most of the weight is off the rope and the rope no longer bites on the pulley. There is no angling of the rope as occurs where a drum is used for winding.

An Improved Method of Blasting Coal

It is claimed by some authorities that even common black powder can be used with comparative safety if the proper method of firing is adopted. Where exploders are used for black powder shooting, it often occurs that the powder is scattered without causing an ignition.

One of the latest improvements that pertains to shot firing is known as the "Star" electric safety fuse. A section of this little device is shown in the accompanying illustration and is constructed as follows: A match, consisting of an insulating sheet covered on two sides with a metal foil, is made; the end of the match carries an incandescent wire bridge; this latter end is dipped into a fulminating composition like that used in making matches. This is afterward tested to its exact and uniform electrical resistance and is then soldered to wires of various lengths, according to the depth of the hole which is to be fired.

The upper end of the wire holding the match is then fastened into a paper tube by sulphur cementing, and the match is thereby protected from injury, which it otherwise might receive during transportation, handling and loading into holes. The paper tube is closed with a small cork and the whole is dipped into a wax to make it moisture proof.



SECTION SHOWING SAFETY FUSE IN DETAIL

Among the several advantages claimed for this style of electric fuse are: (1) they mine more lump coal; (2) they avoid premature blasts as well as hung shots; (3) they avoid blown-out shots; (4) they lessen the liability of gas explosions.

As compared with the cost of using double-tape fuses, the electric safety fuse shows a considerable saving. Any kind of an ordinary battery can be used to generate the current.

It is not necessary to take gate valves apart to clean out the mud carried in with the steam when a boiler foams. It can be done by opening and shutting the valve several times while the water is running through it and the boiler is not under pressure.

Colliery Notes

A large volume of air does not always require a high water-gage; the same water-gage will pass a larger or a smaller volume of air, according as the resistance offered by the mine airways is less or greater.

Illinois contains the largest area of bituminous coal within any single State. Coal-bearing rocks underlie 85 of the 102 counties in Illinois. The coal area may be estimated at from 36,000 to 42,000 square miles.

The use of too quick a powder or an explosive of too fine grain, often results in blow-out shots. The other principal causes of blow-out shots are, seating the shot too deeply, and drilling a hole of too large diameter.

In testing Illinois coal for occluded gases, a drill hole was driven and the dust from the first 2.5 ft. was collected in one flask, while that from the last 3 ft. was sealed in a separate container. The sample farther from the exposed face contained more occluded gas.

Estimates place the original tonnage of coal contained in the Illinois field at about 137,000,000,000 tons. At the close of 1907, the producing companies of the State had mined 645,868,309 tons, while the coal that had been wasted and lost in mining operations amounted to about 396,000,000 tons.

Chemical fire extinguishers have been found effective in fighting underground mine fires, and being always ready for immediate use, are particularly serviceable in stopping an early blaze before serious damage can be done. Several of these ready fire extinguishers should be included in the surface and underground equipment of every coal mine.

In tail-rope hoisting, the rope length may be easily adjusted by changing the position of the transfer wheel. This method of winding is most practicable for hoists 1000 ft. and deeper where the loads are hoisted alternately by both cages from the bottom. The best results are not obtained from this method when it is used for hoisting from intermediate levels.

In pure air with a normal proportion of oxygen, the least percentage of carbon monoxide producing fatal results when breathed by healthy persons for about one minute, is stated as 0.5 per cent.; it is true, however, that when the oxygen is reduced to 10 per cent. in the air breathed, 0.05 per cent. of carbon monoxide will likely produce fatal results.

The explosion of black powder produces 33 volumes of nitrogen; 51 volumes of carbon dioxide; 10.5 volumes of carbon monoxide; 3 volumes of water, and 2.5 volumes of hydrogen sulphide. It is easy to see, therefore, that in a mine where there is an excessive use of powder in blasting, these poisonous and irrespirable gases soon vitiate the air and render it unfit for breathing.

It is impossible to detect violations of the law in reference to the use of powder, when the miners are permitted to charge and fire their own holes; the foreman can keep an exact account of the number of holes fired and the powder used by each man, but even a record of this kind will only show the average charge of powder used. The employment of special men to inspect, load, and fire the holes is the only safe way.

Tests on the weathering of coal in Illinois gave the following results: 1. Submerged coal does not lose appreciably in heating value. 2. Outdoor exposure results in a loss of heating value carrying from 2 to 10 per cent. 3. Dry storage has no advantage over storage in the open, except for high-sulphur coal. 4. In most cases the losses during storage appear to be practically complete at the end of five months.

The anthracite mine law prohibits the storing of gunpowder or other explosive in a mine, and limits the quantity of powder a workman shall have at one time in one place, to 25 lb., except where more is required for a day's work; this law also requires that such explosive shall be kept in a locked box 10 ft. from the tracks, in all cases where room at such a distance is available. A workman in handling such an explosive shall place his lamp not less than 5 ft. away, and in such a position that the air-current cannot convey sparks to the explosive.

In mines where naked lights are used, the question of a proper grade of oil for the miner's lamp generally receives too little attention. Rape oil of good quality maintains an intense flame of fairly uniform hight, but the wick chars quickly and must be trimmed often; good clear seal oil is far superior to the refined vegetable oil, such as rape and colza, with respect to the hight of flame without recourse to trimming the wick. The investigation recently carried on by the English Mines Commission also suggested the admixture to seal oil or to the vegetable oils, of petroleum, having a flashing point not lower than 80 deg. F., in the proportion [illegible] volume of petroleum to two volumes of vegetable or animal oil.

The principal causes of waste and losses in [illegible] at present are due to the cheapness of "coal in place," and to the low market prices, resulting from extreme competition. The average total cost per ton of coal loaded on cars, including general and selling expense and amortization, but not capitalization interest charges, is from $1.20 to $1.30 for the coal produced in the longwall district, and from 70 to 95c. for the other districts. It is safe to say that the average net profit per ton throughout the State of Illinois for a whole year does not exceed 20c., and if the interest on the capital be taken out the average profit will be reduced to 10 or 15c. per ton. The Illinois operator, therefore, claims that if he were to carefully conserve the coal he owns or leases, he would undoubtedly wreck his business.

Each succeeding mine accident, such as the one that has just occurred at the Radbod mine in Germany, calls our attention more forcibly to the necessity of providing rescue stations and hospitals underground. A station of this sort should be connected with an air-compressing plant on the surface by adequate pipe lines, which latter should be designed to supply sufficient air to keep alive a large body of men who might find their way to such stations, in case of accidents shutting off all other avenues of escape and destroying the circulation of air in the mine. The pipe for carrying such a supply of air should be laid just beneath the floor of the mine road, to protect them against roof falls. The end of each pipe line should be provided with a trap, which should be kept closed, and opened only by those occupying the station at the time of accident. Many experienced engineers also suggest that each safety station should be reached by drill holes sunk from the surface, a single hole for each station, and of sufficient size for passing food and water to the imprisoned men. The supply of air should be sufficiently strong to drive back the damp from entering the inclosed area.

The question is often asked as to whether or not the breaking of an incandescent lamp underground will ignite the surrounding gas in a fiery mine. One authority states that the danger from this cause depends on the character of the lamp, the manner in which it is broken, and to some extent, on the character of the gaseous mixture and the temperature of the mine air. It is also stated that if the filament is not broken, but remains intact when the glass is shattered, it becomes almost dark for a moment immediately after the glass is broken. This is due to the cooling effect of the expanding air and gas that rush into the vacuous space of the broken globe. In a few seconds, however, the filament again glows and burns out, with a spark that is certain to ignite the gas. It is seldom, however, that the filament remains unbroken when the glass is shattered. If the filament is broken at the same moment the glass is struck, there is no sparking, and consequently no ignition of the gas. Considering this subject further, it is explained that the long slender filament of the high-voltage lamp is safer that a lamp [illegible] current, which latter lamp has a short thick filament. The reason for this belief is that the slender filament is more sensitive to the cooling effect, and also less liable to remain unbroken when the glass is shattered.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage, in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1908, was 52,800 copies.

Nov. 7	12,500
Nov. 14	10,000
Nov. 21	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
The Situation in the Aluminum Industry ... 1016
To What Extent Are Our Zinc Resources Known ... 1017
Coal Production in 1908 ... 1017
*Metallurgical Practice at Hacienda de la Union ... *Francisco Narvaez* 989
Transvaal Mining Notes. *Special Correspondence* 992
*Improvements at the Oronogo Circle Mill No. 5 ... *Otto Ruhl* 993
Absorption of Gold Amalgam by Copper Plates ... 996
Iron Ore in Great Britain ... 996
*Cyanide Mills, Guanajuato Development Co. II ... *Claude T. Rice* 979
*Manhattan, Nevada. *Special Correspondence* 1002
Platinum at the Cracker Jack Mine, Douglas County, Oregon ... *H. B. Pulsifer* 1003
Geographic Distribution of Lead and Zinc Deposits of the Mississippi Valley. *Charles R. Keyes* 1004
*The Lea-Degen Turbine Pump ... 1005
Ankylostomiasis ... 1005
*Las Chispas Mines, Sonora, Mexico. *B. E. Russell* 1006
*The Scott Gasolene Rock Drill ... 1008
Rhodesian Mines ... 1008
Device for Shaking Bags in Smelter Baghouse ... *Special Correspondence* 1009
*A Hopper for Unloading Railway Cars ... 1009
Rapid Hoisting ... 1010
Deep Gold Mines ... 1010
*Steel Shaft Guides ... 1010
British Guiana Mines ... 1010
Development of Electric Power in Coal Mines ... *George E. Walsh* 1011
The Eyesight of Coal Miners. *Special Correspondence* 1012
Coal in the Polar Region ... 1012
Steam Winding Engines in English Coal Mines ... *J. Hinton* 1013
The Modification of Illinois Coal by Low Temperature Distillation ... 1014
A New Development in Hoisting ... 1014
An Improved Method of Blasting Coal ... 1014
Colliery Notes ... 1015
Correspondence:
Sampling by Machine. *J. A. Church, A. Van Zwaluwenburg* 1018
Questions and Answers ... 1020
An Important Dredge Decision. *Special Correspondence* 1021
Revising the Tariff ... 1021
South Australian Production ... 1012
Calumet & Hecla Copper ... 1022
The Burma Ruby Mines ... 1022
Mineral and Metal Production in Sweden ... 1022
Transvaal Gold Mines ... 1022
Personals, Obituaries, Societies and Technical Schools ... 1023
Special Correspondence ... 1024
Mining News ... 1026
Markets, etc ... 1032
*Illustrated.

The Situation in the Aluminum Industry

We have foretold many times in our annual reviews that aluminum would soon become one of the ordinary commercial metals. During 1908 the making of history in that direction has been rapid. At the beginning of the year the producers in Europe, still bound together by the terms of a convention, reduced their price from 33c. per pound to 22c., the decline in the demand for consumption, along with that of all the other metals, leading to this reduction. At about the same time the American producer reduced its price from 38c. per pound to 33c. Previous to the panic in 1907 the American price was 42c.

It has been the policy of the Aluminum Company of America to make the price for its product all that the trade would bear. This has excited more or less adverse criticism and also has aroused dissatisfaction and dislike on the part of the consumers, so that the latter have been looking anxiously forward to the time when competition might develop after the expiry of the patent monopoly. From the standpoint of the producer the policy was probably sufficiently wise. Consumers were willing to pay a price yielding nearly 200 per cent. profit for all the metal that the company could produce; indeed the company was strained to the utmost to increase its capacity; consequently why not make hay while the sun was shining?

If the Aluminum Company is open to any criticism, it is for failing to bow more quickly to adverse conditions. Toward the end of 1907, demand having dwindled to a comparatively small rate, the company made a rather grudging concession in price and shut down two-thirds of its smelting capacity, rather than attempt to revive consumption by a sweeping reduction in price. At this time the management was imbued with the well known policy of the U. S. Steel Corporation, which Judge Gary expounded on several occasions, that the cutting of prices does not stimulate consumption, wherefore prices are best maintained. Thus the Aluminum Company of America maintained its price steadily at 33c. until a few weeks ago.

On Sept. 30, the convention among the European producers was dissolved, and immediately there was a scramble for business in a market which had suffered severely by the enormous falling off in orders from automobile manufacturers, and from competition of ferrosilicon in the iron trade. Aluminum immediately passed upon the footing of the staple metals, like copper, tin, lead and zinc, wherein there is free competition and the establishment of prices in which the buyer as well as the seller has a part. The price for aluminum in Europe fell consequently to as low as 13½c. per lb., which rules at present. The American producer is protected by the duty of 8c. per lb. upon ingot aluminum, but in spite of that preposterous duty, the slump in Europe was so great as to compel successive reductions in price here. The last quotation is 25½c. per lb. nominally, but probably considerable discounts from that price are made to well informed customers, inasmuch as high-grade European aluminum has been freely offered here at 22c. per pound.

The present price puts aluminum on a basis comparable with those of tin and copper. Weight for weight it is cheaper than tin, but bulk for bulk it is cheaper than either tin or copper. This level of price ought to stimulate greatly the consumption of aluminum, especially when the revival in general trade goes a little further. We look upon aluminum as having now fallen to somewhere near its natural level, around which the price will hover, rather than as having suffered a slump to a very low price from which there will be a recovery. The producing capacity of Europe is increasing, while in the United States the Bradley patent will expire early in 1909, permitting free competition in the business just as there is now in Europe. Even at present prices there is a good profit to the Aluminum Company of America, the manufacturing cost of which is probably in the neighborhood of 15c. per lb. Indeed, except for the tariff, there is no reason why aluminum should not sell as cheaply in the United States as in Europe. According to a recent writer in the Frankfurter *Zeitung* the average cost of production in Europe is 17¼c. per lb. (higher than the present selling price), but undoubtedly there are important differences in the positions of the various European smelters, and, of course, the market price is established by the most favorably situated under the present condition of over-supply. However, it is probably safe to say at least that the cost of making aluminum in Europe is no lower than in the United States.

To What Extent are Our Zinc Resources Known?

The article by Doctor Keyes, published elsewhere in this issue, is particularly suggestive. If there be any of the principal metals of which the known supply is suffering such exhaustion in the United States as to cause a higher range of prices, zinc is the one. The Joplin district for several years has been reduced to a large extent to the mining of ore which yields only 3 per cent. of mineral (blende, plus galena). Leadville began as a zinc producer by shipping the tailings derived from the concentration of ore containing lead, but that kind of [illegible] hausted and the producers were obliged to turn to ore consisting chiefly of blende and pyrites, which had to be worked for the zinc content alone, whereas zinc had previously been a by-product.

Ever since the zinc industry in the United States has been important, the Joplin district has been the chief source of supply. If it be the only great source of ore supply, and if it be approaching exhaustion insofar as the richer ore is concerned, the outlook will be for an increasing scarcity of spelter and consequently a higher level of prices for it so long as foreign spelter is excluded by a tariff.

Doctor Keyes now points out that the concentration of attention upon southwestern Missouri and the general acceptance that the term "Joplin district" is synonymous with the zinc-producing capacity of that region have created erroneous ideas, and he remarks that contrary to general opinion the ore deposits of the Ozark region are not limited to a few circumscribed areas, but extend far beyond the boundaries of the present recognized mining districts. He expresses the opinion that the ore fields outside of the limited districts now operated will prove to be much more extensive than the fields developed up to the present time.

In this connection it is interesting to note that the recent developments in the Quapaw and Miami districts of Oklahoma already are showing the existence of large deposits of ore. By courtesy these new districts of Oklahoma are included with the Joplin district in the statistical reports of production, but as a matter of fact they are a good many miles away, are different in some important respects as to character, and are confirmatory of the opinion which [illegible] expressed.

Coal Production in 1908

An accompaniment and also an indication of the business depression of the past year is found in the decreased quantity of coal mined. While no returns from the mines can be obtained, those from the railroads and other transportation agencies cover nearly all the more important coal-fields east of the Mississippi. In these fields nine-tenths of the coal used in the United States is mined.

It must be assumed that the consumption of coal for domestic purposes does not vary greatly from year to year. A mild winter, reducing the consumption in one part of the country, is generally balanced by more severe weather in another section. The quantity consumed by the average family is only slightly reduced in hard times, and the aggregate remains nearly the same. The difference in consumption is entirely in the quantity used for raising steam and for manufacturing purposes generally.

The railroad returns available for this purpose cover, generally speaking, the western Pennsylvania district, West Virginia, Ohio, Indiana and the southern part of Illinois in the West; the central districts of Pennsylvania, and the State of Maryland in the East; and finally the anthracite region, which alone furnishes full returns of shipments. A comparison of the railroad traffic statements shows a remarkable approach to uniformity in the decrease of coal shipments in the present year, as compared with 1907. The falling off in coal traffic has been from 20 to 25 per cent., and leads to the conclusion that there must have been a corresponding decrease in consumption. In coke, which finds its chief use in the iron trade, the decrease has been much greater, fully 50 per cent. or in parallel ratio to pig-iron production. This is corroborated by the statements of production in the Connellsville region, the greatest coke-producing district, which show an output only about one-half as great as last year.

The exception to this general reduction is found in the anthracite region, where shipments have been only about 6 per cent. less than in 1907. Anthracite, however, is used in very large part as a domestic fuel, its sales for steam purposes being only a minor part of the [illegible] Moreover, anthracite will stand storage, and the companies handling it have large facilities for storing it and thereby equalizing work at the mines. Shipments, therefore, are not an exact guide to consumption.

The conclusion to be drawn is that the production of bituminous coal in nine months of the present year has been from 20 to 25 per cent. less than in the corresponding period of 1907. For the remaining three months the reduction will probably be less, since business is now improving, and the comparison will be with a poor quarter last year, when the depression had already set in. The total production of bituminous coal in the United States in 1907 was, in round figures, 388,222,000 tons. In 1908 it is doubtful whether it will exceed 320,000,000 tons; but even this is a great figure, far exceeding the output of any other country in the world. The anthracite figures will bring the total up to slightly over 400,000,000 tons for the year.

[illegible] number of the JOURNAL, which will present the statistics of the production of the important metals and minerals in 1908, will be the issue of Saturday, Jan. 9, 1909. It has been the custom heretofore to make the first issue of the year the annual statistical number, but the first issue of the coming volume of the JOURNAL falls on Saturday, Jan. 2, 1909, and inasmuch as the last form of the JOURNAL regularly goes to press on the preceding Wednesday, it is impossible this year to collect the statistics in time for the issue of Jan. 2, wherefore the change.

THE PAPER BY SEÑOR NARVAEZ, published in this issue, will surely excite interest, being an excellent illustration of the great progress in metallurgy in Mexico. Particular note should be directed to the milling cost reported by him. So far as we know, it is not equalled, nor even approached, anywhere else. Although Señor Narvaez conservatively gives 15 tons as the capacity of the mill with a feed of 1½-in. ore, we understand that he is doing better than that with much of the ore as large as 4 in. It is particularly interesting to chronicle the [illegible] which gave to the world the patio process, that for upward of three centuries afforded the major part of the production [illegible]

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sampling by Machine

John A. Church's remarks in the JOURNAL of Nov. 14 about the selective action of the scoops in sampling machines upon a stream of falling ore pleased me more than a little. I had been waiting for some one to put his finger upon that weak spot for several years, ever since I took a laborious part in an exhaustive test of an automatic sampler at a large custom smelting works.

The machine was one of the earlier examples of the type now extensively used, and it did not differ in any essential detail from those now said to give entire satisfaction. It removed a slice from the ore stream cutting entirely across, and the chances for segration during the transfer from one spout to another were at least as small as in machines of later types. It did not recrush and mix the material between cuts, but the size of the particles was kept well within Brunton's limits, so that this alone does not account for the failure of the machine.

Every lot of ore which came to the smelter yard during two or three months was passed through this machine after having been sampled by the old method of quartering, ringing and coning. The hand sampling was done by a corps of trained men under the direction of the most skilful sampling foreman I ever met. The machine gave samples in duplicate. The two machine samples and the one hand sample were assayed separately, five scorifiers being run on each for silver, two crucibles for lead, two crucibles for gold and two 0.5 gram tests for copper analysis.

It would no doubt be possible to dig enough comparative results out of the old records of that smelter to fill page after page of the JOURNAL, but I fear they would not be very instructive. They were studied carefully enough at the time; for if there was any prejudice at the works it was in favor of the machine. Of course, in the great majority of cases the results were as like as two peas, as was to be expected; but on really difficult lots the machine samples varied in every conceivable manner from those obtained by the despised and expensive hand method; and the umpires invariably gave the decision in favor of the shovel-and-broom process. The machine was abandoned reluctantly but definitely. Reason and economy seemed to be in its favor, but practice had no respect for the beautiful theory upon which it was constructed. Its samples were unreliable.

Later I performed some experiments of my own, and reached certain conclusions which agree rather well with those of Mr. Church, and probably also with those of others who are less outspoken than he. Machines which take a sample by slicing a stream of ore exert a selective action upon the ore particles; they are merely modifications of the old pipe sampler in which the ore fell, as it happened to fall, in the various deflecting spouts. We shall never have a sampling machine which approximates the truth as closely as the old quartering method, until we abandon the falling stream principle.

DEFECTS OF THE FALLING-STREAM PRINCIPLE

Practically all the automatic samplers thus far constructed proceed upon the false assumption that a stream of falling ore is in all respects like a stream of liquid, that its particles are uniform, that they fall with the same velocity and have no dimensions; also that the walls of the scoops and dividing diaphragms are mathematical planes with no thickness and no deflecting edges. The designers assume a free fall for the mineral particles, and a free fall is impossible for 100 per cent. of the ore so long as the particles are larger than the theoretical mathematical point. As Mr. Church explains, the edges of the scoops bring into the stream a disturbing zone, its width depending upon the size of the largest particles, and its proportion to the entire area depending upon the width of the scoops and the frequency with which they enter the stream. The cutting edges invariably discriminate against the larger particles. By experiment I have found it possible to eliminate all the larger particles from a sample of ore simply by pouring repeatedly upon an assayer's sampling scoop; and the ratio between the maximum size of the particles and the width of the scoop seemed to have nothing whatever to do with the results.

Sampling deserves a great deal more attention than it has hitherto received. It is sufficiently important, expensive and difficult to merit the best that science can give. In the nature of things an absolutely accurate sample of a heterogenous ore is an impossibility. The best that any sampler can do is to respect certain laws of chance; and when the selection of a small portion is complete, the most that can be said for the sample is that it probably represents the whole. Sampling is a nonproductive operation; its expense is a burden for which there is no return; and expense will always determine how near the approximation to probability shall be carried, certainty being unattainable.

BASIC ASSUMPTIONS

The art of sampling is based upon the theory of averages. It is assumed that however heterogeneous an ore may be, it is still more or less uniform and that such variations as occur will be "averaged" by taking a sufficient number of cuts. In spite of the fact that repetition does not invariably produce an average either in mathematics, in the sampling mill or on the roulette table, in a great majority of cases the results based upon this assumption are sufficiently accurate for all practical purposes. Some of the Lake Superior iron ores are so uniform that any bucketful will fairly represent an entire shipload; at the other extreme we may imagine a $20 gold coin lost in a ton of barren quartz. Ores received at smelting works lie somewhere between these two extremes, sometimes approaching the one, sometimes the other. Calculations and tables showing the size of crushing, the proportion of the first cut, etc., can be of no use whatever in the case of an ore at all resembling the last extreme given. On the other hand refinements of sampling in the case of the iron ore are a useless expense.

The theory of averages requires that any given particle in a lot of ore shall at the time of each division have equal chances of finding its way into the sample and into the reject; also that there shall be no discriminating conditions likely to impair the equality of the chances. This requires that no cut shall be smaller than one-half of the whole, and that all selective factors shall be strictly eliminated. These conditions are fulfilled, at least theoretically, in the old method of quartering, ringing and coning by hand, which represents a result of centuries of bickering and squabbling between ore buyers and miners. The ore is divided, while at rest, into equal parts, and before the operation is repeated, the material is mixed by coning, in which the selective effects of gravity are reduced to a minimum. In practice, however, carelessness and stupidity on the part of the shovelers may introduce errors far more serious than the shortcomings of the most imperfect automatic sampler. The method is not entirely satisfactory, but there is nothing yet in sight to take its place. Friends of the automatic samplers profess to be glad that the old hand method is rapidly passing. Yet very few indeed will trust the final division in the bucking room to a machine.

The desideratum in sampling has always been a machine which shall retain the advantages of the old hand method and eliminate the element of human fallibility. According to several of the JOURNAL'S correspondents this result has already been attained, although all of the machines embody the defects pointed out by Mr. Church. In sampling it is necessary in any case to be satisfied with "good enough," and if both parties are content to accept the results obtained, the search for improvement is not likely to be keen. But the first step toward improvement is a thorough comprehension of the principles involved, and in this respect Mr. Church has performed a real service.

WHAT A MACHINE SHOULD DO

The division of a falling stream of ore is so convenient and may be done with apparatus so simple and inexpensive that the reluctance to give it up is easy to understand. When inventors begin by adopting another principle, we shall soon have an automatic sampler which will do at least as good work as the old hand method, which is none too good at best. The machine required will divide the mass of ore, while at rest, or at least without segregation, repeatedly into two equal parts.

There are several ways in which this can be effected. A scraper or a series of scrapers removing sections from a uniform ribbon of ore carried upon a traveling belt should meet the requirements, and the cost of an installation of this sort would not be prohibitive. Other methods will suggest themselves to those who have given the matter thought. Whatever system may be adopted, especial care must be given to secure a fair representation of the fines and coarse ore, for that is the secret of sampling, if an art which is no better than a series of guesses can be said to have any secrets.

The shaking-tray feed will have no part in the perfect sampling machine, for it involves the principle employed in innumerable concentrating devices to produce segregation; and segregation of coarse from fine ore is to be avoided like the plague in sampling, unless the divisions are made by weight instead of by time or volume. It is no doubt possible to construct a machine that will remove a definite proportion of the weight of a lot of ore, but the complications would be many and expensive.

When we see mechanical sampling devices used in the bucking room to make the final division of the pulp, we shall be convinced that the automatic sampler has won its way into the confidence of those most concerned. That will serve as a final test of efficiency.

The ideal sampling machine, which violates none of the laws of chance, cannot entirely eliminate sampling as a cause of dispute between miners and smelters. No mechanical device could possibly remove a representative pound from the ton of barren quartz containing a gold coin. The best sample is merely the nearest practicable approximation to the probable; the element of chance will never be eliminated. It would be a good thing if the impossibility of getting a really accurate sample were more generally understood. The best work of the assayer and the chemist amounts to nothing at all so long as the sample does not fairly represent the material tested, and how often does the blame for discordant results rest where it belongs? A. VAN ZWALUWENBURG.

New York, Nov., 16, 1908.

I have read Mr. Woodbridge's letter on "Sampling by Machine" in the JOURNAL of Nov. 7, 1908, with interest; but I do not think his facts or arguments controvert my assertion that modern sampling mills are not equipped properly. He described a feed by perforated shaking aprons put in a Cripple Creek mill under Mr. Argall's management "several years ago." This is an excellent device and gives the double advantage of retarded feed and separate sampling of sizes that are wide apart. How is it that it has not been introduced into any of the "modern" mills? Mr. Woodbridge does not point to any mill that has copied it nor does anyone else mention it.

Mr. Woodbridge joins the other correspondents who have discussed the subject in the JOURNAL in intimating that if I knew what is done in sampling mills I would not criticize their work; but he advances the discussion by one step by confining my presumed ignorance to *public* sampling works, and he makes a distinction between these and mills working on home ores. He says: "The public sampling works, having to maintain a standard different from that of mills directly connected with a smelter or reduction plant, make a business of hunting down causes for differences which may appear through the daily comparisons of their work, etc." I cannot see what difference there is between a smelter that buys 300 tons a day on samples taken in its own mill and the same purchase on samples taken by a public sampler, nor do I believe that our great smelting establishments would put up with poor sampling in their own works if they knew how to get good results. What does Mr. Mathewson think of Mr. Woodbridge's opinion of sampling mills in smelting works? In my first article I mentioned two bad mills in large smelters.

I have criticised the general condition of sampling in this country (and elsewhere), and most of the JOURNAL'S correspondents have criticised me on the ground that they knew of some one or two mills where good work has been done. They intimate that there are others and I have no doubt of it, but I think the gen[illegible] as I have represented it.

I have examined the blueprints of 15 sampling mills, all modern in the sense that they have been designed within the last five years, a period, let me remark, [illegible] certainly does not precede the plans of [illegible] 15 mills can be classified as follows:

Nine had one mixer or one shaking-apron feed in the whole mill.

One had a screen above the first sampler, the oversize going to rolls and the fine to the sampler but no other feeder.

One had a shaking apron at each step of the process. That is a mill for sampling purchased ores and the same concern has a similar mill for its own ores.

Four had no provision of either kind, but trusted absolutely to haphazard feed from the top to the bottom of the mill.

My impression is that more faulty mills are built than good ones, and until my critics show that this is not the case, I must insist that the general practice is faulty, although an occasional engineer with the reputation of an Argall or a Klepetko builds a proper mill.

Mr. Woodbridge has done us all a service by joining the ranks of those who do not accept the mechanical sampler as an infallible machine, but puts his trust in its judicious management, as he should. He recognizes that there are certain rules, or combinations of good sense and the laws of nature, which must be observed and which may be called the principles of sampling. So far as he discusses these principles he repeats or runs parallel to what I have written.

Most of the JOURNAL'S correspondents have contributed something that was surprising to this discussion. Mr. Woodbridge's contribution is simply astounding. He says: "I have examined mills where differences of 30 per cent. and more have often occurred in cutting duplicate samples from the few hundred pounds finally delivered to the sample room by the mechanical samplers." Such a mill could hardly be more *modern* in its machine part than in its hand sampling for the same intelligence, or lack of it, presided over both departments.

JOHN A. CHURCH.

New York, Nov. [illegible]

Donald McLeod, minister of mines and forests for Victoria, reports that in 1907 the Victorian Syndicate, Ltd., at Costerfield produced 3900 long tons of antimony ore from which was obtained 830 tons of [illegible] to 38 dwt. gold per ton. The Heathcote Syndicate, Ltd., at the same place, pro[illegible] concentrates valued at £840. The con[illegible] smelted in England.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

CANDLES IN COAL MINES

Are candles used to any extent for lighting purposes in coal mines in the United States?

F. S.

Candles are not used in any of the large or important coal mines in America. The general means of illumination in coal mines is the ordinary miner's lamp, burning oil, and made of tin, with a cotton wick. The miner carries a ball of cotton from which he makes his own wick. Naked lights of this sort are often prohibited in gaseous mines, and in such workings safety lamps are used.

REFINING LAKE COPPER

Does the copper produced at Lake Superior have to be refined after smelting?

S. A. G.

It is "poled," a simple process of furnace refining, chiefly to bring it to the right pitch. A comparatively small percentage of Lake Superior copper is refined electrolytically in order to secure the silver which it contains.

TERNE PLATE

What is terne plate? Does it necessarily contain tin? Is corrugated sheet iron coated with tin and lead sold as a substitute for galvanized iron? What is the relative cost of terne plate and galvanized iron?

A. B. C.

1. A strict definition of terne plate would be an iron or steel sheet or plate coated with a mixture of tin and lead.

2. Terne plate necessarily contains tin. Sheet coated only with lead would be designated as such. Such a sheet is not produced commercially so far as we know.

3. We do not know of any instance of corrugated sheets coated with tin and lead being produced and sold as a substitute for galvanized iron.

4. For equal gage, cost of common ternes is about the same as galvanized iron. The cost of pure lead-coated sheets, if practicable to produce such, would be higher than galvanized, owing to temperature and coating difficulties.

THICKEST COAL SEAM

What is the thickest coal seam in the United States? What is its width? Is it being worked at present, and what kind of coal does it produce?

W. O. K.

The thickest seam of coal in the United States, of which we have record, is a bed of lignite coal in the vicinity of Hebron, in North Park, on the line of the Denver, Northwestern & Pacific railway, in Colorado. This seam is in the Tertiary formation, and has been opened at several points. The bed is from 40 to 65 ft. in thickness, and outcrops on the surface. At the Little Grizzly mine, its thickness was proved by a shaft 90 ft. deep driven through the seam. The coal from this bed is used for domestic purposes by the settlers, who pay $1.25 per ton for it at the coal bank. An analysis of a sample from the Grizzly opening gives: Moisture, 17.80 per cent.; volatile matter, 36.40; fixed carbon, 43.10; ash, 2.70 per cent. Other samples taken at various points show as high as 48 per cent. fixed carbon.

AMERICAN COPPER SMELTERS

What smelters in the United States produce ingot copper? Who are the chief exporters of copper from the United States?

J. R. M.

Assuming the above inquiry to refer only to refined copper, the following is a list of the electrolytic refiners:

Nichols Copper Co.	Laurel Hill, N. Y.
United Metals Selling Company	Perth Amboy, N. J
American Smelting and Refining Company	Perth Amboy, N. J.
U. S. Metals Refining Company	Chrome, N. J.
Baltimore Copper Rolling and Mfg. Company	Baltimore, Md.
Balbach Smelting and Refining Company	Newark, N. J.
Boston & Montana Copper Company	Great Falls, Mont.
Tacoma Smelting Company	Tacoma, Wash.
Mountain Copper Company	Oakland, Cal.
Chicago Copper Refining Company	Blue Island, Ill.
Calumet & Hecla Mining Company	Buffalo, N. Y.
North American Lead Company	Fredericktown, Mo

Most of the producers of electrolytic copper also turn out casting copper. The latter is produced by the Tennessee Copper Company, Isabella, Tenn., and by several refiners of old junk. The following are producers of Lake copper:

Ahmeek Mining Company	199 Washington St.,	Boston, Mass.
Calumet & Hecla Mining Company	12 Ashburton Pl.,	" "
Mass. Consolidated Mining Company	6 Beacon St.,	" "
Franklin Mining Company	15 Congress St.,	" "
Isle Royale Copper Company	303 Washington St.,	" "
Osceola Consolidated Mining Company	303 Washington St.,	" "
Tamarack Mining Company	303 Washington St.,	" "
Victoria Copper Mining Company	539 State St.,	" "
Atlantic Mining Company	15 William St.,	New York City.
Michigan Copper Mining Company	"	" " "
Mohawk Mining Company	"	" " "
Wolverine Copper Mining Company	"	" " "
Adventure Consolidated Copper Company	32 Broadway,	" " "
Quincy Mining Company	"	" " "
Copper Range Consolidated Company	27 State St.,	Boston, Mass.
Baltic Mining Company	"	" "
Champion Copper Company	"	" "
Trimountain Copper Company	"	" "
Winona Copper Company	199 Washington St.,	" "
Centennial Copper Mining Company	60 State St.,	" "
Allouez Mining Company	"	" "

The chief exporters of copper are:

United Metals Selling Company	New York
American Metal Company	"
Phelps, Dodge & Co	"
American Smelting and Refining Company	"
American Smelters Securities Company	"
L. Vogelstein & Co	"
Calumet & Hecla Mining Company	Boston

GARNET

Is garnet produced in the United States? If so, please state the chief localities in which it is found, the amount produced yearly, its value, and any other information of interest on the subject.

F. A. R.

New York is the chief source of supply of garnet in the United States. Following is the production and value in the United States for the last three years: 1905, 3694 short tons, valued at $114,625; 1906, 5404 short tons, valued at $179,548; 1907, 6723 short tons, valued at $209,985. During 1907 the Adirondack region in New York contributed 5709 short tons of the above total.

METALLICS IN SAMPLES

Just what am I to do when I find metallic masses in sampling ores and smelter products?

J. E. B.

It is almost impossible to determine accurately the value of an ore by sampling and assaying when some of the metals separate out in malleable masses. The matter is complicated by the fact that when this condition is encountered the main sample will always retain some metallic particles and the separated metallics will always be contaminated with ore. Fortunately the proportion of separated malleable material is usually small, so that a rough estimate is commonly close enough.

Since the value of an ore is always determined by the weight of metallic contents, the relative weight of ore and metallics must be determined at each stage of sampling. At the end the metallic masses are assembled and treated separately. Malleable metals cannot be sampled in the usual way. They must be converted into bars or buttons by fusion with the proper fluxes and then assayed, the relative weight at each stage being carefully determined. The bar or button is then assayed and the proportion of metal in the metallics found during the various steps in sampling calculated and apportioned.

The main sample of nonmetallic material is treated in the usual way, especial precaution being taken to guard against error due to minute metallic particles which have a constant tendency to segregate, especially in fine, fluffy pulp.

An Important Dredge Decision

Special Correspondence

An important decision has been handed down by Presiding Judge W. C. Van Fleet, of the United States Circuit Court in San Francisco, which is of great interest to manufacturers and users of gold dredges in this country and throughout the world. The suit was that of the Risdon Iron and Locomotive Works, of San Francisco, against the Western Engineering and Construction Company and the Central Gold Dredging Company, of Oroville, Butte county, Cal. The issue involved concerned the details of construction and operation of gold-dredging machinery, and the validity of the Postlethwaite patent owned by the Risdon works, which, it was claimed, had been infringed upon by the defendants named, the Western Engineering and Construction Company, acting as agents of the Bucyrus Company, of South Milwaukee, Wis. The two types of dredges most commonly in use are those built by the Bucyrus Company and the Risdon works. The latter company has built 56 of these machines, sending some as far as the west coast of Africa. The Bucyrus Company has also built a large number of gold-mining dredges for different mining regions of the world, many of them being in use in California. The Western Engineering and Construction Company was sued for selling the infringed device and the Central Dredging Company for using it. The verdict of the court is in favor of the Risdon Iron and Locomotive Works.

Operators of gold-mining dredges will be interested in some of the details of this decision, which upholds the validity of the Postlethwaite patents. The gist of the whole matter lies in the use of the rotary grizzly or separator, instead of shaking tables, but in combination with other parts, to carry out the functions of drying the gravel, elevating it, washing it and saving the gold.

The suit was for infringement of claim No. 3 in the Postlethwaite patent of 1897 for a gold-dredging apparatus. The claim involved is "a combination with a boat, or platform of a rotary grizzly or separator mounted thereon, devices for imparting rotation thereto, means for excavating, and elevating the excavated material, and discharging the same into the rotary grizzly, or separator, or grizzly, a pump for forcing water into said pipe and through its perforations and under disintegrating pressure onto the material fed into the grizzly or separator, collecting tables arranged below the separator or grizzly, and by means of which the separated metal from the dredge material is recovered."

It will be noted that this is a very broad claim indeed, giving the elements of the combination and not the details of the elements. In holding that this claim of the patent was valid and had been infringed, the court laid particular stress on the fact that the combination of devices set forth in the claim were not anticipated by any prior patented device, and that the combination of the claim sued for was not disclosed in any prior publication. The court also held that although a large number of dredges of the character of the patented apparatus were disclosed in the evidence, none of such devices disclosed the invention of the involved claim of the Postlethwaite patent. After discussing at some length the question as to whether the claim was a mere aggregation of elements and not a true combination, the court held that the claim in the suit disclosed a valid combination. In passing on this question the court commented as to "the great value which had undoubtedly resulted from the device patented, and the great success it has had," which undoubtedly was a material factor in connection with the decision.

The combination claim in the patent was for a device made up of various elements which are, under the law, assumed to be old, but a combination of old elements which, it is claimed, required inventive genius for their assembling in such a way as to produce a unitary whole—an instrument patentable under the laws of the United States.

It may be stated that the allowance of the original patent had a very long and hotly-contested passage through the patent office, and the claim involved in this suit was taken on appeal to the Commissioner of Patents. That official finally decided that the claim for the combination involved was patentable, and that the patent should issue. In passing on the commissioner's decision in this respect, Judge Van Fleet expressed the opinion that the ruling was correct.

The contest on this patent right has been pending before the courts for the past five years, and testimony has been taken throughout the country. The defendants argued strongly that the device was anticipated by the use of gold-dredging machines which had been worked at Bannack, Mont., Prescott, Ariz., and Pascoe, Wash., all of which had been made by the Bucyrus Company. The testimony was not sufficient, however, to convince the judge. The patented device has virtually revolutionized the art of mining the class of material which it handles. A few machines still use shaking tables combined with the other features referred to, but lately numerous applications have been made to the Risdon people to put rotary grizzlies or separators in their place.

Undoubtedly the result of this decision will be the beginning of many suits for infringement of the patent involved against a number of manufacturers and users of gold-dredging devices. There are even some in California who manufacture dredges for their own use only, and do not sell them, and these people can hardly escape litigation. Royalty will doubtless be demanded from users of the machines in the future, even in the case of old dredges which they bought in good faith without thought of any patent infringement. What steps will be taken toward manufacturers of gold-dredging devices who have been using this patent, none but [illegible]

Revising the Tariff

Hearings before the Ways and Means Committee began at Washington, Nov. 10. So far the wishes of producers concerned in the mineral industry have been expressed as follows:

[illegible] cuse, N. Y., wants the duty increased on the by-products of coke manufacture; 0.5c per gal. on crude tar, 0.75c. per gal. on pitch, and higher rates on the derivative products.

The Henry Bower Chemical Company, of Philadelphia and Baltimore (bichromate manufacturers) wants increased duties on the articles it manufactures.

The New Jersey Zinc Company thinks that zinc oxide needs more protection. Lithopone, not mentioned in the present tariff, should be mentioned; it is now taxed 1.25c. per lb. as sulphide of zinc. The new duty should be the same.

The barytes miners of Missouri and the South wish the present duty of 75c per ton on barytes to be raised to $5

South Australian Production

The production of metals in South Australia for two years past is officially reported as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The gold production of the northern territory, so far as reported, was 449 oz. last year.

The production of ores and minerals was as follows, in long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The production of miscellaneous minerals of various kinds, in small quantities was valued at $10,780 in 1906, and $12,167 last year

---

The bulk of the manganese ore produced in North Wales comes from a bed of ferruginous manganese, intercalated among the Lower Silurian shales near Aberdaron in Carnarvonshire, and yields an average of 30 per cent. manganese and 10 per cent. iron

Calumet & Hecla Copper

In the testimony in the recent suit of A. S. Bigelow against the Calumet & Hecla company, T. L. Livermore, of the latter company, made the following interesting statements:

"Electrolytic wire bars have increased gradually until during the last three years much more electrolytic copper has been sold in competition with the Calumet copper in that shape than the Calumet itself has sold, and as I have every reason to believe, more than all Lake copper in the shape of wire bars.

"Of Calumet copper I can say that sometimes it has been of the same price as electrolytic and sometimes higher. When electrolytic copper did not have the good reputation for excellency and uniformity that much of it has today, it was more common to get a better price for Calumet than it is now, but today while on a rising market for copper we ordinarily command a little better price, ranging from ¼ to ½c. per lb., than is commanded by electrolytic copper, yet on a falling market we are obliged to take the same price in order to dispose of our product, and do take it.

"I think that the reputation of Calumet copper established in the early days of which I have spoken, when electrolytic copper, as a rule, was not as good as it is today, has descended to the recent period with some users and they have preferred Calumet copper on account of that actual difference which once did exist; but for the most part today, I believe from all I have learned from our customers that it is the uniformity of quality of the Calumet copper which gives it the preference over electrolytic copper where it does do so, and that as a matter of fact there is no absolute necessity of Calumet copper for the uses of consumers which gives it a preference over electrolytic. The reputation of superiority I think has been for the benefit of my company and I should be very glad to have it maintained."

Mr. Livermore was asked what degree of conductivity the Calumet & Hecla copper possessed and he replied that that portion of it which was put into wire bars had an electric conductivity of 99.5 per cent., or more, frequently more.

"I think at one time Tamarack and probably Osceola sold in competition with us and brought as high a price, but in recent years I think they have brought lower prices than ours." Mr. Livermore was questioned as to whether the product of the Copper Range mines was known to the trade as being copper carrying a high percentage of arsenic. Mr. Livermore replied that it was clearly distinguished from Calumet & Hecla copper. He said he thought it was regarded as a different and lower grade than the Calumet and the Quincy product, but as compared with Tamarack and Osceola he was not so confident. He said he was under the impression that sometimes the product of the Copper Range mines sold as high as that of the Tamarack and Osceola and he thought that it had done so within the last year in large quantities.

The Burma Ruby Mines

The reports of the Burma Ruby Mines Company for the past three years show progress in the exploitation of the Mogok valley deposits, though with some fluctuations from various causes. The leading data for the years ending with February, 1906, 1907 and 1908 are as follows:

	Trucks of Earth Washed.	Cost per Truck.	Final Net Profit.	Balance to New Account.
1906	1,773,129	8.4 d.	£8,190	£16,705
1907	1,890,944	7.7 d.	15,160	24,390
1908	2,033,666	7.6 d.	9,466	18,906

The fact is noted that the actual output, in truckloads of ruby-earth washed, for the first time exceeded two millions during the last year.

The net profit, as above given, is that remaining after paying the Government its stipulated share of 30 per cent. on the actual profit over all other expenses. The company's agreement involves an annual rent of R.200,000 (about £13,400), plus 30 per cent. on the general profits, and the same percentage on all that the company receives from license fees, or royalties, on land granted to native miners, above R. 200,000. These royalties vary much, from unknown or uncertain causes affecting the native industry; the figures are given as follows: For the years 1904 to 1907, inclusive, 1904, £23,460; 1905, £14,691; 1906, £12,595; 1907, £18,185.

It may be noted that this source of revenue amounts, on an average, to somewhat more than the regular rental of the mines; beyond that sum, 30 per cent., as above stated, also goes to the Government.

The company declared a dividend on its ordinary shares of 6d. a share, in 1906, amounting to £7475, and of 1s. a share in 1907, amounting to £14,950. In 1908, however, the depression in the market for gems had been felt for some months, and, although the output had increased and the costs somewhat lessened, it was thought best to defer the dividend until the demand for rubies should revive. The semi-annual payment of rent, due in February, 1908, was also deferred, with consent of the Government, although it was deducted, as usual, from the statement above given in the table.

The directors, in 1907, petitioned the Secretary of State for a reduction in the requirement of 30 per cent. of the net profits, on the ground that the Government has thus received nearly thrice the amount that has been paid to the shareholders since the formation of the company. Nothing is said in the 1908 report as to any action upon this request.

The drainage tunnel, which has been under construction for several years, and which will greatly reduce both risks and expenses, is fast nearing completion and is expected to be in operation by the end of 1908.

Mineral and Metal Production of Sweden

According to the official Government report the production of minerals and metals in Sweden during 1906 and 1907 was as follows:

PRODUCTION OF MINERALS AND METALS IN SWEDEN.

(In Metric Tons.)

Material.	1906.	1907
Minerals:		
Alum	167	131
Coal	296,980	305,338
Copper ore	19,655	21,957
Feldspar	21,014	20,244
Iron ore	4,501,656	4,478,917
Lead ore	37	33
Manganese ore	2,680	4,334
Pyrites	21,827	27,113
Silver-lead ore	1,938	1,987
Zinc ore	52,552	50,884
Metals:		
Copper	1,209	1,577
Gold (Kg.)	20.3	28.1
Pig iron	604,789	615,778
Steel	397,525	420,216
Lead	753	813
Silver (Kg.)	938	929

The production of blooms was 174,405 tons in 1907 against 178,298 tons in 1906.

Transvaal Gold Mines

The gold production of the Transvaal mines in October is reported at 617,744 oz. fine. This was 30,110 oz. more than in September and 64,191 oz. more than in October, 1907; it is the largest production ever reported for a month in the history of the Transvaal. For the 10 months ended Oct. 31 the total was 5,418,335 oz. in 1907, and 5,777,603 oz. in 1908; an increase of 359,268 oz. By values, the total was $111,996,984 in 1907, and $119,423,054 in 1908; the gain being $7,426,070, or 6.6 per cent. These figures indicate an approximate output of $145,000,000 this year for the Transvaal.

Magnesium is now being employed to some extent as a deoxidizer in brass manufacture, having the advantage over phosphorus that an excess may be used without harm, and indeed may improve the quality of the brass. (Magnesium is a metal which belongs to the same family as zinc.) Ordinarily the addition of 0.05 per cent of magnesium to the brass is sufficient for deoxidizing purposes.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

James Moffet, of Oakland, Cal., is examining an iron-ore deposit in Colima, Mexico.

John Rutz, of New York, has been inspecting the Catharine-Rudisill gold mine near Charlotte, North Carolina.

Dr. A. R. Ledoux, of New York, has gone to Missouri to examine copper-nickel mines in Madison county.

C. D. Grove is in change of the work of the Skagit Queen Consolidated Mining Company at Marblemount, Washington.

W. H. Landers has been appointed manager for the Standard Consolidated Mining Company, at Bodie, Cal., succeeding Arthur Feust, resigned.

Bertram Hunt, of San Francisco, has been conducting some metallurgical tests for the Hillabee Gold Mining Company at Alexander City, Alabama.

W. F. Ferrier has been appointed mining geologist for the United States Smelting, Refining and Mining Company. He is at present at Mammoth, Shasta county, California.

Robert W. Hunt & Co., of Chicago, engineers, have been selected to inspect the structural steel to be used in the large new terminal station of the Chicago & Northern at Chicago.

Harvey R. Hunter, North Braddock, Penn., has been appointed assistant superintendent of the Edgar Thomson Steel Works of the Carnegie Steel Company, succeeding James M. Rinard.

H. H. Knox, mining engineer, of Knox & Allen, New York, left New York for London on Nov. 4, for an absence of three months. After a brief stay in London, he will go to the Urals in Russia.

Frank H. Crockard, vice-president and general manager of the Tennessee Coal, Iron and Railroad Company, left Birmingham, Ala., for Hot Springs, Va., Nov. 9. He expects to be absent a month.

Prof. Bradley Stoughton, of the department of metallurgy, Columbia University, New York, delivered an illustrated address on "Iron and Steel," at the section meeting of the Franklin Institute, Philadelphia, on the evening of Nov. 12.

Governor Stuart, of Pennsylvania, has appointed the following State delegates to the American Mining Congress: John H. Jones, W. W. Keefer, Pittsburg; George Whyel, Fred C. Keighly, Uniontown; W. H. Clingerman, Scotland; W. W. Jamison, Greensburg; H. H. Stoek, Scranton; W. J. Richards, Pottsville; Morris Williams, Philadelphia.

John Fulton, the well known mining engineer and geologist, left Johnstown, Penn., a few days ago for Augusta, Me., where he has been summoned as a witness in the suit of the Bon Air Coal and Iron Company, against a New York syndicate, which involves the purchase of 200,0000 acres of coal and iron lands in Tennessee.

Obituary

George W. Schwartz died at Hancock, Penn., Nov. 7, aged 55 years. He was for many years an operator of iron mines in eastern Pennsylvania.

Dewitt Clinton Hart, who died at Foxburg, Penn., Nov. 12, aged 67 years, was born in Canastota, N. Y., but passed most of his life in Pennsylvania. He was among the last survivors of the pioneer operators in the Oil Creek district in the early sixties.

William Edward Ayrton, a noted electrical engineer and inventor, died in London Nov. 8, aged 61 years. He held professorships in various institutions, including that of natural philosophy and telegraphy in the Imperial College of Engineering in Japan.

Societies and Technical Schools

[illegible]—Dr. Henry M. Payne, Morgantown, W. Va., secretary, gives notice that the regular December meeting of the association has been postponed until February, on account of the large number of mining and engineering meetings during the month of December. The February meeting will be the annual session and will be held at Frostburg, Maryland.

Mining and Metallurgical Society of America—The first meeting of the Chicago section was held at the Engineers' Club, Oct. 31, and was preceded by a dinner. Only out-of-town members were present, all the resident members being detained at a distance by business engagements. It was the opinion of the gathering that, for the present, the councilor should call meetings quarterly, or upon such special occasions as when a number of resident members were certain to be present, or some visiting members might be entertained. It was also suggested that the next meeting in the district might be held in St. Louis.

Massachusetts Institute of Technology—The office of president, vacant since the resignation of Dr. Henry C. Pritchett, has been filled by the election of Richard C. [illegible] physics at Columbia University, New York. Dr Maclaurin is a young man, only 38 years old, but has a high reputation as an instructor. He was born in Scotland, educated at Cambridge University, England. After graduating he spent some time in the United States and Canada. In 1898 he became professor in the University of New Zealand, and re[illegible] was called to Columbia. He is the author of a number of scientific papers.

[illegible] committee on Safety and the Prevention of Mine Casualties. The members of this committee are: Guy R. Johnson, vice-president and general manager, Alabama Consolidated Coal and Iron Company; Erskine Ramsey, vice-president Pratt Consolidated Coal Company; Edward H. Coxe, general superintendent coal mines and coke ovens, Tennessee Coal, Iron and Railroad Company; A. H. Woodward, vice-president Woodward Iron Company; Priestly Toulmin, president Lehigh Coal Company. This committee represents the largest coal operators of the State. Guy R. Johnson, Birmingham, Ala., is chairman of the committee.

[illegible] formal call has been issued for the eleventh annual meeting, to be held in Pittsburg, Penn., Dec. 2-5 next. It includes an invitation to appoint delegates as follows: The President of the United States, 10 delegates at large; foreign nations, 10 each; governors of States, 10 each; mayors of cities and towns, according to population. Counties, commercial bodies, mining bureaus and associations, scientific and engineering societies and State mining schools are also asked to send delegates—two each—to the meeting.

A meeting of the members of the American Mining Congress, as incorporated, will be held at Pittsburg, Dec. 3, to elect three directors, to serve three years, in place of E. A. Colburn, Alexander Dempster and L. W. Powell, whose terms then expire. The American Mining Congress is an incorporated body and only members of the organization can legally vote upon such matters as relate to permanent business affairs, the control of which is lodged in a board of directors consisting of nine members, three of whom are elected annually to hold office for three years. The Congress is composed of members and duly accredited delegates. The distinction between the rights of members and delegates has caused discussion at previous sessions, and it has been thought best to make this statement of the situation in order to avoid any misunderstanding. Delegates will not exercise such powers as under the law can be exercised by members only, as such acts would be illegal and would jeopardize the powers of the con[illegible] will exercise all the powers of delegates to such bodies, and their suggestions will [illegible] possible, by the permanent organization, the expense of which is maintained by the members, who have equal rights with the delegates in the deliberations of the congress.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte and Goldfield, Mexico and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 10—A mining ditch built in 1851 to carry water to the old North San Juan gravel diggings in Nevada county is to be put in order to become part of a new electric-power plant. Water rights have been located by North Bloomfield men, who have also located a new dam site on the Middle Yuba river, a mile above the old dam. The ditch is seven miles long and terminates at North San Juan. Another power scheme is that where water locations amounting to 60,000 in. have been made in Plumas county, on Nelson creek, Union Valley creek, and the South Fork of Feather river. A canal through Bald Rock cañon is an important part of the project. These power plants will supply electric power not only to miners, but also to towns and villages in that vicinity.

The general committee on tariff revision of the State Board of Trade has received the report of its sub-committee on minerals, which recommends that an effort be made to have Congress place a duty on manganese, chrome and soda imports. These minerals are mined in California but not elsewhere in the United States in commercial quantities. A few thousand tons of crude magnesite, a few thousand tons of crude soda and a few hundred tons of chrome are about all that California produces annually, though the output could easily be made much larger were there sufficient demand on the Pacific Coast, or were the freight rates lower to points of Eastern consumption. It will, however, be a very difficult thing to get a duty placed on these substances simply because a few California miners are to be in any way benefited. The large consumers in Pennsylvania and elsewhere are apt to oppose the plan vigorously since they now use foreign material which they can obtain at a much lower price than if their supply was derived from this State.

Wallace, Idaho

Nov. 10—Suit for the possession of the Wardner lead-silver vein from which millions of dollars worth of ore has been extracted, and for the recovery in actual cash of $7,300,000, has been started in the district court of Wallace by the January Mining Company against the Bunker Hill & Sullivan Mining and Concentrating Company.

The plaintiff claims to be the owner of the Republican Fraction lode claim in the Yreka mining district by virtue of a transfer of the said claim by the Federal Mining and Smelting Company to Frank T. Post, that company's attorney in Spokane and by Mr. Post to the January company. In this claim it is alleged that the Wardner vein has its apex and extends through it in an easterly and westerly direction. It is further claimed that this vein is the same as that which outcrops within the Bunker Hill lode claim, the Stemwinder, the Emma, the Last Chance, and the Tyler lode claims, and which is generally known as the "Wardner vein."

The plaintiff company claims to be entitled to the ownership of this vein throughout its entire length, including that part of it in the claims mentioned. The claims of ownership of the Bunker Hill company are said to be groundless and false.

Nov. 17—Mass meetings were held in every town in Shoshone county last night for the purpose of organizing opposition to any attempt to reduce the tariff on lead and zinc. Committees were appointed to draw up protests, and delegates to attend a conference of business men and mine operators, to be held here today. A delegation will go to Washington.

Goldfield, Nevada

Nov. 10—With the exception of the periods when the mines have been tied up by strikes, the production of Goldfield is the lowest that it has been since Goldfield began to produce ore. There are three main reasons for this. The Consolidated, the largest company in the camp and which already has 1,000,000 tons of ore blocked out, is only producing enough ore to keep the 20 stamps at the Combination mill busy, while the Florence, the second largest producer is not mining any ore on company account, as the main working shaft is being enlarged and the 20-stamp mill is being completed. The second reason is that the production from leases is diminished for the Consolidated has ceased to grant leases or to extend those now about to expire; many leases on other properties have expired and, owing to the financial depression, others that have not been developed to take their places. A third reason is that the Combination Fraction has been shut down owing to an accident to its machinery.

For reasons which are not wholly obvious the ore-purchasing companies at Goldfield have declined for the past two weeks to give out any figures regarding production. In some quarters these companies are accused of combining to suppress competition although they themselves indignantly deny this and attempt to throw the blame for it upon certain producers who desire to manipulate their respective stocks. This latter may be the reason, for while wildcatting has almost died out at Goldfield, there are still a few and one particularly flagrant instance of very yellow methods on the part of prominent operators.

Butte

Nov. 12—The trouble between the coal miners and operators of Montana was settled last week at a conference at Helena between the Montana Coal Owners Association and the United Mineworkers. The miners working for the Spring Creek Coal Company, near Lewiston, are to receive $1.28 per ton as a compromise. The trouble at the Chicago, Milwaukee & St. Paul Railroad's mines at Roundup was also settled at the conference.

In the suit of L. Wilton Strong against the Butte Central and Boston Copper Corporation, Samuel McConnell, the trustee in bankruptcy of the defendant corporation, has filed an answer in which the corporation sets up a counter-claim for $11,000 for money alleged to be owing from Strong's assignor to the bankrupt corporation.

Denver

Nov. 14—In the Central City gold mines, the resumption of work on the Newhouse tunnel is still a question of the future, but Jan. 1 next is the date now set for starting the work.

In a former issue of the JOURNAL details were given of the finding of very rich ore in the War Dance mine, in the Russell district, and the local papers have since then been repeating the usual twaddle about "picture rock" and "fabulously rich ore that startled the mining world," etc. It is now reported that Eastern parties were negotiating for the purchase of the property at $100,000, but a one-tenth owner has secured an injunction against the sale, and applied for a receiver, on the grounds that the lessees are hiding the ore and other charges of crookedness. The ore was a fluorine-stained rock containing calaverite, and being unknown in that district had been thrown over the dump for some time prior to the discovery of its real value.

In the Cripple Creek district, the suit of the Jennie Sample Gold Mining Company, against the owner of the Ophir mine, for the alleged illegal extraction of ore, has been settled out of court by the payment to the Jennie Sample company of $20,000, and the right to use some of the workings on the Ophir mine.

The Camp Bird dividend of 24c. a share, amounting to $196,800, is due this week, and, of course, will be paid, as the company has a very large sum in the treasury. This will make over $4,500,000 paid by this great Colorado mine since 1901, seven years.

Indianapolis

Nov. 16—The Indiana Steel Company at Gary will begin the actual manufacture of steel Jan. 1. The first blast furnace will be blown in on Dec. 15. The gas developed in the furnaces will be utilized in the production of power. At the docks there are piled up 750,000 tons of ore and in the coal bins an immense quantity of coal. The number of men employed is 1000 and this number will be increased as the work progresses.

There is a stong movement on foot to improve the waterways of Indiana. A number of meetings have been held, and it was pointed out that improved rivers and harbors are necessary especially as to the shipment of coal. The low stage of water in the Ohio river due to the continued drought has been felt more than ever before. Millions of tons of coal have been transferred from barges to the railroads at a higher rate.

The improvement of White river, which is included in the list, would, it is said, enable the mine owners to ship coal to consuming centers now cut off by prohibitive freight rates. Both the National and State legislatures will be appealed to for aid in the enterprise.

Mexico City

Nov. 10—The new mining law, with the revisions made at the recent meeting of the cabinet, has been presented to Congress by the Minister of Fomento. If contains 150 articles. The most important feature of the new law is the abolition of the special prospecting permits, which Minister Molina explained have not given satisfactory results. The law will probably be put into force on July 1, 1909.

In the revised law the article forbidding foreign companies to acquire mines in Mexico does not appear, and the provisions which conditioned the acquisition of mines by individual foreigners in frontier States has also been relaxed. These conditions are to apply only to an 80 kilometer zone along the frontier, but in this zone the disqualification of foreign companies is complete. The articles bearing on this feature are as follows:

"Art. 134. No title deed to mining [illegible] [illegible] be issued to foreigners denouncing claims in a zone 80 kilometers wide along the boundary line with foreign States, unless they previously obtain a special permission from the [illegible] the Union. The same formality is necessary when the denouncement is made jointly by foreigners and citizens.

"If the permission be refused the ground denounced will be declared free."

"Art. 135. The permission to which the foregoing article refers will be necessary to enable foreigners to acquire by any other method mining properties or liens thereon within said 80-kilometer zone.

"Art. 137. Foreign companies are incapable of denouncing or acquiring by any means mining properties or liens thereon within the zone mentioned in Art. 134.

"Art. 138. All acquisitions in contravention of Articles 134 to 137 of this law are null and void. Suits for their nullification can be instituted either by a party in interest, or by the federal prosecuting attorney acting under instructions from the Department of Fomento.

"Art. 139. When by inheritance or judicial award in payment of a debt, a foreigner acquires property coming within the scope of Articles 134 and 135, he will be allowed a year to alienate such property, unless before the expiration of that time he shall have secured the permission referred to in the same articles.

"Art. 140. When a foreign company is the beneficiary of the inheritance or judicial adjudication, it must perforce alienate the property within the period of one year."

London

Oct. 31—The Russian Mining Corporation, Ltd., has presented its first report to its shareholders covering the period from Nov. 20, 1906, the date of the incorporation of the company, to June 30, 1908 This company, as its name implies, was formed to develop mining properties in Russia. The first subsidiary company floated was the Lena Goldfields, particulars of which were given in the JOURNAL of Aug. 1. The capital offered for public subscription does not appear to have been readily taken up, as the accounts of Lena Goldfields show a subscription of only 108,088 shares out of the 236,500 offered. The directors of the Russian Mining Corporation, however, expect great results from this flotation, reporting that "the profit to the corporation from this transaction promises to yield a substantial and lasting income, from which regular dividends may be expected." The corporation has also taken an interest in the Precious Metals Syndicate, Ltd., which was formed to acquire an option (since obtained) over certain platinum-bearing lands in Russia.

[illegible] in mining business in Russia has not met with much success so far; indeed the record, as regards Siberian mines at any rate, is unfavorable. The career of these new companies, backed as they are by the influential support of the Consolidated Goldfields of South Africa, will therefore be watched with interest. The information given in the reports is of a slender character; but probably fuller details will be given at the meetings of the two com[illegible]

In a previous letter some information was sent as to the Victoria Falls Power Company whose report was recently issued. At the general meeting of shareholders held last week, the chairman referred to possible competition, and said that his company intended to fight any new power company, and would use every means in its power to prevent other people doing similar business to theirs on the Witwatersrand. This is a very foolish attitude to take up and one with which the mining public in the Transvaal will have little sympathy. The Victoria Falls Power Company would, no doubt, like to have a monopoly of the supply of electrical power on the Rand, but why it should be especially favored it is difficult to see. The company obtained a footing on the Rand by advertising a great scheme of long-distance transmission, which is now only talked about as likely to be installed in the remote future. Before it can be carried through, the consent of the Transvaal Government is required, a condition which one would imagine might have been foreseen before the flotation of the company. But the introduction of power from the falls is not solely delayed on this account. There are other reasons. "We are not ready," said one of the directors, "to bring in power from the falls, because we have not yet educated the Rand sufficiently to be assured of a continuous market for that power when brought in. But before we can do anything further some time must elapse, and your financial position and your views when we next come to you will very likely have experienced a change. For the present will you give us your support and let the future take care of itself?"

It is evident that the long-distance transmission is to be shelved for some time; and meanwhile the company will carry on business as an ordinary steam-driven electrical power company. It is preposterous that the company should demand a monopoly. The mines require cheap electrical power, and it is to their interest that there should be fair competition in its supply. The mines have had experience, and know what monopolies mean to them. They have not forgotten the dynamite monopoly, for example, and if they are wise they will do their best to encourage legitimate competition in the supply of electrical power for which there is a promising demand.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Pinal County

Ray Consolidated Copper Company—The stock of this company is now being traded in upon the New York curb at about $7 per share. The company has 800,000 shares of stock, par $10, of which 300,000 shares are in escrow for the conversion of $3,000,000 of 6-per cent. bonds, which are convertible into stock at par until July 1, 1914. There remains in the treasury $1,844,000 of bonds and 184,400 shares of stock. The treasury securities are under option to Hayden, Stone & Co. until July 1, 1909. The company is said to have approximately $275,000 in cash on hand. The mine is situated at Kelvin. The company is controlled by the same interests which developed the Utah Copper Company.

Yavapai County

Consolidated Arizona Smelting Company—The property of this company, sold in bankruptcy proceedings, realized $200,000, besides which mortgages amounting to about $250,000 were assumed. It is surmised that the purchase was for the benefit of the Nevada-Utah Copper Company.

California

Amador County

Gold Top—This hydraulic property, Pine Grove, was closed down last season by the Débris Commission, but necessary changes have been made, and the commission will permit it to work this year.

Mountain Queen—The mill of this mine at Pine Grove has been put in order to crush ore, after a few months idleness.

Butte County

Lava Beds No. 2—This gold dredge at Oroville, which was recently sunk, is being repaired.

El Dorado County

Vandalia—This mine, near Shingle, now controlled by Louis Rosenfeld, is to be started up again after having been idle for some years.

Humboldt County

Horse Mountain District—Considerable development work is being done on the copper properties in this district, and preparations are being made to ship some ore to the Tacoma Smelting Company. Some shipments have already been made.

Inyo County

Bishop Creek Gold Mining Company—Some ore of good grade has been found in the deepest shaft of this property at Bishop Creek. Shaft sinking will continue all winter.

Mariposa County

Mariposa Commercial and Mining Company—This company has let six leases on the Pine Tree vein, one on the Josephine, one on the Greens Gulch, two on the Princeton, one at Stockton Creek, and seven on the Mariposa vein. Seven companies are leasing ground on the Mariposa or Fremont grant, owned by the company of which F. T. Maguire is manager.

Modoc County

Bidwell Consolidated Mines Company—Quantities of ore are being piled in the dumps, and mining work will be continued steadily until the milling facilities are provided early in the coming year.

Nevada County

Ethel—At this mine, near Washington, the large ledge recently intersected continues to hold out. New levels are about to be run.

Greystone—At this mine, above Washington, George Hegarty, superintendent, a new hoist will shortly be installed, and as soon as the machinery is ready the water will be pumped out.

Plumas County

Gardner—A company has been organized to open up this mine near Poker Flat.

San Diego County

Escondido Mine Development Company—This company, at Escondido, which is working the Asmus mine, E. J. Garvin, manager, has low-grade ore at present, but the value is improving. It is the intention shortly to erect a quartz mill.

Colorado

Lake County—Leadville

B. P. Mining Company—This company has secured the Buffalo, Comstock, President and other claims on Rock hill and is now floating the stock in the East. The company is organized at Toledo, Ohio.

Coon Valley—From this mine, Rock hill, shipments of a good grade of lead ore are being sent out with due regularity, and development work is being pushed in virgin territory.

Coronado—In this mine, down-town section, lessees working at the 460-ft. level and 500 ft. from the shaft, recently opened a body of high-grade iron, and as work has proceeded it has turned into a bonanza shoot of ore from which 75 tons daily will be shipped. The ore found is fully 100 ft. above the water level, so there will be no chance of being flooded out. It is one of the largest bodies of iron ore opened in the down-town section since the Midas ore shoot was first discovered. The lessees are George Bennett and David Harris.

Gallagher Shaft—The work of cleaning out this shaft, Graham park, has been completed and exploration work is now being carried on from the bottom to the east and west.

Helena—Considerable difficulty has been experienced at this mine, Iowa gulch, by the heavy flow of water and the breaking of pumps. The machinery is now in good shape and sinking is progressing favorably. The shaft has already passed through mineralized formation, and before the contract of sinking 200 ft. is completed the orebody may be opened.

Iron Silver—With the advanced price of spelter and lead it is expected that this company will shortly resume work with a large force on the Tucson and Moyer.

Little Evelyn—With the resumption of work on this mine, South Evans gulch, the benefit of driving the Yak tunnel into the section has been felt, as the shaft is making but little water in comparison to what it did a year ago. Drifting to the east from the bottom of the shaft has been started to catch the ore-shoots that run alongside of the Bald Mountain fault.

Star of the West—In addition to the regular ore shipments from this mine, Iron hill, a drift is being run toward California gulch to catch a known orebody that trends in that direction.

Las Animas County

Rocky Mountain Fuel Company—This company has started up its coal mine at Piedmont, two miles from Trinidad.

Larimer County

Northern Colorado Mining and Milling Company—This company has been organized to take over the placer and quartz claims, formerly owned by the Elk Mining Company in the Independence district in North Park, near the town of Pearl. The headquarters of the new company are at Fort Collins, Colo.; its officers are: President, S. H. Clammer; vice-presidents, C. A. Morell and Dr.

George L. Hoel; secretary, Dr. J. C. Van Slyke; treasurer, L. C. Woodford.

TELLER COUNTY—CRIPPLE CREEK

Henry Adney—Shipments from the mine continue steadily. High values are reported from an east-and-west vein recently encountered while drifting on the main vein north of the shaft. The new vein was found in the contact between the granite and phonolite, and is about 3 ft. wide.

Hoosier—This mine, on Tenderfoot hill, owned by the Grafton Gold Mining Company, has been secured under lease by a syndicate headed by A. J. Halter, of New York. J. S. Edwards is manager for the syndicate. The shaft will be sunk an additional 100 ft. from the present depth of 570 feet.

Modoc—Shipments of good smelting ore are reported from this mine.

Old Gold—Shipments are being made from an orebody lately opened on the 250-ft. level, by Joseph Brentlinger & Co., who have a lease on the main shaft.

Idaho

SHOSHONE COUNTY

Snowstorm—A dividend of $45,000 has been declared for the month of November, payable Nov. 20. This is the second dividend paid this year, the last being for the month of October and for a similar amount. With the declaration of the November dividend, which is at the rate of 3c. a share, the company has issued a statement to the stockholders to the effect that dividends at this rate will probably continue in the future.

Bunker Hill & Sullivan—This company has paid its regular dividend of $75,000 for the month of November making a total distributed by the company of $10,590,000, of which $780,000 has been paid this year.

Butte & Coeur d'Alene—Arrangements have been completed by which regular shipments of ore will commence to the Panhandle smelter at Sandpoint some time during the present month. Recently 3 ft. of gray copper ore, carrying all the way from 1000 to 2000 oz. of silver to the ton, was opened up.

Alice—A strike of 1 ft. of steel galena and 9 ft. of concentrating galena ore has been made on the 430-ft. level. The ore was encountered in the hanging-wall side and the footwall has not yet been encountered. Assays of the shipping ore run as high as 75 per cent. lead and about 70 oz. of silver per ton.

Idora—Leasers have begun shipping ore. The first shipment consisted of 40 tons of galena. The lease is on the basis of 87½ per cent. to the lessees and 12½ per cent. to the company.

Missoula Copper—An assessment of three mills a share has been levied. At the annual stockholders' meeting held in Mullan the treasurer's report showed that about $32,000 has been expended on the property during the year and that about $1000 was on hand. It was decided to explore the claims by means of diamond drilling.

Indiana

GIBSON COUNTY

According to report from Hazleton a vein of coal 6 ft. thick has been discovered by oil drillers, who are putting down test wells on the Wm. Johnson farm. The coal was struck at a depth of 150 ft. A company will be organized to sink a shaft and develop the find.

PIKE COUNTY

Ayrshire—Fire destroyed the fan-house of this mine near Oakland City, causing the mine to shut down for a week.

Winslow—John Mackler and Samuel Wulfman, have purchased this coal mine which has been idle for several years. They will install pumps and other equipment and resume operation on a large scale. A new shaft will be sunk at once. The headquarters will be in Petersburg.

SULLIVAN COUNTY

Vandalia—The north half of mine No. 9 will be closed and the indications are that the closing will result in a dispute between the Vandalia company and the miners' officials. The company contends that the coal on the north half is not so good as the other and that it is mined at a higher price. The miners contended a few weeks ago that it should be classed as "wet." At that time, the miners' officials say, the superintendent stated that he would close that part of the mine before he would pay the increased price for work. The dispute was not settled. The mine employs over 300 men.

Kansas

CRAWFORD COUNTY

Lone Oak—This tract of coal land, near Pittsburg, covering 656 acres, has been bought by William Lanyon, of Iola, Kan., and R. H. Lanyon, of St. Louis. It is stated that the purchasers will at once begin to open a mine on the tract.

Massachusetts

BERKSHIRE COUNTY

The old limestone quarry at West Stockbridge is to be reopened, and preparations are being made to clear out the accumulated débris. It is said that the quarry has been leased b the Atlas Cement Company, of Pennsylvania.

Michigan

COPPER

Elm River—The vertical exploratory shaft at this property is down about 175 ft., and has passed through an amygdaloid formation carrying small particles of copper, but the formation is badly shattered and broken. This shaft will be sunk further and a crosscut will be driven to intercept the approximated lines of the Adventure and Lake strikes.

King Phillip—The new electrically operated hoisting plant at this property has gone into commission and is working satisfactorily.

[illegible] No. 1 shaft of this company has gone into commission. This plant is a duplicate of the one at No. 2 shaft and is capable of hoisting from a depth of 1500 ft. The old hoist was operated by compressed air and its going out of commission will afford more power for drilling purposes. The crosscuts from the 500-ft. level of each shaft continue, and No. 2 will probably reach the lode in a few days.

Cliff—This property, under the management of the Tamarack Mining Company, is being explored in a thorough and systematic manner. The old Avery shaft is being unwatered and the surface equipment is being put in working order. The shaft will command the northern portions of the tract. No. 1 shaft, the present working shaft, is being opened on a fissure vein and is yielding a small quantity of good stamp rock.

Missouri

ZINC-LEAD DISTRICT

Cox Land—Clever & Co., of Joplin, have opened up a good prospect on the Root lease on this land near Turkey creek.

[illegible] opened up a good strike of jack at 50 ft. depth, on the Roach land west of Joplin.

Montana—This company is building a second mill on its tract west of Joplin, and just north of the Bullfrog mine.

Opolis—Doctor Tyler and associates of Joplin, have drilled a tract at Opolis, Mo., two miles south of Pittsburg, Kan., and found 5 ft. of lead and jack at 202 ft. depth. This is the farthest north of any drill strike yet made.

[illegible] A. M. Whitworth and brother, of Webb City, has been thoroughly prospected, and 11 drill holes have been put down on the 37 acres without a blank. Sheet ore 14 ft. thick was found at 150 ft. depth.

Marvel—This company has started its mill on the Cosgrove land at Duenweg. This mine has sheet ground claimed to be better than 10 per cent. dirt.

[illegible] company, at Joplin, has been incorporated [illegible] phonso Munger and J. C. Aiken, of New York, and F. W. Kelsey, Arnold Cofer [illegible] stockholders.

Montana

Butte District

Red Metal Company—A deed from John Gillie and wife to the company, conveying a quarter interest in the Nora quartz lode claim has been filed.

Butte-Montana—Within the last month 75,000 shares have changed hands on the local stock exchange. Duluth capitalists have recently secured a large block of the stock and have options on other large amounts. R. A. Kerr, a mining engineer of Duluth, is expected in Butte shortly to take charge of the property in the interest of the Duluth stockholders.

Original Consolidated Mining Company—Wheelock & Abbott have conveyed to the company a portion of the Stewart quartz lode claim.

Jefferson County

Boston & Corbin—It is stated that the company will increase its capital stock from 80,000 shares to 90,000 shares. By this means the company expects to obtain money enough to erect a concentrator.

Alta—It is reported that the Kelly Smelting and Refining Company, which controls this property, will begin sinking the shaft next month. It is planned to sink 500 ft. The Alta is situated at Corbin and up to 1893 was ranked as one of the largest silver and gold producers in Montana.

Nevada

Esmeralda County—Goldfield

Mushett Lease—This lease, on the Laguna property of the Consolidated, has been sold to R. L. Colburn and Eugene Amann by L. L. Mushett and Webb Parkinson, the former owners. There is milling ore of good grade at a depth of 480 ft. It is the intention of the new owners to increase the working force and immediately to resume sinking the shaft.

Florence—Work has begun in the main shaft of the Florence. The two-compartment shaft, 300 ft. deep, will be enlarged to three compartments and when this is completed the shaft will be sunk to a depth of 600 ft. At that depth connection will be made with the workings of the bonanza leases on the Florence ground.

Laguna—The Hazel Goldfield lease on the Third Chance claim of the Laguna has struck ore in its shaft at a depth of 718 ft. The hanging wall only has been cut and the ore assays from $4 to $31. Sinking will be continued until the vein is crossed; then a station will be cut in the footwall, and the development of the orebody will begin. This is the deepest shaft in the camp.

Florence Annex No. 2—The Annex lease has cut the Baby Florence oreshoot on the 150-ft. level. The crosscut will be extended to connect with the old drift in the Wallace workings for the purpose of ventilation; when this is completed, stoping will begin.

Gold Pick Group—M. J. Sullivan, of the Wood-Sullivan Company, has purchased the Gold Pick group of four claims on the east slope of Red mountain about eight miles northeast of Goldfield. Only the location and assessment work has been done. A thorough prospecting of the property has begun.

February Premier Mining and Leasing Company—This company has taken over a lease on the February claim owned by the Consolidated mines, on a block of ground, 400x600 ft. According to the terms of the lease a two-compartment shaft must be sunk to a depth of 300 feet.

Lone Star—The new shaft of the Goldfield Star lease on the Lone Star property is 150 ft. deep. A station is being cut at that depth, and drifts will be run to the orebody discovered in the old incline. On the 200-ft. level crosscuts will be driven to cut this orebody. The shaft is to be sunk deeper.

Baby Florence—At this lease on the Florence a new air compressor is being installed.

Gold Bar—The Goldfield chlorination mill has contracted for 500 tons of ore from the Gold Bar mine of which L. K. Koontz is manager.

Grizzly Bear—The Wilson lease on the Grizzly Bear has been assigned to the Grizzly Bear Mining Company composed of local operators who will resume work immediately.

Combination No. 3—The forfeited lease in the Combination No. 3, known as the Black Eagle and formerly as the Nevada Pearl, has been secured by George Vickers and has been transferred by him to the Denver Leasing and Mining Company which will re-equip the lease and resume prospecting.

Mushett Lease—In recognition of the efforts and expenditures already made the Consolidated has extended the Mushett lease to April 1, 1909.

Esmeralda County—Hornsilver

Great Western—Two more freight teams have been put on to haul Great Western ore to the railroad where it is shipped to the mills at Millers siding. Shipments now amount to about 10 tons per day. The mine manager is authority for the statement that mining costs $2 per ton; wagon haul, $4; freight and milling charges, $12.80; total cost, $18.80 per ton. The shipping ore averages $70 per ton.

Bonnie Claire—The annual assessment work on this property in the Gold Mountain range is being done. The property is well developed. There is an up-to-date mill for treating the ore at Bonnie Claire station on the Tonopah Tidewater and the Las Vegas & Tonopah railroads, but the mill has been shut down since the depression of a year ago.

Esmeralda County—Cuprite

Cuprite Sulphur Group—It has been found that the quartz mixed with the sulphur being shipped carries considerable gold. A recent shipment of sulphur is said to have assayed $120 in gold per ton.

Nye County—Bullfrog

Mayflower—The Mayflower has perfected plans for a 5-stamp mill. An oreshoot 11 ft. wide averaging $50 per ton has been developed sufficiently to require a mill of that capacity.

Nye County—Tonopah

Production for the week ending Oct. 31 amounted to 5108 tons, valued at $129,275. The Tonopah Mining Company mined 3150 tons; Belmont, 600; Montana-Tonopah, 606; Tonopah-Midway, 100; MacNamara, 300; West End, 57; Jim Butler, 250; Tonopah Extension, 45 tons.

MacNamara—Production this week was handicapped by the lack of air for power, which is obtained from the Tonopah Extension compressor. This failure of air was due to a break in the water company's mains.

Tonopah Mining Company—During the week 451 ft. of new ground was opened up, 282 ft. being in the Mizpah and Red Plume claims and 169 ft. in the Silver Top. This is the largest amount of development work done in one week by this company. The station on the 1200-ft. level has been finished; crosscutting to the south on the level will be continued until the wiring and the piping for the hoist are completed; then sinking from the 1500-ft. level will be resumed. Owing to the difficulties experienced with the drill hole in the Red Plume shaft the contractors have given up the job, and for the time being the undertaking has been given up. The diamond-drill hole from the 740-ft level of the Silver Top shaft is 45 ft. deep.

Belmont—Owing to the importance of the new territory now being developed the company is preparing to open up the old Belmont shaft, about 1500 ft. east of the present working shaft.

Nye County—Clifford

Broken Hills—The last carload shipment from the Broken Hills averaged $209 per ton. The ore carried 7.63 oz. gold and 112.7 oz. silver per ton. This ore was taken from the dumps left by the former owners.

Nye County—Round Mountain

Jefferson Mine—The old Jefferson, or as it is sometimes called the Charles Konrahat mine, has been sold to W. H. McBeth, Charles Brenneman and J. Flick, of New York, for $350,000. A 200-ton mill is to be erected immediately. This is one of the old mines at Round Mountain, having been crudely worked for years, only the high-grade ore being shipped. Considerable milling ore has been developed. The ore is free milling and carries mainly gold but also some silver.

New Mexico

Grant County

Sylvanite—At this new camp 18 miles southwest of Hachita, there are at present 500 men. Ore was first found on the Broken Jug claim, belonging to Solomon Camp, a few weeks ago. A townsite is being laid out, and everything is booming for the town already has a newspaper. The deepest shaft in the telluride belt is 60 ft. in depth. Ore is being sacked and shipped to the smelters at Douglas, Arizona. An automobile stage line is operating from La Playa to Sylvanite.

Silver City—A party of mining men, among whom was Sherwood Aldrich, Charles M. McNeil, D. C. Jacklin, Robert E. Grant, A. Chester Beatty, H. M. Blackmer, Eugene Shove, Spencer Penrose and Charles Hayden, has been inspecting mines near Silver City, Fierro and Santa Rita.

New York

St. Lawrence County

Benson Mines Company—This company, which acquired the old Benson iron mines two years ago, and has since operated them, has been reorganized, several of the leading stockholders having sold their interests to others. The new officers of the company are: President, August Heckscher, New York; vice-president, T. I. Crane, Philadelphia; treasurer, W. A. Pilling, Philadelphia; secretary, F. A. Berthold, 43 Exchange place, New York. Pilling & Crane, Philadelphia, are selling agents. The mines are to be worked on a larger scale than heretofore. It has been decided to build a nodulizing plant at the mines, with several rotary kilns having a capacity of 150 tons each per day. The coarser ore will be shipped as mined, and the finer concentrates will be converted into nodules. The present capacity of the concentrating plant is 500 to 700 tons a day, though it has not been operated thus far at this rate. In mining two heavy steam shovels are employed. The average metallic iron content of the magnetic ores at Benson is 33 per cent. Concentrates from this ore finer than 50 mesh, have analyzed 64.18 per cent. iron, 1.58 manganese, 0.401 sulphur and 0.037 phosphorus. The phosphorus varies from 0.025 to 0.05 per cent. The nodulizing process brings the sulphur below the percentage noted.

North Carolina

Cabarrus County

Meadow Creek—A. M. Cox & Co. will add new equipment to this mine and enlarge the workings. Recently a nugget weighing over 10 oz. was found.

Davidson County

Jones Mine—This gold mine at Thomasville, owned by Capt. N. L. Jones, is making regular shipments of gold to the United States assay office at Charlotte.

Franklin County

Portis—This mine at Ransom's Bridge has been bought by A. J. Overton, of Salisbury, from Mrs. Lelia A. Sturges for $150,000 the transfer covering 933 acres of land. It is said that the mine will be operated on a large scale. The Portis is [illegible] years ago.

[illegible]

A gold discovery has been reported near Anvil. The claim has been bonded to C. A. Armstrong.

Ohio

[illegible]tiations are nearly complete for the absorption by this company of the Lorain Coal and Dock Company, of Cleveland. The Johnson company has its headquarters at Columbus, and owns about 12,000 acres of land in the Hocking Valley district, on which there are mines having an output of 400,000 tons yearly. The Lorain company owns dock property at Cleveland and coal lands in Belmont and other counties, on which there are several large mines. The consolidated company will have $3,000,000 capital stock.

Oklahoma

In the Oklahoma oilfield in October 246 new wells were completed; 230 producing oil and 1 gas, while 15 were dry holes. There were 232 new wells drilling on Oct. 31. The production of petroleum in October was 3,727,005 bbl., or 108,731 bbl. more than in September. Of the October output 3,258,332 bbl. were shipped and 469,663 bbl. added to stocks in tanks. The total estimated stocks on Oct. 31 were 51,336,027 bbl. crude oil.

[illegible]

[illegible]

[illegible] ready to start.

[illegible] Miami, have leased this tract of 20 acres from Amos Halten, the owner.

Maxim—The building of a mill has been started at this mine, near Miami.

[illegible] the first set of hand jigs used in the Miami district.

Pennsylvania

Anthracite Coal

[illegible] saved, and the fire kept from extending into the mine.

[illegible]

[illegible] ally that control of the Martin Coke Works and Connellsville coal lands, heretofore owned and operated by the Bessemer [illegible] been acquired by the Republic Iron and Steel Company. The property consists of [illegible] ville coking coal, together with the complete mine equipment, railroad tracks, houses and stores. The Martin coal lands immediately adjoin an undeveloped tract of 500 acres of Connellsville coking coal land known as the Woodside property, which the Republic company owns, but which has remained undeveloped owing to the cost of constructing a railroad which would be involved in opening it up. Through the control of the Martin coke works, the Republic company will now be able to develop the Woodside property, either by means of underground haulage through the Martin mine or by a surface-railroad switch over and through the Martin lands.

South Carolina

Cherokee County

Flint Hill Tin Mine—New machinery is being installed at this mine, near Gaffney.

Pacolet Mining Company—Machinery is being delivered at this gold mine, 12 miles from Gaffney. F. M. Farr, of Union, S. C., is president, and J. S. Lipscomb, is manager.

South Dakota

[illegible]

[illegible] ing capital has been sold by Otto P. Th Grantz, of Deadwood, and the ground near Custer, including the Roosevelt and St. Elmo groups, is to be operated.

Ideal—Superintendent Conover, of Custer, has resumed work on the new 200-ton cyanide mill near Custer and hopes to have it treating ore soon. The old Bessie ground is to be reopened at once and used to supply the mill in connection with the other properties. The Van Camps of Indiana control the Ideal company.

[illegible] of Custer, reports the finding of high-grade material. A 7-ft. ledge is being opened up, the ore being amenable to treatment by the cyanide process used in [illegible]

[illegible]

[illegible]

spring. It will have a capacity of 400 tons daily and treat the same amount of slimes by the Moore process. Robert L. Bailie, of Detroit, the president, has active supervision of the property in the Two Bit district.

Golden Reward—Work has been commenced again on the Ruby Bell group at Terry and the force of miners is being increased each month. Henry Schnitzel, of Deadwood, has the management of the mines and mills.

Mogul—Superintendent William Mc Laughlin, of Deadwood, announces the completion of a new hoist at Terry in place of the one burned some months ago.

Queen Esther—Shaft work will shortly be resumed. The shaft is down 60 ft. and will be sunk to quartzite, about 350 ft., as soon as the sawmill is completed. Stewart Conners, of Tinton, part owner, is in charge of the property.

Tennessee

Polk County

Ducktown—This company is making good progress with the sulphuric-acid plant that it is installing along the lines of that of the Tennessee Copper Company.

Utah

Salt Lake County

Utah Consolidated—Instead of building a new smeltery of its own, this company has made a contract with other interests which intend to build the works for general custom smelting business. The new syndicate has taken over the land options now held by the Utah Consolidated.

Boston Consolidated—The production of the porphyry mine in October was 696,850 lb. of copper, the extraction being 71 per cent. The amount of ore milled was 33,767 tons.

Utah Copper Company—The net profits in the quarter ended Sept. 30 were $501,392 against $493,694 in the preceding quarter. The twelfth section of the mill will be started in November. Copper production for the last quarter was 12,000,925 lb., an average cost of 8.73c. The underground ore sent to the mill amounted to 32 per cent., and the steam shovel ore to 68 per cent. of the total. Transportation difficulties prevented the mills from obtaining their maximum tonnage. The company will probably build its own line of railway from the mine to Garfield.

West Virginia

Barbour County

Luella Coal and Coke Company—This company recently organized by John T. Robinson, Herbert M. Crawford, Wiley L. Byers and others of Uniontown, Penn., has completed the opening up of a new coal plant near Philippi, on the Upper Freeport vein and is now shipping coal. The opening shows about 6 ft. of smokeless coal. The company owns about 1700 acres of coal land on the Tygart's Valley river, adjoining the properties of the Midland and the Overholt companies.

Midland Coal Company—This company, near Philippi, has all its coke ovens now fired. It is making foundry coke, and shipping it as fast as made.

Overholt Coal Company—The stockholders have voted to authorize the erection of a new plant at its mines near Cecil; also the building of a bridge across Tygart's Valley river, to connect the mines with the railroad.

Wisconsin

Zinc-lead District

Benton—The Frontier has resumed working on a double shift. The Fox has subleased its No. 2 mine for a year to Bennett Brothers, at 20 per cent. royalty. At a recent election, B. F. Treuary was chosen president. The Benton Mining and Developing Company is vigorously operating the Pittsburg-Benton mine, which has a solid sheet of jack that is 2 to 4 ft. thick; the company has just declared another dividend. The Wilkinson is maintaining its largest output of lead and has declared another dividend. The Calvert is still under option to Smith & Newman, who are operating three prospecting drills on the property.

Cuba City—The Dall is putting in an 18x42-in. Corliss engine and building a tramway to the new shaft; the company has declared another dividend of 5 per cent., as against 10 per cent. last month. The Roosevelt will probably start up shortly, as the suit over the Trego roasting furnace has been decided in its favor. The Vandeventer expects to erect a 20-ton roaster magnetic plant, as its ore is too low grade to stand the long five-mile wagon haul to the railroad.

Galena—The Hoosier company, which has leased the Graham farm, has erected a sinking pump that is expected to be able to control the heavy water that is known to occur in this ground. The Black Jack mine, one of the largest producers in the district, is preparing to start up again.

Hazel Green—Work is being pushed on the 50-ton roaster magnetic plant for the United States Zinc Company, which is expected to start in December. The Cleveland Mining Company has begun sinking a 6x12-ft. shaft on the orebody under the Chicago & Northwestern railroad. The Scrabble Creek Mining Company has nearly completed the shaft to a depth of 150 ft.; water has been very heavy, amounting to 1500 gal. per minute.

Linden—The Ross mine, which has over 1500 tons of ore in its bins, has sold some of its ore to the Platteville electrostatic separator. The Dark Horse mine has declared another dividend.

Platteville—The Klaw-Piquette and the Kohinoor-Blende mines are again starting up, after a year's shutdown during the hard times, and the latter will shortly erect a mill. The Grant County mine is deepening its shaft to reach a lower run of zinc ore. The Cruson mine has become a regular shipper of ore since the recent completion of its mill, but it will have to add a larger pump, as the water is getting stronger.

Shullsburg—The Eva mine is preparing to start up after a year's shutdown, and will install a new power plant.

Canada

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending Nov. 7 were as follows: Buffalo, 104,000 lb.; Coniagas, 64,430; Crown Reserve, 120,000; City of Cobalt, 67,000; Foster, 140,000; La Rose, 197,000; McKinley-Darragh, 285,000; Nova Scotia, 40,000; Silver Cliff, 46,100; Townsite, 40,600; Temiskaming, 63,360; Temiskaming & Hudson Bay, 60,000; Trethewey, 60,000; total, 1,287,490 pounds.

Foster-Cobalt—At the annual meeting of the company, held in Toronto, Nov. 4, the balance sheet showed $41,527 cash in hand and due from smelters. The president's report stated that the year's development was extensive, but no high-grade ore had been found. The main shaft was carried to a depth of 225 ft., but it had been determined not to sink further at the present time. It was recommended that drifting under Glen Lake be continued from the 225-ft. level and crosscutting from vein No. 8 in the direction of veins Nos. 2 and 6 was also approved, one additional cobalt vein having been discovered. Prospects for high-grade ore were entirely uncertain, depending on the results of the proposed development. Large quantities of low-grade ore on the dumps will be sent to the concentrator during the winter.

Green-Meehan—A financial statement for the year ending Oct. 31, 1908, has been issued, which shows that the company is free from indebtedness and has on hand $27,926. Development work was carried on to the end of 1907, when it was suspended for the time being, the principal reason assigned being that the ore on the 100-ft. level of No. 1 vein had depreciated in value. Operations have now been resumed. Since the last statement 35,000 shares of treasury stock have been sold at par. There are upward of 2500 tons of concentrating ore on the dump and negotiations are under way for shipping it to concentrators during the winter.

Little Nipissing—On the Peterson Lake leasehold, operated by this company, a strong 12-in. vein of rich ore was encountered in drifting at the 100-ft. level.

La Rose—Two good strikes on this property were made recently. The Mc-

Donald vein, heading toward the Chambers-Ferland, was found to be rich in argentite and another calcite vein of equal richness was discovered running parallel to it. Each vein is about 5 in. wide, and the silver content of the ore is stated to be about 10,000 oz. to the ton. The preliminary report of production and earnings for the month of October states that 493 tons of ore were produced containing 195,438 oz. silver valued at $87,416. The cost was estimated at $23,207 leaving a profit for the month of $64,209. For the five months ending October 31, 1908, there were produced 1,230,180 oz. silver giving a net profit of $484,853.

Silver Cross—Active development is being done on this property, embracing 40 acres in the Kerr lake section of the camp, where several promising veins have been found. No. 1 shaft was temporarily abandoned at the depth of 45 ft. on account of flooding, and heavy pumps will be installed and sinking continued; the vein is 22 in. wide and contains silver. Another shaft is down 100 ft.

Temiskaming—This company has secured the Gans claim, a 20-acre tract south of its own location and west of the Cochrane. It is supposed that some of the rich veins of the Temiskaming run into the Gans property.

Victoria—Two parallel veins 3 or 4 ft. apart have been found in addition to a series of calcite veins in their immediate neighborhood. Assays show from 1000 to 2000 oz. silver to the ton. They will be worked from No. 4 shaft. The mine is in charge of Capt. John Harris. A plant comprising two 50-h.p. boilers and a six-drill compressor is in operation.

Deseronto Iron Company—The smelting works at Deseronto, owned by this company, which were struck by lightning and burned down last September, are being reconstructed, and the company expects to have them in operation next spring.

Northern Ontario Smelting and Refining Company—The smeltery at Sturgeon Falls is now in operation treating copper ore from mines in the neighborhood.

Ontario Larder Lake

Larder Lake Proprietary Goldfields—A winding-up order against this company has been issued by the court in Toronto appointing Osler Wade as interim liquidator on petition of Henry T. Brooks, manager of the company, and Charles P. Brown. The company is capitalized at $3,000,000, and holds 37 claims, operations on which were stopped in October, 1907, for want of funds. The liabilities of the company were then stated at $19,559, with no available assets. The petitioners state that out of $160,000 received from the sale of stock and bonds not more than $50,000 was expended in development work, and charge John F. Marskey and N. V. Ulrey, directors, with having received $100,000, which has not been satisfactorily accounted for.

Nova Scotia

Nova Scotia Steel and Coal Company—This company made a new record in October, both in steel and coal production. The pig-iron output for the month was 5800 tons, and that of steel 7750 tons. The coal product for October was 70,160 tons against 57,480 tons for October, 1907; the total for the year to end of October was 574,670 tons, compared with 528,720 tons last year.

Dominion Coal Company—The output for October was 264,959 tons, compared with 339,573 tons for October, 1907. The production for the first 10 months of the year was 3,130,578 tons, compared with 2,927,484 tons for the corresponding period of 1907.

Mexico

Chihuahua

Rio Plata—A recent 29-ton shipment of concentrates from this company's Santa Barbara property netted 40,000 pesos. The 20-stamp concentration plant is handling 60 tons daily. Although there has been no rain in that portion of the Sierra Madres since early September water power is still ample, but the steam plant is being made ready for emergency use. The general manager, D. W. Shanks, is temporarily in New York and other eastern cities, but will be at the mine again in early December.

Parral Output—The production of the Parral camp for the week ending November 6 amounted to 7830 tons, of which 5040 tons were locally treated and the balance sent to outside smelteries.

Cuadras—A force of men, under the directon of C. M. Dobson, has been put to work at this Parral mine belonging to the Marina Mines of Mexico Company. It is also stated that the same London men are making a thorough examination of Los Remedios mines in the Veta Colorada section with a view to their purchase.

Tres Hermanos—A milling plant has been ordered for this gold property in the Batopilas section. The property is owned and operated by Ignacio Ramirez.

Cieneguita—These gold mines, situated in the extreme western part of the State are reported bonded to New York men for the sum of $150,000. They are a portion of the estate of the late Buenaventura Becerra of Urique.

Candelaria—This company is carrying on a large amount of work in the old San Pedro district along the line of the Sierra Madre railway, about 125 miles south of El Paso. The mines in progress of reopening are the Candelaria, San Pedro and Congress. Hoisting and pumping machinery is being installed. It is also stated that operations will be resumed at the San Nicolas, Leon, Santo Benigno and Porvenir. Smith & Laird, of Bisbee, are in charge.

[illegible]

Guanajuato Development Company—E. A. Strout, until recently manager of one of the large mines on the Witwatersrand, Transvaal, has been appointed superintendent succeeding John Butter, resigned. Hugh Rose is general manager and will now give more time to special matters for the company.

Zacatecas

Outside of a few development propositions near the Veta Grande, there is little activity in Zacatecas, and to get new life into the camp a movement is on foot to form a board to stimulate the local mining industry. What Zacatecas needs is large capital. There is absolutely no doubt that such mines as the Veta Grande, San Rafaël, Quebradilla, San Barnaté and many others could be brought into the list of producers.

El Bote—Development below the 900-ft. level has proved very rich ore, and since the installation of a Cameron sinker, sinking has progressed steadily, enabling the company to open up its enormous orebody further. Development work under the El Refugio hill has been successful and large quantities of milling ore have been found running from 600 to 800 grams silver and from 8 to 12 grams gold. This ore is particularly adapted for the cyanide process. The Pattinson circulation cyanide tanks have been tested and seem to work as well as the Pachuca tank, and as soon as the old mill has been cleaned up, the Bote will commence cyaniding. The controlling interest in this company owned by Dudley H. Norris, has been bought out by C. O. Gilbert, who was elected president; Mrs. E. Mac Donald, vice-president; C. A. Heberlein, secretary and treasurer; F. M. Gilbert, commisario. The smelter will be blown in about Jan. 1, as by that time the siding of the Mexico Central will have been completed. The furnace is 48x150 in., and is rated at about 300 tons of charge per 24 hours. The Magistral ore is practically all coarse and is considered an easy smelting ore. The mine-run will average about 5 per cent. copper, 220 grams silver, and 1 gram gold.

[illegible] has started construction on a 70-ton concentrator to handle low-grade iron sulphides too low for shipping

[illegible] Cape Town Copper Company, is doing development work and still shipping sufficient ore to pay more than total expenses. The company is figuring also on installing a concentrator to make all second-grade ores marketable. The ore is practically a sulphide of iron carrying 1 [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 18—Coal trade in the West continues to show steady, though slow, improvement. Railroad cars are finding better employment and shipments are increasing. As usual, there is a tendency on the part of many operators to over-estimate the improvement, and to rush coal to the markets in excess of requirements, with an unfavorable effect on prices.

Although Lake navigation is still open, shipments of coal to the Northwest are practically at an end, as the docks at the upper Lake ports are too crowded to receive more coal.

The Seaboard bituminous trade shows a marked improvement, especially in New England territory. Coastwise trade is good. The anthracite trade has been helped a little by a week of cold weather, but is not specially active.

The commission which has been taking testimony in the case against the alleged anthracite coal combinations, is in Scranton, Penn., this week, hearing evidence from a number of independent operators.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 7, in short tons:

	1907.	1908.	Changes.
Anthracite......	4,834,797	4,371,983	D. 462,814
Bituminous.....	33,749,305	28,531,387	D. 5,217,918
Coke............	12,016,697	5,959,811	D. 6,056,886
Total..........	50,600,799	38,863,181	D. 11,737,618

Total decrease this year to date was 23.2 per cent.

Chesapeake & Ohio shipments, three months of fiscal year July 1 to Sept. 30, short tons:

	Coal.	Coke.	Total.
New River............	1,693,055	49,504	1,742,559
Kanawha..............	1,261,077	6,956	1,268,033
Kentucky............	79,546	......	79,546
Connecting lines.....	54,799	15,372	70,171
Total................	3,088,477	71,832	3,160,309
Total, 1907..........	2,956,814	118,247	3,075,061

Deliveries this year to points west of mines, 1,606,995 tons coal and 41,899 coke; points east, 370,693 tons coal and 29,933 coke; tidewater, 1,107,888 tons coal; anthracite to line points, 2901 tons.

New York

ANTHRACITE

Prepared sizes are in good demand but steam sizes seem to be plentiful. At Lake ports there is an accumulation of coal and the expected demand previous to the close of navigation has not set in.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

New York harbor seems to be the only point which has not felt the increased demand that is prevalent throughout all other consuming territories. On the whole, business is good and the demand keeps up. In the far East the shoalwater ports are cleaning up their contracts, and to New England points considerable coal is going forward. It is reported that the mines are gradually approaching their full schedule. In New York harbor good grades of steam coal fetch $2.45@2.65 per ton. Transportation is good and cars are plentiful.

In the Coastwise vessel market boats are scarce especially light-draft vessels which make shoalwater ports. Large vessels also are in demand, and it is believed that many of the large craft will be tempted out of their winter berths by the rates now prevailing.

Freight rates are firm and higher. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, $1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Nov. 16—There has been no change of any consequence in the coal production in this territory. There is, however, a better demand, and more men will be put to work at once in the mines. The railroads are doing well in furnishing all the cars necessary.

Considerable coke is being accumulated in this district; one of the larger companies is reported to have 15,000 tons on hand. There will be a need in the near future for all the coke that can be supplied.

Chicago

Nov. 17—The coal market continues to be troubled with a surplus of receipts of nearly every grade. Prices remain low, especially for such coals as are in overabundance.

Steam coals generally are improving; domestic coals are still sluggish, though the coming of colder weather has aided sales. Anthracite sells more evenly and in better relative quality than bituminous domestic. Bituminous coals from Illinois and Indiana mines find demurrage affecting screenings most; some consignments of screenings have sold at 95c. Chicago; others of similar grade have brought $1.10@1.20, and the highest grade $1.50@1.65. Run-of-mine brings $1.65@1.75; lump and egg weak at $1.75@2.65.

Of coals from east of Indiana, Hocking is strongest, having steady sales and receipts not too large. Smokeless is weak as regards run-of-mine, some of which sells for $2.70, though Pocahontas and New River hold well up toward the circular prices of $3.05@3.30. Youghiogheny is $3.15 for ¾-in. gas, selling almost wholly on contracts.

Indianapolis

Nov. 16—The Indiana Railroad Commission has issued an order establishing a joint rate on coal over a number of coal-carrying railroads from southern Indiana mines to designated markets. Action of the commission is due to petitions filed by mining companies, which alleged that discriminating rates were maintained against them.

Pittsburg

Nov. 17—A few more railroad coal mines have been put in operation increasing production this week to about 60 per cent. of capacity. This was partly due to the cold weather and to increased shipments to Lake ports. The lake-shipping season is about over. Current prices are based on mine-run coal at $1.15 at the mine. Slack is not quite so strong, some sales being made as low as 60c., although some of the large producers refuse to quote less than 75c. All of the river mines are still idle.

Connellsville Coke—The coke market is stronger. Furnace coke for both spot and first half is quoted at $2, and indications point to further advances. Foundry coke is $2.25 for spot, and for the first half $2.35@2.50 a ton at ovens. Stocks in the two regions are not large, and production is increasing slowly owing to the scarcity of workmen and also to the continued drought It is estimated that the H. C. Frick Coke Company is operating its ovens at about 46 per cent. of capacity, and the independent producers at about 52 per cent. The *Courier* gives production in both regions at 230,559 tons. Shipments were 8090 cars as follows: To

Pittsburg district, 3165; to points [illegible] of Pittsburg, 4371; to points east of Connellsville, 554 cars.

Foreign Coal Trade

Natal Coal—From the returns made for 10 months, it is estimated that the total coal production of the colony of Natal, South Africa, in 1908, will reach 1,750,000 tons, an increase of 220,000 tons over last year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 7: Best Welsh steam, \$3.54; seconds, \$3.42; thirds, \$3.24; dry coals, \$3.36; but Monmouthshire, \$3.18; seconds, \$3.06; best small steam, \$1.86; seconds, \$1.62. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 18—The markets have been more active than for many weeks past, and the improvement which was manifested last week has continued, though there is still some degree of hesitation.

Pig-iron selling has been active, with large transactions in foundry and basic iron. The foundries are apparently beginning to have confidence, and are ready to place contracts well into next year. Southern iron has been well absorbed, and some of the large companies are out of the market for the present. Northern furnaces are not too anxious to make future engagements at present prices.

In finished material increased demand is reported for plates and bars. In structural material no large contracts have been placed, but the small orders make up a considerable tonnage. There is likely to be some discussion over prices, owing to the number of contracts taken by fabricating companies at low prices. The railroads are placing some orders for equipment, but are still holding back on rails.

Lake Iron Ore Movement—It is reported that the leading shipper is providing for a much larger shipment of ore in November than had been anticipated. If this is correct, stock-piles will be drawn down to a low point. The change is due to the increasing demand for pig iron.

Baltimore

Nov. 17—Imports for the week included 2543 tons ferromanganese, [illegible] tons silico-spiegel and 40 casks manganese ore from Liverpool; 8900 tons iron ore from Cuba. Exports include 2,150,000 lb. steel billets and 197,400 lb. zinc dross to Liverpool; 840,318 lb. tin scrap to Rotterdam.

Birmingham

Nov. 16—It is not any more a matter of desiring business, but how much more business can be accepted before the probable make for the first three months of the coming year has been covered sufficiently. Southern iron-masters are not anxious for business now, and in some offices the statement is made that care is being taken that there shall not be more iron sold than can be comfortably handled during the first quarter of 1909. The furnace companies in this district are not yet in the market for second-quarter delivery. There will be an advance in quotations in the near future. The rate of \$13 per ton, No. 2 foundry, is being maintained. The make in this section has been improved recently, the Republic Iron and Steel Company starting up its No. 3 furnace the past week, making all three of the Thomas furnaces in blast. Other furnaces are being placed in readiness for operation. Attention is also being given in this district to the raw-material supplies. Ore mines which have been running on half or slack time will be put in full operation at once. Coke making will be improved and limestone quarries started up.

There is a good demand for basic and [illegible]

Chicago

Nov. 17—Strength continues in the iron market, the confidence of melters being shown in larger orders and inquiries generally. Sales of pig iron above 1000 tons are not exceptional now and contracts are freely made for delivery extending to the middle of next year. Prices show a firmness that is significant of improvement. No. 2 Southern holds to \$13 Birmingham (\$17.35 Chicago) on nearly all transactions, and No. 2 Northern to \$17.50, with the most desirable sales from the seller's point of view made at 25@50c. less. Some iron, indeed, sells for 50c. above the higher quotations, the market showing something of its old-time state as regards premiums for early delivery.

The Illinois Steel Company opens for full operation this week its plate and slab mills; the open-hearth furnaces will start Dec. 1. Sales of iron and steel products show increases in nearly every line though not large anywhere. Coke sales have increased and are brisk at \$4.00 for the best Connellsville

Cleveland

[illegible] Shipments of [illegible] ports, from the Lake Superior region for [illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total decrease this year was 41.3 per cent. The port figures show that there was a larger proportional decrease [illegible] Mesabi.

Philadelphia

[illegible] encouraging one for active buying for early delivery. Many large consumers suddenly appeared and bought. Prices are being held firmly in this territory. Negotiations are pending today for one or two very large lots for local delivery scattered over six months. A basis has at last been laid for stronger prices. Numerous small orders of special brands continue to come in. Forge iron is dragging, and is the weakest on the list. No. 2X [illegible] \$16.25.

Bars—Bar-iron makers claim that they are booking more business than for months. Prices are in buyers' favor and business is being urgently sought for.

[illegible] now extending their orders to cover winter requirements. Merchant pipe is more active and the extreme discounts to small purchasers have been withdrawn.

Plates—A general improvement in plates has set in, due to large orders for steel-car work.

Structural Material—A sharp improvement set in and mills report an influx of orders. Most of them are for early delivery.

Scrap—Large lots of scrap have been sold this week, cleaning out stocks in large yards. The chief demand is for railroad and No. 1 yard. Prices have hardened and scrap men are on the war path to obtain the kinds wanted

Pittsburg

[illegible] steel trade continue to improve slowly. A pronounced improvement is expected after Jan. 1. President W. E. Corey, of the United States Steel Corporation, who was in Pittsburg for a couple of days conferring with officials of the subsidiary companies, is not so optimistic. He declared that while there will be a steady im[illegible] for full operation of the idle mills before the coming summer. All differences between the railroads and the railmakers ar[illegible] and there is now nothing in the way of placing contracts for next year's require[illegible] of a reaffirmation of the \$28 price for standard sections for 1909. It is under[illegible] greater discard from the ingot than has been customary and the railmakers will not ask more for rolling a heavier rail than has been usual in past years. Several roads have sent in inquiries and one [illegible] Mill operations continue about the same as last week, although in some instances production has been slightly increased. The Carnegie Steel Company is operating at about 65 per cent. Preparations are being made to begin work on additional mills at the Ohio works, Youngstown, and the increasing of the capacity of the car-wheel plant acquired a few months ago. The improvements at the Duquesne works are being completed and the two new blast furnaces are almost ready to be blown in.

Pig Iron—There has been considerable activity in pig iron and many large sales have been recorded. As a result a number of furnaces have withdrawn from the market. One large interest is said to have sold 75,000 tons, most of which was at low prices. Others gave options for iron at the old prices which were promptly taken up after the election result was known. The stiff advance in pig iron prices noted last week checked buying to a certain extent but there were a number of transactions and within a week over 10,000 tons were sold. The leading independent producer today announced a further advance of $1 a ton in bessemer pig iron and is quoting $17, Valley furnaces, for first-half delivery. All interests are firmly adhering to the prices quoted a week ago and claim to have made sales at the top prices. These quotations are as follows: Standard bessemer, $15.50@16; malleable bessemer, $15.50@15.75; basic, $15@15.25; No. 2 foundry, $15.50@16; gray forge, $14.50@15, all f.o.b. Valley furnaces. It is said negotiations are pending for a heavy tonnage of outside iron for the United States Steel Corporation, but no confirmation so far has been obtained as to the truth of the report.

Steel—Several small sales of both bessemer and open-hearth billets are reported at the regular price of $25, Pittsburg. A sale of 2000 tons of sheet-bars is also recorded at $27.50, Pittsburg. Plates remain at 1.60c. and merchant steel bars at 1.40c.

Sheets—Production of sheets has increased and the demand seems to be improving. Prices are firm at 2.50c. for black sheets and 3.55c. for galvanized sheets, No. 28 gage.

Ferro-Manganese—Prices have advanced $1 a ton and some sellers are holding for a higher price. Sales of the week were at $47@48, Pittsburg.

Foreign Iron Trade

German Steel Syndicate—The German Steelworks Union reports sales for the nine months ended Sept. 30 as follows, in metric tons: Billets, etc (half-finished material), 1,027,309; railroad material, 1,567,643; shapes and other rolled steel, 1,054,728; total, 3,649,680. This is a decrease of 712,922 tons, or 16.3 per cent. from last year.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 18.

At all U. S. Ports in October and year.

Metal.	Exports.	Imports.	Excess.
Gold.			
Oct. 1908..	$ 1,952,574	$ 3,782,705	Imp.$ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,087,919	" 14,936,871

Exports of specie from New York week ended Nov. 14: Gold, none; silver, $755,063, nearly all to London. Imports: Gold, $155,684, from the West Indies, South America and Japan; silver, $180,900, from Mexico and South America.

Sil ver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
12	4.8575	50	23⅛	16	4.8590	50⅛	23 3/16
13	4.8580	49⅞	23 1/16	17	4.8600	50⅛	23 3/16
14	4.8585	49¾	23 1/16	18	4.8600	50	23 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

The market for silver continues steady, without any marked fluctuations. Large speculative operations have not materially affected the price. The market closes dull and steady.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
12	14⅜ @14⅝	14¼ @14½	64	30¼	4.32½ @4.37½	5.07½ @5.12½	4.92½ @4.97½
13	14½ @14¾	14¼ @14½	63½	30½	4.32½ @4.35	5.07½ @5.12½	4.92½ @4.97½
14	14½ @14⅝	14⅛ @14⅜	....	30¼	4.32½ @4.35	5.07½ @5.12½	4.92½ @4.97½
16	14⅜ @14⅝	14⅛ @14¼	63¼	30	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
17	14⅜ @14⅝	14⅛ @14¼	63¾	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
18	14⅜ @14⅝	14⅛ @14¼	63⅛	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The extraordinary activity chronicled in our last report ceased on Nov. 11, since when the market has been dull and transactions small in volume and few in number. So far as there has been business, it has been chiefly for export, domestic manufacturers having disappeared from the market. Under offerings from second hands and in certain cases from first hands, prices have yielded a little. However, some of the important agencies continue to ask a price above the present market. In general there is no pressure to sell, an early resumption of buying by manufacturers being expected, although views are not uniformly optimistic in this respect. The Calumet & Hecla is still out of the market, but probably will reënter next month. Following the heavy buying movement of the last few weeks, it was naturally to be expected that business would quiet down, as is usually the case after periods of that kind. The tone of the market has become uncertain, and perhaps more so than is usual under similar conditions on account of the heavy speculative commitments by interests not identified with the copper industry. The market closes at 14⅜@14⅝c. for Lake copper; 14⅛@14¼c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 14@14⅛ cents.

A noteworthy feature in the market for Lake copper recently has been the increased demand for the arsenical brands. Not long ago these sold frequently on the basis of prime casting copper, but now there is a demand which prefers them to prime Lake. Certain specifications call for Lake copper containing 0.5 per cent. arsenic, such copper having a conductivity of only 0.60 to 0.65. This copper is used for drawing heavy wire for trolley purposes, for which its superior tensile strength and durability are thought to offset the inferior conductivity. Anyway, practical tests in this direction are being made.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

Realizing sales brought about a sharp break in the London standard market, which at one time declined to £62 17s. 6d. for spot and £63 15s. for the three months' option. The recovery at the close has only been slight, the quotations being cabled at £63 2s. 6d. for spot, £64 2s. 6d. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 1300 tons.

Refined and manufactured sorts we quote: English tough, £67 10s.; best selected, £66 10s.@£67 10s.; strong sheets, £78 10s.@£79 10s.

Tin—The London market has been depressed throughout the week and was no doubt manipulated on account of the impending Banka sale. Transactions were of moderate volume and the close is cabled as quiet at £136 17s. 6d. for spot, £138 15s. for three months.

The domestic market has also been reactionary. The decline in London has had a somewhat chilling effect on consumers, who have ceased operating as freely as they did last week. The market closes quiet at 30¼ cents.

Lead—The market has eased off during the last week under some pressure to sell, refiners having no orders on their books beyond their current production, while buyers have withdrawn from the market. The situation has been rather unsubstantial in view of the position of the Smelting Company, of which the price has been 4.30c. all along. Unusual disparity between the prices at St. Louis and New York developed during the week, the closing price at St. Louis being 4.25@4.30c., on which basis Missouri lead would cost 4.40c. at New York. The closing price for lead at New York is 4.30@4.32½ cents.

The market abroad has also flattened out and closes at £13 12s. 6d. for Spanish lead, £13 15s. for English lead.

Spelter—A large business with consumers, both brass-makers and galvanizers, has been done during the week Nov. 11-18 at 4.92½@4.97½c., St. Louis, and some speculative business has been done at a slightly higher price. A noteworthy feature of the week has been large business in brass specials at 5.12½c., St. Louis, showing a restoration of the premium which disappeared when spelter was under great pressure to sell. The market closes at 4.92½@4.97½c. St. Louis, 5.07½@5.12½c. New York, for ordinaries.

The London market for spelter is unchanged at £21 for good ordinaries, £21 5s. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is steady and a moderate business is being done. Quotations are unchanged at 8¼c. for Cookson's, 8@8¼c. for Halletts' and 7¾@8c. for ordinary brands.

Aluminum—The Aluminum Company of America continues to quote nominally 25½c. per lb. base for No. 1 ingots, and 35c. base for sheets. Foreign aluminum is offered here at 22c. The range of the market is, therefore, 22@25½c.

The foreign market is demoralized, and sales are said to have been made at the equivalent of 13½c. It is reported that the Metal-Gesellschaft, Frankfurt-am-Main, is now handling exclusively the aluminum product of Froges, France.

Platinum—Dealers quote $23.25 per oz. for refined platinum, $26.25 for hard, and $18 for scrap. An advance is probable as business is good. We learn, however, that ingot is still offered for $18 and No. 1 scrap for the same price. In Europe prices declined slightly after the failure of the conference of the refiners held in Paris last week. Russian dealers are quoting crude platinum at 18,000 rubles per pood, on the basis of 83 per cent. The market is very sensitive, and any serious attempt to buy leads to an advance.

Quicksilver—The market is unchanged, with fair demand. New York price is $46@47 per flask of 75 lb. San Francisco quotations are $44@45 for domestic orders, $42@43 for export. London, £8 10s. per flask, with 1s. 6d. less quoted by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 14—This week $38.50 was the highest price paid for zinc ore, on a basis of $38 per ton of 60 per cent. zinc. For 80 per cent. lead ore $56 per ton was paid.

[illegible]	[illegible] ore, lb.	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
Year to Nov. 14	96,030,662	9,353,455	3,844,604

In addition to the above there was shipped to the Platteville Separating Company, 406,280 lb.; to the Joplin Separator Works 121,350 lb.; to the Enterprise roaster 322,000 lb. zinc ore.

Joplin, Mo., Nov. 14—The highest price reported paid for zinc blende was $41 per ton. The highest base price was paid for the heavy iron ore at Miami, of $40 base, while the best ores sold on a base of $39, ranging down to $37 for a few purchases early in the week. The bulk of the shipment was, perhaps, close to a $38 base price, while a considerable tonnage brought $30. Zinc silicate sold on a $17.50 base, the highest price being $25.30. The average price, all grades, was $34.30. The highest price for lead ore was $60 for a few bins purchased at the end of last week and loaded this week, quotations receding to $55 and $54 for this week's purchases. The average price, all grades, was $56.14 per ton.

SHIPMENTS WEEK ENDED NOV. 14

	[illegible]	[illegible]	[illegible]
[illegible]	2,933,690	1,[illegible]	$91,240
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	491,100	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	10,051
[illegible]	[illegible]		[illegible]
[illegible]	131,170		[illegible]
Prosperity	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	22,420	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		1,797
[illegible]	[illegible]		1,793
[illegible]	[illegible]		1,563
[illegible]	[illegible]		884
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Producers succeeded in bulling the [illegible] price offerings and buyers were unable to fill large purchasing orders without meeting these demands.

MONTHLY AVERAGE PRICES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]		[illegible]	
December	31.60	......	30.[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]		[illegible]	

[illegible] ores sold.

Chemicals

[illegible] ket is active and considerable demand is shown, especially for heavy chemicals. Business in October was good and the outlook is encouraging.

Copper Sulphate—The stronger metal market has caused an advance of 10c. per 100 lb. in the price of copper sulphate. Quotations now are $4.75 per 100 lb. for carloads and up to $5 for smaller lots.

[illegible] and little demand has developed except in the fertilizer trade which has closed some orders during the week. Quotations are 2.15c. for spot and future delivery.

Mining Stocks

[illegible] markets have continued active through- [illegible] on the whole with increased strength [illegible] much effect here, and the market closes with rather an upward tendency.

The Curb market was active, with copper stocks showing well and prices fairly maintained, on a good volume of business. Other mining stocks were in con- [illegible] of business was good.

Sales of Homestake, of South Dakota, [illegible]

The Standard Oil Company has declared a dividend of $10 per share, making $40 for the year.

Boston, Nov. 17—Copper shares have reacted and trading has quieted somewhat, although yet of good volume. Some specialties have sought new high levels. Calumet & Arizona took a $5 drop today, making $6.75 for the week, and touched $120. This was due to disappointment in the dividend declaration which was $1 quarterly, when $1.50 had been looked for in some quarters. North Butte really advanced slightly on declaration of the same amount. Nothing more was looked for. Franklin spurted $3 to $18. This company is going to adopt a policy of extension, which includes doubling its capital, and taking over the Rhode Island property on a basis of one share Franklin for three and one-half Rhode Island. It will buy additional land and sell the old Franklin mine to the Quincy company for $170,000.

Old Dominion came within a fraction of touching $60, and closed just above $58 tonight. A quarterly dividend of 50c. declared by Old Dominion of New Jersey will enable the Maine Corporation to distribute 50c. also. Offers of $4 per share are being made for options on the 6700 shares of minority stock at $100 per share before Dec. 15. Boston & Corbin touched $24.25. The 10,000 shares of treasury stock offered at $25 will probably have to be taken by the underwriters.

Mexico Consolidated rose over $1 to $5.75 on announcement of the resignation of President J. A. Coram and several other directors. Frederick Stallforth takes the presidency.

Trading has been active on the Curb,

STOCK QUOTATIONS

NEW YORK Nov. 17		BOSTON Nov. 17	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	½	Adventure	8¾
Amalgamated	86	Allouez	‡39
Anaconda	51¾	Am Zinc	27½
Balaklala	‡2⅛	Arcadian	5½
British Col. Cop.	7½	Arizona Com	38⅝
Butte & London	....	Atlantic	18¼
Butte Coalition	27⅛	Bingham	‡.30
Colonial Silver	½	Boston Con	17
Com. Ely Mining	8 1/16	Calumet & Ariz.	120
Davis Daly	3 9/16	Calumet & Hecla	690
Dominion Cop.	1	Centennial	34½
Douglas Copper	3⅝	Con. Mercur	‡.39
El Rayo	4⅜	Copper Range	81½
Florence	4 1/16	Daly-West	10½
Foster Cobalt	55	Franklin	17⅝
Furnace Creek	16	Greene—Con	11¼
Giroux	4½	Isle Royal	24
Gold Hill	½	La Salle	14
Goldfield Con.	6 1/16	Mass	7¼
Granby	107	Michigan	14¾
Greene Gold	¼	Mohawk	70
Greene G. & S	9	Nevada	20
Greenw'r & D. Val.	‡.75	North Butte	88
Guanajuato	1⅛	Old Colony	‡.60
Guggen Exp.	187	Old Dominion	58¾
Hanapah	15	Osceola	‡124
McKinley Dar.	1.07	Parrot	28
Micmac	2	Quincy	98½
Mines Co. of Am.	1 1/16	Rhode Island	5½
Mitchell Mining		Santa Fe	2¼
Mont. Sho. C.	1	Shannon	18½
Nev. Utah M. & S.	3⅜	Superior	29½
Newhouse M. & S	6⅞	Tamarack	‡85
Nipissing Mines	11½	Trinity	18¾
Old Hundred	1 5/16	United Cop., com.	14¾
Silver Queen	1.11	U. S. Oil	30¼
Stewart		U. S. Smg. & Ref.	46
Tennessee Cop'r.	50½	U.S.Sm. & Re., pd.	47
Tri-Bullion	1	Utah Con.	46¾
Union Copper	‡7/16	Victoria	5
Utah Apex	6¾	Winona	6½
Utah Copper	48¼	Wolverine	153
Yukon Gold	4¾	Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	31⅞
Am. Smelt. & Ref.	95½
Am. Sm. & Ref. pf.	107½
Bethlehem Steel	‡26
Colo. Fuel & Iron	39¾
Federal M. & S., pf.	88½
Inter. Salt	14¾
National Lead	84¾
National Lead, pf.	106
Pittsburg Coal	13½
Republic I. & S.	28½
Republic I. & S., pf.	88¼
Sloss-Sheffield	81¼
Standard Oil	673
U. S. Red. & Ref.	13
U. S. Steel	57⅞
U. S. Steel, pf	113¼
Va. Car. Chem	39½

BOSTON CURB	
Ahmeek	‡125
Black Mt.	4 1/16
East Butte	8¼
Hancock Con.	9¾
Keweenaw	5½
Majestic	.75
Raven	.93
Shawmut	.09
Superior & Pitts	‡14
Troy Man	.25

ST. LOUIS Nov. 14

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	70.00	68.00
C. C. & C. pd.	77.00	75.00
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	20.00
Doe Run	131.00	115.00
Gra. Bimet.	.25	.20
St. Joe	16.00	13.00

LONDON Nov. 18

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	1	3
Camp Bird	0	14	9
Esperanza	3	3	9
Tomboy	1	0	0
El Oro	1	7	0
Oroville	0	8	9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 18.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.30
Best & Belcher	.49
Caledonia	.16
Chollar	14
Comstock	‡.24
Con. Cal. & Va.	60
Crown Point	40
Exchequer	.36
Gould & Curry	16
Hale & Norcross	43
Mexican	77
Ophir	1.90
Overman	11
Potosi	17
Savage	40
Sierra Nevada	34
Union	29
Utah	.04
Yellow Jacket	.48
TONOPAH STOCKS	
Belmont	1.12
Extension	.57
Golden Anchor	.01½
Jim Butler	.21
MacNamara	.50
Midway	.26
Montana	73
North Star	06
Tono'h Mine of N.	7.00
West End Con	48
GOLDFI'D STOCKS	
Adams	04
Atlanta	.22
Booth	.32
Columbia Mt.	.17
Comb. Frac	1.39
Cracker Jack	.06
Dia'dfield B. B. C.	.14
Goldfield Belmont	.05
Goldfield Daisy	.95
Great Bend	.34
Jumbo Extension	.30
Katherine	...
Kendall	.12
Lone Star	.08
May Queen	.06
Oro	.13
Red Hill	.22
Roanoke	..
Sandstorm	.21

Name of Comp.	Clg.
Silver Pick	.12
St. Ives	22
Triangle	04
BULLFROG STOCKS	
Bullfrog Mining	‡ 03
Bullfrog Nat. B.	‡.04
Gibraltar	03
Gold Bar	‡.03
Homestake King	15
Montgomery Mt.	‡.05
Mont. Shoshone C.	.95
Original Bullfrog	‡.01
Tramp Cons	.15½
MANHAT'N STOCKS	
Manhattan Cons.	‡ 05
Manhat'n Dexter	‡.03
Jumping Jack	‡.03
Stray Dog	‡.03
MISCELLANEOUS	
Golden Boulder	‡.05
Bonnie Clare	08
Lee Gold Grotto	..
Nevada Hills	1.50
Nevada Smelting	1.00
Pittsburgh S. Pk.	.90
Round Mt. Sphinx	.18

COLO. SPRINGS Nov. 14

Name of Comp.	Clg.
Acacia	7
Black Bell	....
C. C. Con	‡3½
Dante	6½
Doctor Jack Pot	7
Elkton	67
El Paso	48
Findlay	17
Gold Dollar	8½
Gold Sovereign	3½
Isabella	27
Index	....
Jennie Sample	4¼
Jerry Johnson	‡3⅞
Mary McKinney	30
Pharmacist	‡3⅝
Portland	1.03½
Un. Gold Mines	4
Vindicator	81
Work	8

Assessments

Company.	Delinq.	Sale.	Amt.
Amador, Ida	Nov. 20	Dec. 19	$0.02
American Fork, Utah	Oct. 28	Nov. 25	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Columbus Ext., Utah	Nov. 13	Nov. 25	0.01
Con. Cal. & Va., Nev	Nov. 24	Dec. 15	0.20
Confidence, Nev	Dec. 9	Dec. 30	0.20
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Gould, Mont	Nov. 7	Dec. 7	0.05
Imlay, Utah	Nov. 11	Nov. 28	0.01
Liberty, Utah	Nov. 5	Dec. 2	0.03
Lucky Dutchman, Nev	Nov. 21	Dec. 12	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
Overman, Nev	Dec. 2	Dec. 23	0.05
Penn. Con., Cal	Nov. 2	Nov. 25	0.10
Seg. Belcher & Mides, Nev.	Nov. 7	Nov. 28	0.03
Silver King Con., Utah	Nov. 4	Nov. 25	0.05
Utah-United, Utah	Nov. 10	Nov. 27	0.01
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Zeibright, Cal	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	......	27.154	......
December	54.565	......	25.362	......
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	......	13.870	......	61.226	......
December	13.163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87.007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	.....
June	42.120	28.024	December	27.925	.....
			Av. year.	38.160	....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	......	4.775	......	21.438	......
December	4.254	......	4.104	......	20.075	.....
Year	5.962	......	5.812	......	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, NOVEMBER 28, 1908. NO. 22.

Has the Value of Gold Depreciated?

Recently Commodity Prices Have Risen with Increasing Gold Production but Such Coincidence Has Been Exceptional Rather Than the Rule

BY WALTER RENTON INGALLS

The question forming the title of this article ought to be elaborated so as to read, "Has the value of gold depreciated because of cheaper production of gold?" No one can deny that the value of gold periodically appreciates and depreciates. We talk about gold as the standard of value, but the fixity of the value of an ounce of gold at $20.67 is arbitrary, resulting from the dictum of Congress in 1792 that 270 grains of gold, 0.916 2/3 fine (equal to 247.5 grains of pure gold), shall be stamped $10, which itself is based upon an old English act that 123.275 grains of gold, 0.916 2/3 fine (113 grains of fine gold), shall be stamped £1. However, the real value of gold is what it will buy and that is constantly fluctuating, but inasmuch as there must be something as the standard, gold is so adopted, and the prices for commodities are said to fluctuate with reference to gold, rather than the reverse.

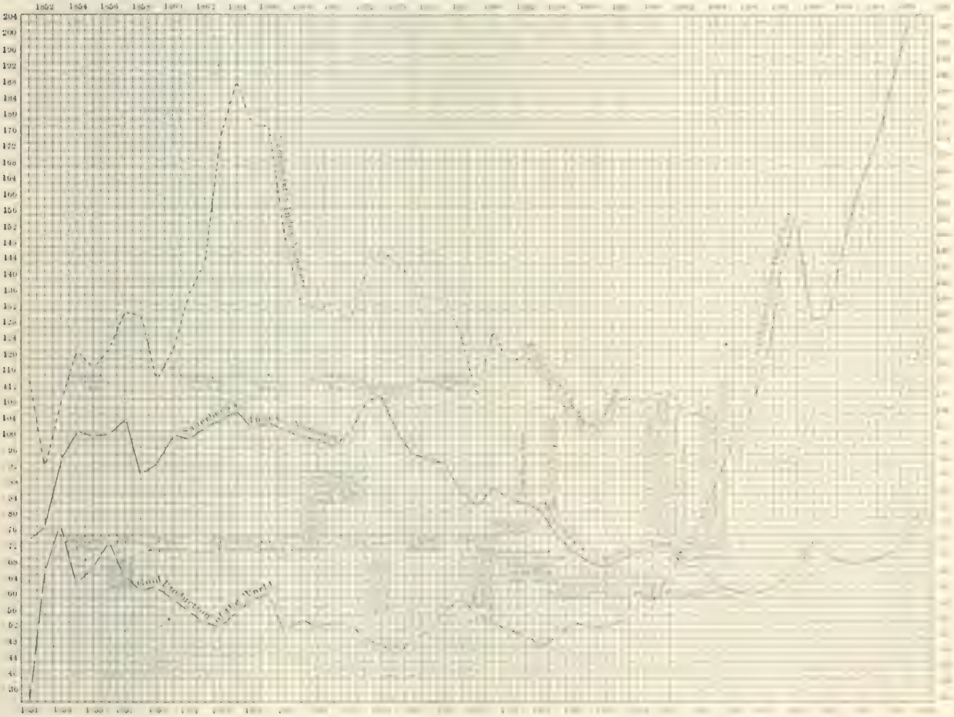


FIGURE 1. GOLD PRODUCTION AND COMMODITY PRICES

The great rise in the value of commodities, which began about 1896 and culminated in 1907, naturally excited the attention of producers, manufacturers and consumers, and equally that of the bankers who regulate industrial developments and economists who study them. The paramount question pertained to the cause of this extraordinary rise. A remarkable increase in the production of gold occurring contemporaneously, it was [illegible] to explain, [illegible] urged [illegible] arguments, that the rise in commodity prices was due to the increased production of gold, meaning that the value of gold as compared with commodities had decreased.

The Prevailing Explanation

This explanation has been offered and [illegible] exemplified by Prof. J. Pease Norton, of Yale University, whose remarks in an article on "The Gold Situation and the Currency Problem" in the Review of Reviews, for January, 1908, illustrate the view of this school. He said: "Although gold is the measure of the prices of all commodities as a standard of value, prices may increase because of a cheapening of the standard relative to commodities, or because of an increase in the value of commodities relative to the standard. In the one case, inventions in gold mining and new discoveries of gold would be active. In the second case, above mentioned, short crops, deficient economic progress and great pressure of population on the means of subsistence would be the effective causes for the high prices." Professor Norton wants to have an international "gold commission" to collect the statistical data necessary for recommendations as to what shall be done to correct the evil effects of the depreciation of gold as to which he is convinced.

It is surprising to discover how generally this idea is held. Professors of political economy, like Doctor Norton; captains of industry, like Andrew Carnegie; and eminent bankers are alike under the sway of this theory which is permeating a wide range of thought. In almost any broker's office the customer will hear that in the long run the prices for stocks are bound to rise, because they represent the capacity to produce commodities, and "the effect of the enormous production of gold is to cause prices to advance generally; not merely commodity prices, but also stock prices."

Cairnes' Analysis

This idea is by no means a new one. In the '50s, when California and Australia were pouring a new wealth of gold into the coffers of the world, there was a common fear that the supply would be increased so largely that the value would be diminished. Indeed, the output of the metal became so large that its purchasing power declined from 9 to 15 per cent., according to Jevons, and induced Holland to adopt the single silver standard, and some other countries to adopt bimetallism. John Stuart Mill is authority for the statement that if the money in circulation in the world be doubled prices will be doubled also, and it is an old and plausible argument that increase in gold production must necessarily increase the prices for commodities. Prof. J. E. Cairnes, of London, in 1859 undertook an inquiry as to how increase in gold production might influence the markets of the world. He pointed out that the wages of labor in the gold-producing countries rose to such hights, on account of the enormous profits, as to divert labor from other industries, necessarily ending in raising the prices of their outputs; the sudden wealth of the successful miners, spent profusely for necessaries and luxuries, created fresh demands for commodities and thereby elevated prices; finally, the addition of the new gold to the banking reserves of the world enabled banks to give largely extended credits and thus facilitate expansion of trade and industry.

Professor Cairnes' conclusions were based upon a sound study of the evidence existing at his time, but in his time gold mining as an industry was scarcely 10 years old, and we know now that (1) a great increase in gold production may occur without increasing wages and without attracting any large number of men away from previous occupations; (2) the profit derived from the production of gold is rarely expended at the place of production, but is distributed among many investors in the commercial countries of the world; and (3) much of what is considered to be profit is really not so, a subject to which I shall revert farther on.

Increasing Supply of Gold Means Increasing Demand for Commodities

The only way in which an increasing supply of gold can affect the prices of commodities is by increasing the demand for them. The new gold is partly expended by the producer himself, and partly invested by the stockholder who receives it in the form of a dividend. The part invested is expended for commodities by somebody else. If deposited in a bank, by the person who borrows it from the bank; if invested in a bond, by the seller thereof. In the words of Horace White, "There is no stopping place between the new gold and the commodities—food, clothing and other necessaries and luxuries—unless the gold is hoarded. In the latter case it has no more effect on prices than it had before it was taken out of the ground. In short, gold is itself demand for goods, new gold is new demand, an increasing supply of it is an increasing demand, and this causes a rise of prices, other things being equal.

So much for the theory. An increase in the production of gold will cause an increase in the prices for commodities, other things being equal. But as a matter of fact, other things do not remain equal. Population and the production of the necessaries of life may increase in the same ratio as the production of gold, so that the latter merely supplies the increased requirement for it, and under that condition will not influence prices one way or the other. Industrial changes in processes of manufacture, means of transportation, and many other conditions may affect prices so that the average of the latter will go down, while the production of gold goes up, or *vice versa*. The crises of 1873 and 1890 were each followed by several years of severe commercial depression, but in each case, while prices were falling the production of gold was increasing, showing that gold of itself may not create sufficient demand to maintain prices. In this connection it is important to study the experience of the world from the time when records first became available.

Statistics of Gold Production

Statistics of the world's production of gold, year by year, have been compiled as far back as 1851. In the early part of this period the statistics were not of contemporaneous compilation by reliable authorities, but are largely the result of the restrospective investigations of later statisticians. For this reason there are discrepancies among the reports of various statisticians, which gradually disappear as the work of collecting the statistics of the gold production of the world was undertaken annually by reliable authorities such as the director of the United States Mint and "The Mineral Industry." In Table I are given statistics of the world's annual production of gold beginning with 1851. The figures for 1851 to 1891, both inclusive, are from the report of the director of the United States Mint; those for subsequent years are as reported by "The Mineral Industry." A different set of figures for 1851-1872 is given in a British Parliamentary report for 1876, based on the figures of Tooke, Newmarch, and the London *Economist*. They are shown in Table II.

I. GOLD PRODUCTION OF THE WORLD, 1851–1907.

Year.	Value.	Year.	Value.
1851	$ 67,600,000	1881	$103,102,000
1852	132,800,000	1882	102,000,000
1853	155,500,000	1883	95,400,000
1854	127,500,000	1884	101,700,000
1855	135,100,000	1885	108,400,000
1856	147,600,000	1886	106,000,000
1857	133,300,000	1887	105,775,000
1858	124,700,000	1888	110,197,000
1859	124,900,000	1889	123,489,000
1860	119,300,000	1890	118,848,700
1861	113,800,000	1891	130,650,000
1862	107,800,000	1892	146,292,600
1863	107,000,000	1893	158,437,551
1864	113,000,000	1894	182,509,283
1865	120,200,000	1895	198,995,741
1866	121,000,000	1896	211,242,081
1867	104,000,000	1897	237,833,984
1868	109,700,000	1898	287,327,833
1869	106,200,000	1899	311,505,947
1870	106,900,000	1900	258,829,703
1871	107,000,000	1901	260,877,429
1872	99,600,000	1902	298,812,493
1873	96,200,000	1903	329,475,401
1874	90,800,000	1904	349,088,293
1875	97,500,000	1905	378,411,754
1876	103,700,000	1906	405,060,969
1877	114,000,000	1907	412,556,136
1878	119,000,000	....	....
1879	109,000,000	....	....
1880	106,600,000	....	....

II. GOLD PRODUCTION OF THE WORLD, 1851–1872.

Year.	Adopted by U. S. Mint.	Parliamentary Report.
1851	$ 67,600,000	$ 67,600,000
1852	132,800,000	135,150,000
1853	155,500,000	140,400,000
1854	127,500,000	141,400,000
1855	135,100,000	151,200,000
1856	147,600,000	161,250,000
1857	133,300,000	138,225,000
1858	124,700,000	122,055,000
1859	124,900,000	107,290,000
1860	119,300,000	93,415,000
1861	113,800,000	112,270,000
1862	107,800,000	110,590,000
1863	107,000,000	100,575,000
1864	113,000,000	94,980,000
1865	120,200,000	101,270,000
1866	121,000,000	108,600,000
1867	104,000,000	103,500,000
1868	109,700,000	97,570,000
1869	106,200,000	106,415,000
1870	106,900,000	92,250,000
1871	107,000,000	108,965,000
1872	99,600,000	87,845,000

Index Numbers of Commodity Prices

The average prices for commodities are represented by index numbers computed by several authorities, of which the best known are those of the London *Economist* and Augustus Sauerbeck. The statistics of both these authorities antedate 1851. Unfortunately, however, the statistics of the *Economist* at present available are only for certain dates of each year, those commonly quoted being of Jan. 1. Annual averages of the *Economist* figures have not been computed, but I understand that a complete survey of its index numbers, which will show the averages, is now in progress. In the diagram which accompanies this article, I have plotted the *Economist* index numbers of Jan. 1 of each year in order to furnish a comparison with the Sauerbeck index numbers, but obviously the more value is to be placed upon the latter, which represent the average for each year.

During the last 20 years there have been additions to the publishers of index numbers, the best known of these being Dun's, Bradstreet's, and the Bureau of Labor, of the U. S. Department of Commerce and Labor. The figures of all of these authorities have been plotted insofar as they are available, but inasmuch as they show the same general trend of prices, it appeared to be unnecessary to prepare an engraving of this comparative diagram.

The *Economist's* and Sauerbeck's index numbers, together with the world's pro[illegible] plotted in Diagram I. It will be understood, of course, that the appearance of these curves may be altered by changes in the scale of the abscissas and ordinates, although their general relationship will be the same. In order to bring the three curves upon the same plate, the *Economist* index numbers were divided by 20, while the world's production of gold is plotted in units of $2,000,000. The Sauerbeck index numbers are plotted normally.

[illegible] between gold production and the index numbers have previously been made by economists, [illegible] little weight upon it, because of (1) inaccuracies in the index numbers, (2) the chance that they may differ from "weighted" averages, and (3) the well known fact that the status of credit may entirely offset the effect of gold production. I hope to forestall criticism on these grounds by pointing out that (1) the index numbers of various authorities agree fairly well, (2) in the cases of many important commodities as to which it has been possible to make the test the "quotational" average and the "weighted" aver[illegible] the effect of gold production may be offset by the status of credit, it is upon the [illegible]

DIAGRAM II. PRODUCTION OF GOLD AND PIG IRON depreciation theory hang their case. Consequently, I hold that a comparison between gold production and the index numbers affords a substantial test of the theory.

But Little Coincidence

Diagram I certainly does not show any constant coincidence between the production of gold and prices for commodities. On the contrary with a singular perversity, the courses of the two curves are to a large extent the opposite. From 1851 to 1859 there appears to be a parallelism, if we disregard the depression in gold production in the middle of the period, which may be due to statistical errors, the statistics for the early times being more or less subject to doubt as previously explained. The statistics of gold production in the British Parliamentary report do not show this depression. In fact there is considerable variation between the Parliamentary statistics and those adopted by the U. S. Mint between 1859 and 1873, although the divergences of the Parliamentary statistics are not sufficient to throw doubt upon the showing of the other statistics which I have plotted. I am disposed to think that the Parliamentary statistics for 1851-56 are the more accurate, but less accurate for 1857-72, this opinion being based upon the appearance of the two curves.

III. INDEX NUMBERS OF COMMODITY PRICES.

Year.	Sauerbeck's.	Economist.
1851	75	2,293
1852	78	1,863
1853	95	2,167
1854	102	2,445
1855	101	2,357
1856	101	2,459
1857	105	2,645
1858	91	2,612
1859	94	2,304
1860	99	2,426
1861	98	2,727
1862	101	2,878
1863	103	3,492
1864	105	3,787
1865	101	3,575
1866	102	3,564
1867	100	3,024
1868	99	2,682
1869	98	2,666
1870	96	2,689
1871	100	2,590
1872	109	2,835
1873	111	2,947
1874	102	2,891
1875	96	2,778
1876	95	2,711
1877	94	2,715
1878	87	2,529
1879	83	2,225
1880	88	2,538
1881	85	2,376
1882	84	2,435
1883	82	2,342
1884	76	2,221
1885	72	2,098
1886	69	2,023
1887	68	2,059
1888	70	2,230
1889	72	2,187
1890	72	2,236
1891	72	2,240
1892	68	2,133
1893	68	2,121
1894	63	2,082
1895	62	1,923
1896	61	1,999
1897	62	1,950
1898	64	1,890
1899	68	1,918
1900	75	2,145
1901	70	2,126
1902	69	1,948
1903	69	2,003
1904	70	2,197
1905	72	2,136
1906	77	2,322
1907	80	2,499

IV INDEX NUMBERS OF COMMODITY PRICES.

Year.	U. S.	Bradstreet's.
1890	112.9	
1891	111.7	
1892	106.1	7.777
1893	105.6	7.532
1894	96.1	6.685
1895	93.6	6.435
1896	90.4	5.912
1897	89.7	6.116
1898	93.4	6.571
1899	101.7	7.210
1900	110.5	7.884
1901	108.5	7.575
1902	112.9	7.876
1903	113.6	7.936
1904	113.0	7.919
1905	115.9	8.100
1906	122.5	8.418
1907	129.5	8.905

After the crisis in 1857, the prices for commodities rose steadily until 1864, while the production of gold was going down. Prices then declined until 1870, while gold production was fluctuating between comparatively narrow limits. In 1871 prices started upward and rose until 1873, while gold production was declining. Prices then fell steadily until 1879, while gold production was increasing. After a slight rise of prices in 1880, the decline was resumed, and this time coincided with a declining gold production until 1883, when gold production began the rise which has continued with only slight interruptions ever since, while the decline in commodity prices kept on until 1896.

V. WORLD'S PRODUCTION OF PIG IRON.

(In Metric Tons.)

1851	4,584,232	1880	18,626,160
1852	4,688,156	1881	20,039,461
1853	5,315,672	1882	21,461,867
1854	5,708,490	1883	21,729,202
1855	5,969,757	1884	20,150,042
1856	6,909,605	1885	19,792,390
1857	7,051,760	1886	20,862,989
1858	6,582,517	1887	22,977,983
1859	6,981,216	1888	24,016,705
1860	7,291,521	1889	26,030,266
1861	7,179,754	1890	27,431,229
1862	7,782,631	1891	26,219,525
1863	8,726,547	1892	25,978,619
1864	9,368,260	1893	25,266,746
1865	9,351,073	1894	25,847,352
1866	9,782,142	1895	29,354,597
1867	10,224,013	1896	30,850,412
1868	11,996,325	1897	33,451,220
1869	11,889,312	1898	36,555,361
1870	12,302,372	1899	40,447,900
1871	13,874,315	1900	41,028,479
1872	14,861,974	1901	40,950,692
1873	15,170,115	1902	44,342,579
1874	13,994,179	1903	47,113,730
1875	14,140,081	1904	46,069,501
1876	13,807,343	1905	54,054,783
1877	14,073,446	1906	59,074,861
1878	14,352,605	1907	60,680,014
1879	14,473,964		

Note:—The statistics for 1851-1899 are compiled from data in Neumann's "Die Metalle;" those for subsequent years are from The Mineral Industry.

Thus it may be seen that from 1858 to 1896 the prices for commodities frequently went down as the production of gold increased, and *vice versa*. In 1896 began for the first time a steady and prolonged rise both in prices and gold production. However, it cannot be scientifically argued that a conclusion should be drawn from this period of 11 years, comparatively brief, to the disregard of the experience of 45 years that preceded it, especially in the light of the knowledge that since 1907 commodity prices have been coming down, while the production of gold is still going up. The outlook at present is for a small increase in the world's production of gold in 1908. It is to be remarked that a substantial part of the gold production is derived from copper, silver and lead ores, the output of which is governed by the prices for those metals. The situation in them has restricted gold production in 1908 to some extent.

Gold and Pig Iron

Comparison between the statistics of gold production and commodity prices being so negative as to a relationship between the two, it appeared useful to consider what relation there has been between the production of gold and the world's requirement for it. The world's production of pig iron was selected as the best indication of the advance in the arts and general civilization, the status of the industrial countries of the world being well established by the amount of pig iron that they use. Pig iron is a substance for which reliable annual statistics are available as far back as 1851.

The world's production of gold and of pig iron is plotted in Diagram II. In this diagram the production of gold is plotted in units of $2,000,000. The production of pig iron is plotted in units of 100,000 tons. Inasmuch as the plotted unit of gold production is $2,000,000, and 100,000 tons of pig iron may be reckoned on the average as being worth approximately $2,000,000, the world's production of these two substances is represented substantially on terms of commercial equality, which consequently affords a reliable means for comparison.

A mere glance at these two curves discloses the striking story that they have to tell. The general tendency of each is to ascend, that of pig iron from the beginning and that of gold since 1883, but the production of pig iron has increased in much greater ratio than the production of gold. If I am correct in the assumption that the production of pig iron is a reliable barometer of the advance in commerce and industry, it is evident that the production of gold has not even kept pace with the commercial requirement of the world for it. If this deduction be sound, there has been no superfluity of gold to manifest itself by a rise in commodity prices, and such increase of the latter as has occurred since 1896 must have been due to other causes. It might even be argued that the production of pig iron, and inferentially the need for a medium of exchange in transacting business, has increased so much more rapidly than the production of gold, that the relative lag of the latter might have led to commercial disturbance, but we find the explanation for the normality of the curves in the knowledge that banking facilities and the means for transacting business have improved, so that we have been able progressively to get along with less and less gold relatively. This idea is emphasized if it moreover be inferred, for which unfortunately there is no statistical evidence, that the proportion of gold consumed in the arts is constantly increasing, leaving less available for financial requirements.

It appears to me to be conclusive from the above statistical analysis that (1) during the last 60 years there has been but slight parallelism between the production of gold and the average of commodity prices; and (2) the production of gold has not increased so rapidly as the production of pig iron and inferentially less rapidly than the advance of the world in commerce and industry. Then let us see in what way the exponents of the theory of the depreciation of gold go astray.

FALLACIES OF THE DEPRECIATION ARGUMENTS

Professor Norton says that "the amount of cheap gold ore is unlimited in nature." This will be news to mining engineers, who spend much time and money in searching for new ore deposits that promise a profit. They will also be interested in learning from Professor Norton that "the ingenuity of chemists and metallurgists" has "succeeded in reducing the profitable working cost (*sic*) per ton of ore from $14 per ton to less than $2 per ton at the present time." The idea of the mining engineers is exemplified by a paper by F. Lynwood Garrison, read before the Franklin Institute, Nov. 20, 1907. He pointed out how gold-mining districts wax and wane and said: "The conclusion is therefore unavoidable that the world's gold production has not reached an abnormal or unhealthy proportion when compared with the enormously increased commercial activities of the times. On the contrary, if anything, we need more gold, for business seems to have outgrown the supply of circulating medium, that is, coined money or currency. Gold is certainly not cheaper, and as some of the chief present sources of supply are exhibiting indubitable signs of exhaustion, it is not likely to become so. It is, therefore, evident that if the present rate of increase is to be maintained we must soon call upon the comparatively undeveloped fields of Siberia, Central and South America, and perhaps parts of Africa, although the prospects for gold in the latter country are not encouraging."

PROFIT IN PRODUCTION AS THE CRITERION

The economists who advance the argument that gold has been becoming cheaper to get would do well to dismiss the matter of working cost and fix their attention upon the formula

$$X = M - (o + d + p).$$

in which X is the net profit per ton of ore, M the value of the metal extractable from a ton of ore, o the direct operating cost, d the proportional cost of development work, and p the amount that must be charged off for amortization of plant and capital invested in all forms. It is quite true that working costs have been greatly reduced during the last 10 years, which has enabled the utilization of lower and lower grade of ore, but it is doubtful if the net profit per ton of ore has been increased. On the contrary, it probably has decreased. The great increase in gold production has come from the Witwatersrand, but its mines have not been so profitable as many think, if all things be considered. This subject is too complex to be taken up in a brief discussion, but it pertains to the question whether in spite of the large dividends paid by the Rand mines they are not failing to return the actual investment in them with a fair interest upon it.

[illegible]

Any possible depreciation in the value of gold must arise from an increase in the ease of obtaining it. However, the experience has been that (1) rich placers are quickly exhausted, (2) the profit gradually diminishes as the poorer ground has to be worked, (3) the discovery of new placers becomes more and more infrequent, and (4) the proportion of gold obtained from placers as compared with lode mines steadily decreases. In the case of many of the remarkable lode-mining districts the history is similar. Cripple Creek and Kalgoorlie, for example, began with extraordinarily rich mines, but within a few years it became a matter of operating on a close margin; doubtless the history of Goldfield will be the same. The output of cheap gold from such sources has generally been, at any given time, small in comparison to the grand total, and never has lasted long.

The deprecation theory must stand upon two conditions, namely, (1) some regular relation between the amount of gold production and commodity prices, and (2) evidence that the cost of producing gold has diminished, while commodity prices have risen, or *vice versa*. These conditions are closely related, because it cannot be argued rationally that an increase in the production of gold depreciates its value, unless the gold be obtained at a reduced cost.

The failure to establish the first condition is shown by the comparison by the statistics of gold production with the index numbers representing the average prices of commodities, which is made in Diagram I. Equally destructive of the depreciation theory is the record of the Witwatersrand, the marvelous and rapidly increasing production of which is apparently the basis for the recrudescence of the theory.

THE RECORD OF THE RAND

The Rand became productive in the '80s In 1890 the gold production of the Transvaal was £1,869,645; in 1895 it was £8,569,555; in 1898 it was £16,240,630; and in 1906 it was £24,579,987, amounting in that year to nearly 30 per cent. of the world's total. While the production of the United States, Australasia, Russia, Mexico, Can- [illegible] has been increasing but slowly, that of the Transvaal has risen by leaps and bounds. However, it does not follow from this that the Transvaal gold has become increasingly easier to obtain. Mining and metallurgical engineers know the contrary to be the case, and their opinions are supported by the statistics which for this district are singularly complete, so much so indeed that the mine managers complain of the burden of an "over-regulated, over-inspected, over-statisticated régime." What the statistics show as to the total production and total dividends appears in an accompanying table.

The total production in the five years 1890-1894 was £22,482,671, out of which dividends amounting to £3,951,211, or 17.5 per cent were paid. In the five years 1895-1899 the production was £60,796,424, out of which dividends to the amount of £14,062,311 or 23.1 per cent. were paid. In the six years 1902-1907 the production was £108,683,521 and the dividends were £27,118,770 or 24.9 per cent. The percentages in 1900 and 1901 are not computed, these being the war years. It appears that the average dividends of the six years since [illegible] of the five years just before the war. The average of 1890-1894, a period when the mining industry of the Transvaal was in its initial stage, was 17.5 per cent.

VI. [illegible] OF THE TRANSVAAL [illegible]

Year.	Production. £		Dividends. £	Per Cent.
[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	2,924,305		334,698	11½
[illegible]	[illegible]		879,320	[illegible]
[illegible]	[illegible]		955,368	[illegible]
1894	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]
1896	[illegible]		[illegible]	[illegible]
1897	[illegible]		[illegible]	23
[illegible]	[illegible]		[illegible]	30
[illegible]	[illegible]	[illegible]	[illegible]	19
1900	1,510,131		[illegible]	
1901	[illegible]	(a)	415,813	
1902	[illegible]	(a)	[illegible]	[illegible]
1903	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]
1906	[illegible]		[illegible]	[illegible]
1907	[illegible]		[illegible]	
1890-1894	22,482,671		[illegible]	[illegible]
[illegible]	60,796,424		14,062,311	[illegible]
[illegible]	[illegible]		27,118,770	[illegible]

(a) War period [illegible]

Such a record of dividends is instructive, but it must not be accepted as the last word in a case like this. Mining [illegible] large part is simply return of the principal invested. As to the amount of the latter, there is seldom any record. The increase in the dividends paid by the Rand has doubtless been to a large extent the result of the investment of great sums of money sent out from Great Britain and France, which have enabled the erection of mining and milling plants capable of operating on a vastly increased scale and at a materially reduced expense. Yet it does not follow that the apparent economy and increase in earnings thus resulting is all profit. On the contrary, there are engineers who argue that the net yield of the Rand mines is on the whole no more than the money put into them would have returned if invested in 3 per cent. consols. While this may be true insofar as the rank and file of investors is concerned, it probably is not true with respect to the money actually invested in the mines, which is to say that the real profits have been anticipated (as is generally the case) by the promoters, but while some of the latter have realized large fortunes, after all their aggregate is small in comparison with the grand total of Rand production.

VII. WITWATERSRAND GOLD PRODUCTION.

(Chamber of Mines Returns.)

Year.	Tons Milled.	Value.	Value per Ton Milled.
		£	s.
1884–9...	1,000,000	2,440,000	48.8
1890	730,350	1,735,491	47.4
1891 ...	1,154,144	2,556,328	44.2
1892 ...	1,979,354	4,297,610	43.4
1893 ...	2,203,704	5,187,206	47.0
1894 ...	2,830,885	6,963,100	49.2
1895 ...	3,456,575	7,840,770	45.2
1896 ...	4,011,697	7,864,341	39.2
1897 ...	5,325,355	10,583,616	39.74
1898 ...	7,331,446	15,141,376	41.3
1899 ...	6,872,750	15,067,473	43.84
1900 ...	459,018	1,510,131	65.82
1901 ...	412,006	1,014,687	49.25
1902 ...	3,416,813	7,179,074	42.00
1903 ...	6,105,016	12,146,307	39.79
1904 ...	8,058,295	15,539,219	38.46
1905 ...	11,160,422	19,991,658	35.82
1906 ...	13,571,554	23,615,400	34.80
1907 ...	15,523,229	26,421,837	34 04

During the recent history of mining on the Rand, the production of gold has been increased greatly through the opening of new mines and the prosecution of mining generally upon a larger and larger scale. The grade of the ore extracted has rather steadily diminished, as is shown in an accompanying table, and the effort of the mine managers has been to diminish the cost of production in a greater ratio. To some extent they have succeeded in that, but at what expense of capital, i.e., accumulated money drawn from investors in Great Britain, France and elsewhere, it is difficult to determine. Consequently, we cannot talk in terms of the ultimate analysis about the cost of producing gold on the Rand. But disregarding this important consideration, it cannot reasonably be argued that a profit of 25 per cent. of the production in the six years after the war against 23 per cent. in the five years just before the war, these periods coinciding with the great increase in the world's gold production that has alarmed certain economists, indicates any such reduction in the cost of obtaining gold as would depreciate the value of the latter so as to account for the great rise in commodity prices. It is worth while in this connection to repeat that the Rand is far and away the most important gold-mining district of the world, and its output represents approximately 30 per cent. of the world's total.

Conditions of Gold Production Have Changed Radically in 60 Years

The conditions of gold mining in the '50s long since ceased to exist, and the analysis of Professor Cairnes, brilliant and probably correct at that time, is obviously not applicable at present. Previous to the nearly contemporaneous discoveries of gold in California and Australia, the industry of gold mining and the world's production of gold were both insignificant according to modern standards. The statistics for the time previous to 1851 are too incomplete and unreliable to furnish a substantial basis for the study of the relations between gold production and commodity prices. Nevertheless, it is well established that prices were at certain times greatly affected by gold supplies. Thus, one of the chief causes of the decay of Spain after the reign of Ferdinand and Isabella is said to have been the extensive importation of gold and silver from the newly found Western Continent, with the prevailing theory that actual money was the only form of wealth. Prices of commodities in Spain were turned topsy-turvy by the vast influx of the precious metals. But I may point out that the precious metals then brought into Spain were the result of conquest, not of direct mining, and were obtained comparatively cheaply.

In the early days of mining in Australia and California, the magnets which attracted men from other industries were placer deposits, the working of which was mining in its elemental form, i.e., the digging of a valuable mineral with the expenditure of nothing but labor. The adventurers who were able to obtain gold from rich river bars with a pan or a long tom were willing to spend their produce profusely and extravagantly, and their cheaply gained gold created commercial disturbances. However, just as the ability to obtain gold by conquest on the Spanish Main disappeared, so also did the ease of obtaining gold from rich placers in Australia and California. Although the early history of those regions was repeated recently in the Klondike and at Nome, the life of their rich placers was brief (as is always the case) and their output was too small in comparison with the world's total at their time to be of any material effect.

From this study of statistics and economic conditions I draw the conclusion that during the last 50 years there has been no cheapening of an ounce of gold; that the production of gold has not increased in so great a ratio as the production of pig iron, and probably the advance of the world in commerce and industry; and that gold production and commodity prices have failed to follow similar courses.

During the commercial depression which began in 1907, the prices for commodities declined, but not to points so low as in 1893-97. The arrest of the decline was to a large extent due to the absence of any radical cut in the wages for labor. Confining attention to the metals, I believe that there were no conditions existing in 1907-08 which would have prevented pig iron, copper and lead from falling to points as low as in 1893-97, if the severity of the depression had compelled certain readjustments; in other words, the arrest of the decline was due to factors which could and would have been swept away if necessary. The ability of the copper-mining companies of Butte, Mont., promptly to reduce the cost of producing copper from 12c. to 10c. per lb. is sufficient evidence on this line.

Recent Rise in Prices Due to Other Conditions

If then the recent rise in commodity prices has not been due to the increasing gold production, the explanation must be sought in other directions. Undoubtedly, the causes have been complex. On the one hand we have remarkable improvements in industrial methods, tending to reduce the cost of production, and consequently prices. On the other hand we have exhaustion of certain natural resources, such as timber, tending to increase prices. Among the factors which undoubtedly have contributed to the increase in commodity prices during the last 10 years are the policy of labor unionism and the increasing inefficiency of labor; the industrial consolidations, accumulation of great fortunes through anticipation of profits, and an inauguration of general extravagance in living; waste of resources and reckless expenditure of money in replacing them; over-extension in enterprise; failure of agricultural development to keep pace with the growth of population, thereby increasing the cost of food and clothing and directly leading to advance of wages for labor in manufacturing. The extent to which these and other factors have operated is an important subject of inquiry by the economists. Less has been heard of the theory that gold has depreciated in value since the commercial depression began in 1907, affording a decisive demonstration that prices still can fall as well as rise. It is scarcely to be doubted that the prices for commodities will continue to fluctuate in the future as they have in the past, independently of the world's production of gold, the effect of which upon prices at any time in the world's history has been but ephemeral and has been due to conditions that long since ceased to exist. The steady increase in the production of gold is in itself evidence that mining for it is now carried on as an industry, and as in the case of most industries at a small margin of profit on the whole; the gold supply is no longer swollen by the unearthing of buried treasure, by piratical or martial conquest, or by the discovery of placer bonanzas.

Iron Operations of the Birmingham District

Red Mountain Furnishes Bulk of Ore Produced; Raw Materials Found within Comparatively Small Area; Labor Conditions Not the Best

BY EDWIN HIGGINS

The Birmingham district ranks [illegible] in importance in the United States as a producer of iron ore, its output during 1907 having been in excess of 4,000,000 long tons, from which more than 1,500,000 tons of pig iron were made. The Lake Superior district, including parts of Michigan, Minnesota and Wisconsin, produced during 1907, in round figures, 42,000,000 tons of iron ore, or approximately 75 per cent. of the iron ore from which pig iron was made in the United States.

The iron ores of the Birmingham district may be conveniently discussed under the following heads: Clinton red hematites; brown ores, known as brown hematites; and Cambrian gray and red hematites of eastern Alabama. These ores are used in the manufacture of pig iron for foundries, pipe works and mills, and for making basic iron for open hearth steel plants. Usually they are too high in phosphorus to be used in the manufacture of bessemer steel. It may be said that the amount of ore smelted in the Birmingham district is equivalent to the amount mined, for the tonnage shipped out for smelting is about equal in amount to that received [illegible] origin of these ores has been discussed by many eminent geologists, and it is not purposed in this article to give more than a brief description of the ores and an outline of their occurrence.

THE CLINTON ORES

The Clinton formation, in which the red ore occurs, in this district consists chiefly of sandstone, shales and beds of hematite. The unweathered beds of hematite are calcareous and range from a calcareous, richly ferruginous sandstone to a ferruginous, silicious limestone. A relatively large amount of either ferrous or ferric iron is distributed throughout all the sediments of the formation.

The Clinton red hematite, which comprises the bulk of the iron ore produced in the Birmingham district, is mined chiefly on Red mountain, from a point just south of Bessemer to northeast of Trussville. The operations cover a distance of about 30 miles. This ore is also mined along Little Wills valley from Attalla to the Georgia line. Red mountain has a northeasterly-southwesterly trend, [illegible] general direction, dipping from 10 to 20 [illegible]

The ores are divided into three beds, the Ida, the Big Seam and the Irondale. On Red mountain the Big Seam presents from 7 to 15 ft. of minable ore. These red ores, which include both oolitic and fossil varieties, are divided into two classes, hard and soft ores. The soft ores, which are the result of leaching by meteoric waters, occur at and near the out- [illegible] down to 400 ft. along the slope of the bed. The distinction between the hard and soft ore is based upon differences of chemical composition, rather than on dif- [illegible] had its lime removed, while the hard ore, [illegible] the meteoric wate[illegible]

The depth to which this leaching has been carried on depends largely upon the permeability of the strata inclosing the ore bed. The soft ores may be said to have the following composition: iron, 52 to 55 [illegible]

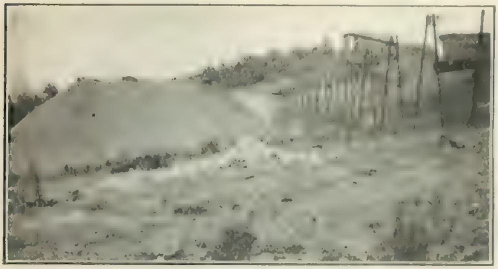


FIG. 1. 125,000-TON STOCK PILE AND [illegible] MUSCODA NO. 6, T. C. I. & R.R. CO.

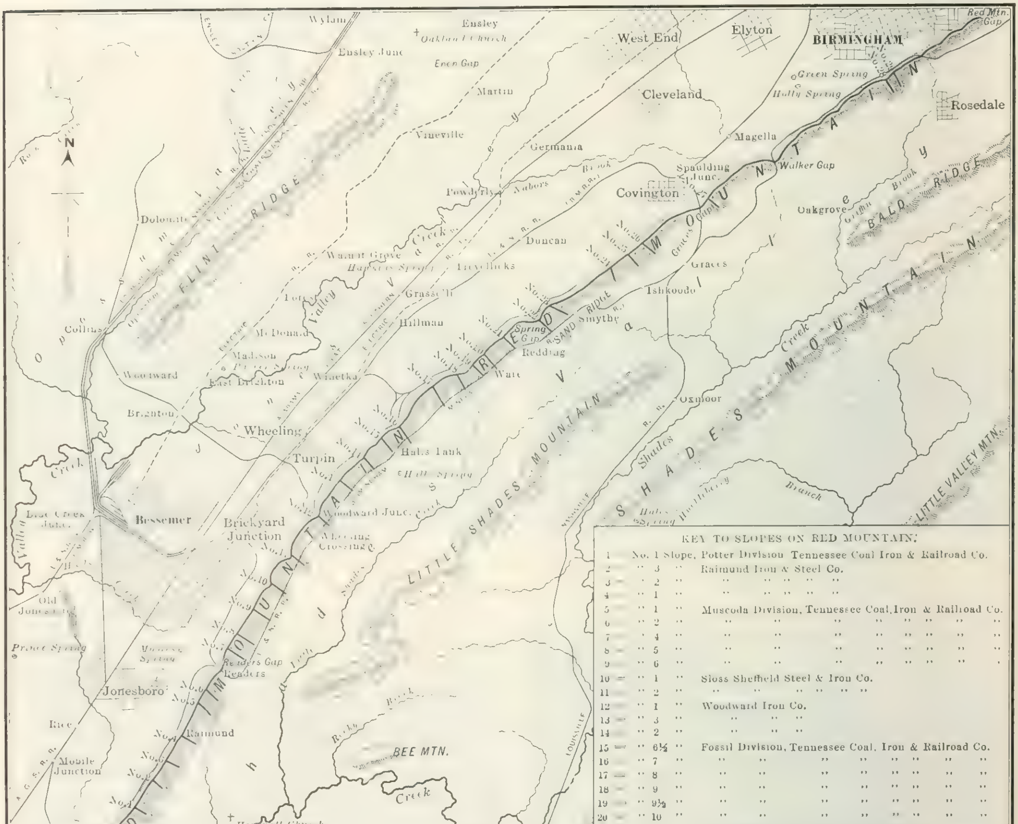
[illegible]

FIG. 3. ISHKOODA NO. 13, [illegible] PLANT, T. C. I. & R.R. CO.

FIG. 4. [illegible] I. & R.R. CO.

sulphur, 0.05; phosphorus, 0.1. Generally speaking, below the 500-ft. level, the ore will have about the following analysis: iron, 36 to 40 per cent.; silica, 6 to 8; alumina, 3 to 4; lime, 18 to 20; manganese, 0.2; sulphur, 0.07; phosphorus, 0.2 to 0.3.

The origin of the Clinton red ores is a subject on which there is room for much discussion. The theories of replacement, original deposition, residual enrichment, etc., all have their ardent supporters among our most able geologists.



KEY TO SLOPES ON RED MOUNTAIN.

1 —	No. 1 Slope,	Potter Division Tennessee Coal Iron & Railroad Co.
2 —	" 3 "	Raimund Iron & Steel Co.
3 —	" 2 "	" " " " "
4 —	" 1 "	" " " " "
5 —	" 1 "	Muscoda Division, Tennessee Coal, Iron & Railroad Co.
6 —	" 2 "	" " " " " " " "
7 —	" 4 "	" " " " " " " "
8 —	" 5 "	" " " " " " " "
9 —	" 6 "	" " " " " " " "
10 —	" 1 "	Sloss Sheffield Steel & Iron Co.
11 —	" 2 "	" " " " " "
12 —	" 1 "	Woodward Iron Co.
13 —	" 3 "	" " "
14 —	" 2 "	" " "
15 —	" 6½ "	Fossil Division, Tennessee Coal, Iron & Railroad Co.
16 —	" 7 "	" " " " " " " "
17 —	" 8 "	" " " " " " " "
18 —	" 9 "	" " " " " " " "
19 —	" 9½ "	" " " " " " " "
20 —	" 10 "	" " " " " " " "
21 —	" 1 "	Songo Mine, Birmingham Coal & Iron Co.
22 —	" 11 "	Ishkooda Division, Tennessee Coal Iron & Railroad Co.
23 —	" 12 "	" " " " " " " "
24 —	" 13 "	" " " " " " " "
25 —	" 14 "	" " " " " " " "
26 —	" 15 "	" " " " " " " "
27 —	" 1 "	Spaulding Division, Raimund Iron & Steel Co.
28 — 29 — }		Helen Bess Mine, Central Iron & Coal Co.

FIG. 5. MAP OF MOST PRODUCTIVE PART OF RED MOUNTAINS, SHOWING SLOPES AND COMPANIES OPERATING THEM

Brown Hematites

The brown hematite ores lie between Red mountain on the southeast and west Red mountain and the Warrior coalfield on the northwest. The Woodstock district, 17 miles southwesterly from Bessemer, is the chief brown-ore district, with an area of about 38 square miles. The Russelville district, 105 miles northwest of Birmingham, in Franklin county, is an important brown-ore field. The Sloss-Sheffield is the only large company working in this district, having in operation five washers, and producing from 25,000 to 30,000 tons of ore monthly. Brown-ore deposits occur in Talladega, Clay, Calhoun and Cherokee counties. Two important operations are those of the Alabama Consolidated Coal and Iron Company, at Ironaton, Talladega county, and the Baker Hill mine of the Tecumseh Iron Company, in Cherokee county.

The brown hematites are distinguished from the red hematites by the fact that the former contain water, having the formula $2Fe_2O_3 + 3H_2O$, the red hematites having the formula Fe_2O_3. The brown hematites occur chiefly in the limestone and in the residual soil of the limestone, and near the contact of the limestone with other formations. The deposits are sometimes small and not to be depended upon. The brown hematites have the following range in composition: iron 42 to 48 per cent.; insoluble, 16 to 26; phosphorus, 0.4 to 0.8; manganese, 0.3 to 1.

Most writers on the subject hold that these brown hematites are secondary precipitations from waters carrying the iron in solution. A smaller number hold that the deposits are concentrations, or the oxidized remains of carbonates, the remnants of original limonite deposits, *in* *situ;* while a still smaller number have suggested that the ores result from the oxidation *in situ* of pyrites, iron carbonates, or other ferriferous minerals.

Cambrian Gray and Red Hematites of Eastern Alabama

Dr. E. C. Eckel and Dr. J. S. Grasty have recently contributed interesting literature on this subject.

The gray hematites occur in various parts of northeastern Alabama, but have been developed only in Talladega county. The area developed comprises a narrow strip extending in a southwesterly direction from Talladega to a point near Sylacauga, a distance of about 20 miles. The ore is associated with a series of metamorphosed quartzites and marbles, and is probably of early Cambrian or pre-Cambrian age. Doctor Eckel holds the theory that the ores are replacement deposits; Doctor Grasty that these, as well as the Cambrian red hematites, are original sedimentary deposits which have been subjected to metamorphic action. The gray ores, according to Eckel, have the following [illegible]

[illegible]

0.2 to 1.5.

The red hematites are found near the town of Columbiana, in what is called the Columbiana district. In an air line this [illegible] tions and the origin and composition of the ore are similar to those of the gray-ore district.

[illegible]

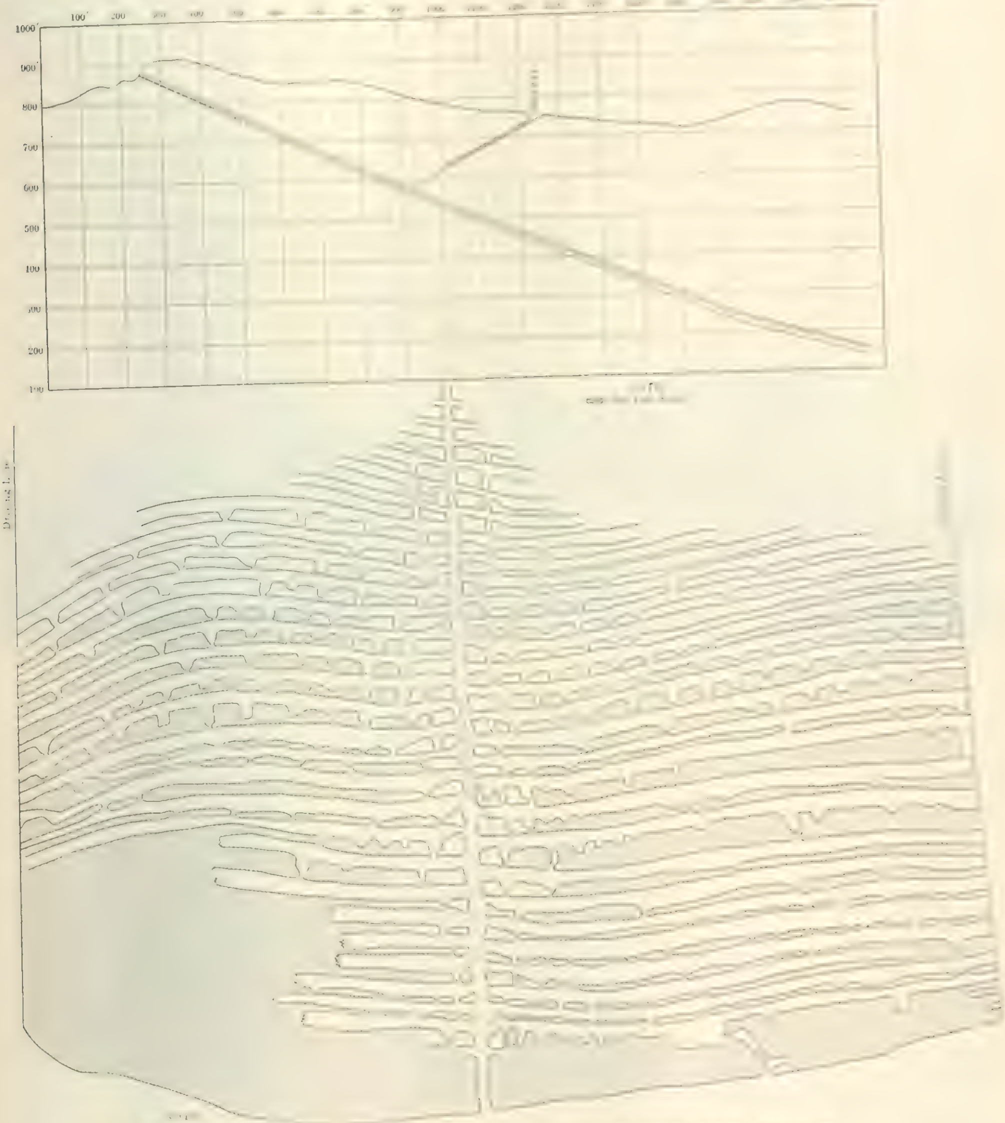


FIG. 6. PLAN AND SECTION OF SLOPE SHOWING [illegible]

of the possibility of mixing and successfully smelting them with the calcareous Clinton ores. In this connection it might be well to mention the experience of the Alabama Consolidated Coal and Iron Company with gray ores at the Gadsden and Ironaton furnaces. For a period of about two years this company used gray ore from the mines at Wewoka, about 10 miles southerly from Talladega. The ore used had the following range of composition: Iron, 36 to 39 per cent.; insoluble, 28 to 36; phosphorus, 0.25 to 0.33; manganese, a trace. This ore was easily smelted, but was lean and not altogether satisfactory. This instance is cited, not for the purpose of condemning the gray ore, but because it was the only working data which I was able to secure bearing on this subject. Further, I do not say that the analysis above is representative of the entire gray-ore district; nor do I know that ore could not be mined at Wewoka which would contain a much higher content of iron. The analyses given by Doctors Eckel and Grasty would indicate that it is possible to obtain ore, both from the red and gray hematite districts, which would show a much higher per cent. of iron. Needless to say, the successful utilization of these ores would add enormously to the reserves in this part of the State.

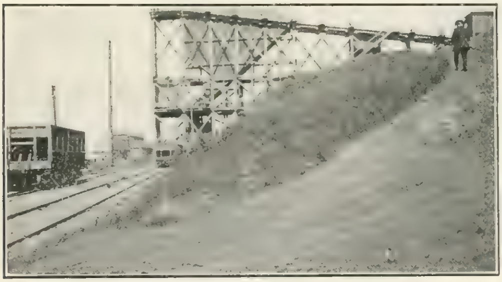


FIG. 7. MUSCODA NO. 5 TIPPLE, POWER HOUSE IN DISTANCE, T.C.I. & R.R. CO.

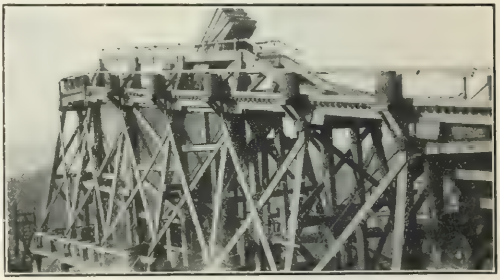


FIG. 8. SKIP DUMPING INTO BIN AT ONE OF T.C.I. & R.R. CO'S. TIPPLES

MINING ON RED MOUNTAIN

That part of Red mountain which furnishes the bulk of the ore mined in the Birmingham district is shown in Fig. 5. The map shows the outcrop, the slopes sunk thereon, and the names of the operating companies.

A description of the operations of the Tennessee Coal, Iron and Railroad Company, the largest operator on Red mountain, will be of interest here. Fig. 6 shows a plan and section of a slope; from it may be obtained a fairly good idea of the method of mining. These slopes, which follow the ore bed, vary in dip from 15 to 25 degrees; they are made from 12 to 14 ft. in width and 9 ft. in hight. Headings are put in every 60 ft., and carried 15 ft. wide for a distance of 75 ft.; here manways are put up to the heading above. From this point to the driving lines of the slope the heading is carried 25 ft. wide; this leaves a pillar of 35 ft., which is robbed retreating. As the ore is broken, it is loaded into cars, five of which are hauled in a trip to the slope; here the ore is dumped into a skip. At the surface the ore is automatically dumped into the tipple pocket, or bin (see Fig. 8), from which it is fed to a crusher delivering about a 2-in. product. The crushed material goes direct to railroad cars. The tipple pockets vary in capacity from 50 to 500 tons. Each contractor has underground one drill helper and two muckers.

SINKING

In deepening the slope the following method is used: A pentice is built below the last working heading; on this is erected a tipple with a 42-in. gage track. A secondary hoist is installed and the rock is hoisted in a 2-ton car which dumps into a drop-bottom sinking skip of 6 tons capacity. When hoisting, the sinking skip is attached to the regular skip by a rope, a clearance of 6 ft. being left.

DESCRIPTION OF SLOPES

The company is operating 14 slopes and is preparing to open one more. These slopes are grouped into different divisions as follows: Potter division, one slope; Muscoda division, slopes 1, 2, 4, 5 and 6: Fossil division, slopes 6½, 7, 8, 9, 9½ and 10; Ishkooda divisions, slopes 11, 12, 13, 14 and 15.

At the Potter slope the workable ore has an average thickness of 7 ft. The slope is 422 ft. in length, its bottom being 200 ft. vertically beneath the surface. It is timbered down to a point 360 ft. from the collar.

In the Muscoda division the workable ore ranges from 9 to 11½ ft. in thickness. The slopes range from 1050 to 1741 ft. in length, or from 300 to 530 ft. vertical depth. The length of haul in the different slopes varies from 1000 to 1680 ft. In this division timbering is carried from 210 to 500 ft. down the slopes. In slope No. 1 there are 14 headings now driving; in No. 2, 5; in No. 4, 13; in No. 5, 17; in No. 6, 23. There are a total of six headings robbing.

In the Fossil division the thickness of workable ore ranges from 9 to 9 ft. 4 in. The lengths of the slopes vary from 1661 to 2034 ft., the vertical depth from 390 to 580 ft. The length of haul varies from 1420 to 1840 ft. The slopes are timbered for lengths varying from 410 to 1000 ft. from the surface. In No. 7 slope there are 17 headings now driving; in No. 8, 11; in No. 9, 20; in No. 10, 7. In this division there are a total of 25 headings robbing.

In the Ishkooda division the workable ore varies from 7 to 11½ ft. in thickness. Slope No. 12 is 1741 ft. in length, the vertical depth of the bottom being 240 ft. The length of haul is 1580 feet.

Tram cars are hauled by mules in all slopes. The amount of water pumped varies from a minimum of 6058 in Ishkooda No. 12, to a maximum of 832,809 gal. per 24 hours, in Muscoda No. 4, against a minimum head of 440 ft., and a maximum head of 480 ft., respectively. The loss of air pressure between compressor and pump is about 5 lb. at all slopes. The air pressure at pumps is 75 pounds.

In all these divisions it is noteworthy that in the deepest part of the slopes the ore shows no change in thickness or chemical composition from that found where the hard ore begins. In the Ishkooda division both benches of the Big Seam appear, showing a thickness of 20 ft.; the upper 11½ ft. is being mined. Coming down the mountain a parting comes in between the upper and lower bench. This is about ¾ in. in the Ishkooda, widening to about 1 ft. in the Fossil. Between Fossil No. 7 and Muskoda No. 6 the bottom bench splits into small seams interbedded with slate. The bottom bench is not of commercial value at any point on the mountain, there being too much silica in the ore.

The production of these mines is from 120,000 to 130,000 tons of ore per

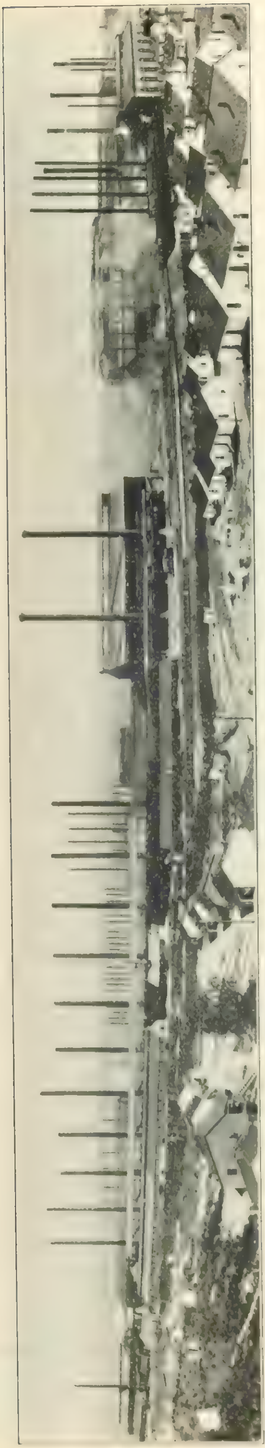


FIG. 2. GENERAL VIEW, PLANT OF TENNESSEE COAL, IRON AND RAILROAD COMPANY, ENSLEY, ALA.

[illegible]. At Muskoda No. 6 and Fossil Nos. 7 and 8 stock piles are carried. One of these stock piles is shown in Fig. 1. There are at present about 300,000 tons of ore in these stock piles. The mines work only one 10-hour shift per day.

The laborers in this district are mostly negroes. The wage scale is from $1.10 to $1.25 per day for surface work, $1.50 to $1.75 for muckers and $1.75 to $2 for drill hoppers. Most of the mining, however, is done on contract.

In the Muskoda division a new change house, with a capacity for 350 men, is being erected. This will have all modern improvements, including shower baths, steel lockers, etc. The building will be of brick.

Equipment

No. 3 Rand and type D-24 Ingersoll-Sargent drills are used underground. The headings are laid with 30-lb. rails, the gage being 42 in.; 70-lb. rails are used in the slope, the track being 5-ft. gage. Two-ton iron tram cars are used underground; the skip has a capacity of about 10 tons. The hoists are Nordberg twin-Corliss, 30x60, 778 h.p.; the drum is 12 ft. in diameter; 1¼-in. wire rope, 6-19, is used. The rope capacity is 7280 ft. The boilers are standard horizontal tubular, 72 in. by 18 ft., 150 h.p., steam pressure 125 lb. Boilers are equipped with the Murphy automatic stoker.

The latest type of compressor in use is the Allis-Chalmers horizontal, heavy duty, two-stage air, twin high-pressure engines, sizes: steam cylinders 26 in. x 48 in. stroke; air cylinders, 38 and 24. in. x 48 in. stroke. There will be installed at No. 7 slope a compound machine of the following size: steam cylinders, 26 and 48 in. x 48 in. stroke; air cylinders, 38 and 24 in. x 48 in. stroke. These machines have a capacity of 4000 cu.ft. of free air per min., at about 65 r.p.m. The standard pressure carried is 80 lb. per square inch. The crusher at the tipple is a standard No. 8 Austin, of 120 tons per hour capacity.

Prescott and Cameron station pumps are used in the mines. The regulation pump is a Prescott duplex 20x7½x18 plunger. In Muscoda No. 4 slope a new triple-expansion Prescott condensing pump has been installed. This has a capacity of 1000 gal. per min. against a head of 600 ft. This pump is operated by steam; all other pumps are operated by air.

Washing Brown Ores, Woodstock District

The following is the general method of handling the brown ores at the Greeley mine of the Tennessee Coal, Iron and Railroad Company, in the Woodstock district. [illegible] side-dump cars of 9 yd. capacity. These cars are hauled over a standard gage track to the washery where the ore is dumped into a mud box. Here the ore is washed with water from two 6-in. pipes. The mud boxes are set on a pitch of 22 deg.; they are 20 ft. long and 25 ft. wide at the upper end, narrowing down to 6 ft. at the lower end. The ore is fed from the mud box onto a grizzly spaced at 4 in. The overs from the grizzly go to a No. 8 Gates crusher which delivers its product to the log washers. The undersize from the grizzly goes through a flume set at an inclination of 22 deg., to a top screen with 2-in. holes. The overs from this screen go to a picking belt, thence to railroad cars. Unders from the top screen go to the log washers. All ore from the log washers is discharged into a cylindrical sand screen. The sand screens discharge direct to cars. The log washers are 30 ft. in length. There is one sand screen to two log washers and one picking belt for each screen. Crushing this brown ore removes a good deal of the included silica and alumina

Coke and Limestone

The coking coal which supplies the Birmingham district is nearly all mined in Jefferson, Walker, Bibb, Tuscaloosa and St. Clair counties. The chief producers, with the situation of their operations, are as follows:

Republic Iron and Steel Company, Republic and Sayreton; Tennessee Coal, Iron and Railroad Company, Pratt mines, Adjer, Blue Creek, Johns, Sumpter and Blocton; Alabama Consolidated Coal and Iron Company, Searles, Brookwood and Lewisburg; Sloss-Sheffield Steel and Iron Company, Brookside, Blossburg and others; Woodstock Iron Works, Newcastle and others; Central Coal and Iron Company, Holt; Birmingham Iron Company, Blossburg, Murry, Adamsville, Short Creek and Mulga; Woodward Iron Company, near Woodward; Southern Steel Company, Altoona, Graves and Virginia City.

In addition to the above there are a few companies which do not make iron, but which make coke for the market. The average analysis of the coke produced is about as follows: Volatile, 3.5 per cent.; fixed carbon, 81.5; ash, 15; sulphur, 0.6 to 0.8. The average cost of coke made by companies owning their own plants is about $3 per ton; the average cost in the open market is $3.50 per ton

The limestone is obtained throughout the district, except in the immediate vicinity of the coal mines. The quarries at Rock Springs, Etowah county, probably [illegible] tion. Several furnaces procure their flux here, the cost being about 30c per ton This limestone runs high in $CaCo_3$, con- [illegible] and small amounts of iron and alumina oxides. A dolomite from near Birmingham gave the following analysis: Calcium carbonate, 55 per cent.; magnesium car- [illegible] alumina, 1.

Furnace Burden and Quality of Pig

The Birmingham district is fortunate in having within its boundaries silicious and calcareous ore. It is often possible to so mix the ores that little or no limestone is required as flux. The accompanying table gives typical burdens in large and small furnaces making foundry iron, and furnaces making basic iron.

AVERAGE FURNACE BURDEN IN BIRMINGHAM DISTRICT.

Large Furnaces, Making Foundry Iron.	
¼ brown ore ¾ Clinton hard ore	16,000 lb
Coke	10,600 "
Limestone	3,500 "
Small Furnaces, Making Foundry Iron	
¾ brown ore ¼ Clinton hard ore	7,600 "
Coke	3,600 "
Limestone	3,600 "
Furnaces Making Basic Iron.	
Ore*	18,000 "
Coke	10,500 "
Limestone	3,800 "

*Usually all Clinton hard ore, or hard and a small percentage of brown ore.

The foundry iron has about the following composition: silicon, 2 to 3 per cent.; sulphur, 0.3; phosphorus, 1; manganese, 1 and under.

The average cost of producting iron in the Birmingham district is $10 per ton, although in one instance it is being produced at a smaller figure. This exception is the Woodward Iron Company, with furnaces at Woodward, which is especially fortunate as regards the proximity of its raw materials to its furnace plant. On one side of the valley in which the furnaces are situated are the best iron-ore deposits; on the other side is the coal, while between the two the limestone occurs. The distance across the valley is only about eight miles, and the company operates its own line of railroad between its mines, quarries and furnace.

Smelting Operations in the District

A partial list of companies operating furnaces, with the situation of their plants and the number of stacks in and out of blast is given below:

Tennessee Coal, Iron and Railroad Company, six stacks at Ensley, four in blast; two stacks at Robertstown, one in blast; two idle stacks at Bessemer; one idle stack on the outskirts of Bessemer; one idle stack at Birmingham; two idle stacks at Oxmoor. This company operates a steel plant at Ensley. A rear view of the blast furnace and steel plant is shown in Fig. 9.

Sloss-Sheffield Coal and Iron Company, four stacks at Birmingham, two in blast; two stacks in North Birmingham, one in blast; three stacks at Sheffield and Florence, two in blast.

Alabama Consolidated Coal and Iron Company, two stacks in blast at Ironaton; two stacks in blast at Gadsden. No. 1 furnace, Ironaton, is shown in Fig. 10.

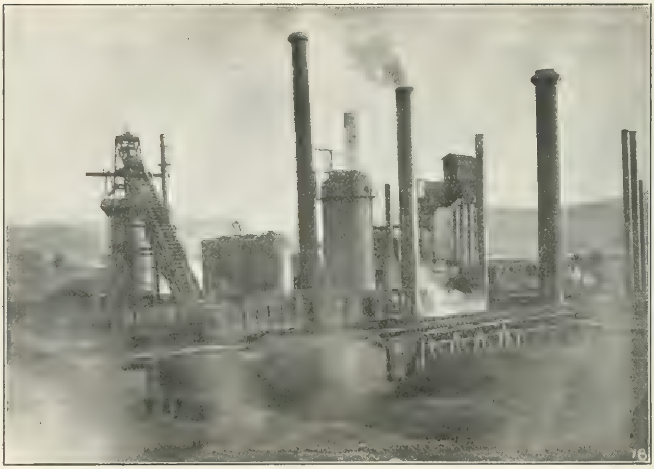


FIG. 10. NO. 1 FURNACE, ALABAMA CONSOLIDATED COAL AND IRON COMPANY, IRONATON

Woodward Iron Company, three stacks at Woodward, two in blast.; Southern Steel Company, one stack at Chattanooga, not in blast; one stack at Gadsden, not in blast; one stack at Rising Fawn, Ga., not in blast. This company operates a wire and nail mill at Ensley. Williamson Iron Company, one stack at Birmingham, not in blast. Republic Iron and Steel Company, three stacks at Thomas, two in blast.

Birmingham Iron Company, two stacks at Birmingham, one in blast. Shelby Iron Company, two charcoal stacks at Shelby, one in blast. Sheffield Coal and Iron Company, two stacks at Sheffield, neither in blast. Woodstock Iron Works, Inc., two stacks at Anniston, one in blast.

Economic and Industrial Conditions

From the foregoing it may be observed that conditions in the Birmingham district are especially favorable for the manufacture of cheap iron. Iron ore, coal and limestone are found within a comparatively small area; the ores in many cases are almost self-fluxing. The excellent climate makes it possible to prosecute outside work the entire year; transportation facilities are good; labor is cheap, although inefficient and at times none too plentiful. The ore reserves are large, being second only to those of the Lake Superior district. From estimates by the U. S. Geological Survey, the total red hematite reserves of the entire district is 483,730,200 tons. The figures for the brown hematites will be omitted, as some of the estimates at hand seem rather vague; this must necessarily be so from the nature of the deposits. Doctor Eckel states that there are 50,000,000 tons of gray ore above the 1500-ft. level in eastern Alabama. Doctor Grasty says there are 5,000,000 tons of Cambrian red hematites in the Columbiana district.

Up to the time that the Tennessee Coal, Iron and Railroad Company started its open-hearth steel plant at Ensley, about four years ago, the market for pig iron manufactured in the district was confined to the buyers of foundry iron. The indications are that the manufacturers of basic iron will increase from year to year. The success of the Ensley plant and the demand for basic iron have served as a stimulus, and other companies are preparing to enter into this branch of the industry. There is no question but that the manufacture of basic iron on a larger scale would greatly benefit the district. The market for its product would be broadened and the manufacturers would be benefited by the profits on the finished material.

In past years the question was often asked, "Why does not Mr. Carnegie or the Steel Corporation go into the Birmingham district?" The fact that neither of these large operators seemed to take any interest in the district handicapped, to a certain extent, its development. In those days Mr. Carnegie was busy with the consolidation of his own properties. The Steel Corporation answered the question, when in November, 1907, it acquired $30,374,825 worth of the common stock and common stock subscription receipts of the Tennessee Coal, Iron and Railroad Company, this constituting all but $225,160 of the total. In this purchase the Steel Corporation assumed between $15,000,000 and $16,000,000 in bonds, and it is said it has spent in improvements between $4,000,000 and $5,000,000. It thus appears that the Steel Corporation has in the neighborhood of $50,000,000 invested in the district.

The advantages of the Birmingham iron district may be summed up as follows: (1) Large ore reserves; (2) low cost of manufacturing pig iron; (3) adequate transportation facilities and good climatic conditions.

The disadvantages may be summed up as follows: (1) Inadequate supply and inferior quality of labor; (2) limited market for the product of the furnaces. It might also be mentioned that much benefit would accrue from the expenditure of more millions in the improvement of some of the mining and smelting plants. These difficulties are not serious and will doubtless be gradually overcome. Judging from present conditions and indications for the future, it seems safe to predict that the Birmingham district will not only retain its position as an important iron-producing center, but will forge ahead and become of increasing importance as the years go by.

The Copper Deposits of Katanga

The directors of Tanganyika Concessions, Ltd., have issued an interim report showing progress made since the last meeting of shareholders, from which the following is extracted:

The smelting operations commenced on the Kansanshi mine last March have been proceeding satisfactorily. The latest advices from the mine show that 83 tons of bar copper were produced in the month of June, while Allan Gibb (the company's chief engineer) states that it is expected that at least 100 tons will be the normal monthly production from the present furnace.

Mr. Gibb's general conclusions as to the Star of the Congo mine, on which developments have been commenced with the object of preparing it to supply an output of at least 1000 tons of copper monthly as soon as the railway arrives, are summarized as follows: The copper-bearing beds are about 3500 ft. long and 500 ft. wide. At places fully 250 ft. of the width will not be of immediate value on account of mining or metallurgical difficulties. At places a considerable portion of the remaining 250 ft. is so low in copper as not to be of immediate value. The general cost of mining and delivering the two classes of ore to bins will be 4s. per ton of ore. The mine can be quickly put into condition to produce 12,000 tons of ore monthly, which will insure a production of 1000 tons of copper monthly. The bulk of the ore to water level can conveniently be removed by haulage arrangements that will not require shafts. There are 320,000 tons of ore with 15 per cent. copper available that can be directly smelted to bar copper at a cost of about 35s. per ton of ore, assuming coke can be delivered at £5 per ton. There are 900,000 tons of ore with 6.5 per cent. copper available that can be treated by the reduction method at a cost of 12s per ton of ore. Large metallurgical works cannot be erected at any point nearer than nine miles from the mine.

The general investigation of the Kambove mine shows there are about 3,000,000 tons of ore in sight.

Treatment of Katanga Ores

The proposed scheme of treatment of the ores of Katanga is based on the fact that these ores occur, or can be readily separated into, two forms that are exactly opposite in character from a metallurgical point of view. The copper, so far as is known at present, entirely occurs in an oxidized form, and consequently can be reduced to metal by heating with carbon. The difference in the methods that will be adopted for the treatment of the two classes of ore arises from the character of the gangues that accompany the oxidized compounds of copper.

The two classes of ore may be generally described as follows: (1) Ore, usually containing more than 15 per cent. copper, of which the gangue may be fused in blast furnaces of a suitable type with the addition of moderate amounts of basic fluxes. (2) Ore, usually containing less than 10 per cent. copper, of which the gangue is absolutely infusible at or near the melting point of copper. This ore will be treated by the "reduction" method, in which the copper will be reduced to a metallic state and separated from the unsmelted gangue by water concentration.

The treatment of the smelting ore will present no novelties. Suitable slags will be produced either by admixture of various ores or by the addition of fluxes. The copper in the silicious ores will be reduced to the metallic state and fused to "shots," but no attempt will be made to fuse the attendant gangue. The reduced shots of copper are readily separated from the attendant vein stuff by mechanical concentration, and the concentrates will be fused into bars in reverberatory furnaces.

Railway Agreements

The following is a synopsis of the various railway agreements that have been entered into: The Katanga Railway Company to construct and finance railway from the Rhodesian frontier at Mabaya to Star of the Congo mine, thence eventually through the copper belt to Ruwe mine, and on to the navigable Lualaba river. £3,000,000 is being deposited with the Société Generale de Belgique to complete the first section from the Rhodesian frontier to the Star of the Congo mine. The Rhodesian railways to construct and finance its line from Broken Hill to the Congo frontier.

The following are the rates agreed upon The following are the rates agreed upon for the carriage of ores, metals, concentrates, etc., from the northern boundary of northwestern Rhodesia to Beira or any intermediate point: 1d. per ton per mile [illegible] than 250,000 tons. ¾d. per ton per mile [illegible] The rates for the carriage of coal or coke im[illegible] per ton per mile for full trainloads of 300 tons. 1½d [illegible] or upward, but below 300 tons.

A Lake Superior Iron Ore Dock

[illegible] Superior is now completed and will be ready for the opening of navigation next spring; it was first used on Oct. 28 last. This is dock No. 6 of the Duluth & Iron Range railroad at Two Harbors, Minn. Its cost was $1,125,000, and it differs from most of the Lake Superior ore docks in its construction, being all steel except the pockets.

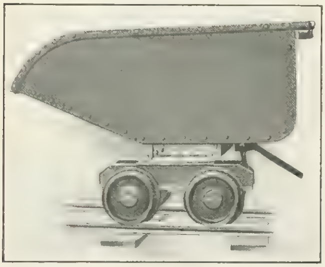
The dock itself is 938 ft. long; it is reached by a trestle 729 ft. long, of which 329 ft. is of steel construction and 400 ft. [illegible] level. The foundation is of timber cribs or caissons filled with rock and sunk to bedrock, on top of which rest concrete piers 9 ft. high, one-half being above water. The steel bents rest on these concrete piers. There are 74 timber pockets on each side, 148 in all, each holding 300 tons of iron ore; making the total storage capacity 44,400 tons. The length of the dock makes it possible to load four large steamers at once, two on each side. The loading is by spouts which convey the ore direct from the bins to the hold of the vessel. The ore pockets are 12 ft. wide from center to center of partitions, or 11 ft. inside. They are 30 ft. in depth at the outside and 3 ft. in the inside, averaging about 15 ft. They are lined on the sides with Washington fir and at the bottom with maple. The spouts are of heavy steel plates. The partitions in the last 10 pockets at the outer end are constructed of concrete in order to give the material a trial where there is heavy wear. Should it withstand the action of the falling ore, it is the intention to use this material in future construction.

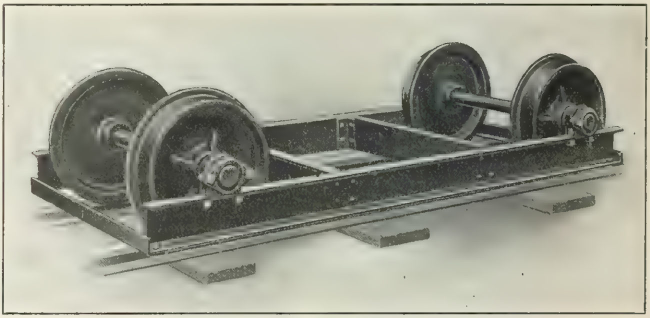
The dock construction work was done by the Barnet & Record Company, the American Bridge Company furnishing the steel work. The engineer in charge was [illegible] superintendent of construction. In the work there were used 4500 piles and 11,000 cu.yd of concrete for the foundation; 7500 tons of structural steel and over 2,000,000 ft. of lumber in the superstructure. It is a notable example of the great structures built to facilitate the handling of Lake Superior iron ores.

Youngstown Industrial Cars

In the JOURNAL of June 13 in an article on "Inclined Room Haulage" an arrangement was described for lowering loaded mine cars out of inclined rooms by means of a low transfer truck upon which the cars can be placed and shifted. An apparatus embodying the same principle and employed for the same purpose has been sold by the Youngstown Car Manufacturing Company for some years with its mining cars and industrial equipment. The truck illustrated in the JOURNAL as used in Belgium was a homemade affair, and was somewhat heavy for the purpose.

The Youngstown transfer car is shown in an accompanying illustration. The frame of steel channels is hung under the axles on roller bearings, thus providing a low platform. The truck is built in varying widths according to the wheelbase of the mine car to be handled, and the platform may be built to carry one or more tracks as desired. In moderate capacities, the construction shown is the one adopted, although it is modified to secure greater strength when necessary.


YOUNGSTOWN MINE CAR


TRANSFER TRUCK FOR MINE CARS

The truck shown is 6 ft. 6 in. long and 33 in. wide and is built for 24-in. gage cars. The top of the frame is only 5⅞ in. above the rail. Chilled cast-iron wheels 16 in. in diameter pressed on 2-in. axles constitute the running gear.

The Youngstown company also furnishes the necessary portable track for this arrangement so that the purchaser has only to procure a windlass and rope to complete his equipment for handling cars in the manner described. The truck illustrated is shown without platform or track; the platform is made of wood or steel plate as desired for any gage of track.

A type of mining car which has found a wide use is shown in the second illustration. It is a rotary dump car of scoop-shaped body so constructed that it is readily operated by one man. It is low and narrow. The box is made of heavy plates which vary according to capacity. The trucks on which the rotating table rests are of channel steel, while the turntable is made of steel plates and is equipped with a forged-steel hinge. The wheels are chilled and have a 3-in. tread and 1-in. flange. These wheels are usually of the self-oiling type. The cars are usually built for 18 and 27 cu.ft. capacity and in gages from 18 to 36 inches.

Mining Claims on Forest Reserves

A circular letter from J. H. Richards, president of the American Mining Congress, gives a letter from Gifford Pinchot, forester of the Department of Agriculture, with regard to complaints made by prospectors and others, closing with the request that a committee of the congress be appointed "to coöperate with the Forest Service in an effort to reach a mutual agreement, both as to the rules which should govern the Forest Service, under the law in dealing with mineral questions on National Forests, and as to the definition and interpretation of these rules, so that there shall be no misunderstanding whatever as to what is just and right for both parties in the premises."

In compliance with this request President Richards, through the executive committee of the American Mining Congress, appointed a committee which is known as the Forest Reserve Committee, composed of A. G. Brownlee, Hon. E. A. Colburn, W. F. R. Mills, William P Daniel and George J. Bancroft, of Denver, Colo. This committee has met several times in connection with the work in hand. It is now engaged in a compilation of the mining laws, and studying the regulations and instructions of the Department of Agriculture for the use of the national forests.

At this time the committee recognizes the necessity of securing full and complete statements of facts in specific cases where the regulations or the spirit of their enforcement by the Forest Service are alleged to have worked undue hardships or injustice upon men engaged in discovering, developing, or operating mines. To this end it invites the presentation in writing of all such statements of facts. Specific cases involving the use of timber, the mineralized character of claims located, rights of way over national forests for all mining purposes, together with the use or storage of waters for power purposes, or domestic use in connection with the mining operations of isolated claims, groups of claims, or affecting the economic problem of improved services throughout mining districts of territories will be considered by the committee upon a presentation of facts in the premises. All such statements should be addressed to the Forest Reserve Committee, American Mining Congress, 1510 Court place, Denver, Colorado. They will be regarded as strictly confidential by the committee if so desired by the persons sending them.

The committee expects to attend the session of the congress, to be held at Pittsburg, Penn., Dec. 2-5, to which Mr. Pinchot has promised to send some of the most liberal and best qualified men of the Forest Service to confer with it, in order that a better understanding between the mining interests and the Forest Service may be had, and an improved service result therefrom.

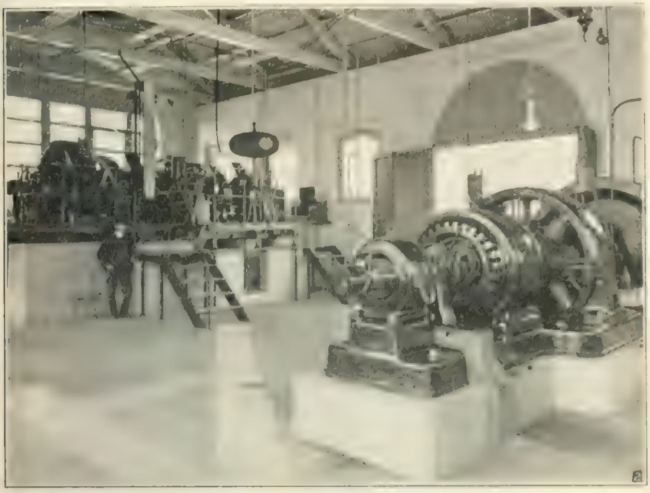
Greater Efficiency on the Rand

As showing the effect of the financial depression upon mining it is interesting to note that on the Rand, South Africa, in January, 1908, at 60 mines the average cost of mining, inclusive of development and redemption, according to *South African Min. Journ.*, Sept. 26, 1908, was 19s. 7d. per ton, while in August, 1908, for the same mines the average cost was 17s. 4d., showing a decrease of 2s. 3d., or a little over 10 per cent.; and this in spite of the fact that ever since the Boer war the cost of mining has been steadily reduced. The average stamp-duty per 24 hours for the whole Transvaal has been increased from 5.80 tons in January, 1908, to 6.17 tons in July, and in August to 6.23 tons. Formerly the hammer "boys" were required to drill 36 in. in a shift, now 42 in. is demanded together with, in many cases, two hours of shoveling. There has been a corresponding increase in efficiency in all the "boys" employed underground.

Some Features of Mining at Pachuca, Mexico

SPECIAL CORRESPONDENCE

There are several interesting points in the mining practice at Pachuca which were not described in our recent article on mining at Pachuca.[1]



ILGNER HOIST, SAN RAFAEL MAIN SHAFT, PACHUCA

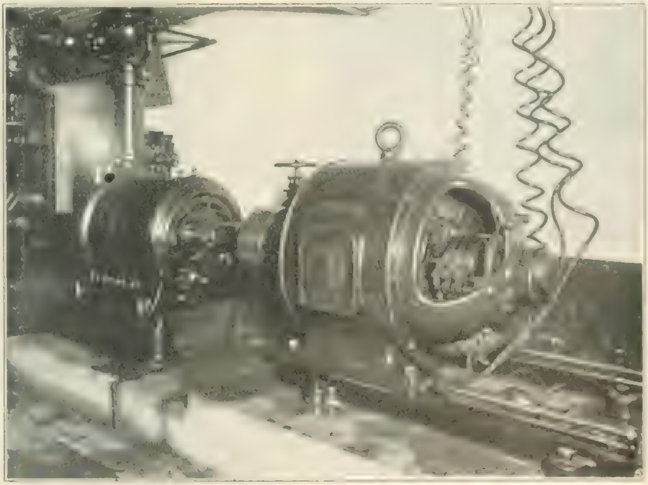
The most peculiar is the arrangement of the shafts. These are sunk more nearly square than is commonly the practice. Typical dimensions are 14.75x9.75 ft.; 16.4x9.75 ft.; 13x8.2 ft.; and 16.4x11.7 feet. The shaft is given these dimensions because of the peculiar method of using the shaft space. Most of them were sunk since the introduction of Cornish pumps in the district; so they were made wide enough for the two cages to run side by side crosswise in one end of the shaft. This left the other end free for the pump-columns, pump-rods, and ladderways. This necessitates an awkward arrangement of the guides, since the outside ones must be placed in the middle of the loading tracks. In order to get the cars off and on, this guide is hinged on a tongue-rabbeted bevel joint so that it can be swung out of the way while loading.

THE CONTRA-TIRO SYSTEM OF SHAFT SINKING

The water in the district is confined to the veins; therefore a *contra-tiro* system of shaft sinking is used to cross the vein. In this method, a crosscut is driven from the bottom of the shaft. In this crosscut at a distance from the vein such that there is little danger of cutting a water-bearing fissure from the vein, the *contra-tiro* is started in the dry country rock. After this two-compartment shaft has been sunk to the level below, a pump station is cut, pumps installed, and from the bottom of the shaft a crosscut is started to the vein. When this crosscut has progressed 15 or 20 ft., it is enlarged so as to receive a masonry retaining wall 2 or 3 ft. thick, to which is hung a water-tight door. Pipes with regulating valves on them extend through this wall or bulkhead. After this masonry bulkhead has been completed, crosscutting begins again, a long hole being kept ahead as a precaution until finally a round of holes breaks into the vein. The iron door is closed and the retaining wall keeps this rush of water from drowning out the pump. The valves in the drain pipes are then opened until the pumps are working at full capacity. Pumping continues until the ground above the level has been drained sufficiently so that the pumps can handle the normal flow of water from the vein; the door of the masonry bulkhead is opened, and then a raise is started to the vein. In this manner the shaft is extended through the vein without danger of being drowned out. Later, after drifting has begun on the new level, the masonry bulkhead protects the mine from being drowned out, for whenever a rush of water comes, the door is closed and the lowest level used as a sump until the pumps can handle the flow again.

ELECTRIC SINKING PUMPS AT PACHUCA

At the Dolores shaft in Real del Monte a hydraulic elevator using inlet water under a pressure of 180 m. is used in sinking, but a No. 7 Cameron sinking pump will soon be used instead. At other shafts Sulzer centrifugal, electric sinking pumps are used, and at the San Rafael both a Sulzer and a Weiss-Monski centrifugal, electric sinking pump are used. These electric sinking pumps require about 5x4 ft. of shaft area, and weigh several tons. In order that the pumps can be moved easily in the shaft, they are mounted on cross-heads, which run along the guides in the compartment not used for hoisting, and a counterpoise is used to balance the weight of the pump and cross-head. The Sulzer sinker at the San Rafael mine has a capacity of 500 gal. per min. against a head of 35 m., while the Weiss-Monski sinker has a capacity of 600 gal. per min. against a head of 60 meters.



SULZER CENTRIFUGAL PUMP, 200 [illegible] SAN RAFAEL [illegible]

---

[1] The JOURNAL, Sept. 12, 1908.

The great disadvantages of centrifugal-sinking pumps are that they wear out rapidly; that they take up much more shaft room than air- or steam-operated, piston pumps that they are not capable of that variation in speed, that air- or steam-operated, piston pumps are; the regulation of the speed of pumping with them is inconvenient, as it can only be effected by the valve on the discharge pipe; and that they are heavy, necessitating special means for moving them. Consequently, electric sinking pumps have not, as yet, proved especially satisfactory.

For the stations, Koppe plunger pumps and Sulzer centrifugal pumps are used, both being electrically driven. The plunger pump is the more efficient, but the only Sulzer pump tested in the district had, when new, an efficiency of 69 per cent. A centrifugal pump costs only about one-quarter as much as a plunger pump, and the centrifugal-pump system is somewhat more flexible than the plunger pump, since it is capable of working under considerable overload for several hours. At the Barron mine a Sulzer octuple centrifugal pump is raising in one lift water from the 450-m. to the 50-m. level, a distance of 1312 ft., probably the highest one-stage lift in Mexico. This pump has a maximum capacity of 2250 liters against this head; it is run by a 350-h.p. induction motor, driven by a 1040-volt current and takes 163 amperes when running at maximum capacity.

A TYPICAL SHAFT AT PACHUCA; OLD-FASHION CAGE-HOOKS AND SPLIT GUIDES ARE USED

The veins are rather wet, but the flow of water is notably greater when opening up and draining a new level. During this time sudden rushes of water are frequent. On this account a pumping capacity two to three times as large as required by the normal flow must be provided. For such extra pumps the electric centrifugal pump, owing to the smaller space required, less weight, and lower first cost, is preferable to a plunger pump, but for station pumps in constant use it is questionable which is the better; probably owing to its greater efficiency the plunger pump.

Narrow-gage Railways for Mines and Smelting Works

By Oskar W. Scholz[1]

For narrow-gage systems about mines and smelting works, wood ties and spiked rails are fairly satisfactory for yard tracks which remain permanently on the ground, but steel ties with the rails bolted to them are far superior for use on lengths of track that must be shifted frequently. Suppose a length of track, switches, etc., must be shifted in the course of a day. The spikes must be pulled out each time. Many spikes will bend and not come out straight. The spikes also tend to split the tie, loosening the rail and causing derailment and dislocation of traffic.

Industrial or portable tracks, or ready-made tracks supplied in sections 15 ft. long, are used for all kinds of industrial purposes, either to remain permanently, or to be shifted around as the work may require. Their main advantages are light weight, stability, and the fact that the ground on which they are to go needs little or no preparation. The sections consist of five metal ties with the rails attached by means of clips and bolts. To rivet the rails to the ties is not to be recommended especially for rails of smaller size, for the holes in the foot weaken the rails. Clips and bolts hold the rails and ties securely in place and allow, in case of breakage, quick and easy repairs on the spot. The ties are of rolled steel, with a corrugated rib in the center, which affords firm ground contact, strengthens the ties, and also prevents "buckling." The connections between the rails are made by regular flat iron fish bars. If, however, the tracks are not to be kept in place for any length of time, it is better to use connections which do not require bolting, such as light angle joints, etc. The total weight of one 15-ft. section is about 130 lb. for light rails.

Cost of Handling Material on Portable Track

The cost of handling material may be considerably reduced by the use of a suitable track system. In a railroad-grading contract about 25,000 cu.yd. of earth was removed, some of it with wheel scrapers and some with portable track and steel dump cars. The cost by wheel scraper for a haul of 350 ft. was 26.25c. per cu.yd., and by portable track and car for a haul of 600 ft. it was 24.25c. per cu.yd. The use of the portable track in this case thus represents a saving of about 25 per cent.

The conditions of location and traffic are those chiefly determining the track specification; the gage of the track and the rail section to be used are largely governed by the nature of the material transported. The accompanying table shows the approximate carrying capacity of the various rail sections.

CARRYING CAPACITY OF RAILS, MAXIMUM WHEEL PRESSURE IN POUNDS.

Weight per yard.	Distance from Center to Center of Ties.			
	3 ft. 3 in.	3 ft.	2 ft. 6 in.	2 ft.
12	1275	1440	1700	1920
14	1500	1700	1950	2240
16	1710	1910	2160	2450
20	2000	2200	2540	2900
25	3150	3540	4050	4620

There is no standard narrow gage, each manufacturer and each branch of industry having a different one. If the gage is wide, the road is expensive to build, requiring longer ties, more ballast, etc., and on account of the greater width required, cannot be built in places where a narrower gage could easily be used. It has been determined in actual practice that for most industrial purposes the 24-in. gage is most practicable. The cost for 36-in. gage is about 10 per cent. higher than for track of 24-in. gage. It is for this reason that nearly 90 per cent. of all light railways are built for 24-in. gage. A narrower gage than 24 in. should only be used if the space is limited, as, for instance, in mines where the track at times has to lead to parts which would otherwise be inaccessible.

The question of curves is often troublesome. To economize space it is desirable to make turns as short as possible, although with ordinary equipment the shortest turns permissible do not always meet the requirements. Thus, for a 24-in. gage track an 18-ft. radius curve is about as short as can be safely used. With especially designed rolling stock and track, much shorter curves can, however, be made, a curve with a radius as short as 12 ft. being permissible for use with specially designed cars.

In a recently installed industrial railway in a large plant there are no curves, turntables being used throughout. Though doubtless necessary in places where want of room prohibits curves, turntables should be confined as largely as possible to inside trackage.

---

[1] Engineer with the Arthur Koppel Company, Pittsburg, Penn.

Prospectors and Prospecting in Nevada

Definite Classified Information Is Hard to Get, and Precedent Is of Little Help in Searching the State for Its Mineral Deposits

BY ROBERT T. HILL*

The call of the West is always in me, and in the spring of 1908 the call drew me on a prospecting trip to Nevada, the land of geological simplicity and mystery, of mountain and desert, of heat and cold, of mines and hippodromes, of success and failure. In fact, Nevada has always been a land of surprises to the mining world, now "coming in" with some tremendous new discovery, and next languishing in depression of "busted" booms. Usually, however, each boom period results in the finding of one or two good staying camps, like Comstock, Ely, Goldfield, Pioche, etc.

I reached Nevada in a period of depression. Booms had boomed and "busted." The whole country had been staked out, and much of it had been abandoned in the period ending with the great failures and labor strikes of 1907. The general feeling was that there was nothing more to it.

Naturally my first step in going prospecting was to ascertain what ground to attack, and the best method was first to find out, as far as possible, what ground my predecessors had found favorable and what ground they had cancelled from the list of possibilities. There are three distinct methods of doing this, all of which should be followed by the prospector, for they dovetail one into the other. Unfortunately most prospectors fail because they only use one of the three. The first is to consult recorded knowledge and to equip oneself with all that others have found out, for this is the day of concerted and coöperative knowledge. The second is to cultivate the horny-hand prospectors, and to get the feel and touch of his personal experiences. The third is to visit and study every detail of an open and successful mine, typical of the region. I used all three methods.

A few geologist friends, such as King, Gilbert, Emmons, Powell, Hague and Walcott, had looked at the Nevada ground long before I had ever seen it, and each had in the literature of the subect recorded priceless observations. A younger generation, including Spurr, Ball, Ransome and others, had also made many recent descriptions. I was so fortunate as to have their scattered papers and maps. The paper by Ball[1] will be found especially useful to the prospector on account [illegible] cluding bits of literature, definitions of rocks, sketch maps, prospecting hints, etc.

The Prospector's Lore

A second method is to get the unrecorded observations of the hundreds of prospectors who have been over the country with burro and gold pan, and who, by careful research and hardship, have worked out the characteristic features of many unfavorable or favorable localities and areas. The exact method of getting this information can hardly be put in print, but there are numerous local academies of science called "thirst parlors" in the vernacular, where these savants rendevouz in their moments of leisure. Any stranger possessing a reasonable degree of "savey" can find admittance, and can soon establish a footing in the discussion.

The prospector and the geologist are brothers; both are studying the same thing, although one is content with the substance and the other with the explanation, and their success depends on rock knowledge. The difference between them is not great. It is mostly a matter of language. When they learn one another's language they become chummy. The "burnt out porphyry blow-outs all shot up with mineral," of the miner, are only phases of the geologist's "oxidized zone peculiar to certain metamorphic replacement phenomena."

Everybody in Nevada has the prospecting fever; men, women and children either go prospecting personally, or grub-stake someone else, and the saloon is the club house and exchange for all information. There are prospectors from the type of the young mining engineer with an automoblie, who wanted a $15,000 grub stake from a New York office, to the chef of the swell Goldfield hotel, who informed me that he was going out prospecting soon. The gambling dealers all invest their daily wages in grub staking, and even a woman brought in a rock which she had found in the road sparkling with free gold, apparently the pocket piece lost from some man's kit.

Having studied rocks and ores for a few years, but being unknown to the local people, I found amusement and instruction in asking apparently foolish questions, how they prospected and [illegible] ore when they found it, the latter being a pertinent question, inasmuch as a pecul- [illegible] the newly described mining camp of Nevada looked nothing like any [illegible] that could be produced, and the prospector pure and simple is a slave to precedent.

The most intelligent of these pros- [illegible] over the country with a galvanized-iron bucket half filled with water in one hand, a small frying pan for panning in the other, a geological hammer and a magnifying glass. He was of unusual intelligence, and could spot gold colors readily, but faulting, rock species, alteration products, alunitization, etc., were Greek to him. He was afterward of great service to me in locating values in formations, which I selected as favorable, but he had not then, and has not now, one idea of the [illegible]

[illegible]

The most startling result of these inquiries was that, with one single exception, a man whom I shall cite extensively later on, I did not meet a man in Nevada who had the least conception of the law of characteristics of the ore occurrence, and I believe it is highly probable that today there may exist in Nevada rich, undiscovered fields of the Goldfield type, which the entire body of prospectors would pass over without recognition, or turn down as worthless.

But, alas! After we had received and digested all the literature that our geologic friends had given us, we were still in the dark; for none of this scattered knowledge has been systematized, and the great mineral State of Nevada possesses neither a geological survey nor a mining bureau to compile and sort it for us. When we turned to our prospector friends we also found confusion. They worked on precedent, and precedents taught them to look for good old indications that do not accompany these erratic Nevada deposits.

By reviewing the last economic cycle 1893-1908, panic through prosperity to panic, it may be seen that of the great mining discoveries which made good, most were of geological types unfamiliar to the prospectors and engineers and geologists of previous cycles.

This is especially true of the great copper mines which "came in," notably the Cananea, Ely, and Bingham camps, which are all of the types of more or less differently disseminated ores in [illegible] ing little of the character of "true fissures," hanging walls, footwalls, etc., which the old-time miner always relied upon, and for the lack of which many of them "turned down" the properties enumerated.

---

*Mining geologist, 25 Broad street, New York.

[1] Bulletin No. 308, United States Geological Survey. "A Geological Reconnaissance in Southwestern Nevada and Eastern California." By Sydney H. Ball, Washington, 1907.

Near the beginning of the close of the cycle, the greatest of discoveries at Cripple Creek and the Goldfield, Nev., mining camps, also afforded examples of notable departures from the old ideals of the geological occurrences of gold ores, and furnished an example of gold disseminated and replaced in igneous rocks, under such conditions that the old miners, who would touch nothing but "true fissures," "good iron outcrops," and vein quartz with true "hanging" and "footwalls," completely failed to recognize the conditions which thousands of old prospectors and novices, floundering around Nevada afoot, on burros, in automobiles and private cars, still do not understand, unless they learn a great deal more about uptodate petrography than even most experts possess.

The third method of feeling the ground by studing a typical mining camp was still before me, and where could one turn for such a purpose to a better camp than Goldfield, and there I saw so much and learned so much that I concluded that really we had just begun to find out something about the laws of ore occurrence, as will be pointed out in a later article.

Utah Consolidated Copper Company

U. H. Broughton, of this company, has issued a statement to shareholders which contains the following:

In January of this year your company's smelting plant in Salt Lake valley was closed by order of the court, after the case had been carried to the court of last resort. Your company was then confronted with the proposition of building a new smelting plant in another locality, which meant the cessation of production for about a year and a half, or the alternative of entering into a contract for the smelting of its ores with the Garfield Smelting Company. In February of this year a contract was made with the Garfield Smelting Company for a period of one year. This contract was the best that could be made under the circumstances; by its provisions your company had the option, in six months' time, of extending the contract for a second year, and the right of discussing the questions of a certain modification and the making of a contract for a period of five years.

In July your company exercised its option to extend the contract for a second year, and informed the Garfield Smelting Company that it was prepared to take up the other questions. The Garfield Smelting Company notified your company that it would prefer to defer these questions for 90 days, which your company could not agree to, for the reason that certain options upon land adjoining the smelter site owned by your company expired on Oct. 1. Your company, however, agreed to a postponement until Sept. 24, upon the condition that its contract should run for 18 months from that date. On Sept. 23 the Garfield Smelting Company notified your company that it could not change any condition of the existing contract, but would make a contract for five years, "but not on any more favorable terms to your company." Your company immediately, as a protection, exercised its options on the lands adjoining its new smelter site.

Your company has now entered into a contract with W. D. Thornton, of Butte, for the smelting of its ores for a period of 10 years, commencing April, 1910, the proper performance of which contract is guaranteed by four persons acceptable to your board of directors. Under the provisions of this contract Mr. Thornton agrees:

1. To erect a smelting plant in Tooele county, Utah, to be in operation by April, 1910, and treat the output of your company's mines up to 1200 tons per day, at a rate which is 67.60c. per ton more favorable to your company than the contract now existing with the Garfield Smelting Company.

2. To buy from your company, at cost, all the lands and options it has acquired in Tooele county.

3. To give your company an option upon any part of $500,000 par value of the capital stock of the company to be formed to operate the new smelter upon as favorable terms as may be extended to any other taker or subscriber to stock.

The cost to your company of transporting ores to the Garfield smelter is 48c. per ton, while the cost of transporting ore to the Tooele smelter will not exceed 15c. per ton.

All figures in connection with the existing contract and that entered into with Mr. Thornton have been approved by E. P. Mathewson, of Anaconda, your company's consulting engineer.

Upon the basis of your company's present output of ore, 800 tons per day, the contract entered into with Mr. Thornton will result in a saving to your company, as compared with the contract now in existence, of over $300,000 per annum, or $1 per share upon the capital stock of your company.

Carnegie on Steel Production

Andrew Carnegie will have in the December number of the *Century* magazine, an article which he calls "My Experience With and Views Upon the Tariff," and in this he advocates the abolition of the duty upon steel. He thinks that steel is no longer an "infant industry." He says:

"The writer has coöperated in making several reductions as steel manufacturers became able to bear reductions. Today they need no protection, unless perhaps in some new specialties unknown to the writer, because steel is now produced cheaper here than anywhere else, notwithstanding the higher wages paid per man.

Britain and Germany are the only important steel-manufacturing nations other than ourselves. I am assured by one who has recently examined the matter that he found even in Germany today that the cost per ton for labor was greater than with us, unusually high as our wages are at present.

The United States made last year more steel (over 23,000,000 tons) than Germany, Britain, France and Belgium combined. New steel works are under construction which will produce enough to enable her to make more than the whole world besides. This she will do within five years, probably within three. The day has passed when any foreign country can seriously affect our steel manufacturers, tariff or no tariff. The republic has become the home of steel and this is the age of steel."

Uniformity in Mining Laws

In Pittsburg, Nov. 18, a conference was held at which many coal operators of the district were present. The chief subjects of discussion were the proposed Federal mining bureau and the movement to amend the mining laws and to secure uniformity in such laws. While no action was taken, it was the generally expressed opinion that better results could be secured through State action and the establishment of State mining bureaus, where they do not already exist. The radical differences between those States where coal mining is the important industry, and those where metal mining is conducted on a large scale were strongly urged. Another meeting is to be held, to decide on some definite course of action.

Governor Stuart, of Pennsylvania, on Nov. 18, issued a formal call and personal invitation to the governors of 16 States to meet in conference in Pittsburg Dec. 4, during the convention of the American Mining Congress. The governors are to be the guests of the congress. The purpose of the conference of governors is to secure uniform legislation.

The governors will take part in the discussion of the topic, "The Federal and State Governments in Relation to the Mining Industry," and following the discussion will go into executive conference. The invitations sent out by Governor Stuart were to the following governors of coal-producing States:

Braxton B. Comer, Alabama; Henry A. Buchtel, Colorado; Charles S. Deneen, Illinois; J. Frank Hanley, Indiana; Albert B. Cummins, Iowa; Edward W. Hoch, Kansas; A. E. Wilson, Kentucky; Austin L. Crothers, Maryland; Joseph W. Folk, Missouri; George L. Sheldon, Nebraska; Andrew L. Harris, Ohio; C. N. Haskell, Oklahoma; John C. Cutler, Utah; Claude A. Swanson, Virginia; William M. O. Dawson, West Virginia; Bryant B. Brooks, Wyoming.

The Rare Metals, III—Molybdenum

By Charles Baskerville*

With tungsten, molybdenum is commonly associated with granite. It is not found free in nature, nor is it widely diffused. The molybdeniferous minerals are:

MOLYBDENUM MINERALS

	Mo. Content.
Molybdenite, molybdenum disulphide	60
Wulfenite, lead molybdate	[illegible]
Molybdite, molybdenum trioxide	66
Powellite, calcium molybdate	[illegible]
Ilsemannite, molybdate of molybdic oxide	[illegible]
Paterаite, cobalt molybdate	[illegible]
Belonesite, magnesium molybdate	[illegible]
Molybdoferrite, iron molybdate	
Wehrlite, formerly considered an ore of silver and molybdenum	trace
Scheelite, calcium tungstate	[illegible]

The first three minerals mentioned are commercial. Molybdenum is employed in metallurgy in the production of an alloy with steel. It can be substituted for tungsten in modern high-speed tools, and one part of molybdenum will produce approximately the same effect as two parts of tungsten; however, molybdenum is not so satisfactory an element as tungsten to use in high-speed tools. Molybdenum tools are brittle, have a tendency to fire-crack, are weak in the body of the tool, or else are irregular in their cutting speeds. Sodium molybdate is used in ceramics to impart a blue color to pottery, and in dyeing silks and woolens; molybdic acid is used in the preparation of chemical reagents. Molybdenum produces fast shades on leather just as titanium does, and a large variety of shades may be produced by using molybdenum tannate with logwood extracts. "Molybdenum indigo" (Mo_5O_7) is a useful but expensive pigment for india-rubber; it is said that it is not injurious to the material.

There is a steady and increasing demand for molybdenum.

Molybdenite

This mineral is the principal ore of molybdenum. It is usually a fairly pure compound, although a variety has been described containing 28.37 per cent. of bismuth. Molybdenite generally occurs embedded in, or disseminated through, granite, gneiss, zircon-syenite, granular limestone and other crystalline rocks. The largest deposits in this country are in Maine, New Hampshire, Colorado, Arizona, Montana, Idaho, California and Washington.

Molybdenite occurs in thin graphite-like scales or foliated masses of metallic luster and lead-gray color, easily separated into flexible non-elastic scales. It is sometimes found in tabular hexagonal forms, also in fine granular masses. It is soft and has a greasy feel; marks paper bluish-gray and porcelain slightly greenish. Its hardness is 1-1.5, and its specific gravity is 4.7-4.8. The cleavage is basal. Although twice as heavy as graphite, molybdenite is often confused with it. The two minerals may be easily distinguished, however, by the color of the streak on porcelain, and by the blowpipe reactions which follow:

In the forceps molybdenite is infusible, but at a high heat it imparts a yellowish-green color to the flame; on charcoal, the pulverized mineral gives a strong odor of sulphur in the oxidizing flame, and coats the carbon with a slight sublimate, which is yellow when hot, white when cold, and deep blue when touched with an intermittent reducing flame. In an open tube, sulphurous fumes and a pale yellow crystalline sublimate of molybdenum trioxide result. Molybdenite is decomposed in nitric acid, and leaves a white or grayish residue. With sulphuric acid, it yields a blue solution. The borax bead is yellow when hot, and colorless when cold in the oxidizing flame; and is brown to black and opaque in the reducing flame. The salt of phosphorus bead is yellowish-green when hot, and colorless when cold in the oxidizing flame; and emerald-green in the reducing flame.

When heated in a platinum spoon with niter, molybdenite deflagrates with a flash and dissolves in the fused salt, leaving yellow flakes, which remain undissolved when the mass is treated with water. In applying this test, the mineral is finely pulverized, and about three times its volume of niter is employed.

Wulfenite

This species occurs in veins with other lead ores, especially vanadinite and pyromorphite. It is found in Massachusetts, Nevada, Wisconsin, Missouri, New Mexico, Arizona, California and Pennsylvania. It sometimes contains chromium, vanadium, calcium, copper and iron. Wulfenite is found usually in thin, square tabular crystals, sometimes very thin, of yellow, orange or bright orange-red color and resinous or adamantine luster. The color is sometimes siskin- and olive-green, yellowish gray, grayish white, and almost colorless. It is found less frequently in granular masses, coarse or fine, and octahedral or prismatic crystals. Wulfenite is brittle and the streak is white. Its hardness is 3, and its specific gravity is 6.7-7. The cleavage is pyramidal.

This mineral fuses easily on charcoal, yielding a yellow coat and finally a metallic globule. The borax bead in the oxidizing flame is colorless; it becomes brown to black or dirty green with black flocks in the reducing flame. It dissolves in salt of phosphorus to a bead, which is yellowish green in the oxidizing flame and green in the reducing flame. When fused with soda on charcoal, it yields metallic lead. It partially dissolves in concentrated hydrochloric acid, forming a green liquid. If the solution is diluted and metallic tin is added, it becomes blue and finally brown. When fused with potassium disulphate in a platinum spoon, it forms [illegible] yellowish [illegible] a white color on cooling; this dissolved by treatment with pure water gives a solution which readily becomes dark blue on adding a piece of tin or zinc. A similar test may be made by boiling the finely pulverized mineral with sulphuric acid in a porcelain crucible or dish and then adding alcohol.

Molybdite

This mineral occurs with molybdenite, from which it is probably derived. It is found in New Hampshire, Pennsylvania, Georgia and California. Molybdite is found as an earthy powder or incrustation, and as hair-like crystals, tufted and radiated, and subfibrous masses. The luster of the crystals is silky to adamantine, and the color is straw-yellow or yellowish white. Its specific gravity is 4.5, and the hardness is 1-2. The streak is straw yellow. Molybdite fuses on charcoal before the blowpipe, yielding minute yellow crystals of molybdic oxide near the assay, becoming white near the outer edge of the coating and when cold. This coating assumes a blue color when treated with the reducing flame for an instant; continued heating produces a dark red color. The borax and salt of phosphorus beads give characteristic molybdenum color reactions (*vide* molybdenite and wulfenite).

Other Minerals

Eosite is a vanado-molybdate of lead. Its color is deep auroro-red, and the streak is brownish orange-yellow. It is found in Scotland.

Achrematite is a lead molybdate containing arsenic trioxide and lead chloride. It is a brittle, resinous mineral of an orange color, and gives a cinnamon-brown streak. It is found in Mexico.

Ilsemannite is a black mineral; it is soluble in water, giving a deep blue solution. It is found in Carinthia.

South Rand Shaft, Transvaal

It is calculated that the South Rand shaft, now 180 ft. deep, which is being sunk to develop several properties, will cut the Main Reef series at a depth of 2200 ft. (*South African Min. Journ.*, Sept. 26, 1908). The shaft has seven compartments and is similar to the Turf mines, City Deep and Wolhuter Deep shafts; six compartments are 5x6 ft. within timbers, [illegible] 6 ft. 6 in. by 5 ft. 10 in. The estimated cost of this [illegible].

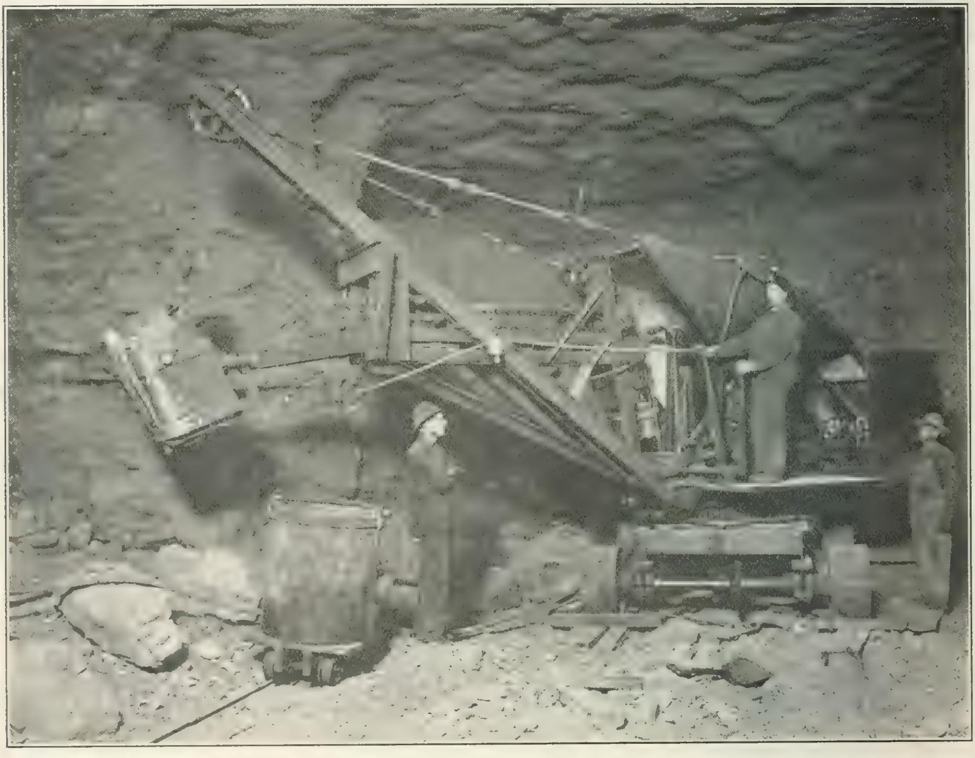
A peculiarity of the method of sinking [illegible] frame and plant were erected before sinking began, instead of proceeding with sinking and erecting a temporary plant immediately. The headframe is 104 ft. [illegible] the property.

---

*Professor of chemistry, College of the City of New York.

Power Shovel for Underground Work

An innovation that has lately claimed the attention of the mineowners of the Joplin district is an installation of a power shovel for underground work. C. W. Landrum, resident general manager for the American Zinc, Lead and Smelting Company, succeeded in interesting Capt. R. Thew, of the Thew Automatic Shovel Company, of Lorain, Ohio, in the question of using a modification of the ordinary steam shovel in the mines, and the machine shown in the accompanying illustration is the result.



POWER SHOVEL, OPERATED BY COMPRESSED AIR, AT WORK UNDERGROUND IN THE JOPLIN DISTRICT

The machine has not materially reduced the number of men required for shoveling, but it can be operated by cheap labor; it handles an increased tonnage of ore, and has thus far never failed to supply the mill with ore.

The American Zinc, Lead and Smelting Company intends to install a second shovel, and a third is contemplated when the second is in working order. The first machine was a slight modification of the standard Thew shovel, the most important change being the adoption of compressed air in place of steam. The second shovel will be materially modified and adjusted to the peculiar requirements of this mining district. It will be lower in hight, and the radial reach will be reduced. There are accompanying features that will be worked out, as additional machines are installed, such as electric motors instead of men or mules for hauling the ore cars to and from the shaft, and other mechanical devices.

The plans for the second shovel to be installed give the following details of the improved machine: The approximate weight of the complete shovel will be 24,000 lb., and the clearance width 7 ft. 6 in. The swing of the boom when working will be 16 ft., and the clearance hight 12 ft. The swing of the rear end of the shovel will be 7 ft., and the radius of cut at a hight of 9 ft. will be 18 ft. The horizontal travel of the trolley will be 4 ft. 6 in., and the clearance hight of the dipper door in dumping 5 ft. The capacity of the dipper for ordinary use will be ⅜ cu.yd. The machine will have three engines: One, 5x6 in. for hoisting, a 4x5-in. for swinging, and the third, 4x5 in., for crowding.

The machine is built almost entirely of steel, and is mounted upon a truck propelled by one of the engines. The machinery is mounted upon a plate which swings from side to side as the movements of operation require. The operating levers are placed to one side near the front of the platform, and the operator stands upon a plate extension of the main platform.

Largest Hoisting Engines on the Rand

The largest hoisting engines on the Rand, South Africa, are those used at the mines of the Kleinfontein Gold Mining Company and the East Rand mines. The engine is of the cross-compound type, high-pressure cylinder 30 in. diameter, low-pressure cylinder 48 in., stroke, 5 ft. Each of the two drums carries 5000 ft. of taper steel rope, one-fourth being wound on the conical part and the rest on the cylinder is 20 ft. Inside each main drum the cone is 12 ft., and the diameter of the cylinder is 20 ft. Inside each main drum is an auxiliary drum on which is wound 400 ft. of spare rope (in excess of the 5000 ft. on the main drum). The size of the hoist is also indicated by the fact that the distance between the centers of the cylinders is 38 ft. 9 inches.

Buffalo Mines, Ltd.

In a communication to the stockholders of the Buffalo Mines, Ltd., of Cobalt, under date of Nov. 12, 1908, President Charles L. Denison says:

"I shall recommend to your directors the payment of a 5-per cent. quarterly dividend, followed by an additional extra dividend monthly of 1 per cent., and if conditions warrant, from time to time to pay such other dividends as may seem wise, beginning Jan. 2, 1909. I ask you to remember that our capitalization is moderate; our mine well developed; our veins unstoped. Our strength has not been misrepresented by record shipments of carefully selected ores, nor by large dividends obtained at a sacrifice to the proper development of the mine. We are today in a position to mine continuously from our developed ore reserves and to produce rapidly and cheaply, as our interests may warrant, saving as well the values of the extensive bodies of the lower grades of ore.

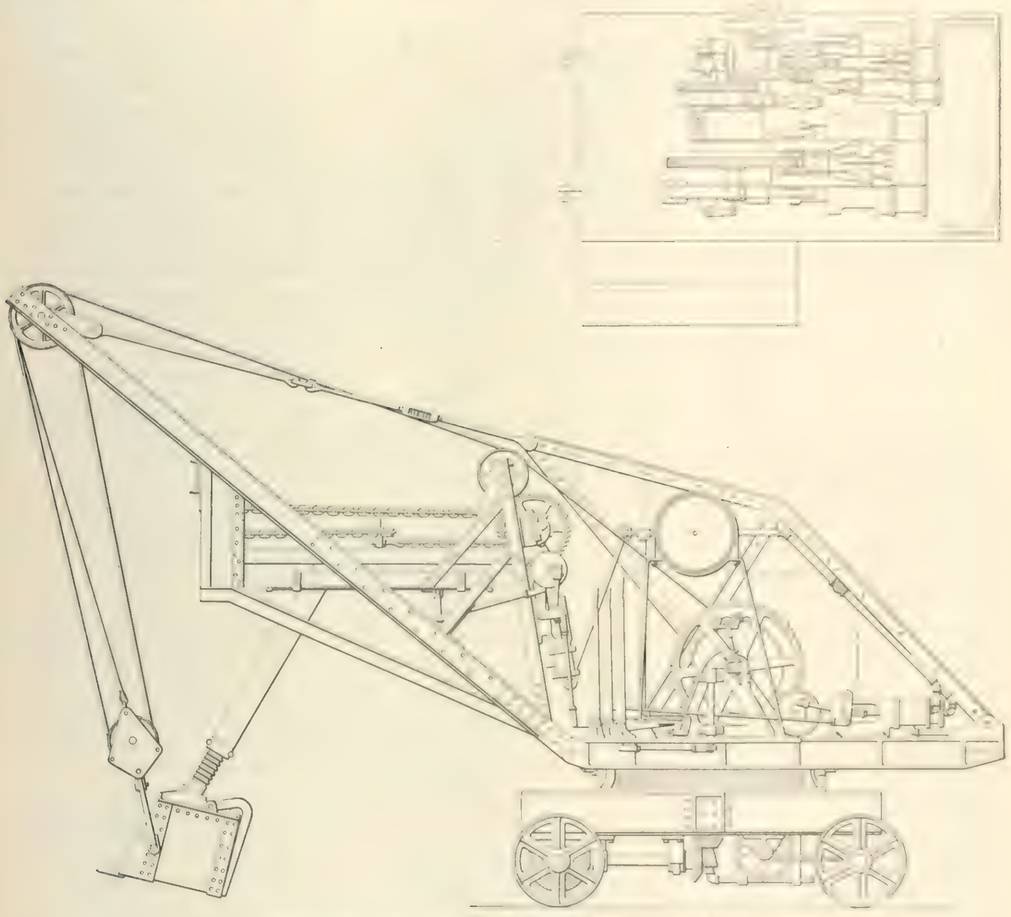
"We have demonstrated that the concentration of our ore is profitable; we have proved large orebodies; we have shown that dividends were paid from the earnings, while the development of the property progressed, and we have shown that we did not take out all the ore in sight for a temporary showing. Our plan of operation, our methods of mining, and our statement of conditions have been conservative. We have declined to prophesy or guess at values. There are now orebodies in sight greater in extent and of far greater value than I ever expected to see in this or any other property in Cobalt."

The concentrating plant has been built to its planned capacity and the company has installed a new electric pump, water lines and tanks, new boilers and boiler house, sampling and cyanide plants.

Indian Gold Mines

The production of the Kolar goldfield in Mysore, India, in October, was 45,585 oz. bullion; which is 2163 oz. more than in September, and is the largest monthly production reported this year. For the 10 months ended Oct. 31 the total was 436,996 oz. bullion in 1907, and 437,841 oz. in 1908, an increase of 845 oz. only. The bullion reported this year was equal to [illegible]

The diamond-bearing pipe at the Premier diamond mine is probably the largest in the world. While approximately [illegible] have been taken from the pipe, the average depth of working is only [illegible]



SIDE ELEVATION AND PLAN, POWER SHOVEL FOR UNDERGROUND WORK

Philippine Coals [*]

By Alvin J. Cox[†]

The subject of Philippine coal is of great importance to the islands. Although coal occurs so abundantly, Philippine coal is used only sparingly as a fuel. It has been employed on the small vessels plying along the coast with fairly satisfactory results, but largely owing to the undeveloped condition of the mines and the difficulty of transportation, it has come very little into competition with the coal imported from Japan and Australia. As a result, the development of commercial industries is handicapped by the high price of fuel. In view of this fact efforts have been made to foster coal production in the islands. W. D. Smith has made geologic studies of some of the more important coalfields, and I have investigated the quality and means of utilization of the coal from as many representative sources as could be obtained.

The older and larger deposits of Philippine coal known are on Batan island, Cebu and Polillo, although coal occurs in greater or less quantity in Negros, Mindoro, Masbate, Samar, Surigao, Zamboanga, Tayabas, Rizal, Lepanto-Bontoc, Nueva Vizcaya and elsewhere.

No Coking Coal Yet Found

The Philippine coal deposits resemble those of black lignite, but are superior to the ordinary lignite in every respect. It is rather the exception for these coals to have a brownish color, and they seldom show a woody structure. In appearance they are usually black and shiny, much resembling bituminous coal, but generally have a slightly lower calorific value than the latter. On the other hand, they have a much higher calorific value than ordinary brown lignite. The name "subbituminous" best describes this coal, since it conveys the most accurate idea of its nature and value. So far as is definitely known, all Philippine coals are non-coking. Although I have investigated coals from every available authentic source, not a single sample of coking coal has been found among them. A few samples from time to time have shown incipient coking, and recently one said to be from near Cebu, has been brought in which gives a coke having the appearance of being of good quality. This may be the beginning of a sufficient supply, and perhaps in the deeper beds coking coal may be abundant. The importance of such a discovery will at once be recognized when it is remembered that both iron and copper occur in the Philippines.

The quality of the Philippine coal will be shown by the following representative analyses:

TABLE I REPRESENTATIVE ANALYSES OF PHILIPPINE COAL.

(Figures give percentages.)

Source.	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Ash.	Sulphur.
Batan Island:					
Bett's	15.41	39.46	41.01	4.12	0.22
Military reservation	7.44	35.26	44.81	2.49	0.25
Cebu:					
Near Carmen	16.70	35.10	43.92	4.28	0 67
Compostela	8.60	36.95	51.75	2.70	0 71
Danao	9.97	37.94	46.29	5.80	0.8
Polillo	5.90	39.29	48.82	6.00	....
Negros	15.90	35.44	34.37	14.29	0 99
Mindoro	15.35	46 26	32.24	6.15	....
Samar	15.24	45.38	36.36	3.02	....

These analysis were made by the "smoking-off method." The empirical methods usually employed for the analyses of coals are not applicable to those of the Philippines, owing to certain peculiarities of the latter

Barring diluents, water, ash, and sulphur, it is surprising what a general uniformity there is in all Philippine coal, and this fact suggests, if no other reason were apparent, that it was all bedded under about the same conditions.

How best to utilize the coal deposits of this country is a question which has long attracted attention; however, little progress has been made toward its solution. I am at present carrying on some actual steaming tests under the boiler with as many coals as are available from representative sources. These, although not in all cases satisfactory, are encouraging. They were all compared with Australian coal used as a fuel by this bureau. The coal is "double screened and picked twice." The contract price delivered at Manila, piled in the coalsheds and yards of the civil government is 10.75 pesos per ton of 2240 lb. In considering the following data it must be remembered that the samples of Philippine coal were used as they came from the mine and were neither screened nor picked.

TABLE II. STEAMING TESTS OF PHILLIPPINE COMPARED WITH AUSTRALIAN COAL AS UNITY.

(Figures give percentages.)

	Outcrop Coal From Batan Island.	Coalfield of Danao, Cebu.	Military Reservation. Batan Island.
Theorical heat value as determined in the calorimeter	69	91¾	85½
Actual steaming value when burned under the boiler	63	84	66
Efficiency from the standpoint of the actual heat value	91	92	77½

The loss of heat in the use of the Philippine coal was for the greater part through the smokestack, although a certain amount was due to fine coal falling through the grate. The following data will show these facts:

TABLE III. FLUE TEMPERATURE WHEN VARIOUS COALS WERE BURNED.

(Degrees centigrade.)

	Australian Coal.	Batan Island Coal.	Danao, Cebu Coal.	Military Reservation, Batan Island Coal.
Average	360	440	389	413
Maximum	435	504	454	468
Minimum	330	440	391	385

TABLE IV. RELATIVE LOSS OF COMBUSTIBLE MATTER IN ASH.

Percentages.	Australian Coal.	Batan Island Coal.	Danao, Cebu Coal.	Military Reservation, Batan Island Coal.
Total refuse	13.3	.	6.1	18.8
Combustible matter in total refuse	22.32		28.9	36.5
Combustible matter of coal lost	2.97	4.5	1.8	6 88

It has several times been reported that Philippine coal burns well when mixed with a certain proportion, say, 30 per cent. of Australian coal, or even slack. This condition would be anticipated. The effect is probably entirely physical. The Australian, which is a coking coal, would help to sinter together and retard the escape of the light particles of the non-coking native coal, until combustion could be effected in the range of the water-heating surface of an ordinarily constructed boiler.

The comparison of the theoretical and

---

[*] Abstract of paper in "The Mineral Resources of the Philippine Islands." Manila, 1908.

[†] Chemical laboratory, Bureau of Science, Manila.

the actual ratios in Table 2 is satisfactory when all the facts are considered. The fuel was all fired in the gridiron-grate furnace of this bureau, for which the usual fuel is Australian coking coal; in fact it is especially suited to and designed for the consumption of coal of this class. It is probable that a more satisfactory grate could be used for native coal, and I am convinced that a saving would follow by the use of a different style of furnace. A furnace with a short firebox, planned for a high-grade steaming coal which burns with a short, hot, smokeless flame, is entirely unsuited to Philippine coal. The firebox must be lengthened, or else a considerable portion of the fuel value of the volatile combustible matter, which approaches 50 per cent., will be lost.

Few of the Philippine coals form clinker; generally they are easily fired and burn well. This was the characteristic tenor of the reports of the officers in charge of the United States army transports "Chukong," "Sacramento," and "Palawan," when trials were made of the coal from Batan island.

Granting the usefulness of Philippine coal for steaming purposes, there are other points to consider, namely, the economy and the preservation of the supply. In developing, opening up and working the mines, there is always a large amount of outcrop coal and slack that is unsuited for steaming purposes, and which for sake of economy should be used.

It is believed, however, that recent experiments with gas-producer plants show a method by which these can be used. The gas-producing power of Philippine coals has been studied, and while the gas is not always equal to that of American bituminous coals in quantity, the quality is, in most cases, fairly good. There is no doubt that Philippine coals are well adapted for use in a producer plant. Physically they are ideal to handle. They are non-coking, they do not swell, they burn steadily, form very little clinker, and the ash could be removed automatically without difficulty. Slack and outcrop coal used in this way may become almost as valuable as better coal used in a steam plant.

With a satisfactory scheme for the use of the upper and poorer grades of coal, the mines can be worked successfully and the deeper coal can be used for steaming, where a producer plant and gas engine are impracticable. For the production of power, the utilization of our low-grade and outcrop coal for producer gas seems promising.

This bureau hopes to establish a trial plant at no distant date, and when it is in operation can add very definite data to present information.

As a general rule, air-courses should always have as large an area as possible; this reduces the rubbing surface per square foot of section.

Improved Methods in Mine Ventilation

Special Correspondence

Until recent years it was the general opinion of mining engineers that the fans required for ventilation must necessarily be of large diameters. When, however, the turbine or multivane mine fan was invented, it became evident that this opinion needed considerable modification, and it became still more obvious when the results obtained with these fans under actual working conditions were made public.

The first installation where the "Sirocco" multivane fan was used, bore out the makers' claims, a 75-in. diameter fan of the double-inlet type not only doing the work of two other fans, whose aggregate diameters amounted to ten and one-half times that of the "Sirocco," but even delivering a 12-per cent. larger volume of air. This was only the first of many similar instances. At another mine, a 77-in. diameter "Sirocco" is replacing a fan measuring 44 ft. in diameter, while many others of less than 100 in. are being installed in place of fans of the old type measuring 30 to 40 feet.

ADVANTAGES OF REDUCED DIAMETER

Interesting though this question of reduced diameter undoubtedly is from the mechanical standpoint, it would be of little value if it could not show some advantageous features when considered also from a commercial aspect. The chief advantage of fans of small diameter lies in the fact that they can be run at comparatively high speeds, making it possible to couple them directly to motors or engines which develop the required power at high speed of rotation.

The first cost of the motor or engine is consequently very much lower than is the case of a slow-running fan, which often could not be direct-coupled, owing to slow speed necessitating the use of a large size motor or engine with the proportionate increase of cost.

The reduced dimensions of the high-speed fans lead to a marked economy in the cost of erection, owing to the small amount of brickwork and masonry necessary to provide their housing, and this fact is clearly evidenced when taking the actual space occupied by the fan wheels into consideration. Thus, taking an actual installation as an example where a wheel occupying a space of 325 cu.ft. is replacing another occupying 15,000 cu.ft., it is obvious that the amount of brickwork required to inclose the former is very much less than that needed by the latter. An additional saving is frequently effected in the reduced size of the engine and motor house, due to the use of a high-speed in place of a low-speed, and consequently larger dimensioned machine.

HIGH EFF[illegible] IS OBTAINED

Although the "Sirocco" multivane fans are small in diameter they are capable of fulfilling large duties, as is borne out by a number of installations. Tests have shown that a double-inlet fan 119 in. in diameter, is capable of passing 300,000 cu.ft. per min. at a 3-in. water gage, while another ventilator measuring 140 in. has been found to deliver 375,000 cu.ft. per min. at a 4-in. water gage. Furthermore, one of these fans is now in course of construction, which will have an output of half a million cubic feet at a 6-in. water gage, and will be direct-coupled to a motor of 1000 horsepower.

It has been sometimes argued that the slow-speed fans of large diameters show far better efficiencies than the smaller high-speed fans. This, however, is not the case, considering that a turbine fan is able to give an efficiency of more than 70 per cent. when tested under actual working conditions in mines.

Alaska's Great Coal Reserve

According to Alfred H. Brooks, chief geologist of the Alaskan division of the United States Geological Survey, it is not impossible that the area of lignite and low-grade bituminous coal in this Territory may be double the present known coal area, which is estimated at 12,000 square miles. The coal of Alaska ranges in quality from lignite to a fuel that compares favorably with the famous Pocahontas coal of West Virginia. Some of the bituminous coals make good coke. Several of the coal seams of the territory attain great width, reaching a total thickness of 60 ft. at many points. It is stated by those who are familiar with the Alaskan coalfield that this district is destined to play an important part in the advancement of all industry on the entire Pacific seaboard of the North American continent.

The minable coal, in the ground, in Alaska has not yet been definitely determined, and whatever estimates are made for some years to come, will doubtless be subject to wide expansion, as further geological explorations are carried forward. It is proper to say, however, that the coal resources of the territory are great, and that they will be figured at hundreds of millions, and even billions of tons.

The new Crescent mine, of the Monongahela River Consolidated Coal and Coke Company is one of the most carefully planned operations in the Pennsylvania coalfield. The mine has over three miles of underground standard-gage railroad laid with 60-lb. rails. Four-ton mine cars are used. The tipple has a capacity of 6 tons a minute.

An Underground Fire Disaster

By James Ashworth*

The official account by the English Chief Inspector of Mines of the disaster which occurred at the Hamstead colliery in England having now been issued as a white paper, it is open to anyone who desires, at a cost of, say, 36c. plus the postage, to ascertain what that official has reported as the results of his special inquiry into the circumstances attending the underground fire at this colliery; the lives of 24 men, a large number of horses and also of one explorer named John Welsby (who was using the Weg rescue apparatus), were sacrificed.

This official document records something of the history of one of the most regrettable incidents in the annals of British mining, where the want of pluck and cool courage on the part of a few miners led up to the smothering of 24 of their mates, and the destruction by fire of property which provided a considerable population with their daily bread.

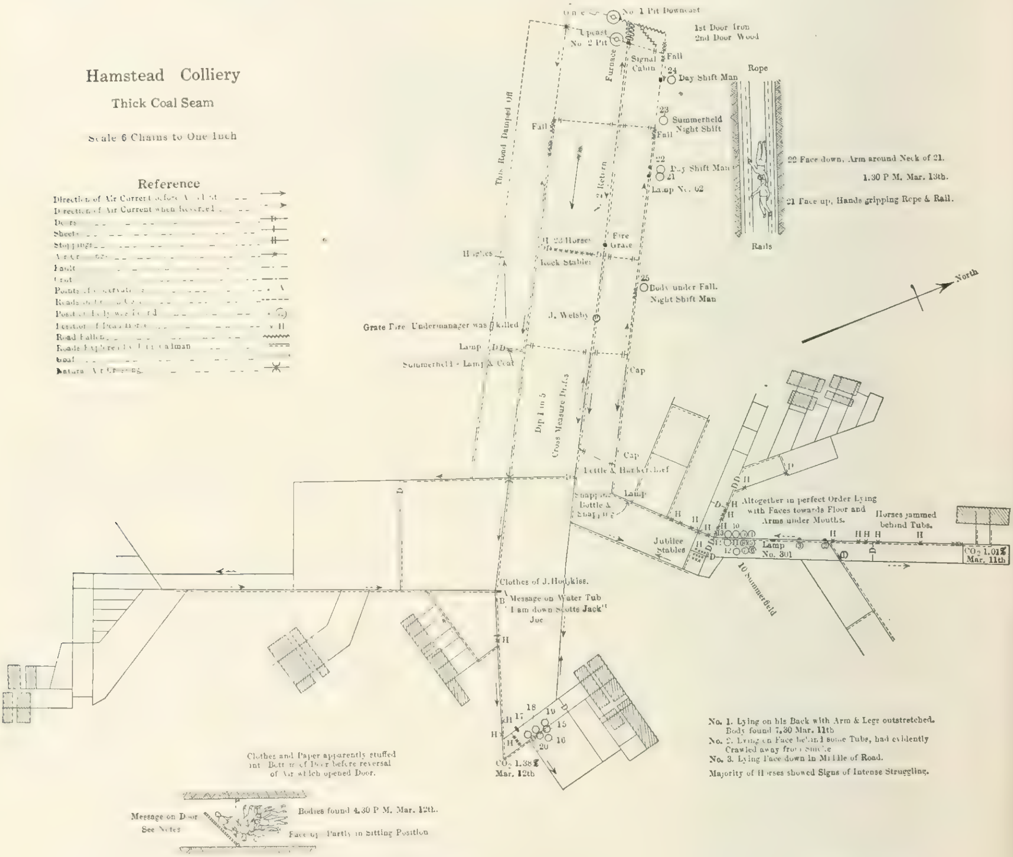
As if to atone for the first unfortunate incident, the succeeding phases of the attempted rescues were distinguished by almost reckless contempt of the insidious dangers of heat and gases resulting from the fire, and, therefore, in studying the plain facts, it is necessary to do so with as little sentiment as possible.

Here was a colliery 580 yd. deep, with a somewhat unfortunate history, mainly no doubt resulting from the frequent outbreaks of spontaneous combustion which are said to have averaged about one every two days. The seam is known as the Thick coal of South Staffordshire and was worked by means of downhill rock crosscuts from the level of the Brooch coal, and thus the pit bottoms and the haulage roads were for some hundreds of yards around the shafts in rock strata and entirely free from spontaneous fire troubles.

Cause of the Accident

On Monday, March 2, the winding engine at No. 1, or the downcast shaft, broke down, and coal-winding had to be discontinued, but the necessary repairs to the mine and the feeding of the ponies and horses were proceeded with as usual. During the change of the day and night shifts, about 5 o'clock on Wednesday the fourth, someone is supposed to have gone to a candle box, which stood on the south side of the top deck of the scaffolding of the three-deck caging arrangement, and after burning off one or more candles left the wicks of the others smouldering, and these, afterward bursting into flame, set the whole place on fire.

There were at the time three men in the office on the south side of the pit, but these do not appear to have perceived anything wrong until one of them coming outside, found smoke. About the same time smoke had also made its presence felt in another office or signal cabin on the inbye side of four separation doors on the north side of No. 2 shaft. The joint parties of men from Nos. 1 and 2 pits then appear to have tried to find a ladder by which to reach a water tap with the in-


Hamstead Colliery
Thick Coal Seam
Scale 6 Chains to One Inch
Reference
Direction of Air Current before Accident
Direction of Air Current when Reversed
Doors
Sheets
Stoppings
Air Crossings
Fault
Crut
Points of Observation
Roads on Fire or Closed
Position Body was Found
Position of Dead Horses
Road Fallen
Roads Explored by Fireman
Goaf
Natural Air Crossing
No 1 Pit Downcast
Upcast No 2 Pit
1st Door Iron
2nd Door Wood
Furnace
Signal Cabin
Fall
24
Day Shift Man
23
Summerfield Night Shift
22
Day Shift Man
21
Lamp No. 62
Rope
Rails
22 Face down, Arm around Neck of 21.
1.30 P M. Mar. 13th.
21 Face up, Hands gripping Rope & Rail.
This Road Damped Off
Return
23 Horses
Fire Grate
Rock Stables
Hughes
25
Body under Fall.
Night Shift Man
North
J. Welsby
Grate Fire Undermanager was killed
Lamp
Summerfield - Lamp & Coat
Cap
Dip 1 in 5
Cross Measure Drifts
Kettle & Handkerchief
Snapping Bottle & Snapping
Lamp
Jubilee Stables
Altogether in perfect Order Lying with Faces towards Floor and Arms under Mouths.
Horses jammed behind Tubs.
Lamp No. 301
10 Summerfield
CO₂ 1.01% Mar. 11th
Clothes of J. Hodgkiss.
Message on Water Tub "I am down Scotts Jack" Joe
18
17
19
15
16
20
CO₂ 1.38% Mar. 12th
Clothes and Paper apparently stuffed into Bottom of Door before reversal of Air which opened Door.
Message on Door See Notes
Bodies found 4.30 P M. Mar. 12th.
Face up Partly in Sitting Position
No. 1. Lying on his Back with Arm & Legs outstretched. Body found 7.30 Mar. 11th
No. 2. Lying on Face behind some Tubs, had evidently Crawled away from Smoke
No. 3. Lying Face down in Middle of Road.
Majority of Horses showed Signs of Intense Struggling.

GENERAL DIAGRAM OF HAMSTEAD COLLIERY SHOWING POSITIONS OF MEN WHO PERISHED IN THE UNDERGROUND FIRE tention of turning water on the fire, but although they found the ladder they could not find the tap, as the electric lights went out and all made a *sauve qui peut* rush for the No. 2 shaft, and left the fire to burn itself out. Arriving at the surface, the timekeeper, who had come from the office on the south side of No. 1 pit, went to the enginewright, and asked him if No. 1 engine could be used, and was informed that "the engine was on the dead center and nothing could be done, for it would not go one way or the other."

---

*Mining engineer, Edgecroft, Rushton, Macclesfield, England.

What the enginewright meant is not by any means clear, because some time between this period, which has been variously estimated as 5:30 or 5:45 p.m., and 8:45 p.m., something must have been done as the engine was used for lowering the first of the rescue or investigating parties down the shaft, and it also appears to have been used for a similar purpose still earlier, as the report says that at 8:45 p.m., "a further and partially successful attempt was made to descend No. 1 shaft by a party consisting of the manager, enginewright and some others, about six in all." The history of this first descent is, therefore, from many points of view a very important missing link from the chain of evidence. Thus the simple fact that the cage or cages were moved up and down the shaft, and that the fire had not then burned the guide rods or in any way interfered with the free use of the cages stands out most prominently.

All Attempts Seemed to Fail

The report goes on to relate that the men descended to within 25 yd. of No. 1 pit bottom, but does not state whether or not any attempt was made to get at the water pipes, and thus play on the fire from this point of vantage. On returning to the surface, they reported hearing noises from falling materials, and in consequence of these noises nothing practical was attempted. In no part of the report does it relate what amount of destruction was done to the No. 1 pit bottom staging, or if the whole or what part of 30 to 40 trucks of coal standing on the north side were destroyed, nor to what extent the brickwork of this pit bottom was damaged by fire, nor why water was not poured onto either from the pipes in the pit, or from the surface.

It is useful to note that at this time between, say, 5:45 and 8:45 p.m., the fan had been stopped by the enginewright, but after the manager reached the colliery and his party had returned from No. 1 pit, say, about 9 o'clock, the manager ordered the restarting of the fan at about 10 r.p.m., and No. 1 shaft was again descended to within 10 yd. of the pit bottom. Again there is no mention of water and on returning to the surface, the fan was speeded up to 22 r.p.m. No. 1 shaft was again descended (called the third descent in the report) and this time the party could not get any lower, so they returned to the surface; still another descent was made, but the noise of heavy falls caused the manager to conclude that the venture was too dangerous and the exploration or attempted quenching of the fire at this pit came to an ignominious conclusion, and from this time the fire was allowed to burn unhindered. With this scant knowledge of the state and quantity of the burning material in and about the bottom of the downcast shaft, a party consisting of the manager and two others descended No. 2 pit, and got as far as the separation doors. Following up this dangerous exploration, the inspector of mines accompanied by the manager and three others then descended the pit and made a further examination of the separation doors and attempted to make them still more air-tight. This party accidentally made an important discovery, viz., that the air in the return was more respirable than that in the shaft, and another party led by the assistant inspector of mines descended the shaft, but the air had become too deleterious and they were unable to reach the pit bottom and had to return.

The Parties with Rescue Apparatus Get Busy

The fact of the air in the return airway being more respirable than in the shaft does not appear to have caused any comment, and consequently the reason "why" does not appear to have been looked for, but its importance was clearly demonstrated later on when the brave Yorkshire men came on the scene with their rescue apparatus (Dræger and Weg), and the first party after visiting the separation doors and going through three of them to the fourth or iron door, went along the return airway toward the Rock stables and found a cat alive, thus a second time demonstrating that there was respirable air in that direction. This exploration was followed up by two of the Dræger party, accompanied by the manager, also wearing a Dræger apparatus, and this time two horses were found alive in the Rock stables. What had kept them alive? Clearly the leakage of air through the doors communicating with the south side of No. 1 pit, where there was the least quantity of burning material, and where the return air current had been "damped down" some days previously.

Had Whittinghame and Welsby been told to explore through the three doors in the stable road, there cannot be a doubt but that the trouble and danger of dealing with the fire would have been reduced to a minimum, and poor Welsby would have been saved from the inferno where he later on lost his life.

After the loss of Welsby everybody appears to have been agreed that there was no other cure than to reverse the air current, and if any reader of the report, or of these notes, is placed in a similar predicament, and has to decide whether or not he will reverse his air current, he had better carry in his mind the accompanying drawing showing the position of bodies 15 to 20, and the door close to which they had taken refuge and attempted to make as air-tight as possible with paper, etc.

[illegible]

It is also important to note that the death of Welsby was not due to any failure of his apparatus but to the great heat of the mine which caused him to attempt to refresh himself by consuming his stock of oxygen through the bye pass instead of in the ordinary way through the apparatus. When another party of three rescue men went in to try to recover his body they were driven back by the excessive heat and smoke.

Up to this point all the efforts made to get into the part of the mine where the majority of the men were at work were made under the supposition that they might have short-circuited the air current and be in an atmosphere free or nearly free from smoke. This, however, was felt to be a forlorn hope, and after the loss of Welsby it was decided to reverse the air current, and make the upcast into the downcast, but the colliery had not been laid out, as many American collieries are, with reversible fans, and therefore a great loss of time ensued through the making of a connection between the downcast and the fan. Unfortunately the report does not say what effect the reversal had on the various doors, but taking the one close to where the bodies 15 to 20 were found as an instance, it will be seen that the reversal opened the door and left the men exposed to the vitiated atmosphere they had to some extent escaped from. Even if the enginewright had been able to reverse the fan immediately the workings were by that time so full of smoke that it is extremely doubtful whether any one of the miners could have escaped alive, and as previously observed the only chance for the men was in the opening of the four separation doors near the pit shafts.

The novel and complicated means used to ventilate this colliery are altogether unusual; thus, two fire "grates" were placed in the return air course, the one [illegible] and the other 620 yd. inbye from the upcast shaft for the purpose as stated at the inquiry, of "drying" the air, also at the mouth of the upcast a furnace was used to assist the 36-ft. Guibal fan, which was placed on the surface. These combined means of producing a ventilating current of air in the workings, succeeded in moving [illegible] return air road was blocked off.

Water Should have been Used

In these days of water sprays and other applications of water designed to restrict the extension of a firedamp or coal-dust explosion flame, the natural course would seem to be to have applied water in some form for the extinguishment of this fire, even if it were only thrown down from the top of the shaft; if water failed, flue dust or sand, or salt and water, might all have been tried to reduce the flame and heat sufficiently for the men to have got to close quarters and extinguish the remains of the staging bit by bit. One objection to throwing anything down the pit from the surface might have been that it would increase the ventilation and therefore increase the heat of the fire, but this objection would not be valid as the fan was kept running. The reason why water was not poured down the upcast to reverse the air was that the shaft needed repair at one point and it was thought that the water would make it cave in.

The occasions when it is necessary or convenient to reverse the ventilation of a mine are so infrequent that a reversible fan does not appear to be necessary, excepting only where the haulage-ways are liable to become frozen in winter weather. There is, however, a possibility that if a colliery were blown up through any case whatever, and the coal set on fire, eventually creating such a large volume of smoke as to drive the rescue parties out of the mine (as at the Maypole colliery, Wigan), the fan might be used to drive the smoke back again onto the fire and thus either put it out by smothering it in its own products, or so reducing it as to permit the miners getting to close quarters and extinguishing it. This mode of extinguishing an underground fire without flooding the mine, is suggested as being similar to that adopted by a mining engineer at the Leycett collieries, who allowed firedamp to accumulate and thus extinguish gob fires. To return to the Hamstead case, it may be queried whether, in the first place, a reversing of the air current could have been brought into action in time to save the men at work inbye if the fan had been a reversible one; and secondly if it would not have saved the men, had the products of combustion been brought back again over the fire, thus likely extinguishing it.

A Separate Lighting System

In underground lighting it is often considered desirable to have an entirely separate system for this purpose; in the event of an overload, the power circuit might temporarily be broken, and if the lighting were on the same circuit, it would also be cut off just when most required. Variations in load also might affect the lighting system if it were combined with the power circuit. For underground lighting the incandescent lamp should be inclosed in a gas-tight glass case.

Colliery Notes

As a general rule it may be considered that 12 ordinary by-product coke ovens will be capable of heating one boiler of about 8 ft. diameter, the steam pressure being about 120 lb. per square inch.

A Westinghouse locomotive weighing 15,000 lb. and running at a speed of eight miles per hour, exerts a draw-bar pull at full running load, of 2100 lb. on level; 1800 lb on a 2-per cent. grade, and 1360 lb. on a 5-per cent. grade.

When holes are charged with dynamite, but little good results from tamping, as the action of this explosive is violent and sudden. If, however, tamping is preferred, a 3- or 4-in. plug of clay backed on top by sand or gravel gives the best results.

In calculating the power required to operate a main- and tail-rope haulage system underground, the heaviest gradient on the road should be taken, and in addition to the friction of the cars and main rope, the friction of the tail rope must be considered.

The volume of air passing through a mine is directly proportional to the number of splits made, provided that these are of the same length and the power remains constant. The pressure is reduced in the same ratio as the quantity is increased under these conditions.

No policy at a coal-mining plant is more short-sighted than where quality in machinery is sacrificed to cheapness. In the long run, this plan is most uneconomical, for the breakdown of a cheap haulage plant, or other similar installation, will certainly result in a loss of time and output that will cost the company more than would have been required to install a reliable plant.

At a central electrical plant on the Continent, the working costs were found to be as follows: Three pounds of fuel produced 20 lb. of steam, which latter quantity of steam was consumed for each indicated horsepower. The fuel was here valued at 95c. per ton so that the cost, averaged over a period of time, was found to be about 0.2c. per i.h.p.-hour. The repairs and renewals to maintain this plant were found to be about 0.24c. per i.h.p.-hour.

The direct-current series motor gives a higher starting torque for a given current than any other type of motor. It should be remembered, however, that if a heavy starting torque is required, a heavy current will have to be used and a heavy starting resistance must be employed to take this current without undue heating. The direct-current series motor is usually designed to give its highest efficiency on light loads; the efficiency falls off rapidly as the load increases. A shunt motor usually gives its highest efficiency on about full load.

When fire occurs in the intake of a mine where many men are working, the circulation should be promptly stopped, and if possible reversed. An effort should be made to open all doors that will carry the smoke into the return airway. If for some reason the current cannot be reversed, then the intake should be immediately stopped off so as to prevent fresh air from reaching the fire. Only when the fire passes control and cannot be successfully fought by laying hose and throwing water on it, should steps be taken to isolate it by building dams and flooding the mine.

The question as to whether it is best to use a rope or a belt drive is a subject often discussed. The relative merits of each depend largely on local conditions. With a rope drive, there is certainly less chance of a breakdown, as the rope would break singly, while the breaking of a belt will cause some delay if not a serious accident. In determining the power that ropes will transmit, a common rule is to multiply the square of the diameter of rope in inches by the velocity in feet per minute and divide by 300; the result will be the power which may safely be transmitted by one rope. The number of ropes should be at least one more than actually required, so as to allow for changing, etc.

In discussing the question of accidents due to the short-circuiting of electric cables underground, one authority advocates the use of separate cables. This engineer claims that a heavy fall of roof breaking a concentric cable, would certainly cause a short-circuit at the point of fracture or crushing; however, if there were two separate cables, it would be necessary that each cable be simultaneously fractured and be connected with the earth before a short-circuit could take place. If these two separate cables were in separate roadways, it would be improbable that simultaneous fractures would occur from falls of roof; it is further suggested that if the two separate cables were in the same roadway, but on opposite sides, it is even then probable that one of the conductors would escape fracture.

There are, generally speaking, two types of arc lamps; first, the open or inverted type; second, the inclosed form in which the carbon, or rather the arc and part of the carbon, are inclosed in a glass globe arranged so that there is practically no circulation of air. Carbons that would last only about 20 hours in the open type will last about 200 hours in the inclosed type. Ordinary arc lamps require from 0.5 to 0.8 watts per c.-p., and it is usual to allow roughly one indicated horsepower at the engine of an electric generating set for each lamp of 1000 c.-p. Comparing the two types, the advantages lie mostly with the inclosed form; the latter consumes less carbon, burns for a longer period, needs re-trimming less frequently, requires but one-half the current, will burn on a higher voltage circuit and provides immunity from fire.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec.
505 Pearl St., New York.
London Office 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour," N. Y.

Subscription payable in advance $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 *we printed and circulated* **507,500** *copies of* The Engineering and Mining Journal.

Our circulation for October, 1908, *was* **52,800** *copies.*

Nov. 7	12,500
Nov. 14	10,000
Nov. 21	10,000
Nov. 28	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
American Supremacy in Smelting Practice 1063
The Tennessee Acid Contract 1063
Silver Prices 1063
Blast Furnace Gas Power Plant 1064
*Has the Value of Gold Depreciated? *Walter Renton Ingalls* 1037
*Iron Operations of the Birmingham District ..... *Edwin Higgins* 1043
The Copper Deposits of Katanga 1049
A Lake Superior Iron Ore Dock 1049
*Youngstown Industrial Cars 1050
Mining Claims on Forest Reserves 1050
Greater Efficiency on the Rand 1050
*Some Features of Mining at Pachuca, Mexico 1051
Narrow-gage Railways for Mines and Smelting Works ... *Oskar W. Scholz* 1052
Prospectors and Prospecting in Nevada. *Robert T. Hill* 1053
Utah Consolidated Copper Company 1054
Carnegie on Steel Production 1054
Uniformity in Mining Laws 1054
The Rare Metals, III—Molybdenum *Chas. Baskerville* 1055
*Steam Shovel for Underground Work 1056
Buffalo Mines, Ltd. 1057
Indian Gold Mines 1057
Philippines' Coals ..... *Alvin J. Cox* 1058
Improved Method in Mine Ventilation *Special Correspondence* 1059
Alaska's Great Coal Reserve 1059
*An Underground Fire Disaster *James Ashworth* 1060
Colliery Notes 1062
Correspondence:
Prospecting in the Government Reserves 1065
Loading Blast Holes *Joseph Hocking* 1066
The U. S. Geological Survey 1066
Patents 1067
Personals, Obituaries, Societies and Technical Schools 1068
Special Correspondence 1069
Mining News 1071
Markets, etc. 1077
**Illustrated.*

American Supremacy in Smelting Practice

The declaration of Andrew Carnegie that the steel works of the United States can produce more cheaply than those of any other country will create no surprise among the well informed, however inconvenient to some interests the statement may be at the present time. It has become well recognized by practical industrialists, as well as by economists, that the laborer is generally worthy of his hire. In mining the cheap native labor of India and the Transvaal does not result in a lower cost of production per ton of ore than with the high-priced labor of America, simply because the American miner is correspondingly more efficient. In metallurgical practice, besides iron and steel, it is well known that America leads the world in copper smelting and refining and in lead smelting and refining.

Even in the case of zinc smelting, wherein an unusual factor in labor conditions is introduced, it is believed by some authorities that the process can be performed as cheaply in the United States as in Europe, the somewhat higher cost for labor on this side of the Atlantic being offset by the lower cost of fuel. In some of the minor metals, such as nickel and aluminum, the United States is at no disadvantage as compared with Europe. Inasmuch as we do not smelt tin ore, this list practically covers the metal industry. If in any case our cost of production be higher, as in the case of much of the lead and spelter, it is because of the exceedingly low grade of the ore that we work, and the high freight charges resulting from conveying the products as much as 2500 miles by rail to the markets.

The Tennessee Acid Contract

An event of importance last week was the consummation of a contract between the Tennessee Copper Company and a recently organized concern called the Independent Fertilizer Company, whereby the latter is to take the sulphuric-acid product of the copper company for a long term of years at a price not announced, which, however, is understood to be very satisfactory to the copper company. The fertilizer company, moreover, in consideration of this contract agrees to pay to the copper company a large sum of money in cash, of which one-half is to be paid before the end of the present year, and the remainder at intervals later on. The Independent Fertilizer Company includes German interests that are closely identified with the potash syndicate.

This contract is an event of great importance to the Tennessee Copper Company, which has recently perfected its process of making sulphuric acid from the gases delivered by its smelting furnaces, this being a radical innovation in metallurgical practice. Naturally, many difficulties developed that had to be overcome by careful experimentation. The company contemplates the production of about 300,000 tons of tower acid per annum. The successful marketing of so large a quantity was a serious problem. The total acid consumption of the United States at present is probably in the neighborhood of 2,500,000 tons per annum, but of this only about one-half is used for fertilizer manufacture, and acid being a commodity that will not stand the freight charges to a very long distance from the point of production, the distribution of so large a new supply as that which the Tennessee Copper Company proposes, besides that which the Ducktown Copper, Sulphur and Iron Company is going to manufacture in a similar way, has been considered likely to create market disturbances. Whatever may now happen in the fertilizer industry, the Tennessee Copper Company is to be congratulated upon its success in disposing of its new product, hereafter to be more profitable than the copper product for which alone the property has heretofore been worked. The Independent Fertilizer Company is in no way affiliated with the American Agricultural Chemical Company or the Virginia-Carolina Chemical Company.

Silver Prices

The price of silver this week has fallen to a point almost the lowest on record; sales having been made at 49⅝c. in New York, and 22 15/16d. in London. This is in sharp contrast to the prices obtaining last year; but it is higher than five years ago, when for five months silver sold below 50c in New York, while for two months more it was very little above that point.

The average price reported in New York for the month of October, just [illegible] from October, 1902, to April, 1903, inclusive, it was below that point, the averages for those months in order being 50.57, 49.07, 48.03, 47.57, 47.89, 48.72 and 50.56c. Present prices, therefore, are not unprecedented. The highest monthly average price reported in recent years was 70.813c. in November, 1906. From that point for nearly a year the fluctuations were moderate, the average for September, 1907, being 67.792c. Then there was a sharp fall, 54.565c. being reached in December; while during the current year there has been a steady decline, broken only by a temporary rally in March.

In considering prices, it must be remembered that silver occupies a peculiar position, in that its production does not depend upon the demand for it. By far the greater part of the output is made in connection with other metals—chiefly lead and copper—and depends on the production of those metals. It may well be, therefore, that the supply of silver is greater when the demand for it is smaller. For the current year there are no reliable statistics of production, but as there has been a lighter demand for copper and lead, there may have been a smaller production from those sources. On the other hand, there has been an increase from the Cobalt mines of Ontario, so that it is quite probable that the total quantity put upon the market has shown little change from 1907.

The exports and imports of silver in the United States, which is next to the largest producer, for the nine months ended Sept. 30—the latest officially reported—were:

	1907.	1908.	Changes.
Exports	$47,970,793	$38,781,380	D. $9,189,413
Imports.... ...	34,488,224	30,725,475	D. 3,762,749
Net exports..	$13,482,569	$ 8,055,905	D. $5,426,664
App. ounces...	20,103,100	15,031,100	D. 5,072,000

The decrease in value of the net exports this year was 40.2 per cent.; the decrease in quantities, owing to the lower value, was only 25.2 per cent.

The main cause for the decline in values is, as usual, found in the Far East. It is somewhat remarkable, however, that while there was a decline of 16.7 per cent. in the value of the exports from London, the market from which the East is generally supplied, there was, apparently an increase of 4.3 per cent. in the quantities, as shown in the table below.

Export of silver from London to the East for the 10 months ended with October were as follows:

	1907.	1908.	Changes.
India.........	£9,899,954	£8,171,813	D. £1,728,141
China.........	99,850	516,400	I. 416,550
Straits........	625,950	164,885	D. 461,065
Totat........	£10,625,754	£ 8,853,098	D. £1,772,656
App. ounces..	82,333,200	85,879,500	I. 3,546,300

From this table it appears that India has taken at least the same quantity of silver as in 1907, but there has been a large decrease in other Eastern countries. The Straits are practically out of the market. China took some quantities early in the year, but since then has been a seller, not a buyer, disposing of the surplus metal taken two years ago, chiefly in India, but occasionally in London. These sales, which were combined with bear operations conducted by large Chinese operators, have been an important factor in depressing the price.

There have been minor contributing factors to the depression. The demand for silver for use in the arts has been small, in consequence of the general condition of business. The United States Mint has not been a buyer since early in the year. European mints, except the French mint, have taken less than the usual quantities. While of less importance than the trade with the East, these factors have had their effect.

Blast Furnace Gas Power Plants

While all the large iron-making countries have shown decreases in pig-iron output this year, and a general depression in business, Germany reports the smallest loss. For the eight months ended with August the total make of pig iron was only 7 per cent. less than in the corresponding period of 1907. This decrease is less than that in steel and finished material, so far as statistics are accessible; and it is reported that many furnaces have accumulated large stocks of unsold or unused iron, the existence of which is depressing the market.

One reason for this small decrease and the piling up of stocks is suggested by some of our French and German contemporaries. This is the widespread adoption at many German works of gas-engine plants operated by the gas from the furnaces. In many cases these plants not only supply the power needed for blast and other purposes about the furnace itself, but also generate electric power which is used to operate rolling mills, lighting plants and other parts of the works. Hence it is necessary to keep the furnace going to supply power, even if the iron is not needed. Unless there is a general shutdown of the entire works, the power plant must be kept in operation.

This was one of the objections suggested when the use of blast-furnace gases was first introduced. The objection was disregarded, in view of the many advantages and economies to be secured. That it may have some real weight seems now to be in progress of demonstration. A remedy suggested is the provision of gas producers to supply the power plant when the furnace is out of blast. The objection to this is, of course, the first cost. It may be a fair question, however, whether it would not be cheaper to install the producers than to carry heavy stocks of iron from furnaces run chiefly to furnish power.

It is of interest to note that the United States Steel Corporation has decided to establish a special bureau of scientific research. More or less research has accompanied its various operations, of course, but it has been incidental and has depended largely upon the officers in charge of the several plants. The object of the new bureau is to systematize investigation and to bring together data which will be useful. The bureau will have a building of its own at the Duquesne works, near Pittsburg; its first head is to be John S. Unger, now assistant general manager of the Homestead works.

The German iron market has been feeling lately the depression of business to a considerable extent. The dissolution of the Rhenish pig-iron syndicate, which was due, it is said, to the impossibility of maintaining prices longer, has had the effect of demoralizing the market. The quotation for steel-making iron has fallen to 60 marks ($14.28) per ton, and for average foundry to 50 marks ($11.95). The market is further affected by the existence of large stocks of unsold pig iron, said to be over 700,000 tons. It is, apparently, another case of the failure of combinations to maintain prices in the face of declining consumption.

Arizona is now producing more copper than ever before in its history, and the outlook is that in 1908 this Territory will retain the position as the premier producer of copper which it gained in 1907.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Prospecting on the Government Reserves

I have read with a great deal of interest the JOURNAL's editorial on "Prospecting on the Government Reserves," as well as previous articles and discussion on the subject. I rather hesitate to attempt anything on the subject on account of the scope and the false light in which the matter has been placed before the people of the country at large and the general ignorance of the public as to the actual conditions. I shall try to be brief and consume as little space as possible while turning on a few sidelights.

Out of all the discussion the question arises, From whom do all these complaints come? Who is propagating all this discussion?

Title XXXII, Chapter 6, Revised Statutes states:

Sec. 2318. "In all cases lands valuable for minerals shall be reserved from sale, except as otherwise expressly directed by law."

Sec. 2319. "All valuable mineral deposits * * * are hereby declared to be free and open to exploration and purchase, and the lands in which they are found, to occupation and purchase, by citizens of the United States * *, * under regulations prescribed by law * * *."

Sec. 2320. "Mining claims upon veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits, heretofore located, * * * but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located."

Sec. 2329. "Claims usually called 'placers,' including all forms of deposits, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivision of the public lands."

WHERE THE TROUBLE ARISES

From these quotations from the statutes, it is certainly plain that: "It was not intended by Congress in passing these laws that prospecting should be prevented in any way," nor was it intended that these laws made for the purpose of developing the mineral resources of the country should be used for the passing of title to these lands for any other purpose. I think that I am absolutely safe in saying that the *bona fide* prospector has in no way been prevented from carrying on his prospecting in the Public Forest Reserves, [illegible] representatives of the Forest Service or, "through another bureau of the Department of the Interior," reference here probably being made to the special agents service of the General Land Office.

The land laws state what lands can be taken under each kind of entry; the entry-[illegible] the Government to give him title to that land, the Government asks no further questions. When it comes to the point of passing title to its lands, and there seems reason therefor, an investigation may be ordered.

Herein is where the confusion arises over the rights in the Forest Reserves, and the fact is overlooked that there are several steps in the perfecting of a title to a mining or any other claim. It is manifestly at the point of asking for patent that all the trouble arises; this will be found on inquiry to be the fact, and right at this point we may ask, Is this law that has been characterized as "one of the antiquated laws remaining on our statute books, and has for so many years been conceded to be so irrational that by common consent it has been disregarded," after all so irrational and dead? In answer the following questions become pertinent: (1) If the law is to be disregarded, where is the prospector to set his stakes? (2) Will a practical prospector set up his stakes before he knows his vein or lode, later to find that he has a small section of a vein cutting through one corner of his claim? (3) Suppose that the first is answered by saying that he will make his record from his discovery(?) shaft, locating his lines thereby, the shaft being arbitrarily sunk, and he proceeds to spend $500 for development work in sinking this shaft 50 ft. deep, or perhaps in running a tunnel. Suppose he then asks the Government for a patent; shall the Government give him a patent to that claim? Most emphatically, no! The authority for refusing lies in Section 2320 of the statutes.

[illegible]

The same is true of the placer prospect. The prospector makes his discovery and locates his ground accordingly, or on surveyed lands by legal subdivisions. Let us assume that he is ostensibly looking for the "deep lead" and starts his deep shaft or long tunnel, does $500 worth of work, and asks the Government to patent the land, stating that he has not yet attained the supposed object of that work. Shall the Government issue patent to him for that 160 acres of land? Again no!

There is no law, nor are there any instructions that will disturb a man in his peaceful possession and operation of the claims as located in any of the above instances, but without that law and without its vitality, how many acres of valuable timber or agricultural land would be alienated from the people of the United States for the magnificent sum of $500 actually spent, or so sworn to?

No man has a right to apply for patent until he has made the discovery that the law calls for in Section 2320, and has done his $500 worth of work. Then he is entitled to a patent just the same as the man who has made his discovery and proceeded to the expenditure of the $500, after which, and not before, he is entitled to his patent.

[illegible]

There is a class of prospectors who work outside, and are, in their own minds, much abused by the Government. These men, possibly representing a mining company, or a contractor, wish to secure timber from a forest on Government lands, in all probability not classified as mineral land, and, therefore, not open to cutting of timber. The land must, therefore, be made mineral(?) land.

A number of claims are located, this "antiquated law" is disregarded, $500 worth of work is done (or sworn to in the returns, which amounts to the same thing), and patent is asked for; or perhaps this formality is passed, the claims [illegible] land *is mineral*, the foundation of the whole fabric being the disregard of the "antiquated law." They are then ready to take from the lands of the people of the United States the timber that should be adding to the treasury of the people.

[illegible] what entries can be made within a re-[illegible] entries. There is a trait in human nature [illegible] possess something, be it what it may, by other means than those plainly provided. The wild fowl, hare and deer in a hunting preserve are more to be desired in the eyes of the poacher than are the denizens of the free wood. So with the farm, the timber and the water-power of the forest reserve; but how shall the poacher poach on those? There is but one avenue, the mineral claim. The poacher goes upon Uncle Sam's timber preserve, digs a hole, or more often the pretense for one, and locates as many 20-acre lots as he will, covering the timber or farm land, swears to $500 worth of work, and asks the Government to give him title. Has he discovered a "vein or lode within the limits of the claim located?"

If this fails, or is inconvenient, he with several associates (accomplices) takes up twenty or thirty 160-acre placer claims; he does a little work here and there, has the land surveyed and asks for patent. The poachers have not noticed the timber, or if they have, only so far as it will increase the expense of their operations(?). Have they made a discovery of value in the limits of the claims located?

The Cry of Persecution

When this point is reached the Forest Service steps in, and as "the Forest Service cannot legally eject prospectors from its reserves," it calls in "that other bureau of the Department of the Interior," evidently the special agents, who make an investigation and report to Washington. A hearing is ordered and the mineral inspector of that department together with an expert miner of the Forest Service and possibly a geologist of known reputation from the U. S. Geological Survey, make an impartial examination of the land in controversy, and go into the hearing to present their testimony and to stand a rigid cross-examination by the best lawyers obtainable for the purpose. Then the local papers are full of the cry of persecution of the poor prospector, congressmen and senators are appealed to to use their influence with the department, and the men locally employed are slandered and abused. In not a few instances "the poor prospector" takes the brunt of these investigations, for whom?

This is the story of the persecuted prospector. Go to any of the *bona fide* prospectors on the reserves throughout the West and you will hear of no complaints. The howl has been made by those who have been snared in their own meshes, who have appealed to their representatives with a tale of woe, one side only being told, the circle ever widening until we see the story in prominent journals. This gives some color of truth to the charge and misleads the uninformed reader to the conclusion that the Government of the United States is a tyrant and a despot to those hardy pioneers who have blazed the way of the empire through desert and mountain.

It appears, therefore, that Section 2320 is as full of vitality and of as much importance in the chain of land laws as any section ever enacted by Congress, and that without it the West would be one orgy of land grabbing, bad as it has been in the past and bad as it is today, in spite of constant vigilance. The dialogue between the supposed prospector and the forest ranger has that familiar ring of the stump speeches of the late campaign, from the lips of those who opposed the administration.

Mining Engineer and Prospector.
Denver, Colo., Nov. 10, 1908.

Loading Blast Holes

I note that the article on "Speed in Small Drifts," in the Journal of Oct. 17, has brought out some discussion as to how to charge a hole.

I think the method used in Mr. Adkinson's article to be the best in that case. It is evidently less labor to remove the primer in case of a missed fire if the primer is the last put in, but I see no reason for removing the primer if there is but a small quantity of dirt of some kind, say, 4 in., on top of the primer. All that is required in case of missed fire is to place another primer on top of it. I believe that where the fuse has not been damaged by water before it is put in the hole or after, it is a defect in the making that caused the missed fire.

J. K. Hay must remember that 35 years ago miners used a hammer on an iron bar to tamp holes. I do not think the tamping stick or the doubling of the fuse is the cause of but few missed holes. The all-prevailing method here in this district (and I presume there are more holes blasted in the copper country in one day than in any other mining camp in the world), when there are several holes to be fired at one time, is to make a difference of about 4 to 6 in. in the length of the fuse, and after the hole is charged, to place all the fuse with the exception of 6 in. in the hole.

The Practical Miner

The drifting done in Mr. Adkinson's article no doubt beats the record. At the same time I think 10 holes should have done the work of the 15. Taking it for granted that Nos. 8 and 9 took the cut, eight more holes properly placed should have done the rest of the work. In my experience in small drifts it requires about one-half as many holes to take the cut as are required to square it after it is taken.

Where two holes drilled at an angle of about 20 deg. from the horizontal, 6 ft. deep in the breast of a drift would break to bottom in taking a cut, it evidently must be very fine rock to break.

J. K. Hay has not a very exalted opinion of the miner. He says that mining is no trade, and that miners as a class follow the leader. He says that owing to the greater complexity of mining problems it is rare that the prospector or the working miner works himself up to a place higher than foreman

Now I think miners have as much brains as other men; 20 years ago, 90 per cent. of the mining superintendents had risen from the ranks. But these old men have dropped out and their sons, or some other younger men, have taken their places. Some of them are mining-school graduates who can write a good report, but who would be in a tight place if they had not good miners as mining captains under them. The best way to get miners to do good work is to set them a contract. They will work their brains as well as their muscles if they have some inducement to do so.

Joseph Hocking.
Opechee, Mich., Nov. 18, 1908.

The U. S. Geological Survey

I was greatly pleased to see the remarks at p. 866 of the Engineering and Mining Journal of Oct. 31, 1908, apropos of the work of the U. S. Geological Survey. The case was diagnosed perfectly. The complaint that the Survey is not attending to its legitimate work is invariably met with the same clap-trap excuse; that it is required by law to do all these odd jobs. And the odd jobs are given the Survey at its own suggestion, and largely because it wants to have the handling of any funds voted by Congress. The August-September number of *Economic Geology*, p. 568, gives what is probably an authorized statement of the specific appropriations for the Survey for the year 1908-9. These include $75,000 for forest reserve topographic surveys, $100,000 for water resources investigations, $100,000 for structural materials investigation, and $250,000 for fuel-testing investigations; a total of $525,000 for work that, however useful and important, is not geologic in any proper sense of the word.

The Journal refers to the "high mark of its past history," and might have shown, had it cared to do so, that that high mark was not attained with the million dollar appropriations that swept the work of the Survey into every congressional district in this country and even into foreign lands, but in the early days of its existence when its more modest appropriations necessarily compelled it to stick to geology.

It is a great pity that it is not still poor enough to mind its own business, and to have that spirit of humility that goes with good, conscientious work.

New York, Nov. 10, 1908. Geologist.

The average cost of dipping or brushing new timber with preservative, according to a statement made by E. F. Hartmann, of the Carbolineum Wood Preserving Company, before the American Street and Interurban Railway Engineering Association, is $8.33 per 1000 ft. board measure. The cost of treating railroad ties he stated to be $8.70 per 1000 feet.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

MANUFACTURE. Process for the Production of Aluminum. Emilien A. O. Viel, Paris. (Brit. No. 24,612 of 1907.)

SOLDER. Aluminum Solder. William H. Finfrock, Chicago, Ill. (U. S. No. 901,607; October 20, 1908.)

SOLDERING. Improvements in and Relating to Soldering Aluminum and Alloys Thereof. Feodor M. Mrazsek, South Kensington, London, S. W. (Brit. No. 13,689 of 1907.)

AMMONIA AND AMMONIUM SULPHATE

MANUFACTURE AND RECOVERY—Process and Apparatus for the Manufacture and Recovery of Ammonia and Other By-Products from the Gases of Blast and Other Furnaces, Retorts, Coke Ovens and the Like. William Dunnachie, Coatbridge, Lanarkshire, Scotland. (Brit. No. 10,305 of 1907.)

ARSENIC

REDUCTION PROCESS. Improvements in the Process of Reducing Arsenical Ores. Gustaf M. Westman, New York City. (Brit. No. 3480 of 1908.)

COAL AND COKE

CAGES—Improvements Relating to Colliery and Like Pit Cages. Dixon Powner, Briggate, Leeds, Eng. (Brit. No. 1085 of 1908.)

COAL-CUTTING MACHINERY—Improvements in Machines for Cutting Coal and Other Minerals and in Apparatus and Appliances Connected Therewith. Richard H. Radford, Sheffield, Eng. (Brit. No. 6435 of 1908.)

COAL WASHING. Improvements in Apparatus for Withdrawing Sediments or Sludge from Settling Tanks Used in Coal Washing Machinery. Communicated from Franz Meguin & Co., Actiengesellschaft, Engineering Works, Dillingen on the Saar, Germany. (Brit. No. 10,303 of 1908.)

COKE—Improvements in, or Relating to the Treatment of Coke. Charles F. R. Dunal and René Masse, Gennevilliers, Seine, France. (Brit. No. 8508 of 1908.)

COKE—Machine for Leveling Coke-Oven Charges. William B. Morgan, Lawson W. Hubbartt, and James H. Wirts, Trinidad, Colo. (U. S. No. 903,604; November 10, 1908.)

COKE-DRAWER. Robert L. Martin, Jr., and Walter W. MacFarren, Pittsburg, Penn., assignors of three-fourths to said Martin and one-fourth to said MacFarren. (U. S. No. 902,243; Oct. 27, 1908.)

COKE OVEN OPERATION. Improvements in Removing Tar from the Hot Gases from Coke Ovens, Gas Retorts or the Like. The Otto-Hilgenstock Coke Oven Company, Ltd., Holborn, London, W. C. (Brit. No. 12,809 of 1908.)

COKE-PUSHING MACHINE. Charles Rouse and Norwell C. Neemes, Pittsburg, Penn. (U. S. No. 903,783; November 10, 1908.)

MINING MACHINE—Electric Pick Mining Machine. Alfred Sandstrom, Chicago, Ill., assignor to John F. Bush, Chicago, Ill.

SPRINKLING-CAR FOR MINES. Peter Doney and Alexander P. Cochrane, Monongahela, Penn. (U. S. No. 902,950; November 3, 1908.)

COPPER

CONVERTER—Liquation-Furnace. Ralph Baggaley, Pittsburg, Penn., Charles M. Allen, Lo Lo, Mont., and Edward W. Lindquist, Chicago, Ill. (U. S. No. 902,047; Oct. 27, 1908.)

COPPER LEACHING PROCESS. Frederick Laist, Butte, Mont. (U. S. No. 903,732; November 10, 1908.)

IRON AND STEEL

ALLOYS—Improvements in Steel Alloys. James Churchward, New York City. (Brit. No. [illegible] of 1907.)

ALLOYS. The Manufacture of New or Improved Alloys of Steel. Jack R. Crawford, Pasadena, Cal. (Brit. No. 21,355 of 1907.)

BRIQUETTING. Improvements in Consolidating Flue Dust, Pulverized or Finely Divided Ores or Other Materials Containing Iron or Manganese or Other Cognate Metals, into Blocks or Lumps for Use in the Manufacture of Iron or Steel. William Thomlinson, Durham, Eng. (Brit. No. 21,428 of 1907.)

DRY AIR BLAST. Method of Drying Air. Louis Block, Mamaroneck, N. Y. (U. S. No. [illegible]; November 10, 1908.)

MANUFACTURE. Process for Manufacturing Steel from Chromiferous Pig Iron. Frank D. Carney, Steelton, Penn., assignor to the Pennsylvania Steel Company, Steelton, Penn., a Corporation of Pennsylvania. (U. S. No. 902,052; Oct. 27, 1908.)

PUDDLING FURNACES—Improvements in, and Relating to Puddling Furnaces. James P. Roe, Pottstown, Penn. (Brit. No. 5413 of 1908.)

REDUCTION PROCESS—An Improved Method of Reducing Ores, Principally Iron Ores. Karl A. F. Hiorth, Christiania, Norway. (Brit. No. 3680 of 1908.)

SLAG-LADLES. Improvements in Ladles for Carrying and Tipping Blast Furnace Slag. John H. Dewhurst, Sheffield, Eng. (Brit. No. 24,195 of 1907.)

SALT

EVAPORATION—An Apparatus for the Continuous Evaporation of Saline Solutions. Edmond Cantenot, Lons-le-Saunier, Jura, France. (Brit. No. 9868 of 1908.)

MANUFACTURE—Art of Manufacturing Salt. Pearl L. Clifton, Pomeroy, Ohio, assignor to the Pomeroy Salt Association Company, Pomeroy, Ohio, a Corporation of Ohio. (U. S. No. 903,357; November 10, 1908.)

SALT-MAKING MACHINERY. Pearl L. Clifton, Pomeroy, Ohio, assignor to the Pomeroy Salt Association Company, Pomeroy, Ohio, a Corporation of Ohio. (U. S. No. 903,358; November 10, 1908.)

ZINC

EXTRACTION PROCESS—Process of Obtaining Metallic Oxides. Richard Seiffert, Bobrek, Germany. (U. S. No. 902,260; October 27, 1908.)

PROTECTION OF WORKMEN. Means for Protecting the Operatives of Zinc and Other Analogous Furnaces from Heat, Fumes and Dust. Emile Dor-Delattre, Dorplein, Budel, Holland. (Brit. No. 15,288 of 1908.)

MINING—GENERAL

MINE GASES—Method and Apparatus for Preventing the Liberation of Fire Damp or Other Gases in Mines. Emile Læhrner, Paris. (Brit. No. 6346 of 1908.)

SKIP-DUMP. John Angove, Calumet, Mich. (U. S. No. 903,263; November 10, 1908.)

ORE DRESSING

CONCENTRATING TABLES—Head-Motion for Concentrating Tables. Samuel H. Boylan, Denver, Colo. (U. S. No. 901,585; Oct. 20, 1908.)

JIG. Robert H. Richards, Boston, Mass. (U. S. No. 901,475; Oct. 20, 1908.)

MAGNETIC SEPARATION—Improved Apparatus for Magnetic Separation of Ore. Metallurgiska Patentaktiebolaget, Centralpalatset, Stockholm, Sweden. (Brit. No. 16,780 of 1907.)

MILLS—Improvements in Mills or Apparatus for Crushing or Pulverizing Ores, Minerals and the Like. William H. Fletcher, Elkenhof, Jackson's Drift, Transvaal. (Brit. No. 5411 of 1908.)

ORE CONCENTRATOR. Henry L. Sulman and [illegible], London, England, [illegible] London, England. (U. S. No. 902,018; Oct. 27, 1908.)

SEPARATING MACHINE. [illegible] and Peter D. Burke, Roswell, S. D. (U. S. No. [illegible])

SEPARATION—Apparatus for Separating and Classifying Minerals. Robert H. Richards, [illegible] (U. S. No. [illegible])

METALLURGY—GENERAL

CONDENSING [illegible]. Woolsey M. Johnson, Hartford, Conn. (U. S. No. [illegible])

CONDENSING [illegible]. Woolsey M. Johnson, Hartford, Conn. (U. S. No. 902,535; October 27, 1908.)

SLAG [illegible]. Isaac C. Hoffman, South Chicago, Ill. (U. S. No. [illegible]; October 27, 1908.)

MINING MACHINERY AND APPARATUS

DRILL-SHARPENER. Dorsey E. Gilson, Coalinga, Cal. (U. S. No. 902,146; October 27, 1908.)

DRILL SHARPENING—Apparatus for Sharpening Drills or Drill-Bits. Walter E. Kimber, Johannesburg, Transvaal. (U. S. No. 902,416; October 27, 1908.)

DRILLS. Improvements in Bits or Drills for Boring Rocks and Other Hard Substances. William Stephens, Carn Brea, Cornwall, Eng. (Brit. No. 21,586 of 1907.)

HAULAGE. A New or Improved Rope [illegible] for Mine Haulage and the Like Purposes. John King, Leeds, Eng. (Brit. No. 28,239 of 1907.)

MINE-CAR-HAULING DEVICE. James Rowney, East St. Louis, Ill., assignor of one-half to William Eppmeyer, East St. Louis, Ill. (U. S. No. [illegible]; November 3, 1908.)

MINE TRANSIT. William A. Berger, Boston, Mass. (U. S. No. 902,272; October 27, 1908.)

MINERS' LAMPS. Wick-Raiser for Miners' Lamps. [illegible] (U. S. No. 903,064; November 3, 1908.)

MINING MACHINES—Improvements in and Relating to Electrically Driven Mining Machines. Communicated from Joseph A. Jeffrey, Columbus, Ohio. (Brit. No. 1250 of 1908.)

PICK MINING MACHINE. Edmund C. Morgan, Chicago, Ill. (U. S. No. 902,756; November 3, 1908.)

PROSPECTING DRILL. Anton W. Johnson, Chicago, Ill. (U. S. No. 903,194; November 10, 1908.)

ROCK-DRILLING MACHINES—Improvements in Fluid-Actuated Rock-Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. No. 13,759 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

FURNACE—Smokeless Furnace. August Krippel and Freidrich Kargl, Vienna, Austria. (Brit. No. 10,701 of 1908.)

HYDROMETALLURGY—Apparatus for the Extraction of Metals from [illegible] Ores. William E. Greenawalt, Denver, Colo. (U. S. No. [illegible])

METALLURGICAL BLAST FURNACE. William S. Dempsey, New York, N. Y. (U. S. No. [illegible])

POURING APPARATUS. Improvements in [illegible]

REGENERATIVE FURNACES. [illegible] ton, Staffordshire, Eng., [illegible] of 1907.)

REGENERATIVE FURNACES. [illegible]

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. Parke Channing, of New York, has returned from Tennessee.

J. E. Spurr, of New York, left last week on a professional trip to Arizona.

Pope Yeatman, consulting engineer for the Guggenheim Exploration Company, is at Ely, Nev.

Dr. Franz Meyer will reside at Werdigen-am-Niederrhein, Germany, after the end of this year.

George C. Stone, chief engineer of the New Jersey Zinc Company, has returned from a trip to Europe.

George A. Packard, of Boston, started Nov. 22 on a professional trip to California, Nevada and Sonora, Mexico.

Dr. George W. Maynard has returned to New York, after an absence of three months in the West on professional business.

Fred J. Pope and assistants, who have spent three months examining properties in the Pachuca district, Mexico, have returned to California.

W. F. Taylor, manager of the Taylor Gold Mines Company at Magnolia, Boulder county, Colo., is making a business visit to Chicago.

Prof. E. C. Lindemann, of Boulder, Colo., has returned from an expert trip to look over oil lands in central Wyoming, with a party of British investors.

T. J. Drummond, now superintendent for the Newhouse Mines and Smelters, at Cactus, Utah, will assume the general management on Dec. 1, relieving Lafayette Hanchett.

Thomas Hoatson, managing director of the Keweenaw Copper Company, has left Michigan for the Southwest on an inspection trip of the various properties in which he is interested.

James W. Gayley has resigned his position as a vice-president of the United States Steel Corporation. Mr. Gayley's position as a metallurgist is well known; he has been the most prominent technical officer of the corporation.

Dr. Eugene Haanel, Director of Mines, Department of the Interior, Ottawa, Canada, sailed for Europe on the "Lusitania" Nov. 25. He is going to Sweden to make further investigation of methods for the electrothermic smelting of iron ore.

It is reported that Prof. Henry Mace Payne, of the University of West Virginia, has been offered the position of chief mine inspector of that State, to succeed James W. Paul, whose resignation will take effect Dec. 31. Mr. Paul has accepted a position with the United States Geological Survey.

John S. Unger, heretofore assistant manager of the Homestake Steel Works, has been placed in charge of the department of scientific research, a new bureau just established by the United States Steel Corporation. This bureau will have its headquarters at Duquesne, Penn. A. A. Corey, recently at the Donora plant, succeeds Mr. Unger at Homestead.

H. S. Denny, of London, has been in Mexico for the past month engaged in inspecting mines and studying mining conditions. In connection with G. A. Denny, who is also in Mexico, he has established a branch office of Denny Brothers in the City of Mexico. The firm will represent several foreign syndicates in Mexico, and will also act as general consulting engineers.

Obituary

Alfonso Calsado, general manager of the Compañia Carbonifera de Ciudad Porfirio Diaz, Monterey, Mexico, was drowned Nov. 8, while on a hunting trip, in a lake near the mine.

William P. Schall, who died at Bedford, Penn., Nov. 14, was a pioneer in the development of the Broad Top coal region in Pennsylvania, and was interested in several coal companies.

George Tod died at Youngstown, Ohio, Nov. 16, aged 68 years. He was active in the development of the coal industry of Ohio, and was president of the Hill Iron and Coal Company for a number of years.

William S. McKinnon died at Ashtabula, Ohio, Nov. 17, aged 56 years. He was born in Canada, but came to Ohio when a young man, and settled in Cleveland. Later he founded the McKinnon Iron Works at Ashtabula, which he managed until his death.

Joseph Bryan died in Richmond, Va., Nov. 20, aged 63 years. He was best known as a financier and newspaper owner; but he was active in the first development of the iron industry in Alabama. He was a director of the North Birmingham Land Company and the Sloss-Sheffield Steel and Iron Company.

An accident in Ellsworth mine No. 2, at Ellsworth, Penn., on Nov. 17, caused by a loose timber on a cage catching in the side of the shaft threw the men in the cage off; they fell 300 ft. and were instantly killed. The dead included J. B. Newcomer, chief mining engineer in charge of the mine; Eugene G. Smyth and M. J. Walsh, assistant mining engineers.

Walter A. Dennison, president of the American Oil Development Company, of Pittsburg, died in Brooklyn, N. Y., Nov. 5 aged 56 years. He was born in Philadelphia, and when a young man went to western Pennsylvania, where he was interested in the development of the oilfields. At one time he was a prominent independent operator there, and controlled large interests.

Alfred Marsh, a chemist, geologist and inventor, died in Detroit, Mich., Nov. 16, aged 90 years. He was born in England, but came to this country as a young man. He was for a time with the Manhattan Gas Company in New York, and while there invented a gas meter of the type now in general use. Later he was connected with several copper mines in the Lake Superior country. For many years he was chemist of the Detroit smelting works of the Detroit & Lake Superior Copper Company. He was a student of geology, and was regarded as an authority on rock formations.

Rev. Henry F. O'Reilly, who died suddenly at Shenandoah, Penn., Nov. 23, aged 73 years, was a prominent figure in the anthracite country for many years. He had been rector of the Catholic church at Shenandoah for 40 years, and was widely known and respected. At the time of the Molly Maguire troubles, 30 years ago, he did much to quiet the excitement among the miners. In the great strike of 1902-3 his influence among the miners, especially the foreign element, was exerted strongly in favor of a settlement, and he did much to assist the Anthracite Coal Commission in its labors.

Max Heberlein died recently at Mainz, Germany, aged 48 years. He was born at Braubach, Germany, and educated at Freiberg. He came to this country when a young man, about 1882, and passed a number of years in the United States and Mexico, being connected here with several plants in Montana. After returning to Germany, he went to Tasmania as general manager for the Tasmanian Smelting Company. In 1902 he went back to Germany and for several years was associated with his brother in perfecting and introducing the Huntington-Heberlein process. While so engaged he superintended the erection of plants in British Columbia and Spain. For two years past he had acted as consulting metallurgical engineer.

Societies and Technical Schools

Lehigh University—At this institution Bethlehem, Penn., Floyd W. Parsons, associate editor of the ENGINEERING AND MINING JOURNAL, on Nov. 20, delivered a lecture on coal mining before the students. The lecture was illustrated by a number of lantern slides.

Mining and Metallurgical Society—The New York section held its regular monthly meeting at the Engineers' Club, on Nov. 19. After an informal dinner, discussion of the question, "What information should a mining company include in its report to be fair with its stockholders," was resumed. The meeting was well attended. The Philadelphia section held its organization meeting on Nov. 20. The San Francisco section has also had its organization meeting.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte and Goldfield, Mexico and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 19—Several miners near Bodfish, in Kern county, one of whom has a small mill on his mine, are after the Kern River Power Development Company, for encroaching on their properties. The power company, in making applications for patents in that section, has, it is alleged, moved the monuments on the old mining claims to one side. The miners also claim that the advertising notices are worded with intent to deceive and are about to contest the applications for patent made by the power company. Some of these mining claims were located as far back as 1895 and regular assessment work has been done upon them.

It is evident that some large company is about to take hold of the gravel mines in the Sierra county region about Slate Creek, Scales Diggings and Port Wine. There is supposed to be a deep rich gravel channel running through that section, being a continuation of the Alleghany channel. Several mining engineers of standing have been examining different properties in that section and getting at the facts connected with them. The region needs capital for extensive development, as most of the mines must be drifted and this means long and expensive tunnels before the pay gravel may be reached.

Near Big Oak Flat in Tuolumne county the Santa Ana Mining Company has built a 300,000 gal. reservoir, supplied from the Golden Rock ditch, the water to be used in ground-sluicing the surface of the Eureka and Mississippi quartz mines. A number of blanket veins and shoots of rich ore have already been found. In addition to the ground-sluice a hydraulic giant will also be used in washing away the surface.

Wallace, Idaho

Nov. 18—The greatest activity has prevailed all through the different towns of the Cœur d'Alene in connection with the report that there is an organized attempt on foot to have the tariff on lead and zinc ores reduced when that matter comes before the congressional committee on tariff revision at Washington, D. C. In connection with this report mass meetings were held in Murray, Burke, Wallace, Wardner, Kellogg and practically every other center in the district. At each of these meetings delegates were appointd to a grand conference held in Wallace yesterday, at which the following committee was appointed to attend the deliberations of the congressional committee: W. Clayton Miller, manager, Federal Mining and Smelting Company; Al Page, of Wardner; D. E. Keys, of Mullan; Herman J. Rossi, of Wallace, and William J. Brand, of Mace. Petitions have been circulated protesting against any attempt to reduce the tariff, and the committee from the Cœur d'Alene has been instructed to cooperate with Senator W. B. Heyburn, Senator Borah, if possible, and with all other districts which will be represented at the meeting.

Goldfield, Nevada

Nov. 17—T. B. Rickey, the indicted president of the defunct State Bank and Trust Company, while passing through Reno, on his way to San Francisco from Independence, Cal., where he was defendant in a suit to recover a large block of Keane Wonder stock, was served on the train with papers in a suit for an accounting of the State Bank funds amounting to $1,062,000. At the recent election a new district attorney was elected, the new incumbent being pledged to bring Rickey to trial.

Arthur Winslow, of Boston, president of the Liberty Bell Mining Company, of Telluride, Colo., has been at Goldfield this week looking over the situation generally and the Consolidated in particular. Mr. Winslow was the first president of the Combination Mines Company, whose property was put into the Consolidated at a valuation of $4,000,000. Those formerly interested in the Combination are represented on the board of directors of the Consolidated company by J. T. Hubbard, of Chicago, who visited the camp recently. The visits of large stockholders at this time just prior to the annual meeting and the quiet, but aggressive, soliciting of proxies by two different influential interests portends interesting developments at the meeting. It is confidently asserted by some that Bernard Baruch, of New York, and Mr. Hayden, of Hayden & Stone, of Boston, will be elected directors.

The steel work of the Consolidated mill is now all in place and the putting-on of the corrugated sheeting will soon be finished, but only the most optimistic believe that the mill will start before the early part of next year.

After a lapse of five years, during which the plant of the Boston Electrolytic Refining Company, a copper-lead smelter one mile east of Reno, will soon begin operations. It has been leased under option to the Nevada Commonwealth mines. This remodeled smelter will be the first plant in the State to make a specialty of zinc ores. The Commonwealth ore contains large percentages of both zinc and arsenic; both will be recovered, for the smelter will be run as a zinc-arsenic-lead plant rather than a copper smelter. The electrolytic copper-refining department will be run to treat the copper furnished by the copper plant at Carson City.

The Engineers lease has just declared a dividend amounting to $180,000. In some respects this is the most remarkable lease in the history of the camp. Ninety per cent. of the lease stock is held by three mining engineers. Work was started May 8. 1908. The owners were "strapped," the lease in debt for labor and machinery, and the engineers about to quit when ore was found June 15. Two days later the first shipment was made. In just four months of production $1,100,000 was extracted. The lease expired Nov. 8, but another dividend will be paid from the final cleanup.

Salt Lake City

Nov. 21—To voice their protest against any reduction in the tariff on lead, a mass meeting of Utah mine owners last night chose O. E. Loose, of Provo, and C. E. Allen, of Salt Lake, to appear as delegates before the Ways and Means Committee at Washington. The meeting was held under the auspices of the Utah Mine Owners' Association. The circulation of a petition to be signed against the reduction of duty was authorized by the meeting.

Butte

Nov. 19—After the conference between the coal operators and the miners of Montana at Helena two weeks ago, it was thought that the troubles at the Spring Creek and Roundup mines had been finally settled. The miners, however, refused to accept the agreement made by their representatives and went out on a strike the early part of this week. Just what action will be taken by the operators is not yet known.

The motion for the appointment of a receiver for the North Butte Extension Copper Mining Company is still pending in the United States District Court. A number of conferences have been held between the attorneys for the company and the various local creditors. The action for the appointment of a receiver was brought chiefly for the purpose of keeping the company from transferring its property to the newly organized North Butte Extension Copper Development Company, and was in the interests of the stockholders of the old company. The creditors strongly oppose the idea of a receiver and take the position that they will not receive payment any sooner by such methods. They threaten to bring other proceedings unless their claims are settled within a short time.

Kelly, New Mexico

Nov. 18—Considerable mining is being done in Socorro county, in the Kelly and the Magdalena districts. The Kelly mine is being worked by the Tri-Bullion company, for which R. W. Bull, of Kelly, is manager. The usual amount of development work is being done, and considerable ore is being shipped. The Key and Tip Top group of claims to the east of the Kelly mine and higher in the Magdalena mountains is being worked steadily. The ore bins are filled with ore of good grade, while a large tonnage of ore lies broken in the stopes. It is supposed that this group of mines, which is being worked by the Boston Development Company, will probably resume shipments in the near future. C. T. Brown, of Socorro, is manager. Mr. Brown is also developing two other promising properties, the Alhambra and the Germany Tunnel, both near the Kelly mine, and is also mining zinc and lead carbonates from his lease in the upper workings of the Kelly mine.

At the Graphic group, owned by the Ozark Mining and Smelting Company, considerable ore is developed. In the upper workings there are large stopes of lead and zinc carbonates while in the workings from the Waldo adit considerable sulphide ore containing zinc, lead and copper has been developed. Joseph Brown, of Kelly, is manager.

Simeon Exter is mining some good ore, containing lead and copper, from his lease on the Young America mine. At the Cavern and Grand Ledge mines, where the ore contains copper, lead and gold, development is going steadily ahead under the management of B. A. Stattz of Albuquerque. At the mines of the Mistletoe Mining Company and the Magdalena Tunnel Company, which are both operated under the management of W. F. Gordon, of Kelly, considerable good ore containing lead and zinc has been developed. As a result the companies are considering the building of a mill to treat the ore. At the Success group of claims controlled by John Hill, of Kelly, the 400 ft. of development work has opened up considerable good ore. William Martin, has the Stone Wall mine under lease and is shipping high-grade zinc, lead and gold ores. The Hardscrabble Extension which is being developed by the Copper Ridge Mining Company is about to begin shipping. The ore carries gold and copper. George Keith of Magdalena is in charge of the mine.

The Keystone & Barrister group of claims, two miles northeast of Magdalena in the Magdalena basin, has developed quite a large reserve of free-milling gold ore. A 10-stamp mill has been ordered. P. A. McMahan, of Magdalena, is in charge. Considerable work is also being done at the Burton and the Russell groups in Magdalena basin. This development work under the direction of Wayne Russell, of Magdalena, has opened up considerable ore carrying lead, copper and gold.

At the Silver Line group of claims in Magdalena basin a well defined vein, 9 ft. wide, has been opened up. The ore contains considerable vanadium combined with lead, copper and silver. Beautiful crystals of vanadanite occur in the ore. A. L. Heister, of Kelly, is in charge of this property. Considerable free-milling gold ore has been developed at the Carbonate and Last Chance properties in Magdalena basin. H. F. Brittenstein, of Magdalena, is in charge of these two mines.

Denver

Nov. 20—On the ground that any further reduction in the price of lead will force many of the mines in Colorado to close down, the American Smelting and Refining Company will join with the commercial organizations of Denver in fighting any effort on the part of the next Congress to reduce the import duty on that metal. The first step in the campaign against such a reduction was taken yesterday, when the Colorado Manufacturers' Association, through its board of directors, addressed a telegram to Sereno E. Payne, chairman of the Ways and Means Committee of the House of Representatives, protesting against any lowering of the tariff on lead. Other Denver commercial organizations are expected to take similar action.

At Lake City, an important strike of copper ore is reported. The orebody is said to be 11 ft. in width, and to run 35 per cent. in copper and over 50 oz. silver to the ton. It is being shipped out *via* Silverton.

In the Cripple Creek district, the Acacia company's miners broke through into the Findley workings, which latter had passed beyond its territory from 12 to 49 ft., and taken out a stope from 4 to 15 ft. wide and 50 ft. high, in Acacia ground. The manager of the Findley company has offered to settle for ore extracted, and the matter will be amicably arranged.

It is now almost certain that the Union Pacific will build from Wamsutter, on its main line in Wyoming, to Craig, on the projected line of the Denver, Northwestern & Pacific, or Moffat road. Craig is in the center of the Yampa coalfield, in Routt county, and the coal, of course, is the object of the incursion of the Union Pacific into this territory. Craig is about 40 miles west of Steamboat Springs, to which point the Moffat road will be running trains next month.

A great deal of nonsense is being published in the local papers about the Royal Flush mine at Hahn's Peak, north of Steamboat Springs. Those interested would do well to read a description of this property by a special correspondent in the JOURNAL of Oct. 24 last.

Calumet, Michigan

Nov. 20—Plans are about consummated for the consolidation of the Franklin Jr., Rhode Island and a section of land now owned by the St. Mary's Mineral Land Company. At a meeting of the Franklin stockholders to be held at Boston on Dec. 22, 1908, definite arrangements will be made. It is proposed to increase the capitalization of the Franklin property from 100,000 shares to 200,000, to sell a portion of its lands upon which the old workings were opened and also the millsite on the shore of Portage lake. The proposed company will start with an issue of 150,000 shares and will have about $400,000 and 50,000 shares in the treasury. It will control about four square miles of land in the heart of the Houghton county mineral zone, containing an extension of about 14,000 ft. on the Pewabic lode, which is to be the main working lode. The Pewabic lode is being opened up at the Franklin Jr. property by crosscuts and at the 23rd level it is exceedingly rich, indicative of the good results that are to be expected with depth. The crosscut from the 24th level is just coming into ground in close proximity to the lode.

Toronto

Nov. 20—J. B. Tyrrell, mining engineer, for many years connected with the Canadian Geological Survey, has returned to Toronto after an extended trip through the Montreal river mining district, which is now attracting much attention on account of the numerous flotations of new mining companies. Speaking of the prospects of the district generally, Mr. Tyrrell said that the noticeable feature was the great extent over which silver-bearing veins are distributed. There was silver everywhere awaiting development, but the public should not expect a repetition of Cobalt experiences, as it was not at all likely that development would pay for itself as in many of the Cobalt mines; plants must be built and much money must be expended before returns can be looked for.

S. Bennett, a trusted employee of the O'Brien mine, was tried at Cobalt, Nov. 17, for stealing 320 lb. of ore, nearly all silver nuggets; on being found guilty he received a sentence of 8 months' imprisonment.

A rich discovery of copper is reported in the Port Arthur district. The deposit, which is said to extend for miles, is near Flor island, off Isle St. Ignace, at the entrance to Nipegon strait. It was discovered by Didace Carufel, of Sudbury, and 17 claims have been taken up by Carufel and his associates.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Jefferson County

Alabama Consolidated—This company has installed a Covington coke-drawing machine in its coke plant at Brookwood.

Birmingham Coal and Iron Company—This company has installed two Covington coke drawers and loaders at its No. 2 coke plant at Short Creek.

Tennessee Coal, Iron and Railroad Company—Mine No. 3 of this company, between Ensley and Pratt City, was set on fire Nov. 16. The fire started about 50 feet. down the manway from the mouth of the slope. The mine is worked by convicts, nearly all negroes, and it is believed that a gang of these convicts started a small fire in the slope to call the attention of the guards and cover an attempt to escape. The fire, however, extended to the slope timbers and got beyond control, with the result that some 60 men were shut up in the mine. The rescue parties had much difficulty in entering and getting the fire under control. The result was that 10 men were suffocated and a number of others are missing, and are believed to be still in the mine.

Arizona

Graham County

Arizona Copper—This company's production for October amounted to 1451 tons of copper.

California

Alpine County

Welcome Mining Company—This company, owning 33 claims near Markleville, C. N. Diller, manager, has found some ore of high grade. Most of the stockholders in this company are residents of Sacramento.

Amador County

Clinton Consolidated—This old mine at Wieland, at one time a good producer, is to be started up again, this time by people from Scotland. It has been closed down since 1893. The Edinburgh group of mines at the same place is again at work, and $20-ore is being mined.

Garibaldi—In the orchard of J. Garibaldi, near Volcano, he has found gravel yielding high in gold, close to the surface. The Volcano ditch runs close to the property, and the gravel will be ground-sluiced.

Butte County

Bader—This old gravel property on the Magalia ridge, has been bonded by A. E. Smith.

Calaveras County

Angels—With few exceptions all the large and smaller mines at this important camp are closed down on account of lack of water, and rains are anxiously expected.

Eastland-Gray—This drift mine on the Calaveras river has been bonded for a short time to S. R. Fox and associates, who will prospect it with a view of dredging the ground.

El Dorado County

Prevolcanic Channel—The large gravel crusher at this mine, near Pacific, 16 miles from Placerville, has been started up. About 150 tons of gravel daily will be crushed.

Fresno County

Arrangements are being made for more extensive operations by the Fresno Copper Mines, Ltd., near Clovis. A contract has been let to a Los Angeles firm to build a railroad about four miles long from the Pollasky branch of the Southern Pacific to a connection with the north end of the copper company's existing tracks at its mine. The hauling of ore is now being done by team, and this ore has to be handled twice. With the new branch completed, as it will be shortly, the teaming will be done away with and the ore handled by rail. The Fresno copper mine is owned by a Glasgow, Scotland, company, and the ore is shipped to smelters in the State of Washington for reduction.

Inyo County

Britain—In this mine, at Beveridge, the Spear Brothers, of Lone Pine, are drifting on an oreshoot, trying to determine its extent. The ore is of high grade.

Casa Diablo—The ore being milled at this mine is a mixture from three veins, and is giving good results. The winze below the tunnel is to be extended to a depth of 500 ft. Ten stamps are to be added to the mill, which already has 10 stamps.

Mariposa County

Roosevelt No. 2—This mine on the Mt. Gaines lode, at Hornitos, owned by Taylor, Longe & Stierwalt, is showing up high-grade ore in the new strike.

Mono County

[illegible]—This mine, owned by A. Bryant, of Bridgeport, adjoins the Parrott group, and has been leased by two Italians, who have recently opened up some good orebodies.

Shasta County

[illegible] [illegible] Mining Company—This property, French Gulch district, G. A. Von Kruze, manager, is yielding ore of a satisfactory grade.

Siskiyou County

Highland—This company, at China gulch, has started up its mill.

Hardscrabble—This mine, on French creek, owned by Charles Parrott, is again being worked and its mill has been started up.

Tehama County

Tom Head Copper Company—In the lower tunnel 18-per cent. copper ore has been encountered, carrying some gold, also. The vein is much wider than where found on the surface.

Trinity County

Bonanza King—At this mine, six miles from Trinity Center, crews are being engaged for continuing work during the winter. A new tunnel is being run on the property.

Tuolumne County

Draper—Operations have been resumed at this property under superintendency of R. A. Nichols.

Gem—This mine, five miles from Confidence, under bond to Addis, Scott & Holland, has been started up.

Colorado

Boulder County

Boulder County Mines—Deeds have been filed for record conveying from C. F. Lake, of Boulder, Colo. and T. N. Barnsdall, of Pittsburg, Penn., to the Primos Mining Company, several mines for $100,000. The mines are situated in the Cardinal and Nederland tungsten sections and the Primos company is an auxiliary company to the Primos Chemical Company, which markets the major portion of the tungsten concentrates from Boulder county.

Consolidated Copper Mining Company—Work has been suspended at this mine at the base of Arapahoe peak for the winter, but the company will build a concentrating mill and power plant next spring. Main office is located in Boulder.

Eagle Rock Mill—This mill has been leased by Lincoln, Neb., and Denver men, is being overhauled and improved machinery is being installed for the purpose of handling tungsten custom ores.

Zopher—Boston men are interested in the taking over of the Wood Mountain property at Wall Street, with J. B. Annear, Wall Street, Colo., in charge of the operations. The company intends to remodel the mill.

Clear Creek County

Continental Mines, Power and Reduction Company—The power plant of this company on Fall river is to be increased by the addition of another unit of 720 h.p. and it is reported that the company will erect another power plant next season. Henry I. Seemann, Equitable building, Denver, Colo., is manager.

Conqueror—Machinery is being installed and plans have been made for heavy development. W. S. Prior, Empire, Colo., has been re-elected president and general manager.

Knickerbocker — Eastern and Idaho Springs men have become interested in a lease and bond on the Sprankle group in Empire district and William E. Hogel, of Idaho Springs, Colo., is manager. Machinery is to be installed and electric power will be used.

Memphis-Tennessee—New machinery is being hauled to the mine for installation. Charles Fuller, Idaho Springs, is in charge.

Lake County—Leadville

Canterbury—This mine, on the hill of the same name, has been under lease to local miners and worked steadily for the past few months with the result that a small vein of ore was opened recently that carries gold and silver. This is the first time that gold to any amount has been found in any vein on the hill.

Coronado—With the opening of the new orebody several hundred feet from the shaft, the air became so bad that it was impossible to work it, therefore the lessees were compelled to drive an air shaft.

Iron Silver—A small force of men has been put to work on the Tucson, North and South Moyers, to clean out the different drifts and make the necessary repairs on the shafts, preparatory to starting the properties up with a full force.

Ontario—O. P. DeFord and Myron Marsh, W. Va., are financing this property, Twin Lakes, and have asked for bids for sinking the shaft and driving the tunnel; the contracts will be let and work will be carried on during the winter.

Pitkin County

Smuggler—It is reported that this company is about to resume work on the Free Silver shaft near Aspen. The shaft is to be unwatered and sunk 200 ft.; possibly a tunnel will be driven also.

San Juan County

Gold King—All damage done by fire last June to this mine at Silverton has been repaired. The mine is now fully at work, and 70 stamps are in use at the mill.

Idaho

Shoshone County

Hecla—The following officers and directors were elected at the postponed annual meeting, held in Spokane last week: President, Frank Upman, of Chicago; vice-president, W. J. C. Wakefield, of Spokane; secretary-treasurer and manager, James H. McCarthy, of Wallace; assistant treasurer, F. F. Johnson, of Wallace; directors, S. E. Smith, of Chicago; Carl Landsee and F. J. Klipp, of Milwaukee, and Henry Ulick, of Youngstown, Ohio. Mr. Upman succeeds James R. Smith, deceased, and Mr. Wakefield succeeds A. B. Campbell, of Spokane.

Butte & Coeur d'Alene—At a meeting of the stockholders, at Mullan, it was decided to install a quantity of machinery at once. The contract for the treatment of the ore by the Panhandle smelter was also closed up. This is the property on which a strike was made recently.

Charles Dickens—The Idaho-Knickerbocker Mines Company has been formed for the purpose of acquiring the Charles Dickens mine; all of the stock in the new company, with the exception of 50 shares, has been subscribed for by A. D. Gritman. Mr. Gritman has forwarded a notice to each of the stockholders of the Charles Dickens company offering them the same number of shares in the Knickerbocker company as they hold in the Charles Dickens company in consideration of a payment at the rate of 7c. a share and the surrender of their stock in the Charles Dickens company.

Indiana

Clay County

Crawford Coal Mining Company—Nine miners employed at mine No. 9 of this company have been discharged for loading dirty coal. The matter has been referred to President Golden, of the blockcoal miners, who take the position that the men loaded only as much fireclay as was needed in shooting the kiln. Trouble is anticipated.

Sullivan County

A heavy passenger train on the Indiana Southern Railroad while crossing the undermined area of the Dugger or Vandalia Mine No. 30 caused the surface and track to subside for a space of 60 ft. The speed of the train carried it over and averted an accident. The rooms below the track were thought to be securely timbered, but it will require considerable time and expense to repair the mine and track.

Vigo County

Since Governor Hanley has ruled that the law permitted use of larger bits in mining the differences in the coalfields between the miners and operators will likely be settled soon.

Tentative negotiations for the settlement of the Hudson mine case by the operators' and miners' officials of this district have been stopped. The mine remains idle because of a difference of $17.50 wages alleged to be due a mule driver who was discharged, and refusal to reinstate him precipitated a walk out.

Iowa

Bear Creek Coal and Mining Company—This new company has secured coal rights on about 30,000 acres of land in Dallas, Boone, Polk and Marion counties. Provings are being made with a view to proving the coal and indicating the best places to sink shafts. The office of the company is at Des Moines, Iowa. The officers are: President, A. E. Hollingsworth; vice-president, J. H. Polk; treasurer, George B. Hippee; secretary, A. P. Chamberlain.

Michigan

Copper

Copper Range—At the Globe shaft, held under option by this company, drifting continues both ways from the 1000-ft. level; copper-bearing rock appears from time to time, but nothing of a permanent nature has yet been exposed. A diamond drill has been started from this point and a hole will be driven on the pitch of the formation for a considerable distance to ascertain its value at depth. At the first level, a distance of 356 ft. from surface, a crosscut has been started to cut the formation. In sinking this shaft the stations were cut at the various proposed levels, it being the intention to begin crosscutting to the lode simultaneously when the lode appeared in the shaft; the shaft is vertical and is being sunk in the hanging wall, but, owing to the disappointing showing at its intersection, these plans have been modified.

Adventure—Diamond drilling continues at this property, two outfits being in service to check and to obtain additional data regarding the rich formation that was penetrated by a drill core some time ago.

Wyandot—On the crosscut that this company is driving eastward from the 700-ft level of its exploratory shaft an amygdaloid formation was cut carrying a rich seam of copper-bearing rock. Drifting will start on this as soon as the crosscut has been extended far enough to allow the full value to be determined.

Ojibway—No. 2 shaft has just entered the lode in the crosscut being driven from the second, or 500-ft. level. The station at No. 1 shaft disclosed the lode highly mineralized, and the crosscut showed it to be about 20 ft. wide and well charged throughout. This crosscut will be extended farther to open the other beds of the series. Sinking is in progress at both shafts, and levels will be established at intervals of 150 ft. hereafter.

Quincy—Sinking will be resumed shortly at No. 9, or Pontiac shaft, which was temporarily suspended while a concrete collar was being put in. The shaft is bottomed at a depth of 200 ft. from the surface, and a good grade of rock has been in evidence throughout its length.

Missouri

ZINC-LEAD DISTRICT

American Zinc, Lead and Smelting Company—This company has started up its No. 4 plant at Prosperity, after a long shutdown.

Empire Zinc Company—This company is preparing to resume operations at its Carbonate mine near West Plains in Howell county. Capt. Dwyer, of Joplin, is manager.

Kathleen—This company at Zincite has installed a 5-in. centrifugal pump to drain the old ground and will begin operations at once. Frank B. Wilcox, of Joplin, is manager.

Merry Widow—This company has made five good strikes out of nine drill-holes on its lease of the Kalitan mine on Turkey creek.

Midway—A. W. Grannis has leased 30 acres of the Weyman land at Midway. He has installed a 6-in. two-stage centrifugal pump and will operate the old mines.

Sunrise—This company at Spring City is planning to run its hand-jig tailings through the new mill. To get them to the mill the plan devised is to drop them through a drill-hole into cans in the mine, and then hoist the cans of tailings to the hopper at the mill.

Montana

BUTTE DISTRICT

North Butte—The south branch of the Edith May vein has been cut in a crosscut running north from the station on the 2000-ft. level, and 20 ft. of 5-per cent. ore has been encountered. Drifting has progressed a distance of 125 ft. The north crosscut will be continued to cut the Jessie vein, which is between 800 and 900 ft. north of the Edith May vein. On the same level a crosscut has been started south to cut the old Speculator ledge.

Butte-Coalition—At the Tramway mine the station on the 1600-ft. level has been completed and a crosscut started northward to open up the Minnie Healy ground on that level. Through the Tramway shaft the Minnie Healy ground on the 1300-, 1400- and 1500-ft. levels is being developed rapidly and large bodies of ore of good grade have been exposed. The entire surface plant of the Minnie Healy mine has been dismantled and the gallows frame has been taken down and will be hauled away.

Sunday Placer—H. K. Welch has conveyed to James Gillie and others an undivided 56/176 interest in the Sunday placer claim, also an undivided 8/11 interest in the July, June and Wolcott placers. The claims lie near Rocker, five miles west of Butte and just south of the claims of the British-Butte company.

CARBON COUNTY

Northwestern Improvement Company—A fire, which started Nov. 20, from a miner's light in the second drift, east from the No. 2 slope of the company's coal mines at Red Lodge, has already caused the death of six miners and probably of many more, 20 miners being still entombed with faint chance for rescue. Judging from the immense volume of smoke and fire emitted from the second entry, the fire must have advanced over a large area. Iron pipes have been laid into the mines and a flow of water has been turned on the flame. The company is controlled by the officers of the Northern Pacific Railroad and supplies that road with fuel.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Both the ore-purchasing companies continued to refuse to state the tonnage being treated or handled by them. During the week ending Nov. 14 the total production of the camp probably was not more than $100,000. The Chlorination mill treated 225 tons of an average value of $60 per ton. The Combination mill treated 630 tons of an average value of $90 per ton.

Clermont—At the new Clermont shaft of the Consolidated, owing to the breaking of a pinion in the hoisting gear, a bucket of ore weighing nearly a ton fell from the collar to the bottom, a distance of 650 ft. One man was killed and another seriously injured.

Florence—The water supply for the new Florence mine is to be obtained from Indian Springs, six miles west of Goldfield. The water main is a wooden pipe, which has proved unable to carry the pressure; two miles of this wooden pipe is being replaced by iron pipe.

Florence Consolidated—The last car of ore shipped averaged $85 per ton. The raise from the intermediate level between the 300- and the 173-ft. level is in high-grade shipping ore. The north drift on this level is in ore of fair grade. On the 300-ft. level a drift is being driven to cut the payshoot which is producing shipping ore in the upper levels.

Consolidated Red Top—This lease has declared its first dividend of 2c. per share.

Mohawk Jumbo—This lease has announced its fourth dividend amounting to 3c. per share. The MacMillan Holleran Company, which promoted the lease, has dissolved by mutual consent.

Jumbo Lease—A dike carrying sulphide ore of fair grade has been cut at a depth of 360 ft. in the Jumbo lease just beyond the Zinn workings. The control in the lease is owned by W. H. Clark, of Salt Lake City.

Mitchell-Fairfield Lease—Low-grade ore is exposed in the 310-, 400- and 500-ft. levels. A new vein, fairly wide, has been cut on the lowest level in the south crosscut, 26 ft. from the shaft. The crosscut has penetrated the vein 7 ft.; the vein is hardening as the hanging wall is approached. In five months this lease has sunk a two-compartment shaft 520 ft. deep, and has done 625 ft. of lateral work.

St. Ives Leasing Company—Enough ore to make a shipment is sacked at the St. Ives mine. This comes from the 50-ft. level.

Goldfield Consolidated—The Kinkead mill which has been used to evolve and perfect the Hutchinson process for the treatment of sulphide conentrates to make them adaptable to cyanidation has been shut down. No more concentrates will be treated until the new plant on Columbia mountain is completed.

Gold Button—A contract has been let to sink 200 ft. This property is located on the easterly slope of Vindicator mountain in a hitherto-little-prospected portion of the camp.

Combination Extension—The southwest crosscut has now been driven 1200 ft., and while stringers giving high assays have been cut, no commercial ore has been found. Therefore for the present prospecting will be confined to the section north of the shaft where two raises are being driven and a crosscut has been started to the west. If no ore is found, the shaft will be sunk several hundred feet deeper. Preparations have already been made for sinking the shaft.

Florence Annex No. 2—This lease has taken out about 10 tons of ore from the 150-ft. level, where a 20-in. streak averages $60 per ton. The shaft is now 350 ft. deep; crosscuts will be driven to the ore from that level.

[illegible] raise from the 225-ft. level there has been found a streak of ore, 7 in. wide, which assays per ton 42.1 oz. gold, 34.5 oz. silver, 5 per cent. copper and 12.5 per cent. lead. Heretofore lead has been unknown in this camp.

Little Florence—The three-compartment shaft on this lease, which covers the southern three-fifths of the Combination [illegible] tion on the 520-ft. level is completed. All the company's workings are now connected.

[illegible] shut-down, work has been resumed, and

35 tons, averaging $55 per ton, has been shipped this week.

ESMERALDA COUNTY—RAWHIDE

Rawhide Coalition-Rawhide Queen—Although as yet unconfirmed officially, it is practically admitted that a merger of these two companies has been effected by Philadelphia men who have also secured control of the railroad being built to Rawhide from Shurz on the Southern Pacific system.

Rawhide Mining and Reduction Company—The 10-stamp mill for this company has been shipped from the Allis-Chalmers Company's Milwaukee plant.

Rawhide Coalition—The Grutt-Hard lease has just shipped 15 tons of ore to the sampler at Hazen; the ore averaged $300 per ton.

Wright-Price Lease—A hoist has been installed and shaft sinking has been resumed. On the 150-ft. level drifts will be run to cut the vein exposed at surface.

HUMBOLDT COUNTY—CHAFEY

Black Hole Mine—E. S. Chafey and W. M. Sims have made the last payment on the Black Hole mine to Mrs. Floyd and Mrs. Hendra, the former owners. The purchase price was $30,000. Many times this amount has been realized from ore shipped from the property since it was bonded a few months ago.

Gee Whig No. 1—In a lease on this claim a vein of galena 8 to 16 in. wide has been found. The vein is widening with depth.

NYE COUNTY—BULLFROG

Keane Wonder—A gold brick weighing 560 oz., obtained from a 10-day run in the mill, has been sent to the Mint. The October production will be above $15,000. A cyanide plant to treat the tailings dump, which contained about 14,000 tons, will be installed.

Montgomery-Shoshone—The recent report of the bullion tax collection for the first six months of 1908 shows that this company was the second-largest producer; the Tonopah Mining Company was the largest producer.

Homestake—The first clean-up at the Homestake-King mill under the new management yielded a brick worth about $10,000. While this was not a complete clean-up, it represented practically all of the October run, or 1200 tons of ore.

NYE COUNTY—MANHATTAN

Thanksgiving—Gilbert Ross, of Tonopah, has taken an 18-months' lease on the Thanksgiving property, under the terms of which he gets the use of the present mining equipment, but is to sink the shaft, now 350 ft. deep, to a depth of 550 ft. The Thanksgiving has just closed a contract for the milling of 1000 tons of ore at the Canyon mill, which is now under new management.

CHURCHILL COUNTY—FAIRVIEW

Nevada Hills—It is authoritatively announced that the sixth dividend of $75,000 will soon be paid, making a total of $450,000 since the organization of the company two years ago. Prior to Jan. 1, 1908, the Nevada Hills property had shipped to the Salt Lake smelters 4053 tons of ore, for which it received in settlement $533,480 net, equivalent to $132.63 per ton. This is a remarkable record for consecutive high-grade shipments.

HUMBOLDT COUNTY—CHAFEY

Black Hole—The pipe-line, 2500 ft. long, has been completed; the boiler and hoisting plant are installed, but the headframe is not completed as yet.

HUMBOLDT COUNTY—SEVEN TROUGHS

Seven Troughs Coalition—The Seven Troughs, Therein, Kindergarten and Red Cloud properties have been consolidated into a new company known as the Seven Troughs Coalition Mines Company.

NYE COUNTY—TONOPAH

Production for the week ending Nov. 7 amounted to 5318 tons of ore valued at $137,025. The Tonopah Mining Company mined 3300 tons; Belmont, 650; Montana-Tonopah, 623; Midway, 100; MacNamara, 350; West End, 100; Jim Butler, 250; Tonopah Extension, 45 tons.

Montana Tonopah—Repairs to the tube mills have been completed and the amount of ore treated is again normal, being about 1000 tons per week. The diamond-drill hole from the 750-ft. level has made slow progress, owing to the crumbling nature of the rock. The hole is now 130 ft. deep.

Tonopah Mining Company—During the week, 433 ft. of new ground was broken, 161 ft. in the Silver Top claim and the balance in the Mizpah and Red Plume. The diamond-drill hole from the 740-ft. level of the Silver Top mine has reached a depth of 61 ft. It is the intention to sink this hole 1000 feet.

Tonopah Belmont—The orebody on the 1100-ft. level is being developed as rapidly as possible. Where this vein was first crosscut it showed a width of 38 ft. between walls, the larger portion of this width being of milling grade. Since then the east drift has followed the foot-wall side for 90 ft. The north crosscut from the winze on the 1100-ft. level has exposed two orebodies, one 3 ft. wide and the other 6 ft. wide, separated by 8 ft. of vein matter which carries bunches of ore. Drifts are now being driven along these two deposits, both faces showing good ore.

WHITE PINE COUNTY

Giroux—The concentrating mill has been put in operation and running two shifts is treating about 400 tons per day.

New Jersey

WARREN COUNTY

Work on the copper mine near the Delaware river in Pahaquarry township has been suspended. The men employed have been discharged, only a watchman remaining at the mine. The cause is not known.

New Mexico

LINCOLN COUNTY

Eagle Mining and Milling Company—Six of the Huntingtons at the mill at Parsons are running; 35 men are working at the mine.

Oklahoma

MARION COUNTY

Golden Hen—This company is moving a mill from Joplin to its mine at Miami.

Willow Branch—J. W. Barnes has struck high-grade ore at 108 ft. in a shaft on the Willow Branch lease at Miami. This is the first deep ore developed in that camp

Pennsylvania

ANTHRACITE COAL

The shortage of water in the anthracite region, a result of the long drought, is embarrassing the operation of many collieries. The Lehigh Valley company is hauling water from White Haven 30 miles to keep the collieries in the Shenandoah district at work. The Reading Company is putting down nine artesian wells near Mahanoy City. These wells, however, will hardly be available in the present crisis; but they will provide against a repetition of the trouble.

There has been much discussion lately over the dangers of surface caving over coal workings in the anthracite district. A call has been issued for a conference to be held in Scranton, Dec. 1, at which mayors and burgesses of the cities and principal boroughs of Luzerne, Lackawanna, Schuylkill, Northumberland and Columbia counties are expected to attend. The object of the meeting is to devise some measures of protection against caving, and to appeal to the Pennsylvania legislature for the passage of some effective measure to insure safety.

BITUMINOUS COAL

J. V. Thompson, of Uniontown, Penn., has purchased 2500 acres of land in Greene county from James Evans, of McKeesport. The tract lies along Whitely creek, abutting upon the line of the proposed Wheeling shortline. The drillings show the coal to be 8 to 9 ft. thick, 350 to 450 ft. deep, and to be of high grade. This coal is south and to the east of the holdings of the H. C. Frick Coke Company, in Monongalia and Greene townships, and almost immediately south of the tracts purchased by James A. Campbell, the Youngstown Sheet and Tube Company interests, and the Andrews & Hitchcock Iron Company.

Options on coal land in Armstrong and Indiana counties are being taken by interests said to be friendly to the Erie, the Buffalo & Susquehanna and the Buffalo, Rochester & Pittsburg railroad companies. Agents have been working in that section for the past eight months. This is the first move on the part of the interests representing the Erie railroad since the 21-year trackage agreement was made with the Buffalo, Rochester & Pittsburg. On account of the competition among the three companies, owners of the coal property are asking fancy prices.

Puritan Coal Company—This company and the Stineman Coal Company, operating in Cambria county, have begun suit against the Pennsylvania Railroad Company to recover some $340,000 damages for injury done to their business by alleged discrimination in the distribution of cars.

Bessemer Coke Company—This company has let a contract for the building of 200 coke ovens at Millsboro, in Washington county, on the Monongahela river. The coal tract at that point is to be further developed and an additional mine opened. The new ovens will replace those at the Martin works, recently sold to the Republic Iron and Steel Company.

Emerald Coal Company—This company —of which Julian Kennedy, of Pittsburg, is president — has bought from J. V. Thompson, of Uniontown, a tract of 4200 acres in Greene county, the price paid being $220 per acre. The whole transaction involved $1,176,000. In securing this **latest tract the Emerald company rounds** out its Greene county holdings, as the tract lies between its two former purchases. The total acreage purchased by this company from Mr. Thompson in the three transactions reaches 9400 acres.

South Dakota

CUSTER COUNTY

Hartwell—Over 300 ft. has been driven toward the footwall in the tunnel and 55 ft. more will be driven before the main ledge is reached. The vein contains high-grade gold ore and is 40 ft. wide.

LAWRENCE COUNTY

Gilt-Edge-Maid—Superintendent L. A. McCandless has resigned to devote his time to some Wyoming properties. A directors' meeting has been called for Dec. 30, to consider increasing the capital stock from 1,000,000 to 1,500,000 shares and issuing bonds for $300,000 to cover improvements. R. N. Ogden, of Deadwood, is manager of the property.

Homestake South Extension—Superintendent A. H. Oleson, of Deadwood, is about to continue sinking the shaft another 100 ft., making the total depth 300 ft. The mine now shows 2500 ft. of workings; the ore averages $3.50 per ton gold.

PENNINGTON COUNTY

Keystone - Holy Terror — President Frank Gray, of New York, was here and made arrangements for starting up during the month. The Holy Terror will be unwatered and a drift on the 400-ft. level run to the Keystone and ore taken from both mines to the 20-stamp mill. The cyanide annex will be completed.

Tennessee

[illegible] Phosphate [illegible]—The *Manufacturers' Record* reports that this company, which has a capital of $7,500,000, takes over 16,375 acres of phosphate lands in Maury, Hickman and Perry counties, most of this being on the Swan Creek Railroad, just completed. About 10,000 additional acres are under option, and the company will soon begin the erection of plants and the development of the lands. The company is chartered under Arizona laws, and has filed its charter in Tennessee and France. Of the $7,500,000 stock, $5,000,000 will be used for purchasing the lands in Tennessee and $2,500,000 for European plants and working capital. Most of the capital will be furnished by fertilizer manufacturers and bankers of Europe. Wm. G. Daugherty is president of the company, and the offices are at 603 Keyser building, Baltimore.

Washington

[illegible] COUNTY

[illegible] Mountain Mining Company—This month it will begin work at its property on Belcher mountain for the financial difficulties have been settled. Money for carrying on the work will be advanced by Winnipeg stockholders.

Lucile Dreyfus—Shipments from this mine at Danville have ceased; two shifts of men are sinking the shaft to a depth of 450 ft. where a crosscut will be run to catch the vein. The property is owned principally by William R. Ridpath, of Spokane, who is also manager for the company.

Laurier—Six men are driving a crosscut adit at this mine near Laurier, owned by W. D. Greenough. The vein contains copper.

Manila—This mine is sending 30 tons of ore a day to Keller where it is being stored in the bins of the Keller & Indiana Smelting Company's plant, awaiting the blowing-in which will take place either this month or early in December. Over 1200 tons of ore are now in the bins.

STEVENS COUNTY

[illegible] Mining Company—A controlling interest in the Roselle Mining Company owned by Spokane people has been bought by the Germania Mining Company, composed principally of Germans, for a sum slightly exceeding 50,000. This settles a long standing dispute between the two companies regarding the ownership of about 320 acres of land, first located by the Roselle company. The property contains a valuable vein of wolframite; some of this ore has been tested in Germany and used in making tungsten steel for ordnance. William Scheck, of Spokane, is manager for the Germania company. Work on the disputed ground will probably be resumed shortly, as the company has expended $75,000 in development; the orebody has been opened by several adits.

Blue Jim Mining Company—This company has begun to develop its group of five claims on the Pend d'Oreille river. At surface good copper ore has been found.

West Virginia

[illegible]

Pittsvein Coal Company—This company, at Flemington, is erecting a new tipple and retarding conveyer, made by the Fairmont Machinery Company. The company owns about 1200 acres of coal lands, and its plant when completed will have a capacity of 1500 tons daily. John Delaney is manager.

Wisconsin

[illegible]

Benton—The Corr mill equipment was completely destroyed by fire Nov. 13; the plant consisted of a single jig mill, with Wilfley table, and power house; a separate pumping plant was saved. The Corr is a dividend payer and one of the heaviest lead producers in the district; the plant will be rebuilt. The office of the company is at Beloit, Wis.; E. D. Bullock is secretary.

Beloit-Elmo—This company will build a mill on its property three miles west of Elmo. The shaft is down 100 ft. and reveals 3 ft. of jack disseminated through a loose clay and sand which separates very freely. Beloit and Benton men comprise the company, with office at Beloit, Wis.

Bureau Mining Company—The mill equipment moved by this company to the Rooney-Swift mine, will begin operations soon, with gasolene power.

Fox—This company has purchased the roaster equipment at the Wicklow mine and will remove the same to its property at Strawbridge, four miles south of Benton. The Fox is a big low-grade producer and for the past three months has been roasting at the Enterprise plant at Platteville

Dawson—This mine, which was closed down a short time ago, has been reopened.

Platteville—C. D. Harding, who recently reopened the Graham-Stevens mine, is developing new sheet ground in a forehead 8 ft. high and 75 ft. wide; up to [illegible] inated

[illegible]

of 3 per cent. on $75,000 capitalization declared by the St. Rose Mining Company, read as though credited to the Wisconsin Zinc Company.

Wyoming

Carbon County

West Virginia-Wyoming—In this mine near Encampment a body of sulphide copper ore is said to have been found, apparently of considerable size. J. W. Buckley is superintendent.

Canada

Ontario—Cobalt District

Ore Shipments—Shipments of ore for the week ending Nov. 14 were as follows: Chambers-Ferland, 60,000 lb.; City of Cobalt, 61,700; Kerr Lake, 61,400; La Rose, 395,500; Nipissing, 293,740; O'Brien, 255,180; Temiskaming & Hudson Bay, 60,000; total, 1,187,520 pounds.

Buffalo—The management is at present recovering between 80 and 84 per cent. of the silver on the concentrating tables. With the instalment of the cyanide plant, which is expected to be in operation about the first of the year, it is hoped to increase the recovery to 95 per cent. Drifting on vein No. 12, at the 175-ft. level discloses ore richer than that obtained on the same vein at the 80-ft. level.

Chambers-Ferland—A vein 2 in. wide, carrying about 3000 oz. silver per ton, has been struck at the 80-ft. level of No. 2 shaft. Contracts have been made with the Right of Way company to raise from the La Rose vein on the Chambers-Ferland to the surface.

Crown Reserve—Royalties to the Ontario Government for the quarter ending Oct. 31 amounted to $10,257. From the main working shaft at the 100-ft. level drifting is being pushed east and west, blocking out large quantities of high-grade ore. The original shaft is down nearly 130 ft. and will be sunk 70 ft. lower, where drifting to the east will be started. Crosscutting is being continued north to intercept rich veins located by diamond drilling.

Coniagas—The mill of this company is being increased to 30 stamps, which will give it a capacity of 120 tons per day.

Trethewey—The directors have decided to make a 10-per cent. distribution of profits on Dec. 15. The company, instead of declaring dividends at stated intervals, will disburse profits whenever a sufficient surplus accumulates.

King Edward—A new smaltite vein nearly 2 ft. wide has been discovered on the surface.

Magee Location—This property, just north of the Violet, is being developed for Montreal capitalists by Chas. O'Connell with a force of 25 men. A diamond drill is in operation.

Nipissing—Several new finds have been made recently. At the 140-ft. level on the Kendall vein, 305 ft. east in the drift, a series of cross-veins has been encountered, the largest of which is 5 in. in width carrying rich ore. The rock between these veins is heavily shot with silver. Vein No. 49, at the 105-ft. level, has widened to 18 in. and carries 5000 oz. silver to the ton.

Nova Scotia—A rich strike of native silver has been made in the big 8-ft. orebody in the lower level.

Silver Bar—Operations are to be resumed at this mine, which has been idle for some time owing to financial difficulties. A syndicate of Toronto and Cobalt capitalists has secured a controlling interest. Some good ore has been taken from the shaft at a depth of 80 ft., and another promising vein has been found at the surface.

Station Grounds—On this property a good strike has been made. A vein between 5 and 6 ft. wide is said to have been found on the surface showing cobalt bloom. It apparently runs into the Cobalt Lake and Nipissing properties.

Temiskaming—In drifting on the Gans vein, at a depth of 200 ft., a rich native silver vein 7 in. wide has been encountered.

Ontario—Montreal River District

Marcel Mines Company—Work is being done at this property in James township, under the direction of J. W. Moffatt, consulting engineer. Fifteen veins have been traced and several prospecting shafts will be sunk.

Ontario — Rainy Lake Gold District

Several important discoveries have recently been made. At Dyment, Thomas Hogan found a reef of ore, samples from which are stated to assay $3124 to the ton. A number of stamp mills are being erected in the district.

Nova Scotia

Dominion Coal Company — Shipments of coal up the St. Lawrence have closed for the season; the total for the year was 1,345,000 tons, an increase of about 225,000 tons over 1907.

Mexico

Chihuahua

Mineral Production—The mineral output of Chihuahua for the year 1907 amounted to 21,854,309 pesos, according to recently published semi-official statistics. The bulk of this total came from mines in the Santa Eulalia, Parral, Naica and Sierra Madre districts.

Rio Plata—The statement of October operations contains the following items: Production of the month, 62,764 oz. silver, giving net returns of $46,335.12; operating expenses, $13,901; paid account indebtedness on mine, $32,435, leaving a balance of $138,240 due on mine Nov. 1; average value of concentrates shipped during first ten months of year, 1413 oz. silver to the ton.

Hearst Oil Concessions—It is reported that W. R. Hearst and associates will shortly resume oil-drilling operations on their tract in eastern Chihuahua. The exploitation work to date is said to have been encouraging and additional lands are being acquired under concession.

Bullion Shipments—Recent bullion shipments from the Sierra Madre section include the following: Republic, 26 bars; Candemêna, 12 bars; A. Seyfert, 6 bars and Rascon Bros., 3 bars.

La Fortuna—This old silver mine in the vicinity of Nueva Casas Grandes along the line of Rio Grande, Sierra Madre & Pacific railroad in the northern part of the State is reported under profitable operation by La Fortuna Mining Company. A force of 60 men is employed under the direction of L. D. McBane.

Monclova-Chihuahua Railway—Recent reports indicate the probability of the consummation of this project which will benefit localities of known mineral deposits in this State as well as in Coahuila. The promoters have been given substantial encouragement financially. As projected, the eastern terminus will be Monclova, Coahuila, on the International line and the western at Chihuahua.

San Francisco del Oro—It is announced at Parral that this company is shortly to begin building a railroad from Molina station on the Parral & Durango road to its operating mines.

Parral Output—The production of the Parral camp for the week ending Nov. 13 was 9100 tons, of which 5450 tons were locally treated. The October output totaled 42,320 tons.

Guanajuato

Bullion shipments for the week ending Nov. 21 showed a slight increase, amounting to $91,500. The ore and concentrate shipments were valued at $57,000, same as last week. Total for the week, $148,500.

Jalisco

The completion of the railway to Colima makes it possible to go directly from Mexico City to the Pacific coast at Manzanillo via Guadalajara. This is the second transcontinental connection to be made recently, the other being farther south, at Tehuantepec. There are now 12 lines of steamers which touch at the two ports, Puerto Mexico and Salina Cruz.

San Pedro Analco—This company operating near Hostotipaquillo is adding to its present hydraulic power plant on the Santiago river and is also designing a cyanide mill and plant for treating its own and custom ores. The office of the company is in Guadalajara.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial
Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 25—Coal trade in the West seems to be about the same as last reported. There is still some congestion at important centers, owing to large shipments from mines. The Lake trade is closing without any great rush. Steam trade increases slowly, the gain being too small to make any marked difference from week to week. Our recent estimate of a decrease of 20 to 25 per cent. this year in bituminous-coal production seems to be generally accepted as approximately the fact. In the East the bituminous trade shows more activity, especially on the Seaboard and in New England territory, where winter stocks have to be considered.

Anthracite trade is quiet, in view of the continued mild weather. The demand for steam sizes of anthracite continues to be moderate.

The question of liability for damages resulting from discrimination in the distribution of empty cars is to be tested in two suits just begun by coal operators against the Pennsylvania Railroad Company.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 14, in short tons:

	1907.	1908.	Changes.
Anthracite	4,957,237	4,493,592	D. 463,645
Bituminous	34,673,915	29,335,198	D. 5,338,717
Coke	12,223,789	6,125,180	D. 6,098,609
Total	51,854,941	39,953,970	D. 11,900,971

The total decrease this year to date was 23 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, nine months ended Sept. 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	16,336,967	2,135,595	18,472,562
Buff., Roch. & Pitts.	3,974,772	245,953	4,220,725
Buff. & Susqueh'na	812,999	134,312	947,311
Penn. lines, N. Y. C.	4,783,879	52,060	4,835,939
Pitts. & L. Erie	5,866,360	2,121,154	7,987,514
Norfolk & Western	8,056,080	1,384,569	9,440,649
Total	39,831,057	6,073,643	45,904,700
Total, 1907	49,297,747	10,968,080	60,265,827

Total decrease, 14,361,127 tons, 23.7 per cent. In addition the Baltimore & Ohio carried 713,774 tons anthracite in 1907, and 546,959 in 1908; decrease, 166,815 tons.

Coal receipts at St. Louis, nine months ended Sept. 30 were 5,695,571 short tons in 1907, and 4,831,849 in 1908; decrease, 863,722 tons.

Coal shipments by water from Seattle and Tacoma, Wash., nine months ended Sept. 30, were 542,694 tons in 1907, and 401,094 in 1908; decrease, 141,600 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, nine months ended Sept. 30, short tons:

	1907.	1908.	Changes.
Hocking Valley	[illegible]	[illegible]	D. [illegible]
Toledo & Ohio Central	[illegible]	[illegible]	D. [illegible]
Baltimore & Ohio	[illegible]	[illegible]	D. [illegible]
Wheeling & L. Erie	[illegible]	[illegible]	D. [illegible]
Cleve., Lorain & Wh.	[illegible]	[illegible]	D. [illegible]
Zanesville & Western	[illegible]	[illegible]	D. [illegible]
Toledo Div., Penn. Co.	[illegible]	[illegible]	D. [illegible]
L.Erie,Alliance&Wh.	919,551	734,953	D. 184,598
Marietta, Col. & Clev.	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	D. [illegible]

The total decrease this year was 24.9 per cent.

Coastwise shipments of coal from chief Atlantic ports, nine months ended Sept. 30, long tons:

	Anthracite	Bitum.	Total.	Per c't.
New York	[illegible]	[illegible]	[illegible]	[illegible]
Philadelphia	[illegible]	[illegible]	[illegible]	[illegible]
Baltimore	[illegible]	[illegible]	[illegible]	[illegible]
Newport News	....	[illegible]	[illegible]	[illegible]
Norfolk	.. ..	1,249,309	1,249,309	4.2
Total	12,754,492	16,902,207	29,656,699	100.0
Total, 1907.	14,167,426	18,141,460	32,308,886	.....

Total decrease this year, 2,652,187 tons, or 8.2 per cent. New York includes all the New York harbor shipping ports.

New York

Anthracite

Nov. 25—The hard-coal market is dull, and largely dependent upon the weather. Both prepared and small steam sizes are plentiful, and the demand is only moderate. It is stated that the larger anthracite mines will close down on Thanksgiving Day and will not reopen until the following Monday.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The soft-coal market is variable. One day orders are fairly plentiful and the next day there is no demand. On the whole there is a slight improvement, especially when compared with a month ago. New York harbor continues dull, and good grades of steam coal fetch $2.[illegible]@2.65 per ton. No trouble is experienced with either transportation or car supply.

In the Coastwise vessel trade boats over 1500 tons capacity are plentiful, but smaller craft are scarce. Freight rates are firm and unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, [illegible]; Lynn, Newburyport and Bath, [illegible]; Portsmouth, 80c.; Bangor, $1@1.10; Providence and New Bedford and the Sound, [illegible] 75c. per ton.

Birmingham

Nov. 23—Coal operations in Alabama show steadiness and the production is finding a ready demand right along. There is still room for improvement, however. A fire in mine No. 3, of the Tennessee Coal, Iron & Railroad Company, worked exclusively by convicts, caused the death of eight convicts the past week. The mines were out of commission for a couple of days. The Margaret mines were also out of commission for a few days the past week because of a fire on the face of the coal. Coal prices in Alabama show no change. There is still considerable labor waiting the opportunity to pick up tools. Coke is in good demand and the quotations are strong.

Chicago

Nov. 23—The coal market, for both steam and domestic supplies and sales, has improved in the last week, though still far from being satisfactory to most dealers. Supplies of the coals most subjected to demurrage sales have been restricted, and the demand has quickened perceptibly. Much coal from Illinois mines, however, is still sold at 10 or 25c. less than the average market price, to escape demurrage charges, and smokeless run-of-mine has the same trouble of over-consignments. With the mild weather the demand for domestic supplies has slackened; this demand increased under the cold spell that ended in the middle of the week. Sales for steam supplies are increasing with the general betterment of business, but the receipts of steam coals are so large that prices cannot advance.

Lump and egg from Illinois and Indiana mines bring $1.65@2.65; run-of-mine $1.65@1.75 and screenings 95c.@$1.65, car prices. Coals from east of Indiana find in general good demand, Hocking especially, with sales increasing and shipments not too heavy for firmness of prices. Smokeless producers are holding back run-of-mine with the result that more coal is sold at circular prices or near thereto. Smokeless lump and egg are strong, bringing $4.05@4.20, with run-of-mine at $2.85 [illegible] Youghiogheny is [illegible] and Pittsburg No. 8 weak at $2.05@2.85 for the same size.

The anthracite market shows more

steadiness with sales fairly good and well distributed, nut coal being somewhat scarce. Retail dealers are not heavily supplied, in general.

Indianapolis

The coal industry in Indiana up to date has shown a falling off at least 25 per cent. when compared with the same period last year. The operators in Southern Indiana have lost a portion of their trade with river towns south of Evansville because of low water, and because of the continued dry and warm weather the Northwestern trade has been much more tardy and sluggish than usual. During the past week Lake trade orders began coming in and the Indiana miners worked more days than at any time since last March. Prices remain the same except a slight increase for steam coal, the demand for which has materially increased since the election.

Indiana is waking up to the necessity of conserving its natural resources and a movement has been started to improve and develop the water ways of the State. By such improvement lower rates on coal can be secured and impetus given to many industries.

The officials of the Indiana District of the United Mine Workers, in pursuance of the agreement with the operators, have selected Thomas Haggerty National board member from Pennsylvania, to act with Harry Moore of the Indiana operators' executive board to arbitrate and settle the Hudson mine strike. Under the agreement the decision of the two is to be final.

Pittsburg

Nov. 24—A falling off in production is noted this week, not more than 50 per cent. of the railroad mines being in operation. The decline is due to a suspension of shipping to Lake ports. Prices remain firm on the basis of $1.15 for mine-run coal at mine, but small producers are shading this for prompt shipment. Slack is 60@75c. The river mines continue idle, and there are no signs of a rise in the rivers. Stocks loaded and ready for shipment as soon as the rivers are navigable are the largest for many years.

Connellsville Coke—Conditions in the coke trade continue about the same as a week ago. The thousands of men who went to their homes in foreign countries when the depression began last fall are not returning as rapidly as desired. Of the 38,000 ovens in the Connellsville regions, not more than 18,000 are on the active list. This indicates that fully 20,000 men are absent. One independent concern this week was unable to fill a contract on account of a scarcity of men. Prices remain firm at $2 for furnace and $2.25 for foundry for contracts covering the first half. For prompt shipments the price for furnace coke may be shaded. The *Courier* gives the production in both fields at 228,190 tons. The shipments amounted to 7984 cars as follows: To Pittsburg district, 3036; to points west of Pittsburg, 4365; to points east of Connellsville, 583 cars.

Foreign Coal Trade

United States Exports—Exports of coal from the United States, nine months ended Sept. 30—heretofore reported—with the addition of coal furnished to steamships in foreign trade, long tons:

	1907.	1908.	Changes.
Exported.	9,819,143	8,629,683	D. 1,189,460
Steamship coal..	4,223,554	4,470,384	I. 246,830
Total....... ...	14,042,697	13,100,067	D. 942,630

Total decrease this year was 6.7 per cent.

Nova Scotia Coal Shipments—Shipments by companies from Nova Scotia mines, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Dominion	2,716,936	2,815,546	I. 98,610
Novo Scotia Steel ..	518,742	545,305	I. 26,563
Cumberland........	213,409	305,516	I. 92,107
Acadia...........	262,230	265,389	I. 3,159
Inverness..........	198,847	218,236	I. 19,389
Intercolonial.......	222,547	210,296	D. 12,251
Total.....	4,132,711	4,360,288	I. 227,577

All the companies but one show increases. Total gain this year, 5.5 per cent.

British Coal Trade—Coal exports of Great Britain, with coal furnished to steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Coal	52,814,549	52,423,508	D. 391,041
Coke..............	768,415	958,102	I. 189,687
Briquets..........	1,233,226	1,244,869	I. 11,643
Total exports...	54,816,190	54,626,479	D. 189,711
Steamer coal......	15,539,691	6,218,324	I. 678,633
Total............	70,355,881	70,844,803	I. 488,922

The larger exports this year were 8,725,923 tons to France, 8,222,943 to Germany, 7,265,680 to Italy and 3,568,928 tons to Sweden.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 14: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.80; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 25—The sensation of the week has been found in Andrew Carnegie's article published in the *Century Magazine*, in which he claims that duties on iron and steel are no longer needed to protect manufacturers in this country from foreign competition. The matter has been taken so seriously that a conference of iron and steel men has been held in New York and a delegation named to appear before the Ways and Means Committee in Washington. Undoubtedly Mr. Carnegie's views will have much influence on public opinion, in view of the present agitation for tariff revision.

Business in pig iron has been less active so far as foundry iron is concerned, but there have been considerable transactions in basic pig. The foundry demand seems to be largely satisfied for the present, but steel makers are looking forward to more active business. In finished material the market has been rather quiet. Structural steel is still the leader, but the contracts closed have not been large.

There is a report current that the Louisville & Nashville Railroad Company is seeking to place an order for 65,000 tons of open-hearth steel rails, and being dissatisfied with terms offered, has asked bids from some foreign makers for the rails delivered at Pensacola, Fla. It is not possible to confirm this rumor at present.

A conference of steel men, under the auspices of the United States Steel Corporation, has been called, to be held in New York, Dec. 10. It is probable that there will be a general consideration of the price question.

Lake Superior Corporation—The large block of stocks and bonds for some time past held in Philadelphia, chiefly as collateral for loans to the Canadian Improvement Company, has been sold to a syndicate, said to be composed of New York and Canadian capitalists. It has been reported that the deal was in the interest of the United States Steel Corporation, but this is not at all certain.

Birmingham

Nov. 23—An intimation of an advance in quotations for pig iron has been sounded in the Southern territory already, an order for 200 tons of gray-forge iron having been booked by one of the smaller companies during the past week at $11.75 per ton. The iron is to go to the Eastern territory. All manufacturers who are in a position to take on more business for delivery during the first quarter of the coming year are finding no difficulty in disposing of their product. While it is still announced that $13 per ton, No. 2 foundry, is the average quotation for the product in this district, some of the furnace companies are asking a better price.

The big steel plant of the Tennessee company will at the turn of the coming year not only have more men employed, but will start on double turn. The cast-iron pipe makers are landing orders right along and already have reason for steady operation of plants.

Chicago

Nov. 23—The iron market continues to gain strength, but without any startling features. Users of pig iron are generally increasing their purchases, yet limiting tonnage to their needs for the first quarter or first half of next year. The customary reluctance to crossing the imaginary line of the new year is not manifest; confidence exists in the future. It is only a question with the average buyer now how far he can go without running too far ahead of general business recovery. Not only is the aggregate tonnage of sales now increasing, but the increase is caused by an enlargement of the average order. Hand-to-mouth buying is disappearing.

Southern No. 2 foundry holds to $13 Birmingham ($17.35 Chicago), with perhaps a few sales made at slightly less, but with more in which $13.50 Birmingham is asked and obtained. Northern No. 2 finds its low point at $17, with a range of 50c. higher. Lake Superior charcoal is firm at $19.50@20. These prices are for the first and second quarters, with the concession made to delivery within the next 30 to 60 days practically out of existence.

Iron and steel products show increasing strength, with structural materials and railroad supplies in heavy prospective demand, to judge from inquiries, and a fair amount of buying almost everywhere. Coke is active and slightly higher in price, the best Connellsville commanding $5, with 25c. more said to be obtained on some contracts.

Philadelphia

Nov. 25—The pig iron market is quieter. Sales of foundry are slower, but basic is doing well. Forge is picking up a bit. Sales run into the first quarter of 1909, but furnaces are beginning to hold back on second-quarter orders at current prices. No. 2X may be quoted at $17@17.50; basic around $16.25; forge at $15.50. Not much Alabama iron is offered, but Virginia pig is in evidence.

Bars—Retail business is picking up. An advance of $2 per ton on iron bars is reported from Pittsburg, putting them higher than steel bars.

Sheets—Store business is better, and small orders are coming to mill; but no big ones.

Plates—Car building and other work requiring plates are looking up. There is a better demand, and mills are filling up gradually.

Steel Billets—Inquiries are better, especially for forging billets.

Structural Steel—An increased demand for moderate sized lots for bridge and building work is the feature. Some large orders are held upon the price question.

Scrap—Dealers are raking in scrap, in anticipation of higher prices. They are feeling better than for some time, and will not sell except at their own figures. There is talk of $16.50@17 for heavy-steel melting; $19@20 for No. 1 railroad, and $15@15.50 for good cast scrap.

Pittsburg

Nov. 24—While there has been no decided improvement in conditions in the iron and steel trade compared with last week, the tone is much better and the outlook is considerably brighter. In finished-steel lines small orders are being booked, and production shows slight gains. It is reported, but not officially confirmed, that a new, long-term contract has been made by the American Sheet and Tin Plate Company with the American Can Company. It is said the Can company will take fully 65 per cent. of the tinplate production, but this is regarded as entirely too high. The tinplate company is operating its tinplate and sheet mills at about 55 per cent. of capacity. The large steel companies—Carnegie, Republic, Jones & Laughlin, National Tube and American Steel and Wire—are operating to nearly 65 per cent. of capacity. The Republic will put its bessemer-steel plant at Youngstown in operation on Monday. New business taken by the Jones & Laughlin Steel Company includes plates and shapes for the new ore boat to be built by Great Lakes Engineering Company for the Shenango Steamship Company, one of the W. P. Snyder interests. About 7000 tons of steel will be required. The Pressed Steel Car Company is figuring on about 6000 steel cars, which will mean a contract with the Carnegie company for upward of 60,000 tons of plates. The Carnegie company has taken orders for 5000 tons standard steel rails and about 3000 tons of light rails. It also has booked an order for 2000 steel wheels which will be turned out at its plant at McKees Rocks, Pittsburg.

Pig Iron—The market is not as active as a week ago, although there have been some good sales at higher prices. Quotations continue to be made at the figures given a week ago, and in some cases at the maximum. One producer is naming $16, Valley furnaces, as the minimum for standard bessemer, malleable bessemer, No. 2 foundry and basic, for prompt and first-quarter delivery. Sales made during the week have been at lower prices. The Standard Sanitary Manufacturing Company has bought in the past three weeks 10,000 tons for the New Brighton and Allegheny plants, covering requirements up to July 1, 1909. The company has not covered for its plant at Louisville, where only Southern iron is used. The Westinghouse Electric and Manufacturing Company closed for 3000 tons of Nos. 1, 2 and 3 foundry. The price is said to have been $15.50 for No. 2. The iron is for second-quarter delivery. Small sales of bessemer for prompt shipment were made at $15.75; malleable bessemer at $15.50; basic at $15.75; No. 2 foundry at $[illegible] 15.75, and gray forge at $14.25, all f.o.b. Valley furnaces.

Steel—There is but little doing in billets at $25, Pittsburg, the regular quotations. Sheet-bars remain at $27.50, steel bars at 1.40c., and plates at 1.60c. Iron bars have been advanced to $2 per ton above steel bars, being 1.50c. Pittsburg.

Sheets—There is a slight improvement in sheets, and recent shading has been stopped. Black sheets are quoted at 2.50c.; galvanized at 3.55c. for No. 28 gage.

Ferro-manganese—The market is strong; prices for prompt and first-quarter are $47@48, with indications of an advance.

Foreign Iron Trade

Russian Iron Ore Exports—Exports of iron ore from Russia have shown a remarkable gain, rising from 28,884,000 poods (464,200 long tons) in 1906, to 54,905,000 poods (882,400 tons) in 1907; an increase of 90.9 per cent. A large part of these exports are to Germany.

Blast Furnaces in Great Britain—On Sept. 30 there were reported in Great Britain 301 furnaces active and 214 out of blast. The average number of furnaces in blast for the quarter ended Sept. 30 was 298, or 15 less than in the June quarter.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 25.

[illegible]

[illegible]	[illegible]	Imports.	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
" 1907..	[illegible]	[illegible]	[illegible]

[illegible]

Gold—Bar gold is quoted on the London open market at 77s. 11¼d. per ounce, a decline of ⅜d. from last week. American gold eagles are 76s. 6¼d. Foreign exchange is higher in New York, approaching the gold export point. Some gold has gone to Canada.

Foreign commerce of the United States 10 months ended Oct. 31, as reported by Bureau of Statistics, Department of Commerce and Labor:

[illegible]	[illegible]	[illegible]
[illegible]	$ [illegible]	$ [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	$ [illegible]	$ [illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		$ [illegible]

The gold and silver movement in detail [illegible] column

Platinum—The market is inclined to be higher. Some small lots of scrap sold this week at $21; dealers are quoting $24 for ordinary refined, $26.50 for hard, and $19 for scrap. This represents, of course, the ordinary business, which is more or less of a retail character. It is reported that large consumers are still able to buy on a basis of $18 for ingot.

Silver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
19	4.8600	49⅞	23 1/16	23	4.8645	49⅝	22 15/16
20	4.8630	49⅞	23 1/16	24	4.8650	49¼	22¾
21	4.8625	49⅞	23 1/16	25	4.8650	49¼	22¾

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver—The market still shows a slight declining tendency. The bear account in London, we understand, still remains uncovered. Without active purchases on a larger scale than has been obtaining, no advance is to be expected.

The Mexican Financial Agency in London announces that the Mexican Monetary Commission will accept offers of 5000 kg. weekly of silver for coinage; this amount may be increased in future.

Shipments of silver from London to the East, year to Nov. 12, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India........	£10,133,904	£8,250,623	D. £1,883,281
China........	217,350	516,400	I. 299,050
Straits......	645,950	164,885	D. 481,065
Total......	£10,997,204	£8,931,908	D. £2,065,296

Exports for the week, £42,000 to India. Imports, £10,000 from New Zealand, £6000 from Mexico, £144,000 from New York; £160,000 in all.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
19	14⅜ @14½	14 @14¼	62⅞	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
20	14⅜ @14½	14 @14¼	63⅜	30¼	4.30 @4.32½	5.07½ @5.12½	4.92½ @4.97½
21	14¼ @14½	14 @14⅛	....	30⅛	4.30 @4.32½	5.10 @5.12½	4.95 @4.97½
23	14¼ @14⅜	14 @14⅛	62⅝	30	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½
24	14¼ @14⅜	14 @14⅛	62⅝	30	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½
25	14¼ @14⅜	14 @14⅛	64	30⅜	4.27½ @4.32½	5.10 @5.12½	4.95 @4.97½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Nov. 18 the market has continued dull and has been dominated by the offers from and transactions effected by the weaker speculative interests. The market has been followed downward by certain first hands, but in general the producers have made no concessions from their prices previously asked, which they expect will soon be realized. The setback in the market has, moreover, been stayed by bids from consumers at a shade less than is the price quoted. Consequently, although the market has appeared weaker, some speculative lots having been sold sporadically as low as 13⅞c. for electrolytic and 14⅛c. for Lake, there is felt to be a strong undercurrent in the general situation and an early recovery is confidentially expected, which may go higher than the last previous rise, but the idea of a runaway market is discouraged among the more conservative interests. On the comparatively small business of Nov. 18-25 prices have been rather irregular. At the close Lake copper is quoted at 14¼@14⅜c.; electrolytic in ingots, cakes and wire bars at 14@14⅛c. The average for casting copper has been 13¾@13⅞ cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

An important feature in the copper market recently has been the increased participation of bold speculative interests in New York. These have operated chiefly in Standard copper in London, commitments to the extent of 1000 tons having been entered into in some cases. There have also been some speculative transactions in refined copper on this side, but these have been discouraged by the selling agencies and have been permitted only in special cases when blunt refusals might have been impolitic. The present large speculative ventures are viewed with apprehension among the selling agencies, which aim to deal only with manufacturers, inasmuch as they may be an unusually disturbing factor should the market fail to make a further advance in the near future. As is well known, there is a close relation between the prices for Standard in London and refined in New York.

During most of the week the London market for Standard copper fluctuated uncertainly, but on Tuesday a good speculative demand again set in and the market advanced £1, closing strong at £64 for spot, £64 18s. 9d. for three months.

Refined and manufactured sorts we quote: English tough, £67 10s.; best selected, £66 10s.@£67 10s.; strong sheets, £78 10s.@£79 10s.

Exports of copper from New York and Philadelphia for the week were 4762 long tons. Our special correspondent states the exports from Baltimore at 1058 tons.

The office of L. Vogelstein & Co. has been removed from 100 Broadway to 42 Broadway, New York.

Tin—The London market evinced a rather firmish tendency throughout the week. While at one time prices showed a maximum decline of about £2, the turn was just as pronounced and the close is firm at £137 10s. for spot, £139 for three months.

The home market is a rather dull affair, owing to an entire absence of interest among consumers. Such transactions as are being consummated are of a retail character only. At the close the market is quoted at 30⅜ cents.

Exports of tin from the Straits, 10 months ended Sept. 30, were 45,503 long tons in 1907, and 49,608 in 1908; increase, 4105 tons.

Receipts of Bolivian tin in Europe in October included 61 tons of bars and 2691 tons concentrates; the equivalent metal being 1677 tons.

The output of the Federated Malay States, nine months ended Sept. 30 was 35,573 long tons tin in 1907, and 36,679 in 1908; increase, 1106 tons.

Lead—Buyers remained out of the market and little business has taken place. At the close, lead at New York is quoted at 4.27½@4.32½c., and 4.20@4.25c. at St. Louis.

The market abroad has declined further, Spanish lead being quoted at £13 8s. 9d., English lead £13 11s. 3d. per ton.

Spelter—Demand for this metal continues very good, and a large business has been done, both for prompt and future deliveries, at somewhat higher prices. At the close St. Louis is quoted 4.95@4.97½c., New York, 5.10@5.12½ cents.

The London market for spelter is a little higher, good ordinaries being quoted at £21 2s. 6d., with £21 7s. 6d. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Aluminum—Prices have been reduced again, and the Aluminum Company of America is now quoting 24c. base for No. 1 ingots; 33@34c. base for sheets. Foreign aluminum is offered at 22c. for ingots. The range is, therefore, 22@24c. per pound. Abroad, aluminum is still quoted at 13½ and 14 cents.

Antimony—The market is quiet, but a good feeling prevails. Prices are firmer abroad than in New York. Quotations are 8⅛@8¼c. for Cookson's, 8@8⅛c. for

Hallett's, and [illegible] for ordinary brand.

Quicksilver—The market is unchanged, with fair demand. New York price is $46@47 per flask of 75 lb. San Francisco quotations are $44@45 for domestic orders, $42@43 for export. London, £8 10s. per flask, with 1s. 6d. less quoted by jobbers.

Nickel—Large lots, [illegible] New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, ten months ended Oct. 31, figures in long tons, except quicksilver, which is in pounds.

	Imports.	Exports.	Excess.	
Copper	[illegible]	[illegible]	Imp.	[illegible]
Copper, 1907	[illegible]	56,966	Imp.	37,117
Tin	[illegible]	33,764	Imp.	5,447
Tin, 1907	[illegible]	[illegible]	Imp.	[illegible]
Lead	[illegible]	42,733	Imp.	156,151
Lead, 1907	167,105	[illegible]	Imp.	129,839
Spelter	[illegible]	6,922	Imp.	[illegible]
Spelter, 1907	89,183	5,126	Imp.	84,057
Quicksilver, lb.	3,168,186	1,542,250	Imp.	1,625,936
Quicksilver, '07	[illegible]	2,061,470	Imp.	878,326
Ores:				
Tin ore and con.	21,724	....	Imp.	[illegible]
Tin ore, 1907	17,918	....	Imp.	17,918
Pyrites	652,241	....	Imp.	652,241
Pyrites, 1907	[illegible]	..	Imp.	[illegible]

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports this year the United States furnished 5820 tons copper matte, 51,[illegible] tons fine copper and 31,080 tons lead.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 21—The $40-mark was reached this week as the highest price paid for zinc ore on a basis of $38@39 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $55 per ton was paid, one car of chunk lead bringing $56 per ton.

SHIPMENTS, WEEK ENDED NOV. 21

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	[illegible]	66,070	[illegible]
Cuba City	[illegible]	[illegible]	
Benton	[illegible]	53,860	
Days Siding	[illegible]		
Strawbridge	[illegible]		
Hazel Green	[illegible]		
Galena	[illegible]	.....	.
Total	[illegible]	[illegible]	[illegible]
Year to Nov. 21	98,924,552	9,562,915	4,164,604

Highland, Linden and Mineral Point are not reported, but this tonnage will be included next week. In addition to the above there was shipped to the Platteville Separating Company 436,150 lb.; to the Joplin Separator Works, 158,800 lb.; to the Enterprise roaster, 133,000 lb. zinc ore.

The higher price paid for zinc ore is effecting a revival of activity and increased production in the Platteville district. The average weekly shipment from the district of 2,400,000 lb. will be increased 40 per cent. within the next 30 days.

Joplin, Mo., Nov. 21—The highest price paid was $43, on an assay basis of $40. The base price ranged during the week from $38 to $42 per ton of 60 per cent. zinc, on sulphide concentrates. The higher base price was paid for concentrate carrying heavy iron contents, and is equivalent to dropping the penalty on 3 per cent., or under of iron. Zinc silicate sold on a base of $17.50 per ton of 40 per cent. zinc and the highest price was $24 per ton. The average price, all grades, was $35.62. The highest price of lead this week was $55 per ton, receding on Friday to $54 and on Saturday to $53. The average price, all grades, was $53.96 per ton.

Approximately 2000 tons of reserve stock were sold this week on a $40 base price, being divided among the several smelting companies. With a shipment of 6420 tons and an output of about 5600 tons it is seen that the stock was really reduced only 800 tons, permitting an accumulation of this week's output to take the place of the older stocks shipped.

SHIPMENTS, WEEK ENDED NOV. 21

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,411,830	405,940	$94,785
Joplin	2,361,230	435,870	58,482
Galena	924,110	76,390	19,618
Spurgeon	703,660	113,480	12,467
Miami	687,800	177,510	12,357
Prosperity	423,030	100,740	10,756
Duenweg	547,860	78,590	10,612
Oronogo	722,000	52,000	10,400
Aurora	[illegible]		7,824
Alba-Neck	[illegible]		7,725
Badger	313,160	24,750	[illegible]
Sarcoxie	[illegible]		4,573
Carl Junction	[illegible]	....	3,515
Carthage	[illegible]	.....	2,982
Quapaw	[illegible]		2,746
Cave Springs	[illegible]		1,600
Zincite	[illegible]		[illegible]
Totals	[illegible]	[illegible]	[illegible]
47 weeks	436,778,940	70,617,330	$9,647,716

Zinc value, the week, [illegible]; 47 weeks, [illegible]
Lead value, the week, 39,573; 47 weeks, 1,943,923

MONTHLY AVERAGE PRICES

Month.	ZINC ORE. Base Price.		ZINC ORE. All Ores.		LEAD ORE. All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	48.30	36.63	47.11	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	34.08	79.76	52.47
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	47.00	33.06	44.82	32.07	73.66	60.48
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	33.42	59.54	60.34
September	[illegible]	[illegible]	[illegible]	34.44	54.52	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	52.63
November	[illegible]		[illegible]		[illegible]	
December	[illegible]		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

Note—Under zinc ore the first two [illegible] the second two the [illegible] Lead [illegible] the average [illegible] sold.

Chemicals

New York, Nov. 25—The improvement in the general trade is gradual, but steady.

Arsenic—The demand is small and confined to immediate requirements. Spot goods are offered at 3c. per lb. and up.

Copper Sulphate—The demand is fair, and prices are unchanged at $4.75 per 100 lb. for carloads and $5 for smaller lots.

Nitrate of Soda—The demand seems to be for immediate requirements, and little interest is taken in futures. Quotations are 2.15c. for spot and futures.

Mining Stocks

New York, Nov. 25—The general stock markets for most of the week were rather erratic in tone. Prices for several days were inclined to be weak, and stocks were absorbed slowly; the indications being that the public was inclined to leave the market to professional dealers. On Nov. 24, however, there was a sharp rally and advancing prices, with heavy trading. At the close there is a decided upward tendency.

On the Curb there was a similar course, business being rather dull and prices weak. There was some selling of copper stocks at a rather lower level. This was followed by activity and rising prices, with a good demand for stocks developing. The copper shares were leaders throughout in the volume of business.

Sales of Homestake, of South Dakota, were reported at $94@96.50 per share.

Boston, Nov. 24—Mining shares have been weak, but yesterday and today there was a recurrence of the late strength. Net changes for the week are trifling as a rule. Superior Copper has been conspicuous with a $6.62½ rise to $36.50. The majority of this company's 100,000 shares is in the treasury of the Calumet & Hecla Company and these people manage the mine. Early production is expected. Lake Copper spurted $2.25 to $18.75 and Franklin $2 to $18.25.

The declaration of a $5 dividend by Calumet & Hecla was not unexpected. The stock closed at $685, ex-dividend. Utah Consolidated slid off $1.50 to $45.50, but has recovered most of it. The late buying of this stock is said to have been by the Cole-Ryan-Thornton interests, which makes them a factor in this enterprise. The new smelter will save quite a con- [illegible] covered to $85.50 today. Butte Coalition [illegible]

Boston & Corbin ran off $1.25 to $22.25, but rallied to $24.75 today. The right to subscribe to the 10,000 shares of treasury [illegible] dividend announcement has been made, that of the Utah Copper Company, 50c.

quarterly. Tennessee Copper broke over $5 to $45. North Butte ran off $2.75 to $85.25, recovering most of it, and Copper Range $2 to $79.50, rallying to $81.75. Isle Royale has risen $2 during the week to $25.

The annual meeting of the Shannon Copper Company was held last week and it developed that President Amster was the largest individual stockholder with 11,100 shares.

On the Curb National Mining and Exploration took a spurt from 70c. to $1.25; subsequently it ran back to 85c. Judge Loring has issued an injunction against the Boston Curb from trading on Doane street, but it does not become effective for 30 days.

San Francisco, Nov. 22—The Alta-Sonora Mining Company has succeeded in getting control of several claims in the immediate vicinity of their own and the famous O'Hara mine near Sonora, Tuolumne county. Rather an unusual step is to be taken by this company shortly; that is, listing its stock on the San Francisco Stock and Exchange Board. This is something seldom done with California gold properties. This will be the first of the Tuolumne county mines for some time which has taken this step. As a general thing miners are averse to stock transactions in their gold properties publicly on the stock boards. While hundreds of Nevada mining properties are listed there are not a half dozen California gold mines on the Board lists.

STOCK QUOTATIONS

NEW YORK Nov. 24

Name of Comp.	Clg.
Alaska Mine	½
Amalgamated	85⅜
Anaconda	51⅝
Balaklala	‡2 1/16
British Col. Cop.	8⅛
Butte & London	....
Butte Coalition	27⅞
Colonial Silver	½
Com. Ely Mining	8¼
Davis Daly	3 5/16
Dominion Cop.	1
Douglas Copper	3⅜
El Rayo	4 1/16
Florence	4 3/16
Foster Cobalt	.48
Furnace Creek	.15
Giroux	4⅝
Gold Hill	½
Goldfield Con.	7
Granby	107
Greene Gold	¼
Greene G. & S	7
Greenw'r & D. Val.	‡.75
Guanajuato	2
Guggen. Exp.	180
Hanapah	.15
McKinley Dar.	1.02
Micmac	2½
Mines Co. of Am.	1¼
Mitchell Mining	⅜
Mont. Sho. C.	1
Nev. Utah M. & S	3[illegible]
Newhouse M. & S	6½
Nipissing Mines	10⅝
Old Hundred	1 1/16
Silver Queen	1.08
Stewart	⅝
Tennessee Cop'r.	44½
Tri-Bullion	1
Union Copper	⅞
Utah Apex	5⅞
Utah Copper	48¼
Yukon Gold	4 3/16

BOSTON Nov. 24

Name of Comp.	Clg.
Adventure	8½
Allouez	40
Am. Zinc	27
Arcadian	5
Arizona Com	38¾
Atlantic	18⅝
Bingham	‡.30
Boston Con	16
Calumet & Ariz	120½
Calumet & Hecla	685
Centennial	‡35½
Con. Mercur	‡.33
Copper Range	82
Daly-West	10⅝
Franklin	18¼
Greene—Con	11⅛
Isle Royal	24⅞
La Salle	14¼
Mass	7
Michigan	14
Mohawk	70⅛
Nevada	19⅜
North Butte	87½
Old Colony	‡.55
Old Dominion	58½
Osceola	‡120
Parrot	29
Quincy	96½
Rhode Island	6
Santa Fe	3
Shannon	18¼
Superior	36
Tamarack	84
Trinity	17¾
United Cop., com.	14¼
U. S. Oil	‡29½
U. S. Smg. & Ref.	46
U.S.Sm. & Re.,pd.	46¼
Utah Con	47¼
Victoria	4½
Winona	7
Wolverine	152
Wyandotte	2½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	34⅞
Am. Smelt. & Ref.	85⅞
Am. Sm. & Ref. pf.	‡106½
Bethlehem Steel	24
Colo. Fuel & Iron	39
Federal M. & S., pf.	88½
Inter. Salt	15½
National Lead	84¼
National Lead, pf.	‡106¼
Pittsburg Coal	‡13½
Republic I. & S.	27¾
Republic I. & S., pf.	88
Sloss-Sheffield	80
Standard Oil	667
U. S. Red. & Ref.	‡13
U. S. Steel	56½
U. S. Steel, pf	112¾
Va. Car. Chem	42¾

BOSTON CURB

Ahmeek	120
Black Mt	‡3⅞
East Butte	7½
Hancock Con	9¼
Keweenaw	5½
Majestic	.74
Raven	.90
Shawmut	.10
Superior & Pitts.	‡14
Troy Man	‡.25

ST. LOUIS Nov. 21

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.05	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	70.00	68.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	19.00
Doe Run	130.00	115.00
Gra. Bimet.	.30	.25
St. Joe.	16.00	14.00

LONDON Nov. 25

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 2 0
Camp Bird	0 17 6
Esperanza	3 3 0
Tomboy	1 0 0
El Oro	1 6 3
Oroville	0 8 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 25.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.12
Belcher	.28	St. Ives	.21
Best & Belcher	.44	Triangle	.04
Caledonia	.15	BULLFROG STOCKS	
Chollar	.11	Bullfrog Mining	‡.03
Comstock	.31	Bullfrog Nat. B	‡.04
Con. Cal. & Va	.87	Gibraltar	.03
Crown Point	.40	Gold Bar	‡.03
Exchequer	.32	Homestake King.	.14
Gould & Curry	.14	Montgomery Mt.	‡.05
Hale & Norcross	.42	Mont. Shoshone C.	.95
Mexican	1.10	Original Bullfrog.	‡.01
Ophir.	1.90	Tramp Cons.	.13
Overman	.12	MANHAT'N STOCKS	
Potosi	.15	Manhattan Cons	‡.05
Savage	.40	Manhat'n Dexter	‡.03
Sierra Nevada	.33	Jumping Jack	‡.03
Union	.26	Stray Dog	‡.03
Utah	.03	MISCELLANEOUS	
Yellow Jacket	.47	Golden Boulder	‡.05
TONOPAH STOCKS		Bonnie Clare	.08
Belmont	.95	Lee Gold Grotto	..
Extension	.53	Nevada Hills	1.37½
Golden Anchor	.01	Nevada Smelting.	1.00
Jim Butler	.17	Pittsburgh S. Pk.	.87
MacNamara	.46	Round Mt. Sphinx	.18
Midway	.25		
Montana	.73		
North Star	.06		
Tono'h Mine of N.	6.75		
West End Con	.43		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.20		
Booth	.29		
Columbia Mt	.16		
Comb. Frac	1.45		
Cracker Jack	.05		
Dia'dfield B. B. C.	.13		
Goldfield Belmont	.05		
Goldfield Daisy	.97		
Great Bend	.33		
Jumbo Extension	.28		
Katherine	...		
Kendall	.10		
Lone Star	.07		
May Queen	.06		
Oro	.13		
Red Hill	.22		
Roanoke	...		
Sandstorm	.20		

COLO. SPRINGS Nov. 21

Name of Comp.	Clg.
Acacia	7½
Black Bell	...
C. C. Con	‡3½
Dante	6
Doctor Jack Pot.	7
Elkton	68
El Paso	47½
Findlay	17
Gold Dollar	8¼
Gold Sovereign	‡3½
Isabella	27
Index	....
Jennie Sample	5½
Jerry Johnson	3⅞
Mary McKinney	31¾
Pharmacist	3½
Portland	1.03½
Un. Gold Mines	4
Vindicator	81
Work	‡8

Assessments

Company.	Delinq.	Sale.	Amt.
Amador, Ida	Nov. 20	Dec. 19	$0.02
American Fork, Utah.	Oct. 28	Nov. 25	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Columbus Ext., Utah	Nov. 13	Nov. 25	0.01
Con. Cal. & Va., Nev	Nov. 24	Dec. 15	0.20
Confidence, Nev	Dec. 9	Dec. 30	0.20
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Gould, Mont	Nov. 7	Dec. 7	0.05
Imlay, Utah	Nov. 11	Nov. 28	0.01
Liberty, Utah	Nov. 5	Dec. 2	0.03
Lucky Dutchman, Nev	Nov. 21	Dec. 12	0.01
Mexican, Nev	Nov. 12	Dec. 3	0.10
Overman, Nev	Dec. 2	Dec. 23	0.05
Penn. Con., Cal	Nov. 2	Nov. 25	0.10
Seg. Belcher & Mides, Nev.	Nov. 7	Nov. 28	0.03
Silver King Con., Utah	Nov. 4	Nov. 25	0.05
Utah-United, Utah	Nov. 10	Nov. 27	0.01
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Zeibright, Cal	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	......	27.154	......
December	54.565	......	25.362	......
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	......	13.870	.....	61.226	......
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	......
June	42.120	28.024	December	27.925	......
			Av. year.	38.160	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	......	17.281	......
December	3.658	......	14.500	......
Year	5.325	......	19.034	....

New York. cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	......	4.775	......	21.438	.....
December	4.254	......	4.104	......	20.075	...
Year	5.962	......	5.812	......	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, DECEMBER 5, 1908. NO. 23

Iron Operations in Northeastern Alabama

Clinton Red Hematites Occur in Comparatively Thin Seams; Brown Hematites Are Found in Residual Clays; Ores Require Little Flux

BY EDWIN HIGGINS

A description of the operations of the Alabama Consolidated Coal and Iron Company will give an idea of the practice in mining the thin red-ore seams and brown-ore banks of northeastern Alabama, and also point out some interesting features in iron blast-furnace equipment and operation. Although the practice may vary slightly, the methods herein outlined may be said to typify operations in this district. In every case where costs are given they refer to this district generally, and not to the operations of the Alabama Consolidated Coal and Iron Company.

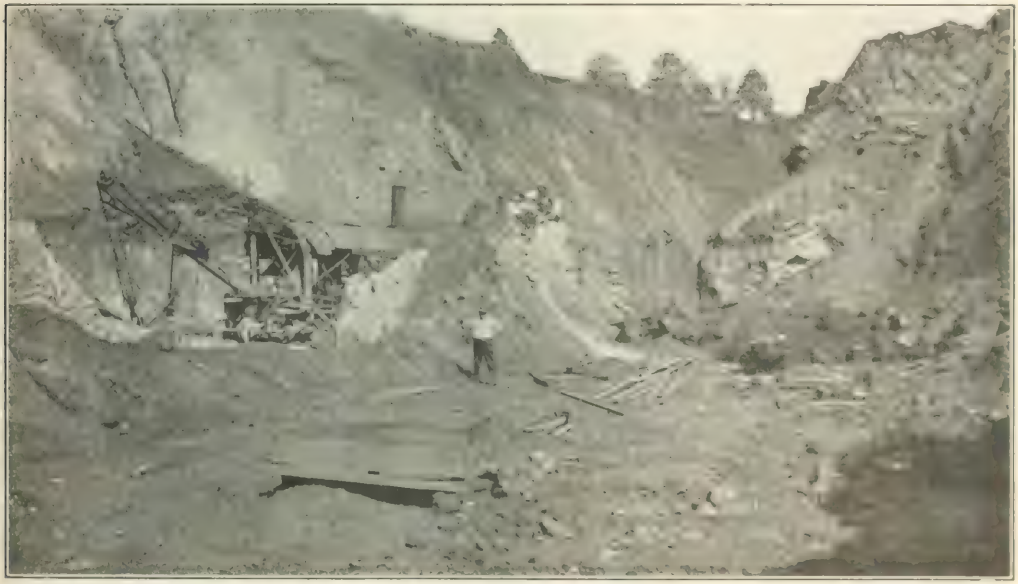


FIG. 1. NO. 3 BROWN-ORE CUT, IRONATON

This company has two blast furnaces at Gadsden, Etowah county, and two at Ironaton, Talladega county. The red-ore mines are situated at Etowah and Attalla, in Etowah county, and Hammond (or Gate City), Jefferson county. The chief brown-ore mines are situated at Ironaton, but the company has some brown-ore deposits in Polk county, Georgia.

ATTALLA RED-ORE MINES

As typical of the red-ore operations of the company, the Attalla mine, situated at Attalla, about five miles west of Gadsden, will be described.

Here the ore, which is a Clinton red hematite, outcrops in a northeasterly-southwesterly direction, following the general trend of a ridge which rises to varying hights up to 500 ft. above the surrounding country. On the northwest slope of this ridge Big Wills creek flows southwesterly and empties into the Coosa river near Gadsden. The ore occurs in a well defined bed from 36 to 48 in. in width, and dips from 20 to 25 deg. toward the southeast. Immediately overlying the ore is about 18 in. of slatey material which often comes down when the ore is blasted. Above this is a tough sandstone. The footwall is a medium hard slate. Here the soft ore, which is found to a depth of about 400 ft., has the following range of composition: Iron, 44 to 50 per cent.; lime, none; insolubles, 20 to 28; phosphorus, 0.3; manganese, trace. The hard ore has the following range of composition: Iron, 39 to 44 per cent.; lime, 10 to 16; insolubles, 12 to 14; phosphorus, 0.4; manganese, trace.

MINING

This orebody was first mined from adit levels. Headings were turned off and raises put up to the surface, a distance of about 500 ft. This method was followed until the ground had been worked for a distance of about ½ mile north and ½ mile south. Some little work is still being done in the north end.

The bulk of the ore, however, comes through the new slopes. Two main slopes are used, about [illegible] ft. apart. The main haulage entry meets the bed at a point about 500 ft. on the slope from the outcrop. No. 1 slope, the most southerly, is now down 800 ft. below the level of the main entry; No. 2 slope is down 1000 ft. below it. These slopes are about 14 ft. in width and are not timbered.

Headings are turned off from the slopes at 50-ft. centers, and all ore is mined with the exception of a 10-ft. pillar which is left to protect the floor of the level above. The roof is held by white or yellow pine timbers, one stick from 10 to 12 in. wide holding an area about 10 ft. square. On the return the pillars are robbed and the ground is allowed to cave.

Most of the holes are drilled with ratchets (similar to a breast auger) attached to a breast bar. Some Ingersoll-Rand and Leyner drills are used.

After the ore is broken it is shoveled into cars of about two tons capacity. These cars are pushed to the slope, where two of them are loaded onto the double-decked cage. The total weight of the loaded cage is about six tons. For hoisting, a 1-in. 7-19 wire rope is used.

The hoists are placed above the main entry level. They are of Flory single-drum, link-motion type, with drums 48 in. in diameter. No. 1 slope is equipped with a 10x16, and No. 2 with a 12x16 hoist.

On the main entry level the cars are made up into trips of four and are trammed by mules to the outside; here they are lowered by gravity, in trips of 13, to the tipple (Fig. 2), 2300 ft. distant, the grade being 3 per cent. At the tipple the cars dump into a bin, from which the ore is fed to a crusher delivering a 3½- to 4-in. product direct to railroad cars below. The car-dumping arrangement, shown in Fig. 3, is simple and explains itself.

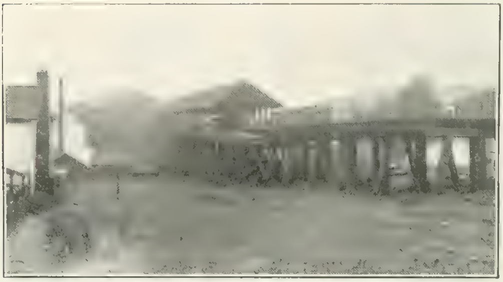


FIG. 2. TIPPLE, ATTALLA MINE

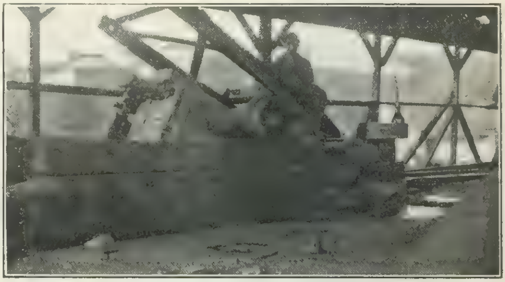


FIG. 3. CAR-DUMPING ARRANGEMENT, ATTALLA MINE

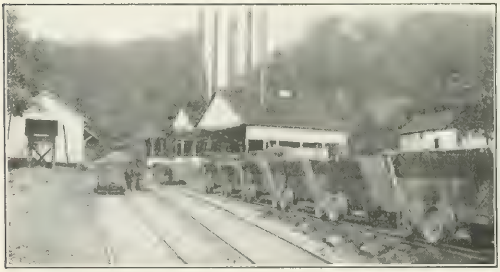


FIG. 4. SURFACE PLANT, ATTALLA MINE

FIG. 5. NO. 3 LOG WASHER, IRONATON

Pumping, Surface Plant, Labor, etc.

No. 1 slope is equipped with a No. 10 Cameron station pump, which is worked eight hours out of every 24. The water from No. 2 slope is handled by a No. 9 Cameron station pump, which works about the same number of hours.

Just outside of the main entry is the surface plant shown in Fig. 4. Here are two Ingersoll compressors of 800 cu.ft. per min. capacity each, and one Rand of 400 cu.ft. capacity, all of the straight-line, single-cylinder type. There are five boilers ranging from 50 to 100 h.p. each, which furnish a total of 350 h.p. This plant furnishes the power for the pumping, the two inside hoists, and the drills. The Flory hoists are run with air, as well as the Leyner and Ingersoll-Rand drills, and the pumps.

There are employed at this mine about 125 men, 75 to 80 of whom are worked underground. The output is about 300 tons per day. The cost of mining red ore in this district varies from 80c. to $1.10 per ton. Mining is generally done by contract, and is paid for at the rate of 45c. per ton of ore delivered at the slope. When not working on contract, outside labor is paid $1 per day, inside labor $1.25 per day. Timbers cost about 10c. per stick of an average length of 5 ft., and an average width of 11 inches.

At the time of my visit there were 10,000 tons of red ore in the stock pile at this mine.

Brown-ore Mines at Ironaton

Although the company has brown-ore mines in Polk county, Ga., its chief source of supply is from its deposits in the immediate vicinity of Ironaton. These ores occur in the residual clays overlying the limestone, and have the following range of composition: Iron, 46 to 52 per cent.; insolubles, 9 to 20; phosphorus, 0.2 and less; manganese, 1 to 3.

Within a radius of ½ mile of the furnace there are eight mines, six of which are now in operation. No. 3 cut is shown in Fig. 1. The ore is all transported to the furnace over the company's own equipment. The production at present is about 15,000 tons per month.

Mining is done almost entirely with Marion steam shovels of one cubic yard dipper capacity. These shovels handle on an average of 300 yards of dirt per day of 12 hours. Although the proportion of ore to dirt varies, it may be said to average 1 to 3. A steam-shovel crew, with the wages paid in this district, is about as follows: One cut foreman, $2.10; one shovel runner, $1.90; one crane-man, $1.50; one fireman, $1.25; three laborers at $1, $3. Each shovel burns on an average of 1000 lb. of coal per day, which will cost about 75c. Repairs, oils, etc., will cost about 25c. per day.

At only one operation is hand work done. The ore is milled down into carts and hauled to the washer, this work being done on contract; the average rate is

12½c. per yard of dirt delivered at the washer. The steam shovels deliver the ore to side-dump cars of two cubic yards capacity; these are hauled to the washer by a locomotive in trips of from six to 10 cars each.

LOG WASHERS

The company has in operation at Ironaton five 4-log washers and one 2-log washer. The ore from the cars is dumped onto a 3-in. grizzly; the undersize goes to the log washers; overs go to a Blake jaw crusher, which breaks the ore to pass a 4-in. ring, delivering it to the log washers. These washers are 30 ft. in length and make from 9 to 20 r.p.m., depending upon the quality of the dirt. The log washers discharge into a revolving 12-mesh screen, which runs at the same speed as the log washers. Here the sand is washed out. The revolving screen discharges onto a picking belt, running at a speed of 20 ft. per min., where quartz and other waste material are removed. From two to six pickers are employed, depending upon the quality of the ore. From the picking belt the ore goes to bins, from which it is loaded into railroad cars. No. 3 washer is shown in Fig. 5.

A 4-log plant will average 150 tons in 12 hours. About an 80-h.p. boiler plant is required. The cost of washing the ore varies with the quality, but will average about 40c. per ton. A 4-log washer requires the following crew: One foreman, $1.90 per day; six men for dumping cars and working on the grizzly, at $1 each, $6; one engineer and fireman, $1.50; one dinkey engineer, $1.55; one dinkey fireman, $1.25.

COKE AND LIMESTONE

The coke used is made from coal obtained at the company's mines at Brookwood and Searles, Tuscaloosa county, and Lewisburg, Jefferson county. The Brookwood and Searles coals are about the same and furnish coke of about the following range of composition: ash, 9 to 13 per cent.; volatile combustible matter, 2.5 to 3; fixed carbon, 79 to 84; sulphur, 0.6 to 0.8. This is a dense, hard coke and is well adapted to carrying a heavy burden and withstanding hard blowing. The Lewisburg coke has the following range of composition: ash, 12 to 16 per cent.; volatile combustible matter, 2.75 to 3; fixed carbon, 79 to 83; sulphur, 0.7. This makes a good blast-furnace coke, but runs a little higher in ash than that made at Brookwood and Searles. Practically all coke is 72-hour coke.

The limestone used comes from the company's quarry at Rock Springs, Etowah county. This limestone contains only from 1½ to 2 per cent. of insolubles, and carries in addition to the calcium carbonate about 3 per cent. magnesium carbonate. The cost of limestone delivered in this district is about the same as in the Birmingham district,[1], i.e., 30c. per ton.

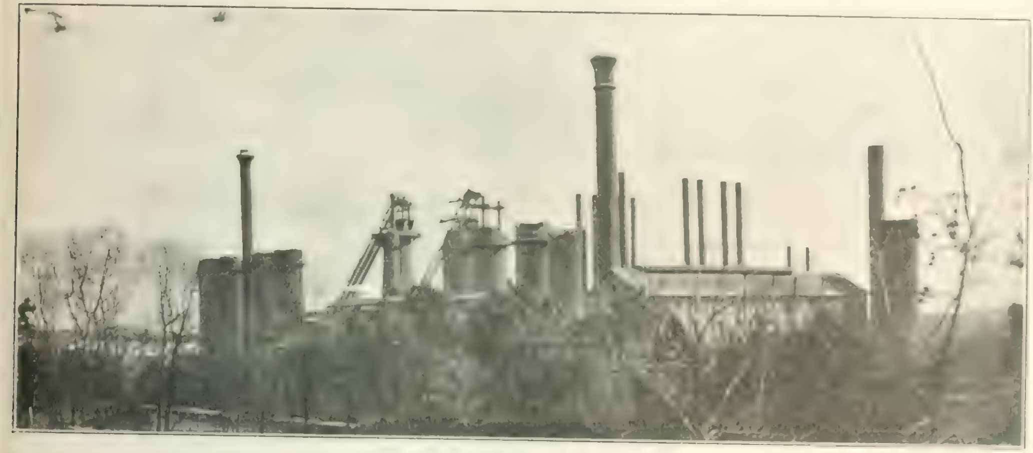


FIG. 6. FURNACE PLANT AT GADSDEN

GADSDEN FURNACE

There are two stacks at the Gadsden plant, shown in Fig. 6. No. 1 has the following lines: Hearth, 12 ft.; bosh, 18 ft.; top, 13 ft. 6 in.; bell, 8 ft.; total hight, 76 ft.; angle of bosh, 71 deg. There are four 20x80 hot-blast stoves, all equipped with Kennedy valves. No. 2 furnace has the following lines: Hearth, 11 ft.; bosh, 16 ft. 8 in.; top, 11 ft. 6 in.; bell, 8 ft.; total hight, 87 ft.; angle of bosh, 75 deg. There are four 20x80 hot-blast stoves, equipped with Kennedy valves.

Both furnaces are equipped with Brown tops, No. 1 having a single skip and No. 2 a double skip; the latter is a part of the original Walter Kennedy top, with which this furnace was first equipped.

The blowing-engine room contains seven vertical, long crosshead, Todd blowing engines. Two of these engines are low pressure and are operated compound non-condensing. The boiler plant consists of 14 Rust, four Wickes, and four Babcock & Wilcox boilers, giving a total rated horsepower of 6400.

The power plant contains one direct-connected 200-kw. General Electric generator, 240 volts, with one small 50-kw. generator for emergencies. Both furnaces are filled by electric scale cars of 75 cu.ft. capacity each. Cinder is handled by Pollock steam-dump, self-cleaning cars.

In connection with this plant there is a well-equipped blacksmith shop and a large machine shop; also a locomotive repair shop. For handling cinder at Ironaton the Hartman end-dump and side-dump cars are used; to some extent the Weimer [illegible]

MATERIALS

Both furnaces are making standard foundry iron of the following range of composition: Silicon, 1½ to 4 per cent.; phosphorus, 1; manganese, 0.5 and under; sulphur, under 0.05; total carbons, 3.25 to [illegible]

The ores used are Alabama brown hematite and Georgia brown hematite, together with Clinton red ores, both hard and soft. The red ores are obtained from the company's mines within a radius of five miles of the furnace. The average [illegible] another part of this article.

The brown hematites used at the Gadsden plant are bought in the open market and consequently vary in iron content, as well as insolubles. These ores have the following range of composition: iron, 42 [illegible]

---

[1] [illegible] Nov. 28, 1908, p. 1042.

The following mixture is at present being used in No. 1 furnace: brown hematite, 25 per cent.; Clinton red hematite, hard, 75 per cent.; in No. 2 furnace, brown hematite, 25 per cent.; Gate City semi-hard red hematite, 25; Clinton, hard, 50. The burden carried is usually about 15,600 lb. per charge, with a coke unit of 10,400 lb. to the charge, and the necessary limestone. The yields through the furnaces vary from 38 to 42 per cent. The Gadsden plant is now making from 200 to 225 tons of pig iron per stack, or a total of from 400 to 450 tons per 24 hours.

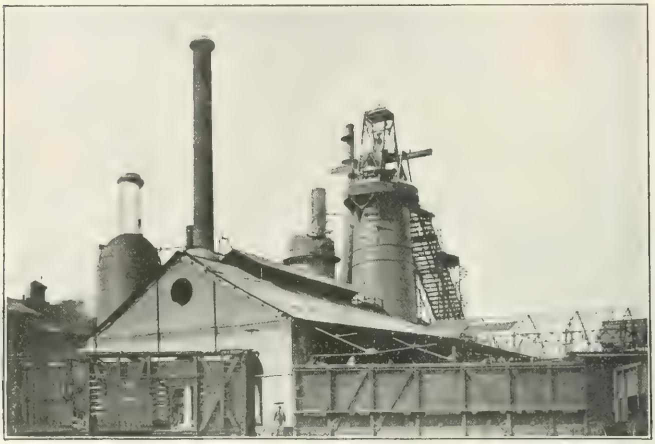


FIG. 7. NO. 1 FURNACE, IRONATON

Ironaton Furnace

The blast-furnace plant at Ironaton consists of two stacks. No. 1 has the following lines: Hearth, 9 ft.; bosh, 15 ft. 6 in.; top, 11 ft.; bell, 7 ft.; angle of bosh, 76 deg.; total hight, 73 ft. No. 2 has the following lines: Hearth, 9 ft.; bosh, 15 ft.; top, 11 ft.; bell, 7 ft.; angle of bosh, 76 deg.; total hight, 67 feet.

No. 1 furnace (Fig. 7) is equipped with Baker top (Fig. 9), and has one 20x80 and four 20x60 hot-blast stoves. It is equipped with an electric scale car, built under the direction of David Baker. The car has a capacity of 110 cu.ft., and is fitted with Fairbanks scales and Westinghouse motor.

No. 2 furnace (Fig. 8) has four 18x65 hot-blast stoves, and is equipped with an electric scale car, built by C. W. Hill & Co. The furnace top is of the Miller type; the hoist is vertical.

The blowing-engine room contains two 5x7 Wiemer blowing engines, equipped with poppet valves; two 4x7 Todd (air cylinder) blowing engines, equipped with piston valves; one 5x7 Todd blowing engine, equipped with piston valve; one 4½x7 Weimer blowing engine, equipped with poppet valve.

The boiler plant consists of a total of 19 boilers of different makes, which furnish a total of 4600 h.p. The power house contains a 100-kw., 240-volt, Northern Manufacturing Company generator, driven by an Erie ball engine, 12x16 ft.; one Worthington compound pump for handling waste waters from the furnaces to the reservoir; one Cameron simplex pump, and one small Worthington as an auxiliary; one small air compressor for furnishing air to tools required by the plant.

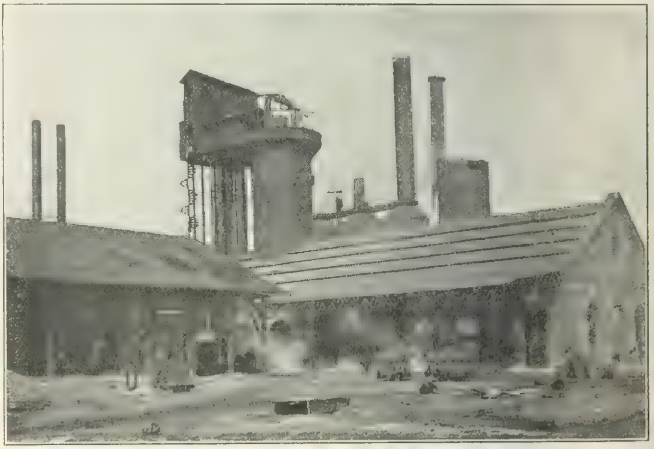


FIG. 8. NO. 2 FURNACE, IRONATON

Materials

The ores used at the Ironaton furnace are Alabama brown hematite, obtained in the immediate vicinity, with a small percentage of Clinton hard ore. The latter is shipped from Gadsden. These brown hematites will show the following range of composition: Iron, 46 to 52 per cent.; insolubles, 9 to 20; phosphorus, 0.2 and under; manganese, 1 to 3. The analysis of the red ore is given elsewhere in this article.

The yield through these furnaces is from 40 to 44 per cent., and the capacity of each furnace 125 to 150 tons per 24 hours. The following ore mixture is used in both furnaces: 75 per cent. brown hematite; 25 per cent. Clinton red hematite. No. 1 furnace carries a burden of about 15,800 lb. of ore, with a coke unit of 8000 lb., and the necessary lime. No. 2 furnace carries a burden of 7000 lb. of ore, 3600 lb. of coke and the necessary lime.

The product made is a special brand of low-phosphorus, low-sulphur, high-silicon, high-grade foundry pig iron of the following analysis: Silicon, 1½ to 4 per cent.; sulphur, 0.03 and less; phosphorus, 0.7 and less; manganese, 1 and over; total carbons, 3.5 to 3.75. This iron is especially adapted to making gray-iron castings and for car-wheel work. It commands a premium of from 50c. to $1 per ton over the iron usually made in this district.

In connection with the blast-furnace plant at Ironaton, there is a well equipped blacksmith shop and a large machine shop, a pattern shop and a foundry. The castings for all the company's operations are made at the foundry here.

The water supply for the operation is pumped from two sources into a reservoir ¾ mile east of the furnace plant. The first pumping station at Fain's creek delivers an 8-in. stream into the reservoir; the second pumping station at Curry's Station, on Chehaw creek, delivers a 10-in. stream. The operations (furnaces and mines) require about 3,000,000 gal. water per day.

Revival of Hydraulic Mining in California

Special Correspondence

FIG. 9. NO. 1 FURNACE, IRONATON, SHOWING BAKER TOP

In Yuba county, California, there is now considerable mining activity, though for many years, since the closing down of hydraulic mining, little or nothing has been done in either gravel or quartz mining. At one time some of the more extensive hydraulic mines of the State were in operation in the vicinity of Smartsville. They have been idle and unproductive for many years, but have now come into new ownership and the old ditches are being cleaned out and repaired to bring water on the ground again, though the hydraulic system of mining will not this time be used. In some other portions of the county, however, there is a small revival of hydraulic mining. At Indian Hill some 50 men are building a large restraining dam for the débris, which will permit the working of a rich gravel channel. This section was very productive at one time and may be again. After making application to the California Débris Commission to resume mining under the prevailing laws, a permit was granted and work on the dam commenced. It has still to be approved by the Commission, and when this takes place the Indian Hill mine will resume operations with the hydraulic process. They have still the Anti-Débris Association to deal with, however, and this is a body of men intent upon stopping hydraulic mining when it can possibly be done. They care little or nothing about the Government permit and are apt to bring injunction suits, notwithstanding the opinions of the Federal engineers appointed by law to regulate hydraulic mining.

In this same county, near Marysville, the Yuba Consolidated Goldfields is operating 12 modern gold dredges of the largest size and the Marysville Gold Dredging Company is operating two. The Marysville gold-dredging field is considered by many as apt to be the most productive in the State. The ground being dug has laid idle many years and for a long time was not considered worth paying taxes upon. Some people who bought up these tracts at 25c. an acre later sold them to the dredging companies for as much as $1000 an acre.

Above Camptonville, also in Yuba county, three big restraining dams are being built by as many companies. On Willow creek Fred Joubert is building a substantial concrete dam to hold a large amount of mining débris from the Depot Hill mine. The Brandy City Mining Company is doing extensive work preparatory to commencing hydraulic mining again. A large force of men has been at work over a year and a large dam has been built. The capacity of the Indian Hill dam above referred to will be very great.

All this looks like a real revival of gravel mining in Yuba county, though for many years the miners almost despaired of ever being able to wash a piece of gravel in the county.

Dr. C. K. Gilbert, of the United States Geological Survey, has been for the last few years gathering data relative to the amount of débris or detritus swept into the rivers of the northern part of this State either through the process of hydraulic mining or by natural erosion. Just at present he is investigating the section around Washington, Omega and neighboring places in Nevada county, drained by the South Yuba river. His investigation will cover the whole of the drainage of this river from the point where it empties into the Feather river up into the mountains as far as any mining has been done.

Magnesite Brick

The manufacturers of magnesite brick in the United States are the Harbison-Walker Refractories Company, of Pittsburg, Penn., and the American Refractories Company, of Chicago, the latter being a new concern. The Harbison-Walker company obtains its supply of raw material from the Veitscher Magnesitwerke [illegible] ican Refractories Company has secured control of a large deposit in Styria. This company has already begun the manufacture of magnesite and chrome bricks at its plant at Joliet, Ill.

Prevention of Mine Accidents

Only Four States Have Passed Comprehensive Laws Regulating Metalliferous Mining and Several Important States Have No Law

SUMMARY OF THE LAWS

At the meeting of the American Mining Congress, at Denver, Colo., in November, 1906, a committee was appointed to prepare a modern law governing quarrying and metalliferous mining, with the view to its adoption by the American Mining Congress and recommendation to the various States of the Union for its passage as a uniform law, replacing existing laws which, in the best cases, are more or less imperfect and out of date. The advantages of a uniform law among all the States are so obvious that no discussion of them is necessary. It is well to explain, however, that the work of the committee pertains only to the laws regulating quarrying and mining from the standpoint of public safety, which regulation comes within the police powers of the States, and in no way extends to the laws which determine the titles to mineral lands and the ownership of mines. The investigations of the committee were limited to quarrying and metalliferous mining, because the conditions governing coal mining are so special in character that they can be met properly only by special laws.

The committee that was appointed comprises W. R. Ingalls (chairman), John Hays Hammond, James Douglas, J. Parke Channing, and James R. Finlay. The first step of this committee was to secure copies of the existing laws, for which purpose letters were addressed to the Governments of all the States. The replies to these letters developed that many States in which mining is done have no laws at all. Other States have elaborate laws governing coal mining, but none applying to metalliferous mining; some States have what may be called fragmentary laws, i.e., articles aiming to prevent some limited classes of accidents, the enactment of such having been prompted apparently by the occurrence of some disastrous accidents of that kind. It appeared that Colorado, Missouri, Montana and New York are the only States which have formulated a general mining law of broad scope. It is particularly noteworthy that States in which the mining industry is so important as California and Michigan have no such laws. In Idaho, Robert N. Bell, the State Mine Inspector, has been for years endeavoring to secure the passage of a general law in that State, which at present has clauses covering only a few special cases. South Dakota appears to have no law.

Summarizing briefly the present status of this matter, the following States have laws which apply to collieries only: Alabama, Illinois, Iowa, Michigan, Ohio, Pennsylvania and West Virginia. The following States have a general law applying to metalliferous mining: Colorado, Missouri, Montana and New York. The following States have special laws pertaining to metalliferous mining, but with few provisions as to safety: Arizona, Idaho, Michigan, Nevada, New Mexico, North Carolina, Oregon, Utah and Wyoming. The following States have no laws: California, Connecticut, Kansas, Louisiana, Massachusetts, New Hampshire, Rhode Island, South Dakota, Vermont, Virginia and Washington. Underground mining is, or has been, conducted in all of these States. Tennessee has an elaborate law as to the inspection of mines, but it contains few provisions as to safety. Michigan also has a law providing for mine inspection. The other States either have no law, or the few provisions covering the subject are so incorporated in other laws as to be not readily available and consequently remain generally unknown. The elaborate factory laws of many States contain some provisions that apply to mining and metallurgical work, but only to surface operations in so far as mining is concerned.

The committee recommended to the American Mining Congress at the meeting at Joplin, Mo., November, 1907, that the laws of Colorado, Missouri, Montana and New York be printed, believing that such a publication would be of value to everyone engaged in mining, and also that it would enable the invitation to be extended to everyone to criticize the existing laws, both for shortcomings and for improper provisions, and thereby assist the committee. The report of the committee to this effect was adopted and the committee was continued. As a matter of convenience and to insure the widest possible circulation, the officers of the American Mining Congress requested that the first publication of this matter be made in the ENGINEERING AND MINING JOURNAL, which is now done with the approval of the committee and the officers of the American Mining Congress. It is hoped that this publication will lead to many suggestions as to provisions that ought to be included in, or excluded from, a composite, comprehensive mining law. Communications upon this subject should be addressed to the undersigned.

In making the present publication of the laws of Colorado, Idaho, Missouri, Montana, New York and Utah, the latter have been edited in order to save space and facilitate consideration. This editing has been done with great care and in no way alters the expression of the substance of the law. The editing has consisted only of the excision of matter not pertaining to the subject of quarrying and metalliferous mining, a slight re-arrangement of paragraphs in some cases in order to bring together the same subject matter, and the modification of certain unimportant legal verbiage. Also, certain subheads, not to be found in the originals, have been added in order to assist classification.

W. R. INGALLS.
505 Pearl street, New York.

Colorado

EXPLOSIVES

Storage of Explosives—Explosives must be stored in a magazine far enough from the working shaft, adit or incline to insure that, in case all the explosive should explode, the adit or shaft will not be wrecked. All explosive in excess of the amount required for one shift's work must be kept in this magazine, and no powder or other explosive shall be stored in underground workings where men are employed. No oils or other combustible substances shall be kept or stored in the same magazine with the explosives. Every mine shall employ a suitable device for thawing dynamite sufficiently so that it can be used safely.

Tamping Sticks—In charging a hole with nitroglycerin powder or other explosive, no one shall use a tamping stick made of steel or iron.

HOISTING

Hoisting Engineer—No person addicted to the use of intoxicating liquors, or under 18 years of age, shall be employed as a hoisting engineer.

Hoisting Machinery—All hoisting engines shall be equipped with an indicator placed near to and in clear view of the engineer.

Signals—The commissioner of mines shall establish a code of signals, embracing those most generally used at metal mines, and these shall be used in all mines. A legible copy of this code of signals shall be securely posted in the engine room, at the collar of the shaft, and at each level or station. Wherever possible all shafts and cages shall be fully equipped with a system of electrical signals from cage and stations to the engineer.

Code of Signals—The code of signals is as follows: One bell, hoist; one bell, stop if in motion; two bells, lower; three bells, men on, run slow; seven bells, accident, hoist or lower by verbal orders only; 3-2-1 bells, ready to shoot. After signal 3-2-1, engineer shall raise the bucket or cage 2 ft., lower again, and remain at his post until the final signal is given and the command executed. The station signals are as follows:

1-1	bells,	1st	level.	4-1	bells,	11th	level.
1-2	"	2d	"	4-2		12th	
1-3	"	3d	"	4-3		13th	
1-4	"	4th	"	4-4		14th	
1-5	"	5th	"	4-5		15th	
2-1	"	6th	"	5-1	"	16th	
2-2	"	7th	"	5-2		17th	
2-3	"	8th	"	5-3		18th	
2-4	"	9th	"	5-4		19th	
2-5	"	10th	"	5-5		20th	" etc.

Rules Governing Signals—In giving ordinary signals, make strokes on the bell at regular intervals. When men are to be hoisted or lowered, give signal three bells. After that signal has been given, the men must get on the cage or bucket; when ready to be hoisted or lowered, ring final signal, one or two bells. After the signal 3-2-1 bells, the engineer must indicate that he is ready to hoist by raising and lowering the bucket or cage. Miners must give the answering signal "men on" (three bells), then spit the fuse, get on the bucket or cage, and give the final signal to hoist. The signal three bells means "men on," and nothing in conflict with it will be allowed in any set of signals. Signals to meet local demands and not in conflict with the code given above may be added by local operators, but these signals must be posted in clear and legible form in connection with the regular code.

False Signals—All persons giving, or causing to be given, false signals, or riding upon any cage, skip or bucket upon signals that designate to the engineer that no employees are on the cage shall be deemed guilty of a misdemeanor.

Lowering Supplies—All timbers, tools, etc., longer than the depth of the bucket or placed erect upon the cage, must be securely lashed before being hoisted or lowered.

Riding With Supplies—No person shall ride upon any cage, skip or bucket that is loaded with tools, timber, powder or other material, except for the purpose of assisting in passing these through the shaft or incline, and then only after a special signal has been given.

Number of Men Allowed on Cage—The maximum number of men permitted to ride at one time upon or in the cage, skip or bucket, shall be posted at the collar of the shaft and at each level. All employees riding upon or in an overloaded cage, skip or bucket shall be guilty of a misdemeanor.

MANWAYS

Shaft Ladders and Landings—All shafts more than 200 ft. deep and equipped with hoisting machinery, shall be divided into at least two compartments, and one of these compartments shall be partitioned off and set aside for a ladderway. In vertical shafts, landings shall be constructed not more than 20 ft. apart; these landings, except for an opening large enough to permit the passage of a man, shall be closely covered. The ladders shall be inclined at the most convenient angle that the space allows; they must be firmly fastened and kept in good order. In incline shafts the landings shall be put in as previously described, but a straight ladder having the inclination of the shaft shall be used. Ladders in raises and winzes shall be likewise provided and kept in order, but where the winzes are used only for ventilation and exit, on each level, only one such winze need be so equipped.

Fire Exits—When the only means of exit from the mine is a shaft covered with a building and equipped with machinery, this shaft shall be divided into at least two compartments. One of these compartments shall be tightly partitioned off and used for a ladderway as hereinbefore ordered. This ladderway shall be securely bulkheaded at a point at least 25 ft. below the collar of the shaft, and below this bulkhead, if the shaft is situated upon a side-hill, a drift shall be driven to the surface; if the shaft is situated in a level country, this drift shall be driven to a safe distance beyond the walls of the building and from there a raise made to the surface. This ladderway and landings shall be kept in good repair and shall afford an easy escape in the event of fire.

[illegible] a safe distance from their mouths all tunnels or adit levels shall connect with the surface; this connection shall be provided with suitable ladders so as to serve as an exit in case that fire destroys the building at the mouth of the adit.

Fire Protection—At all mines where the mouth of the shaft or adit is covered with a building containing the mechanical plant, furnace room and blacksmith shop, fire protection shall be provided. This shall be water if possible, but at mines where water is not available chemical fire-extinguishers or hand grenades shall be kept in convenient places for immediate use.

SHAFTS

[illegible] sinking a shaft or incline shall at all times be provided with chain or other kind of ladder.

Guard Rails at Shafts and Winzes—At all shafts the collars shall be protected so that persons or foreign objects cannot fall into the shaft. Safety clutches shall be used on all cages; if the hoisting is done with buckets, shaft doors must be constructed which will prevent any material from falling into the shaft while dumping the bucket. At all shaft stations a guard rail shall be provided and kept in place across the shaft. All winzes and mill-holes extending from one level to another shall either be covered or protected with a guard rail.

Passageway Around Shafts—All stations or levels shall, when practicable, have a passageway around the working shaft so that crossing over the hoisting compartments may be avoided.

Shaft Pillar—When any shaft is sunk on a vein, oreshoot or orebody, a pillar of ground large enough to protect and secure the shaft shall be left standing on each side of the shaft, and stoping shall not be permitted within such close proximity to the shaft as to render the same insecure, unless the mine is being abandoned.

Abandoned Shafts—All abandoned shafts or other excavations endangering life shall be securely covered or fenced, and any person removing this covering or fencing shall be deemed guilty of a misdemeanor.

[illegible]

Removing Old Timber—All old timber shall be removed as soon as practicable from the mine, and shall not be permitted to decay underground.

Misrepresentation—Any owner or person in charge of any metal mine, who shall wilfully misrepresent or withhold facts or information regarding the mine from any inspector or other officer of the Bureau of Mines, such as the length of time timbers have been in place or who shall make any misrepresentations tending to show safety when the reverse is true, shall be deemed guilty of a misdemeanor.

Visitors—Strangers or visitors shall not be allowed underground in any mine, unless accompanied by the owner, official or employee deputized to accompany them.

Reporting Accidents—The person in charge of a metal mine at which occurs an accident either fatal or serious enough to cause the injured person to stop work for two consecutive days shall immediately notify the commissioner of mines, reporting to him all facts regarding the accident. The commissioner upon being notified shall investigate the cause of the accident, and shall file a report of this accident in his office.

Power of Commissioner—The commissioner of mines and inspectors under him have authority to examine any mine and the machinery used at it so as to see whether the mining laws are being complied with. The commissioner has the right to appear at all coroner's inquests held over the remains of anyone killed in a mine accident, and, if he deems it necessary, he can call, examine and cross-examine witnesses.

[illegible]

After investigating many accidents, the

State Bureau of Mines, of Colorado, makes the following recommendations:

HOISTING PLANTS

An auxiliary throttle valve should be used on all hoisting engines. At all shafts equipped with cages, a set of automatic chairs should be placed in the headframe, a few inches more than the length of the cage below the sheave wheel. A detaching device should be used at all shafts to prevent overwinding; the Humble safety hook and the Akron safety hook are devices worthy of adoption as their utility has been amply proved both in operation with and without the automatic chair.

In connection with the detaching device it will be necessary to provide, at the point in the headframe at which the cage or bucket is stopped, some means to keep the men from falling from the cage or bucket back into the shaft. This can be done in various ways when a cage is used, but when buckets are used, the only way of effecting this is by means of a platform and doors which close the shaft opening at that point. The safety clutches should be carefully tested at intervals of not more than one week apart so as to insure their working in case of necessity.

At all adits the head-house should be built at some distance from the mouth of the adit. A shaft-house should not be constructed over the collar of the shaft. A double exist must be provided in the case of both shaft and adits, and the only exception to this arrangement should be in the event of ample connections being made with others means of exit.

Idaho

INSPECTION OF MINES

Mine Inspector—The inspector has authority to examine any and all mines whenever he desires. Whenever the inspector finds a mine to be in an unsafe condition, he shall at once notify in writing the persons operating this mine. In this notice the inspector shall state in detail in what particulars the mine is dangerous, and he shall require all changes necessary to render the mine safe to be made without delay.

Inspection Upon Complaint—Whenever the inspector shall receive a complaint in writing, signed by three or more persons, setting forth that the mine in which they are employed is dangerous in any respect, he must examine that mine in person. In case he finds the conditions so dangerous as to warrant the closing of the mine or portions of the mine, he shall order all mining to cease in the dangerous portions until they have been made safe.

Accidents—Whenever a serious or fatal accident occurs, the person in charge of the mine shall immediately notify the inspector of mines by the quickest means available. Upon being notified the inspector, or his deputy, shall investigate fully the cause of such accident. The inspector, or his deputy, shall be present at every coroner's inquest held over the remains of any person killed in any mine accident, then the statements of those who spector has power to examine and cross-examine witnesses, and to compel the attendance of witnesses. Whenever the inspector, or his deputy, cannot immediately visit the scene of the accident, it is the duty of the person in charge of the mine to have statements made and verified by those who have seen the accident; in case no one was present at the time of the accident, then the statements of those who first arrived after the accident occurred shall be taken and verified so as to be sent to the inspector of mines.

Marking of Dynamite—No persons or corporation shall deal in or use any high explosive containing nitroglycerin, unless on every box and wrapper containing this explosive there shall be plainly printed the name and place of business of the manufacturer of the explosive, the percentage of nitroglycerin or other high explosive contained in it, and the date of its manufacture.

ADDITIONS RECOMMENDED

Robert N. Bell, inspector of mines for Idaho, has recommended to the legislature many additional provisions. In his recommendations the sections regarding the storing of explosives, tamping sticks, old timbers, number of men allowed to ride on cage, riding on a loaded cage, signals, more than one exit from mine, shaft ladders, chain ladders while sinking shafts, guard rails at shafts and winzes, shaft pillars, abandoned shafts, false reports, visitors and power of inspection are the same as those given in the laws of Colorado, and are, therefore, not here repeated. The provisions regarding hoisting engineers are the same as those for Colorado, but cages do not have to be used until a depth of 300 ft. has been attained in the shaft. The following sections of Mr. Bell's recommendations are not included in the mining laws of Colorado.

Extra Tunnel Exits—Every adit, at the mouth of which is a timber shed, blacksmith shop or building containing the mechanical plant, shall connect, at a safe distance from the portal, with the surface by means of a raise that is provided with safe and suitable ladders; and in such adits, near the mouth, doors shall be provided that can be closed from the outside buildings by pull wires, so as to keep the gases of combustion from entering the mine in case that fire destroys the building at the mouth of the adit.

Bonnets on Cage—The collars of all shafts shall be fixed so that persons or foreign objects cannot fall into the shaft. The cage shall be equipped with safety clutches and a steel hood or bonnet. If solid, this hood shall be oval in shape; if divided in the middle and hinged at the sides, the angle of the sides when closed shall not be less than 45 deg. nor the steel less than 3/16 in. thick.

Indicator on Hoist—All machinery used for the purpose of hoisting or lowering employees and material into metal mines shall be equipped with an indicator geared positively to the shaft of the drum and so adjusted with dial or slide as to provide a target or indicator that at all times shows the exact location of the cage, bucket or skip in the shaft. This indicator must be placed near to and in clear view of the engineer, and shall be free from gongs, bells or automatic attachments.

Cager—All mines, equipped with cages or skips, when hoisting material from two or more levels, shall employ a man to be known as a "cager" whose duties shall be to load and unload the cage or skip, and to give all signals to the hoisting engineer.

Fire Protection—All mines having but one exit and that covered with the building containing the mechanical plant, furnace room and blacksmith shop shall have fire protection. Where steam is used, hose of sufficient length to reach to the farthest points of the plant shall be attached to the feed pump or injector, ready for immediate use. In mines where water is not available, chemical fire extinguishers or hand grenades shall be kept in convenient places, ready for immediate use.

Storage of Inflammable Material—Oils and other inflammable material shall be stored in a building, kept only for them, situated at a safe distance from the other buildings and from the powder magazine. Only sufficient oil, etc., shall be removed to meet the requirements of one day.

Missouri

MISCELLANEOUS LAWS

Mine Maps—The owner or operator of every mine employing 10 or more men shall make, at the discretion of the mine inspector, an accurate map of the workings of his mine. On this every vein shall be shown together with the general inclination of the strata. A copy of this map shall be deposited with the clerk of the court of the county in which the mine is situated, and another copy sent to the inspector of mines. During the month of January of each year the owner or operator shall furnish the inspector a map showing the work that has been done from the time of the last report to the end of the preceding December, and the inspector shall correct his map or plan of the workings of this mine in accordance with this addition. When any mine is worked out or abandoned, that fact shall be reported to the inspector, and the plan or map of that mine in the office of the clerk of the county court shall be carefully corrected and verified.

Inspector May Make Maps—Whenever the owner or operator of any mine shall neglect or refuse to furnish the inspector and clerk with the map or additions to the map, the inspector is authorized to cause an accurate map of such workings to be made at the expense of the owner or operator.

MINE INSPECTION

Bureau of Mines—The Governor shall appoint two inspectors of metal mines, who shall have had practical experience in lead and zinc mining. These inspectors have the power to examine and inspect all mines and the machinery belonging thereto, at all reasonable times, but they shall not hinder or obstruct more than is necessary the working of the mine. If, after examining any mine workings and the machinery pertaining thereto, the inspector shall find that the mine is being worked contrary to the provisions of the mining law, or that it is unsafe for the workmen employed therein, he shall, after giving at least two-days' notice to such owner or operator, proceed, by injunction, against the owner or operator of that mine. If it is shown that the mine is unsafe or that it is worked contrary to the provisions of the mining law, the court shall prohibit the working of that mine, until it has been made safe and the requirements of the law have been complied with.

LAWS REGARDING SAFETY OF MINES

Oils for Illuminating Purposes—Nothing but a pure animal or vegetable oil, or other oil as free from smoke as is a pure animal or vegetable oil, and not the product or by-product of rosin, and which on inspection complies with the following test, shall be used for illuminating purposes in the mines of this State. All such oils must be tested at 60 deg. F. The specific gravity of the oil must not exceed 24 deg., Tagliabue. The test of the oil must be made in a glass jar of 1 1/5 in. diameter by 7 in. deep. If the oil to be tested is below 45 deg. F. it must be heated until it reaches about 80 deg. F., and should the oil be above 45 deg. F. and below 60 deg. F., it must be raised to 70 deg. F., then after being well shaken it should be allowed to cool gradually to 60 deg. F. before finally being tested. In testing the specific gravity of the oil the Tagliabue hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading. Where the oil is tested under difficult circumstances, before condemning the oil for use in the mine, an allowance of ½ deg. shall be made for possible error in parrallax.

Mine Timbers—At every mine a sufficient supply of timber suitable for props shall be kept, so that the miners may at all times be able promptly to secure the workings from caving, and the owners or operators must send down props whenever they are required.

Bore Holes—When advancing toward a mine working that is suspected to contain inflammable gases or to be filled with water, a bore hole must be kept at least 20 ft. in advance, not only of the face, but also, if necessary, on both sides of the working place.

Passageway Around Shafts—The bottom of every shaft shall be supplied with a traveling way so that the men can pass from one side of the shaft to the other without passing under or over the cages. All sumps shall be securely planked over.

HOISTING

Cage—Guides shall be used in all shafts in which the hoisting is done with cages, and this cage shall be provided with safety catches and a bonnet made of boiler iron.

Signals—At all shaft mines a suitable means of signaling in the shaft shall be provided. The owners or operators of every shaft mine shall use the following code of signals: One bell or whistle signifies stop when in motion, hoist when not in motion; two bells or whistles, lower; three bells, hoist rock; four bells, men on cage; five bells, turn on or off air; six bells, turn on or off steam; seven bells, mule on cage.

Hoisting Engineer—No one but an experienced, competent and sober person, not under 18 years of age, shall be employed as hoisting engineer.

Lowering Supplies—No timbers or rails shall be lowered on a cage while men are descending or ascending out of the mine.

Number of Men on Cage—The number of persons permitted to ride on the cage shall be determined by the mine inspector, but in no case shall the number be more than 12 nor less than 4; nor shall men be hoisted or lowered more rapidly than 500 ft. per minute. No person shall ride upon a loaded cage.

Entrance to Mine—The top of all shafts and the entrance to all adits must be securely fastened by gates properly covering and protecting the shaft or adit entrance. The entrance to every abandoned incline or vertical shaft must be securely fenced off.

ACCIDENTS

Reporting Accidents—Whenever a serious or fatal accident occurs in any mine, the person in charge must report the facts regarding the accident to the State mine inspector without delay. The inspector, upon receiving the report, shall, if he deem it necessary, go to the scene of the accident, and make suggestions and render such assistance as he may deem necessary for the safety of the men. The inspector shall investigate the cause of all accidents, and shall file in his office a report regarding each. In order to make this investigation he has the power to take depositions, to summon witnesses, and to administer oaths.

Hindrances on Part of Miners—Any miner, who does any wilful act whereby the lives and health of persons working in the mines, or the security of the mine or miners, or the machinery, is endangered, shall be guilty of a misdemeanor.

EXPLOSIVES

Blasting Explosives—Owners or operators of coal, lead, zinc, or copper mines shall require all miners or other persons using black powder or high-power nitro-explosives to keep in a strong box all explosive not for immediate use. These boxes shall be fastened with a lock, and shall not be kept within 100 ft. of the place of blasting. In all mines shot-firers or blasters shall be employed to fire all shots after the miners in the vicinity of the blast have retired to a safe distance. After the blasts have been fired the shot-firer shall make a thorough examination of each hole that he charged, and shall ascertain whether it has been discharged or has misfired. The holes that have misfired shall be marked in some way, and the shot-firer shall report the position of such holes to all employees working in that part of the mine.

Electric Blasting in Shafts—At all mines where 10 or more men are employed on any shift, all holes in the shaft must be fired by an electric battery placed above ground, and in no case shall caps and fuse, or any other method than electric blasting be employed for exploding holes in shafts.

Montana

INSPECTION OF MINES

Mine Inspectors—The Governor must appoint an inspector of mines and a deputy inspector, each of whom shall be at least 30 years of age, a resident of Montana at least one year, theoretically and practically acquainted with mining in all its branches. Each shall hold his office for four years, unless removed by the Governor. No person shall hold the office of inspector or deputy inspector, while an employee or officer of any mining, milling or smelting company. The inspector of mines and his deputy must devote their entire time to the duties of their office.

Duties of Inspector—It is the duty of the inspector of mines, by himself or by deputy, to visit every mine in the State once every year, and to inspect its working, timbering, ventilation, means of ingress and egress, and the means taken to protect the lives and to insure the safety of the miners. For this purpose the inspector or his deputy shall at all times have access to any part of any mine. Whenever the inspector shall find any mine or part of any mine in an unsafe condition, he shall at once notify in writing the owner or person in charge of that mine of this condition. In this notice he shall set forth the nature of the defects which render the mine unsafe and the point or place in the mine where such defect exists; and he shall require that the repairs necessary to remedy these defects shall be made within a specified time. If in his judgment the circumstances require it, the inspector shall forbid the operation of that mine or the portion that has been declared unsafe until it has been rendered safe. No work shall be done in that portion of the mine, except for the purpose of rendering it safe, until the inspector gives permission.

Complaints to Inspector—Whenever the inspector of mines receives a complaint in writing signed by one or more persons, setting forth that the mine in which he or they are working is dangerous in any respect, the inspector or deputy inspector must in person examine that mine as soon as possible. Every complaint must set forth the nature of the danger and also the time that the danger was first observed.

Recommendations as to Working Methods—The inspector, while visiting a mine, shall make such recommendations as in his judgment are necessary to insure the safety of the workmen.

Accidents—Whenever a serious or fatal accident occurs in any mine, the person in charge of the mine must immediately notify the inspector. Upon receiving that notice the inspector or his deputy must in person go at once to the place of the accident, and investigate as fully as possible the cause of that accident. Whenever possible, the inspector or deputy inspector shall be present at every coroner's inquest held over the remains of a person killed by a mining accident, and he shall testify as to the cause of this accident and state whether in his opinion the accident was due to the negligence or mismanagement of the person in charge of the mine. Whenever the inspector or his deputy cannot immediately be present at the scene of the accident, the person in charge of the mine must secure a written statement made by those who witnessed the accident. In case no one was present at the time of the accident, then the verified statement of those first present at the scene of the accident must be taken, and such statement must be given to the inspector or deputy inspector. If, after making such investigation, the inspector deems the fact warrant it, he may criminally prosecute the owners or person in charge of the mine in which the accident occurred, but the provisions of this paragraph do not apply to mines in which less than five men are employed.

PROTECTION TO MINERS UNDERGROUND

Two Exits from Mine—At all mines that have been worked to a greater depth than 100 ft., and at which the vein has been driven on for more than 200 ft. after it has been reached by a crosscut, in case the collar of the shaft is covered with a building that is not fire-proof, it is necessary to provide more than one means of exit from the mine. When, at the time that stoping begins, there is no such escapement shaft or opening, work upon this means of exit must be commenced immediately afterward and be diligently carried on until completed. This escapement shaft must be connected with the deepest workings in the mine, and it must afford an easy passageway; if it be a raise or a shaft, it must be provided with good, substantial ladders from the deepest workings to the surface. Whenever the exit or outlet is not in a direct or continuous course, sign boards, plainly marked so as to show the directions to be taken, must be placed at each departure from the continuous course. This paragraph shall not apply to mines in which less than nine men are employed; nor to mines not actually producing ore by stoping; nor to mines at which the shaft is not covered by a shaft-house and which has no building within 30 ft. of it; nor to mines in which the shaft or opening is covered by a fireproof shaft-house or building.

Building at Entrance of Adit—After an adit has been driven a distance of 300 ft., it is unlawful for any person or corporation to erect or maintain any building or inclosure over or around the mouth of that adit unless that structure is fireproof in its construction.

HOISTING

Shaft Pillars—It is unlawful for any corporation or person, operating a mine that is worked through a vertical or inclined shaft, to stope closer than 25 ft. to the shaft when other work is being carried on below that level.

Hoisting Speed—It is unlawful for any person or corporation to hoist men out of, or lower men into, a mine at a speed greater than 800 ft. per minute. When it is shown that in running his engine at a greater speed than 800 ft. per minute the engineer has violated the orders of his employer, the engineer alone shall be subject to prosecution.

Cage for Hoisting Men—It is unlawful for any corporation or person to sink, or work through, a vertical shaft deeper than 300 ft. unless an iron-bonneted, safety cage is used for hoisting and lowering men. This cage shall be provided with sheet-iron or steel casing, not less than 1/8 in. thick, or with a netting composed of wire not less than 1/8 in. diameter. Except when the cage is used only for sinking, these cages shall be provided with doors, made of the same material, either hung on hinges, or working in slides. These doors shall extend at least 5 ft. above the bottom of the cage, and must be closed when lowering or hoisting the men. The safety apparatus, whether extension springs or some other device, must be securely fastened to the cage, and must be of sufficient strength to hold the cage at any depth to which the shaft may be sunk. The iron bonnet must be made of boiler iron of good quality, and at least 3/16 in. thick, and this bonnet must cover the top of the cage in such a manner as to protect as much as possible those on the cage from objects falling in the shaft. The mine inspector and his assistant must see that all cages are kept in compliance with this paragraph, and that on all cages the safety dogs are kept in good condition.

SIGNALS

Preparation of Signal Code—The inspector of mines shall prepare a complete code of signals for use in all mines that are worked through a shaft more than 75 ft. deep, and at which 10 or more men are employed. The inspector may add to or change this code of signals as circumstances may require, but no change of signals shall go into effect until the time specified by him, which shall not be less than 60 days, nor more than 90 days from the time that the change is ordered by him.

Signal Code—One bell, hoist; one bell, stop, if in motion; two bells, lower; three bells, men on cage; four bells, blasting signal; engineer must answer by raising bucket a few feet, letting it back slowly; then one bell, hoist men away from the blast; five bells, steam on; six bells, steam off; seven bells, air on; eight bells, air off; 3-2-2, send down drills; 3-2-3, send down picks; nine bells, danger signal, to be used in case of fire or other danger; then ring number of station where danger exists. No person except the station tender shall ring any bell except in case of danger, or when the main shaft is being sunk. Engineers must slow up when passing stations when men are on the cage. The station signals are:

Bells.	Pause.	Bells.	Station.
2	..	1	1
2	..	2	2
2	..	3	3
2	..	4	4
2	..	5	5
3	..	1	6
3	..	2	7
3	..	3	8
3	..	4	9
3	..	5	10
4	..	1	11
4	..	2	12
4	..	3	13
4	..	4	14
4	..	5	15
5	..	1	16, etc

Call Signals—Where electric bells or flash signals are installed in connection with other signaling device, the electric-bell or flashing device is to be used only for call signals. If the cage is wanted, ring station signal; the station tender will answer one bell; reply one bell to go up, reply two bells to go down. If station is full of ore and the station tender is wanted, ring station signal and do not answer back. If 2-1-2 bells are rung, engineer or station tender does not understand; repeat signal. In case of danger or accident, ring station signal; the station tender will reply one bell; ring nine bells.

STORING EXPLOSIVES

Record of Explosives—A record of all transfers of black powders, gunpowder or nitro-explosives shall be kept in a book that is at all times open to the inspection of the State inspector of mines, or any peace officer.

Explosives in Mines—No person or company shall store or keep in any mine more than 3000 lb. of blasting powder or other high explosives, and these explosives shall not be stored in any place where their accidental explosion would cut off the escape of the miners working in that mine.

Liability of Employer—Every company or individual operating any mine shall be liable for any injury sustained by an employee when the accident is caused by the negligence of any superintendent, foreman, shiftboss, hoisting or other engineer, or trainman, provided there is no contributory negligence on the part of the miner. No contract of insurance, release, benefit or indemnity in case of injury or death, or any other contract entered into, before the injury, between the person injured and any of the employers named in this paragraph shall constitute a bar or defense to any cause for action brought under the provision of this paragraph.

New York

INSPECTION

Duties of Commissioner of Labor—Among the duties of the commissioner of labor is to see that every precaution is taken to insure the safety and health of employees in mines, and to examine carefully into the methods of timbering shafts, drifts, inclines, slopes and tunnels, performance of daily labors, and to see that all persons or companies owning or operating mines in this State shall comply with the laws regarding the operation of mines.

Two Exits from Mines—Whenever the commissioner of labor thinks that the safety of the employee demands two entrances to a mine, he has the right to forbid the working of that mine, whether it is worked through a vertical or inclined shaft or through an adit, until two means of exit have been provided. The escapement outlet shall be so constructed as to provide at all times a safe and separate passageway from and to the surface.

Ventilation—In each mine a ventilating current shall be circulated along the face of all working places and through the roadways in sufficient quantities to insure healthful conditions for the employees and the removal of smoke and obnoxious gases.

Timbering—Each mine must be properly timbered, and the faces and roofs of all working places properly secured from caving. No person shall be required or permitted to work in any unsafe place or under dangerous ground except to make it safe.

PROVISIONS FOR THE SAFETY OF MINERS

Riding On Loaded Cars—No person shall be allowed to ride into or out of a mine on any loaded car, cage or bucket.

Inspection of Boilers and Apparatus—The owner or person in charge of the mine must have the boilers inspected once in six months by a competent person, approved by the commissioner of labor; a duplicate of the certificate showing the results of this inspection must be sent to the commissioner of labor, and the original kept on file at the mine office. All engines, brakes, cages, buckets, ropes and chains shall be kept in good order, and inspected daily by the superintendent of the mine or by some person designated by him. All lifts, hoists, ropes and other mechanical devices shall be properly designed and maintained so as to sustain the weights intended to be placed on or suspended from them, the factors of safety generally accepted by competent engineers being used. All cars and lifts shall be provided with safety brakes. Hoisting ropes shall at all times have a breaking strength of not less than five times the gross load suspended from them, including the weight of the rope itself. Each boiler or battery of boilers shall be provided with a proper safety valve and with steam and water gages to show respectively the pressure of the steam and the hight of water in the boilers. A steam gage shall be attached to the steam-pipe in the engine room and so placed that the engineer can readily ascertain the pressure carried.

[illegible] powder nor oils of any description shall be stored in a mine, tunnel, or quarry, or in or around a shaft, engine or boiler house, but all supplies of an inflammable or destructive nature must be stored at a safe distance from the mine opening.

ACCIDENTS

Reports of Accidents—Whenever a serious or fatal accident occurs at a mine, the owner or person in charge must report, in writing, to the commissioner of labor all the facts connected with the accident.

Notice of Dangerous Conditions—If in the opinion of the commissioner of labor a mine or anything used in the operation of the mine is unsafe, he shall immediately serve upon the owner or person in charge of the mine a written notice specifying the defects. If this notice is not complied with, the commissioner of labor shall begin an action in the Supreme Court to enforce compliance with the notice, and, if the facts warrant, the Court may grant an order restraining the working of that mine. In carrying out his work, the commissioner of labor shall have the right of entering any mine at any time.

Traveling Ways—A traveling way not less than 5 ft. high and 3 ft. wide, shall be cut around the side of every hoisting shaft or driven through the solid strata at the bottom thereof so as to permit travel from one side to the other without crossing the shaft.

Shaft House—Every underground working where the depth exceeds 40 ft. shall be equipped with a proper head house and trap doors.

Wash-Room—Every mine employing more than 25 men shall maintain a suitably equipped and heated wash-room which shall at all times be open to employees.

Duties of the Superintendent—The superintendent shall see that all rules and laws regarding mining are enforced at his mine, no matter whether the work is done on day's pay or on contract.

Daily Inspection—The superintendent shall designate a competent person who shall each day make an inspection of all mining appliances, boilers, engines, magazines, shafts, shaft-houses, underground workings, roofs, pillars, timbers, explosives, bell ropes, telephones, tracks, ladders, etc., and this person shall at once report in writing any defects to the superintendent.

Timbering—The timbers shall be of ample size and strength, and shall be used freely and wherever there is any chance of danger. Only new and properly seasoned timber, which has been inspected carefully for rot or other defects shall be used. All timbering shall be inspected periodically for decay.

HOISTING

Signals—Special care must be taken to keep the signaling apparatus in order. The bell lines must be of ample strength, and must be kept clear of all rock and timbers. Shafts more than 400 ft. deep must have speaking tubes or telephones from the foot of the shaft to the engine room. A code of signals together with a notice of the penalty for a wrong signal, shall be posted at different parts of the workings and particularly at the shaft-house. Mistakes in signals should be severely punished.

Ladderways—Ladders shall be strong and kept intact. In vertical shafts and highly pitching inclines, landings should be placed not more than 20 ft. apart and closely covered except for a hole large enough to allow a man to pass through to the next ladder. In incline shafts there shall be a hand-rail, attached to the ladder, and wherever possible steps shall be used with hand-rails attached.

Shafts—The collar of the shaft shall be covered and guarded so as to prevent accidents from persons or foreign objects falling into it; in most cases, automatic doors should be used. The manway shall be around and not across the shaft head. The timbering in shafts shall be examined often, for it decays rapidly under certain conditions. Inside shafts, raises, and chutes shall be carefully guarded. When sinking the shaft below levels on which mining is being done, the shaft shall be bulkheaded at the lower level; this bulkhead must be made of timbers not less than 4 in. thick.

Hoisting Engineers — Superintendents should use great care to see that their hoisting engineers are mentally and physically qualified for their positions. When persons are lowered into or hoisted out of a mine, the hoisting engineer must be not less than 21 years old; when rock is hoisted, not less than 18. The hoisting engineer shall never delegate the control of the machinery to any other person, and no one shall interfere with him in his duties. The hoisting engineer shall be in constant attendance at his engine or boiler whenever men are working underground. The engineer shall not permit anyone to loiter in the engine room except those whose duties require them to be there, and he shall hold no conversation with anyone while the engine is in motion or while his attention is occupied with signals. A notice to this effect shall be posted on the door of the engine house. Whenever men are on the cage, the hoisting engineer must run the engine with extra care and at only moderate speed.

Hoisting Machinery—All hoisting machinery must be inspected once in 24 hours. The cage or car used for hoisting or lowering men in the shaft must be provided with a proper safety catch and with a sufficient overhead covering to protect the men from falling rock. The hoisting drum must be provided with flanges extending more than 4 in. higher than the rope when the entire length is wound on the drum. Adequate brakes must be attached to the hoisting drum, and safety gates must be placed at all shafts so as to prevent persons from falling down the shaft. The main governing chain attached to the socket of the wire rope shall be made of the best quality of iron and properly tested. When the cage is used in lowering or hoisting men, a bridle chain shall be attached to the hoisting rope above the socket from the top part of the carriage or cage, and no single chain shall be used to fasten the cage to the hoisting rope. Notice of the maximum number of men allowed to be lowered or hoisted at any one time shall be posted in a conspicuous place at the top of the shaft, and no greater number of persons shall be lowered or hoisted at any one time than is permitted by the commissioner of labor. All machinery which is liable to cause accidents should be suitably fenced off with a guard rail.

Fire—All oil, waste, candles, etc., shall be stored at a safe distance from the boiler house, engine room and shaft house, and a quantity of water shall be stored at such places to guard against fire. All shaft houses shall have ample fire protection, and the appliances shall be kept in condition for instant use. All mining plants using steam should have a hose attached to the injector or feed pipe to be used in case of fire.

EXPLOSIVES

Storing Explosives—All explosives in excess of that required during one shift shall be stored in a magazine placed far enough from the working shaft, stopes or adit that, in case the whole quantity should explode, no damage will be done to the mine workings. This magazine should be fire-proof, and so constructed that a bullet from a modern rifle or pistol cannot penetrate it. Exploders and powder shall not be kept in the same room. A suitable place separate from the boiler or engine room shall be provided for preparing charges. One man shall have full charge of the powder magazine.

Storing Dynamite—Dynamite must be stored in a building isolated from other buildings and from traffic. Caps and electric exploders must never be stored in the same building with dynamite, but must always be kept apart until the time for preparing the charge.

Thawing Room—A suitable place for thawing dynamite shall be provided. Either a hot-water or steam bath device should be used; dry heat must never be used. A receptacle for carrying explosives shall be provided.

Thawing Dynamite—When large quantities are used, a separate building should be provided in which the dynamite is thawed by the heat from steam radiators. Use only exhaust steam for heating this building, and, if possible, keep the temperature of the room at 80 deg. F. The dynamite should be placed in racks as far as possible from the radiator. When only small quantities of dynamite are to be thawed, a thawing kettle consisting of two water-tight kettles should be used. The dynamite should be placed in the smaller kettle, the smaller kettle placed inside the larger one, and the space between filled with water having a temperature of from 120 to 130 deg. F. Never place the kettle over a fire, but when more heat is required, empty the kettle and fill with more hot water. Never attempt to thaw the dynamite by placing it in hot water, or by exposing it to the direct action of steam.

Precautions in Handling Dynamite—Powder must never be placed on, in, nor near hot steam pipes, boilers, hot stoves, nor any other hot metal, nor close to radiated heat from a hot fire or stove. Never roast, toast, or bake dynamite in any way, nor take it near a blacksmith's forge. Never allow a person to smoke near dynamite, nor fire of any description to be brought near it; nor shall any loose caps or fuse be left lying near dynamite.

Blasting—No person shall use explosive who has not been judged competent by the person in charge of the mine. When a blast is about to be fired, timely warning must be given. All blasting must be done by the head blaster or by his helpers who are designated by the superintendent for that purpose. No person who is addicted to the use of intoxicants shall use or handle any explosive. All tamping of high-power explosives shall be done with a wooden stick. After blasting no one except the blaster shall be allowed in that part of the mine until the blaster has made a personal examination and pronounced everything safe. After a misfire, no one except the blaster and his helper shall be allowed in that part of the mine until three hours have passed, unless the blaster has made a personal examination and pronounced everything safe.

Moving Dynamite—When dynamite is moved in wagons, railroad trains, mine cars, etc., the greatest care must be exercised, and neither percussion caps, exploders, fulminators, friction matches, nor any articles of like nature shall be loaded in the same vehicle.

Preparation of Charge—Cut a piece of fuse the right length and then, after seeing that the cap is free from any particle of sawdust, carefully insert the freshly cut end into the blasting cap as far as it will go. Crimp the other end of the cap tightly around the fuse with a pair of cap nippers, but do not under any conditions disturb the foundation or filling in the cap. Then carefully open one end of a dynamite cartridge, and, after making a hole in the dynamite with a sharpened lead pencil, or pointed wooden stick, insert the capped end of the fuse, being careful to see that at least ¼ in. of the cap remains out of the dynamite. Finally, draw the paper closely about the fuse and tie it with a strong cord.

Tamping Stick—No iron or steel-pointed needle or tamping bar shall be used for charging holes with explosives, unless the end of the bar is tipped with at least 6 in. of copper or other soft material.

Charging the Drill-hole—The cartridge must be pushed gently to the bottom of the drill-hole with a wooden stick, putting the cartridge on top. Having placed the required quantity of explosive in the hole, cover with 6 or 8 in. of loose tamping, and press it down firmly with a wooden stick. After that the hole may be, if desired, tamped to the top, ramming the tamping down hard. Never use an iron or metal bar; wood is always sufficient.

Exploding Blasts—In electric blasting a current having higher voltage than 250 volts must not be used.

Misfire—In the case of misfire, never attempt to remove the tamping or draw the charge; always drill a new hole.

RULES FOR THE DAILY GUIDANCE OF EMPLOYEES

Riding on Loaded Cage—No employee shall ride on any loaded skip, car, cage or bucket, nor shall any employee walk up or down any slope, or shaft, while any skip, car, cage or bucket is above.

Examining Stope Walls—The pit boss shall carefully examine the roof of all slopes, levels and working chambers daily. Machine runners shall carefully examine and sound the roof at the working face, and remove all loose rock or ore before beginning to drill.

Utah

MISCELLANEOUS LAWS

Fire Protection—All mines having but one exit and that covered with a building containing the mechanical plant, furnace room or blacksmith shop shall be provided with fire protection. Where steam is used, hose of sufficient length to reach to the farthest part of the plant shall be attached to the feed pump or injector, and kept ready for immediate use. In mines where water is not available, chemical extinguishers or hand grenades shall be kept ready for immediate use.

Mine Cages—In all shafts deeper than 200 ft., a cage, if used, must be covered with an iron bonnet. This bonnet must be made of boiler sheet iron of good quality at least 3/16 in. thick. The bonnet must cover the top of the cage in such a manner as to afford the greatest protection to life and limb from any falling objects. The safety apparatus, whether consisting of eccentrics, springs, or other device, must be securely fastened to the cage, and be of sufficient strength to hold the loaded cage at any depth.

EXPLOSIVES

Storage of Explosives—No mining company or person operating a mine employing more than 10 men shall, at any time, store at any shaft house or at any covering over any adit or incline, or within the underground workings of any mine, more powder or high explosive than is required in 24 hours.

Care of Injured—At all mines where 10 or more men are employed, a woolen blanket, a waterproof blanket, a supply of linseed oil, antiseptic gauze, carbolated vaseline, sponges, soap, liniment and carbolic acid, rubber bandages, suitable towels and a wash basin shall be kept readily accessible for the comfort and treatment of anyone injured.

Mineral Production of Japan

From official returns published in the *Chamber of Commerce Journal* of Yokohama, it appears that the production of metals in Japan for the six months ended June 30 was as follows:

	1907.	1908.	Changes	
Gold, oz.	46,847	35,905	D.	10,942
Silver, oz.	1,306,784	1,706,413	I.	399,629
Copper, lb.	23,841,475	24,348,811	I.	[illegible]
Iron, long tons.	21,465	18,418	D.	3,047

The exports of copper for the first half of 1908 were 2,458,253 lb. The production of non metallic minerals is reported as follows:

	1907	1908	Changes	
Sulphur, lb.	1,589,893	1,716,103	I.	126,210
Petroleum, gal.	28,726,137	27,915,157	D.	810,980
Coal, long tons	5,783,896	5,945,718	I.	161,822

The copper figures appear to be only a partial statement of the production.

Nevada Consolidated Copper Company

The report of this company for the year ended Sept. 30, 1908, covers a period largely devoted to development and preparation for future production. An important part of it is the report on the property made by Pope Yeatman, consulting engineer, an abstract of which was published in the JOURNAL of Nov. 14, page 972. The balance sheet at the close of the year was as follows:

Capital stock, 1,600,000 shares	$8,000,000
Surplus realized on sale of stock, etc.	[illegible]
Mortgage bonds	[illegible]
Accounts payable	178,153
Profit and loss	[illegible]
Total liabilities	**$14,404,040**
Cost of mine and construction	[illegible]
Stock of other companies	[illegible]
Trusteed capital stock	[illegible]
Materials on hand	120,688
Ores in process of treatment	152,869
Accounts collectable	12,835
Cash and call loans	[illegible]
Total assets	$14,404,040

The trusteed stock is stock of the company held in trust to provide for the conversion of the first mortgage bonds of the company and those of the Nevada Northern Railroad. The stocks owned include shares of the Steptoe Valley Smelting, the Cumberland-Ely Copper and the Nevada Northern Railroad companies.

The report of James Phillips, Jr., president, says, in substance; "For the final four months of this fiscal year your company has been, upon a constantly increasing scale, an actual producer and shipper of copper, and is today marketing the metal. From the data at hand, it may be accepted with confidence that in January, 1909, our monthly production will be at a rate equivalent to an annual production of at least 35,000,000 lb., and that by April next, when the additions to the concentrating and smelting plant now under way are completed, the increased facilities will result in raising our annual output to 50,000,000 or 55,000,000 lb. of copper. Should still another unit be added to our plant it is well within the range of probability that by September next your company will take its place as one of the six largest copper producing companies of the world. A year ago your consulting engineer reported that the actual tonnage blocked out in the Eureka and the Ruth groups then aggregated 14,432,962 tons; to which total more than 5,500,000 tons have been added by development operations during the current year. In view of the fact that only a small portion of the territory, consisting of 850 acres, has been prospected, the possibilities for a large increase of developed tonnage in the near future are great, and the latest returns from drillings on both groups are calculated to confirm this prediction. Despite the intervention of a financial panic and the delays [illegible] in prosecuting construction during two winters, just 18 months elapsed between the turning of the first spadeful of earth on the smelter site and the beginning of the concentration and the reduction of ores in the first section of your plant, and at this time the treatment of ore and the production of copper [illegible] Nevada Consolidated ore. [illegible] possess the ore to warrant it, that the construction of the additional unit, the fifth of the series, will carry our [illegible] production of blister copper to approximately 70,000,000 lb. yearly.

"In this connection it may be mentioned that the works have now been in operation a sufficient length of time to assure us that when the full measure of mining and smelting capacity is reached the Nevada Consolidated will produce copper as cheaply as any copper company. The utilization of steam shovels at Copper Flat during the current year has demonstrated the great economy of this method of mining, and the fact that the [illegible] of adjacent States have given excellent results has also proved a factor in the cheap production of copper. Our shipments of copper to date aggregate about 3,000,000 lb. The development of the company's water rights for mining, milling and smelting during the past year has progressed satisfactorily, and the works are now supplied with an abundance of water for all present purposes, and we have sufficient for operations many times greater than the capacity of the present plant.

"Concerning the transportation facilities to your mines and to the several departments of the plant by the Nevada Northern, owned jointly with the Cumberland-Ely company, the railroad is thoroughly equipped and in successful operation.

"It is the intention of your officers to supplement the annual reports from time to time, as existing circumstances warrant, with interim reports, treating not only of the progress of development and production at the company's mines and works, but also of the financial details of its [illegible] cent., first mortgage bonds, convertible into stock, which were sold at par, the [illegible] the same."

The United States Smelting Company, of Salt Lake City, Utah, intends to engage in the manufacture of white arsenic, utilizing the fumes [illegible] by the baghouse which filters the smoke from the [illegible] furnaces. The [illegible] plant, which will [illegible] furnaces, is now about [illegible] per cent. completed.

The deepest shaft at Butte, Montana, is the High Ore shaft which is [illegible] ft. deep. The deepest level from this shaft is the 2800-ft. level.

The Goldfield Type of Ore Occurrence

Ransome Shows That the Peculiar Occurrence Is Due to the Action of Acidic Non-ferruginous Vapors Incidentally Causing Alunitization

BY ROBERT T. HILL*

Goldfield is *sui generis* in that nowhere else, not even in Nevada with its many gold camps, until recently, has another locality of a similar geological type of ore occurrence been discovered. *Every natural condition of topography, outcrop, country rock, and of other "indications" considered by the prospector, is different from those with which precedent is familiar.* It is safe to say that had not the ores been discovered accidentally a great majority of prospectors, practical mining men, geologists and engineers would today pass over the ground without thinking it worthy of serious consideration.

The Goldfield ores are a conspicuous example of ores occurring in a manner entirely different from any known precedent. They are neither true filled fissure veins, magmatic segregations, nor contact deposits. The aspects and principles of the Goldfield type of ore occurrence have recently been worked out and defined by Dr. F. Leslie Ransome, of the United States Geological Survey.[1] These principles are so absolutely different from precedent that we believe that Doctor Ransome's results and conclusions, which make one of the most important contributions to the geology of ore deposits which has appeared for years, should be available to every mining man.

THE FLORENCE PROPERTIES, GOLDFIELD, NEV., SILICIFIED RIDGES AND ALTERED ALUNITIZED GROUND

Departure from Precedent

Some of the ways in which the ores differ from the previously known ore occurrence are as follows: (1) The ores do not occur in mountains, but are found in eroded valleys between the adjacent mountains. (2) There are no strong iron outcrops. (3) Coarse quartz veins and well defined true fissure veins are conspicuously absent. (4) The ores do not outcrop strongly at the surface. (5) It is usually difficult, except in exceedingly "high-grade," to tell ore from country rock. (6) It is very difficult to detect or tell the average ore at all, except by panning, and not always by the latter method.

As worked out and discovered by Doctor Ransome *the Goldfield ores are clear examples of deposition or replacement in a favorable matrix by acidic, gold-bearing, solfataric vapors, which, penetrating the igneous rocks from below through fissures, deposited or disseminated the gold in the adjacent country rock coincidently as they altered the feldspars into alunite and kaolinite.*

As stated by Ransome: *"The recognition of alunite as a characteristic constituent of the Goldfield ores and the demonstration of its genetic relation to them establishes a new type, that of 'alunitic and kaolinitic gold-quartz veins.'* While the Goldfield deposits are too irregular in form to come under the usual definition of vein, yet they have the same genesis as what is usually termed a metasomatic replacement fissure vein, i.e., values disseminated throughout the country rock adjacent to the fissures." The key to the peculiar occurrence of the Goldfield ores is the fact that the mineralizing vapors were acidic and nonferruginous, instead of alkaline and ferruginous, as in previously recorded instances, resulting in different aspects of alteration and alteration products in the country rock, and the absence of or feebleness of iron stains.

The Country Rocks

At Goldfield the country rocks consist of volcanic intrusions and eruptions of Tertiary age, cutting through and overflowing a plexus of older sedimentaries and surrounded by desert wash; and at both localities the introduced gold occurs in kaolinized or alunitized "porphyries" of the andesitic family. The ores of Goldfield occur in middle or early Tertiary rhyolite, latite, andesite and dacite. Nearly all of these are extrusive flows, or intrusions.

At Goldfield the ores are largely in an intrusive sheet of dacite, a rock species at the silicious extreme of the andesite, although Collins asserts that the ores of the Little Florence are in andesite. It is very difficult for the layman to distinguish dacite from andesite; in fact, dacite is merely andesite containing free silica and, in the classification of rocks, is near the boundary between andesites and rhyolites. The field worker in Nevada who encounters either of these rocks intensely altered, as they should be if they contain gold or silver, will be lost in distinguishing them, except in some locality where their aspects have been pointed out after microscopic search.

---

*Mining geologist, 25 Broad street, New York City.

[1] "The Association of Alunite with Gold in the Goldfield District, Nevada." By Frederick Leslie Ransome, U. S. Geological Survey. *Economic Geology*, Vol. II, No. 7, October November, 1907.

STRIKES AND STRUCTURE

Goldfield is in the vicinity of an old volcanic eruptive site which broke through at a point of structural weakness along the Nevada fault zones. After their eruption the rocks were in turn fractured so that Goldfield is now an area of numerous cross-faults and fractures in many directions making favorable intersections, fracturelets and other channels for the upward circulation of the volcanic vapors which continued to ascend long after the country rock was laid down, and accomplished the alteration and mineralization of the rocks.

According to Collins, "in the Combination, the general course of the silicified zone is northwest-southeast, while the average course of the richer streaks is nearly north-south. These north-south seams do not extend into the country rock for more than a few feet beyond the limits of the silicification. Where the lode has been rather more shattered than usual and has, therefore, offered a better channel for the mineralizing solutions, the oreshoots may include the whole silicified material."

MINES AT GOLDFIELD. THE WHITE [illegible]

THE ORES

The ore at Goldfield is simply the mineralized altered country rock, a mixture of soft kaolinized material and alunite, with hard igneous rock in all stages of silicification, from rock showing the original porphyritic structure to the dense flinty, fine-grained quartz. Ransome states that: "The native gold of the ores is usually in particles so fine and so closely crowded in the gangue that the precious metal is usually invisible to the naked eye, but when seen resembles a streak of yellow ochre. The gold itself is not easy to see, even in the richest ore, until the specimen is wetted; then it is seen in dull yellow bands formed by minute particles. The gold is sufficiently free, however, to permit the use of the pan in ascertaining what is rich ore; only the material must be ground exceedingly fine before panning. [illegible] *stances, to distinguish ore from country rock, and the pan and assay must constantly be resorted to in prospecting*

"The milling ore of the Combination would be taken for country rock by anyone not knowing from tests that it is ore. The exceedingly 'high grade' is often in the fine-grained quartz; and in some instances where the specimen is from one-third to one-half of its mass in gold, it requires considerable concentration of vision to determine the gold, it is so finely disseminated."

ORE OCCURRENCE

A peculiarity of the Goldfield type of ore occurrence is that the outcrop and superficial zones are poorer, and the good orebodies are not, as a rule, encountered until reaching the sulphide zone. The bottom of the zone of oxidation was between 105 and 115 ft. below the surface at Goldfield. In the Mohawk ground the pay ore usually did not extend upward into the oxidized zone, but in the Sheets, Ish and the Combination, it reached to the surface.

Ransome says: *"The ores, it should be noted, do not occur in typical veins, but in masses of shattered, altered rock of very irregular shape.* In small part only do they appear to have filled visibly open cavities or fissures."

Like all replacement-mineral occurrences in intensely altered rock the ore does not have sharply-cut boundaries and grades or fades into the adjacent country rock. According to Collins, Rickard and other writers: "There are no true veins. The lode-channel has become by silicification harder than the surrounding country The best ore is found in the small stringers and veinlets that traverse the main body of the lode. In the oxidized [illegible] the mine, above the [illegible] level, these are largely filled with small fragments of quartz mixed with a characteristic yellow or reddish ochery material which is mainly kaolin (alunite) formed by the decomposition of the feldspar in the original rock."

The lodes are shattered and fissured zones of silicification, mineralized by hot solutions under pressure from below, which, following the lines of least resistance, the fracturelets and fractures, alunitized the feldspar and deposited the silica and the minerals in the zone of fracturing. As stated by the authors named:

"These silicified zones may be regarded as veins, and ore may be looked for either on the foot- or hanging-wall side, or even throughout the whole of the silicified mass. As a rule, however, the oreshoots follow lines of shattering somewhat diagonal to the general course of the silicified zone itself.

"When the sulphide zone is reached the rich stringers in the lode are easily followed, as the shattered clayey material is heavily impregnated with sulphides forming a well marked dark seam. The richest ore in the mine is usually found on the 'faces' forming the sides of these points, where the gold-bearing solutions have had the best opportunity to precipitate."

The common gangue of the unoxodized ore, the altered andesitic country rock, is quartz, kaolin and alunite. Again quoting Ransome: "The quartz is usually compact, almost flinty in texture, although porous in mass, and in most cases bears unmistakable evidence of having resulted from the silicification of dacite, rhyolite or andesite. *Large vugs and conspicuously* [illegible] *typical veins the world over, are practically absent from the Goldfield district,* where the free development of quartz crystals in open spaces is represented only by drusy films, lining pores left by the solution of phenocrysts or incrusting small interstitial cavities in brecciated material.

"In general the heavy metals brought in [illegible] close to the multitude of small, irregular fissures that afforded opportunity for the depositional process. The sulphur acids, on the other hand, penetrated the wall rock for considerable distances.

"By faulting, the coördinated fissures have been shifted so as to accentuate the multiplicity of fracturing and assist mineralization. The lode-channel, thus formed, has been dislocated in many places by cross-faults; but the rich streaks within the lode-channel appear only to have been diverted, that is, the later enrichment following the fault lines."

Silicification is greatest often on surface, and is less marked as each succeeding level is reached.

CHARACTER OF THE ORES

The aspects of the Goldfield ores under scientific examination are described by Ransome as follows:

"The typical unoxidized ore as it occurs in the dacite near Goldfield consists of pyrite, bismuthinite and a reddish-gray cupriferous mineral having the general composition of tetrahedrite. Native gold is usually associated with these minerals, particularly with the bismuthinite and tetrahedrite. Only the rich ore is easily visible. These minerals are often arranged in successive layers or crusts around silicified fragments of dacite, the inner crust being usually the richer.

"The following minerals have been observed in the Combination mine, the names being quoted in the order of their importance. In the oxidized zone, quartz, kaolin, iron pyrite, gypsum, hydrous ferric oxide, alum, some silvery scales of a mineral that gave blowpipe reactions for bismuth oxide, and small quantities of a tellurite of iron. Near the water level, ferrous sulphate. In the sulphide zone, kaolin, iron pyrite, marcasite, tetrahedrite, bornite, bismuthinite, and very small quantities of chalcopyrite and zinc blende. The gold is accompanied by a small proportion of silver.

"*Of these minerals, the tetrahedrite and the bornite are particularly important as being intimately associated with the gold.* Free gold is often seen mixed with the cupriferous sulphides, but even when this is not the case, and no gold can be seen under the powerful glass, the specimen will almost invariably assay exceedingly rich in gold; from which it is presumed that the gold is either chemically combined with the bornite and tetrahedrite, or else present in a very fine state of division.

"*Gypsum, while not known with actual sulphide ore, is very abundant in the altered rocks within 100 ft. or so from the surface,* and does occur crystallized with quartz and pyrite on the Goldfield-Belmont mine, below the belt of oxidation.

"The brownish, copper-bearing mineral, here provisionally called tetrahedrite, contains antimony and sulphur, as chemically determined by Dr. W. T. Schaller, and is, therefore, not bornite, although it goes by that name in the district. It appears so commonly as a constituent of the best ore that there is a strong suggestion that it is auriferous, particularly as the microscope fails in some specimens of reputed rich ore to reveal any free gold. Further investigation of the mineral is in progress.

"The proportion of silver is rather small, the average of 34 assays of rich ore from the Mohawk mine, made for J. W. Finch, giving 330 fine oz. of gold and 46.5 oz. of silver to the ton.

"Tests and chemical analyses of the ores made for scientific and technical purposes nearly all show a little tellurium, although no tellurium mineral has been recognized in the mines close to Goldfield."

FUMAROLIC ACTION

The intense faulting at Goldfield permitted the ascent of hot fumarolic vapors from underlying igneous magmas. These vapors, penetrating the minute fractures and reacting upon the feldspar in the dark-colored andesites, altered them so intensely as to make them appear as entirely different formations, and introduced the valuable metals as irregular disseminations. The subsequent topographic development of the lower ground at Goldfield is due to the intense shattering of the cross-faults and the ascending of the fumarolic vapors, which so softened the rocks relative to the harder unaltered rocks as to permit more rapid erosion.

The gold and accompanying minerals were disseminated in the country rock, and the country rock altered by these hot, supposedly acid volcanic vapors, rising from some deeper magma below. These vapors altered the feldspar into kaolinite and alunite and segregated the quartz into the fine hornstone-like masses. And still more important, they at the same time carried, introduced and disseminated gold into this altered matrix, thereby mineralizing the altered ground.

The following quotations from Ransome deal with the ore-depositing solutions:

"The mineralogical character of the Goldfield ores and the alteration of the wall rock show that the solutions or vapors which deposited them carried gold, bismuth, antimony, a little arsenic and tellurium, hydrogen sulphide and probably sulphurous and sulphuric acids.

"Two general hypotheses are entertainable with reference to the source of these solutions. They came from above, either the sulphurous or sulphuric acid having been derived from the overlying deposits of oxidizing sulphides; or they came from below. In the former case the solutions were, presumably, cold; in the latter case they were in all probability hot. The intensity of the alteration and the character of the solution, as shown by the composition of the ores and by the metamorphism of the country rock, point to hot ascending waters as the effective agent. *The difficulties in the way of the descensional hypothesis appear to be unsurmountable.*

"In spite of the mass of evidence which indicates the deposition of a large class of gold veins by highly silicious alkaline solutions, it is clear that some deposits, and those of remarkable richness, may be formed by acidic solutions. *The metamorphic agent was evidently a strong acid solution carrying sulphydric and sulphuric acids, and possibly sulphurous acid.*

"The large percentage of loss in calcium, potassium and sodium shows that the active solution was far below its saturation point for these elements and was, therefore, entirely different in character from the supposedly alkaline solutions which deposited the large class of sericitic and calcitic gold-quartz veins exemplified by those of California.

"Whether the sulphuric acid which was doubtless the direct agent in the formation of the alunite was present in the original solution from the first, or whether it was derived from the hydrogen sulphide by oxidation at some stage in the movement of the solution toward its point of attack upon the rocks now visible, is an undecided question.

"The absence of sulphates from contact ore deposits indicates, however, that oxygenated sulphur compounds are not given off directly from solidifying magmas.

"Whether the solutions were notably ferruginous is doubtful. As compared with other districts, the pyrite at Goldfield is not abundant, and all of that in the country rock can, as has been shown, be accounted for without any addition of iron. There has, in fact, been an abstraction of iron which may have been sufficient to form the pyrite in the actual ore, upon the supposition that the dissolved iron, like the silica, migrated toward the fissures."

ASPECTS OF THE ALTERED AND MINERALIZED ROCKS

One of the most important points for the intelligent prospector of the future is that he must be able to distinguish original unaltered igneous rocks from the altered aspects and alteration products. It is difficult for the prospector, engineer, or even the geologist, at first glance, to realize that vast outcrops of white, rhyolitic looking rocks were originally black andesitic porphyries, which have been altered by volcanic vapors; and still more difficult to believe, as the writer has seen, that areas of pulverulent gypsiferous adobe soil are still another residual extreme of the same process.

The following descriptions of the character and alteration of the volcanic rocks by fumarolic vapors are given by Ransome:

"Although comparatively unaltered, representatives of most of the rocks named may be found within the district, yet the metamorphism which they have undergone over much of the area is of a most conspicuous kind. Dark pyroxene-andesites, dacite and rhyolite have alike been changed to nearly white aggregates of secondary minerals. Such products, as a rule, retain only traces of the original textures of the igneous rocks from which they have been derived. To detect and interpret these traces requires patient field observation of the progressive stages of alteration supplemented by microscopical study.

"The altered rock at Goldfield is light gray, flecked with numerous dull white spots which represent the original feldspar phenocrysts. The few quartz phenocrysts are unchanged, but the ferromagnesian or, more briefly, 'femic minerals,' have wholly disappeared. Pyrite in small, disseminated crystals is abundant."

The alteration (alunitization) is characteristically associated with unoxidized ores, and gold, pyrite, tetrahedrite, bismuthinite and the other minerals found in such ores were deposited at the same time that the neighboring rocks were changed to quartz, alunite and kaolinite.

From comparative chemical analyses of the altered and unaltered rocks, Ransome concludes that:

"It appears that the altered rock has lost a little of its silica, more of its alumina, nearly all of its magnesia and lime, three-fourths of its soda and two-thirds of its potash. On the other hand, the water has greatly increased, a large amount of sulphuric anhydrite has been added and the iron has been converted into pyrite."

Three types or stages of alteration are recognizable at Goldfield, as stated by Ransome:

"First, where the chemical activity has been most intense, the rocks have been changed to porous, fine-grained aggregates consisting essentially of quartz. This is the material of which is composed the hundreds of craggy points and ledges which are one of the most characteristic features of the topography of the district. Although most of these ledges, so far as known, contain no orebodies, *yet until recently no ore has been found that was not in or alongside such quartz rock.*

"Some of the discoveries at Goldfield, made in 1906, however, show that very rich bodies of ore occur at places where there is no silicious outcrop.

"The second type of alteration is one in which the rock is changed to a comparatively soft, light-colored mass of quartz, kaolinite, alunite and pyrite. At any given locality the boundaries between the rocks representing two kinds of alteration may be fairly sharp; but the proportions of quartz, kaolinite and alunite vary widely and consequently, over the field at large, gradations in composition and hardness may be found between these two typical metamorphic products.

"The third type of alteration has effected less conspicuous results than the other two, and its products are not closely associated with the ores. It consists in the development of calcite, quartz, chlorite, epidote and pyrite, at the expense of the original minerals and groundmass, and is thus propylitic in character. It is rather sharply marked off from the second type by the presence of calcite and the absence of alunite, these minerals not having yet been observed together in the same specimen. Rocks which have undergone this form of alteration, chiefly andesite, latite and dacite, still retain something of their original color and texture, *the principal external sign of change being a greenish tint instead of the usual gray of the fresh rock,* and a lack of luster in phenocrysts.

"Just what became of the lime and magnesia removed from the altered dacite has not been determined. A part, at least, of the calcium was probably taken into solution as hydrous sulphate *and deposited in fissures as gypsum,* this mineral being known to occur in the district in places where its formation can scarcely have resulted from the action of surface waters.

"The solvent action of the solution upon quartz was comparatively slight, as shown by the fact that the original phenocrysts of the dacite still retain their characteristic 'embayed' outline when the rest of the rock is altered to quartz alunite and kaolinite.

"Large masses of coarsely crystalline vein quartz are absent from this district and it seems necessary to conclude that the ore-bearing solutions were not only poor in silica, but that, in spite of their energetic attack upon the rocks, they were not good solvents for quartz.

"The quartz set free by the decomposition of the silicates has for the most part recrystallized as fine-grained aggregates, constituting the hornstone-like quartz."

The Mineral Alunite

Associated with the quartz in much of the ore at Goldfield are soft white substances such as the miners commonly call "talc," kaolin," etc. Chemical and microscopical tests of the white material, as made by Dr. Ransome, show that in most cases it is either alunite or kaolinite, or a mixture of the two. Alunite, a rare and seldom found mineral, is a decomposition or alteration product of the feldspars of igneous rocks, acted upon by hot sulphurous volcanic vapors penetrating the rocks from deep-seated volcanic magmas. Alunite is a hydrous sulphate of potassium and aluminum with the formula $K_2O\ 3Al_2O_3\ 4SO_3\ 6H_2O$. Concerning this mineral Ransome says:

"The recognition of alunite as a characteristic constituent of the Goldfield ores and the demonstration of its genetic relation to them establishes a new type, that of 'alunitic and kaolinitic gold-quartz veins.'

"In the Goldfield district alunite is so abundant and so generally associated with the intense alteration accompanying ore deposition that it must be looked upon as one of the most characteristic minerals of the gold deposits. Microscopic studies of the bleached, altered rocks of the district have revealed alunite in nearly all of them.

"At Goldfield, the intimate association of the kaolinite with the alunite, gold and sulphites shows that all were formed at the same time and by one general process which was anterior to and entirely independent of oxidation or weathering.

"Alunite is very abundant in the altered andesite and dacite of Preble mountain and the vicinity and is present in practically all of the altered dacite which forms the country rock of the Combination, Florence, January, Red Top, Jumbo, and other mines near Goldfield.

"As a rule, the gold and auriferous sulphides are embedded in quartz. Alunite, however, is often so close to the gold as to appear in the same microscopic field and the telluride of gold in the Jumbo Extension mine is partly embedded in alunite.

"Alunite is found in some islands of the Grecian Archipelago, near Muszay in Hungary, on Mount Dore in France, and in a few other localities in Europe, as well as with tthe opal of Queretaro, in Mexico. In the United States it has been described in the Rosita hills, on Calico peak near Rico, in the National Belle mine near Silverton, and at Cripple Creek, all in Colorado. It occurs also at Tres Cerritos, Mariposa county, California. In all four of the Colorado localities the alunite occurs in regions which contain ore deposits."

Pension Fund for Indiana Coal Miners

Special Correspondence

James Epperson, State mine inspector of Indiana, has prepared a bill to be presented to the next Legislature providing for a pension fund for the benefit of disabled miners, to be maintained jointly by the miners and operators and of which the State shall be the trustee. The purpose of the fund to be so created, is to provide relief for the wives and dependents of men who are killed or permanently injured in accidents in and about the mines of the State; also relief for aged mine employees. The plan is to assess a tax of a stated number of mills for each ton of coal produced, this tax to be paid by the operators, and a small percentage tax on wages earned by the employees.

The money, according to the plan, will be paid into the State treasury and dis[illegible] in sums proportionate to the extent of injury. The law will provide that in each case the benefits will be paid without question as to contributory negligence of the employee injured or killed.

The Rare Metals, IV—Tantalum

By Charles Baskerville*

Tantalum is a rare acid-forming element related to columbium, with which it enters into the composition of a large number of minerals. These minerals are found principally in pegmatites, and are of limited occurrence.

TANTALUM MINERALS.

	Tantalum Pentoxide Content.
Tantalite, iron tantalate	42–84%
Yttrotantalite, tantalite containing yttrium, etc	46%
Manganotantalite, iron manganese tantalate	2–80%
Stibiotantalite, tantalite containing antimony	51%
Columbite, iron niobate	1–77%
Manganocolumbite, manganiferous columbite	1–58%
Samarskite, a tantalo-niobate of cerium, yttrium, etc	14–18%
Loranskite, a tantalate of zirconium, yttrium, etc	47%
Skogbölite, a nearly pure iron tantalate	42–84%
Tapiolite, a tantalate and niobate of iron	74%
Ixiolite, a niobo-tantalate of iron and manganese	
Pyrochlore, a niobate of the cerium metals, etc	....
Microlite, calcium pyro-tantalate	68%
Tantalic ochre, probably tantalic acid	....
Hatchettolite, a tantalo-niobate of uranium	30%
Fergusonite, a metaniobate and tantalate of yttrium	2–43%
Hielmite, a stanno-tantalate of yttrium, iron, manganese, etc	54–72%
Polymignite, a niobate and titanate of cerium, zirconium, etc	2%
Koppite a pyroniobate of cerium, calcium, etc	1%
Sipylite, a niobate of erbium, etc	1– 2%
Mossite, a tantalate and niobate of iron	73%
Annerödite, a pyro-niobate of uranium and yttrium	....
Aeschynite, a niobate and titanate of the cerium metals	21%
Euxenite, a niobate and titanate of yttrium, erbium, etc	....
Polycrase, a niobate and titanate of yttrium, etc	0– 4%
Melanocerite, a fluo-silicate of the cerium and yttrium metals	0– 4%
Tritomite, a fluo-silicate of thorium, etc.	1– 3%
Dysanalyte, a titano-niobate of calcium and iron	0– 5%
Cassiterite (ainalite), tin dioxide	0– 9%

The important tantalum minerals are tantalite, yttrotantalite and samarskite. Tantalite is the chief source of the metal; the supply of this mineral so far is mainly from Scandinavian districts. The new mineral loranskite, from the same locality, may be of importance in the future.

Tantalum is utilized in making filaments for incandescent lamps, known as "tantalum lamps;" these lamps have an energy consumption between 1.5 and 2.5 watts per c.p., and have become of considerable importance in the electric-lighting industry. Tantalum is also employed for manufacturing writing pens, and, either pure or alloyed with iron, silicon, boron, aluminum, titanium, or tin, in the manufacture of watch springs, clock movements, anvils, and cutting edges which are subject to mechanical wear. Tantalum in its purest state unites the hardness of best steel with a greater toughness and ductility than is known to be possessed by any other metal.

The market for tantalum is good.

Tantalite

This mineral, which often contains small percentages of cupric oxide and lime, is generally found in granite associated with beryl, tourmaline, chrysoberyl, cassiterite, samarskite, microlite or monazite, depending on the locality. It occurs more or less isomorphously commingled with columbite. Tantalite is found in Alabama, North Carolina, Connecticut, Massachusetts, Maine, New Hampshire, New York, Virginia, Colorado, South Dakota and California. Tantalite is found in iridescent prismatic crystals, also in large groups of parallel crystals, and massive. The color of the mineral varies from grayish black to iron-black and brownish black, while its luster is sub-metallic, often very brilliant. Specimens are generally brittle and opaque, and have a hardness of 6, and a specific gravity of 5.3-7.3.

Before the blowpipe, tantalite is infusible. With borax it slowly dissolves, yielding an iron glass; this glass at a certain saturation assumes a grayish white color by flaming, especially after treatment in the reducing flame. When completely saturated, it becomes of itself cloudy on cooling. In salt of phosphorus tantalite dissolves slowly to a bead colored with iron, which, if free from tungsten, becomes pale yellow on cooling after being treated in the reducing flame; when treated with tin on charcoal, it becomes green. Many specimens give metallic tin when treated with soda on charcoal, and adding enough borax to dissolve the iron oxide. It is decomposed on fusion with potassium bisulphate in a platinum spoon, and gives a yellow solution and heavy white powder on treatment with dilute hydrochloric acid; on adding metallic zinc to this solution, a smalt-blue color results, but dilution with water causes the blue color to disappear. On boiling the product obtained by the fusion of the finely divided mineral with potassium hydroxide with tin, a deep-blue solution is also produced. Tantalite is insoluble in acids. The streak is dark red to black.

Yttrotantalite

Yttrotantalite is found in Sweden in prismatic and tabular crystals. The color is black, brown, brownish yellow, straw yellow and pale yellow. Its luster is submetallic to greasy, and the streak is gray to colorless. The hardness is 5-5.5, and the specific gravity is 5.5-5.9.

In a closed tube the mineral yields water and turns yellow. On intense ignition before the blowpipe it becomes white, but is infusible. With salt of phosphorus it dissolves completely in a strong heat, and generally gives a glass tinted rose red from the presence of tungsten. It is not decomposed by acids. When fused with potassium bisulphate, it is decomposed; the product assumes a pale-blue color in the solution formed by boiling it with hydrochloric acid to which metallic zinc has been added. This color soon fades, however.

Loranskite

Loranskite is a brittle mineral, having a conchoidal fracture and submetallic luster. It has a hardness of 5 and a specific gravity of 4.6. The streak is greenish gray.

Samarskite

This mineral occurs in reddish-brown feldspar, with crystallized æschynite and columbite. In the United States it is found in North Carolina, Connecticut, Maryland, Colorado; and in Quebec, Canada. It occurs commonly massive and in flattened embedded grains, but sometimes in prismatic crystals. Samarskite is a velvet-black mineral with a resinous luster. It is brittle and opaque, and the hardness is 5-6 and the specific gravity is 5.6-5.8. The streak is dark reddish brown.

When heated in a closed tube, samarskite decrepitates, glows similar to gadolinite, and cracks open. Before the blowpipe it fuses on the edges to a black glass. The borax bead in the oxidizing flame is yellowish green to red; in the reducing flame it is yellow to greenish black, but on flaming becomes opaque and yellowish brown. With salt of phosphorus it yields an emerald-green bead in both flames. With soda it gives a manganese reaction. Samarskite is decomposed on fusion with potassium bisulphate; a yellow mass is produced which, on treatment with dilute hydrochloric acid and metallic zinc, gives a blue color on boiling. Pulverized samarskite is sufficiently decomposed by boiling with concentrated sulphuric acid to give the blue coloration when the acid fluid is treated with tin or zinc.

Microlite

Microlite is found at Chesterfield, Mass., with tourmaline, spodumene, columbite and cassiterite; and at Amelia Court House, Va., with monazite, columbite, beryl and fluorite. It is a pale yellow to brown mineral, with a resinous luster, and yellowish or brownish streak. The hardness is 5.5 and the specific gravity is 5.5.

Microlite is infusible before the blowpipe. It is decomposed by potassium bisulphate, but the solution of the fusion remains uncolored when boiled with metallic tin. It is slowly decomposed by sulphuric acid. The salt of phosphorus bead is colored pale bluish green in the reducing flame after continued blowing. In the oxidizing flame this bead is yellow.

During the six months ending May 31, 1908, the Broken Hill Proprietary Company treated at its mills 262,165 tons of crude ore, as compared with 298,327 tons for the previous six months.

For grade to mine tracks, J. Bowie Wilson (*Aust. Min. Stand.*, Sept. 16, 1908) recommends a fall of ½ per cent. as sufficient aid to the loaded cars.

---

*Professor of chemistry, College of the City of New York.

Sylvanite, New Mexico, the New Gold Camp

The Hachita Range Has Been Worked for Turquoise, Lead and Copper, the Tellurium-Gold Ores Being Until Recently Overlooked

BY FAYETTE A. JONES*

The new gold camp of Sylvanite is situated on the west side of the range of the Little Hatchet mountains in southwestern Grant county, New Mexico. The town Sylvanite is about 12 miles southwest of Hachita, a station on the El Paso & Southwestern railway, and at the point of junction made by a branch line known as the Lordsburg & Hachita railway, which forms a link in the chain of railway transportation that reaches the great copper camps of Clifton and Morenci in Arizona. Sylvanite lies in latitude 31 deg. 48 min. N., longitude 108 deg. 30 min. W. from Greenwich. The accompanying sketch map shows its position with respect to Hachita and the El Paso & Southwestern railway system. Hachita is 117 miles west of El Paso, Texas.

The Little Hatchet range of mountains reaches an elevation of 6700 ft. at the central and highest peak; the surrounding desert plain has an average elevation of 5000 ft. above sea level. The side slopes of the range are rather abrupt, though not excessively rugged in character. Many of the cañons are deep and narrow incisions in the mountain sides.

Abundance of fairly good water is found in springs and shallow wells about the base of the range. As shown on the sketch map, two small lakes occupy a portion of the Playas plain. These lakes are filled during the wet season of the year. At best they are rather shallow; in cases of prolonged drouth they sometimes dry up entirely.

The mountain sides usually have a good growth of [illegible], while the surrounding plain is covered with a species of salt grass, all of which make nutritious food for the prospector's burros and saddle animals. These mountains are practically destitute of any trees or timber; grease wood and a few other kinds of desert growths furnish the chief fuel supply.

SYLVANITE, LOOKING NORTHEAST [illegible]

History of the District

The mining district which embraces the Little Hatchet range, was called Eureka by the first American prospectors who invaded the region about the year 1878. To the great surprise of these prospectors, there were found a number of prehistoric workings at and near the mining camp of Old Hachita. The prospectors, elated about the discovery, called the district "Eureka," which name it still retains. Sylvanite camp is in the Eureka district. In the old dumps and pits were found fragments of ancient pottery, as well as crude stone hammers and other implements, furnishing conclusive proof of the antiquity of the workings.

These ancient workings were the scene of mining for turquoise, as was the case in [illegible] in other parts of New Mexico.

Old Hachita is the principal point where mining has been carried on in more recent years in the Little Hatchet range. The [illegible] per; within the last few years some zinc [illegible] early-day miners. Some of these old phosphate holes in several instances were sunk remarkably close to and even on the veins [illegible] citement at Sylvanite. Since tellurium ores were not known to the early prospector, the gold escaped notice.

---

*Economic geologist, Albuquerque, N. M.

THE BOOM BEGINS

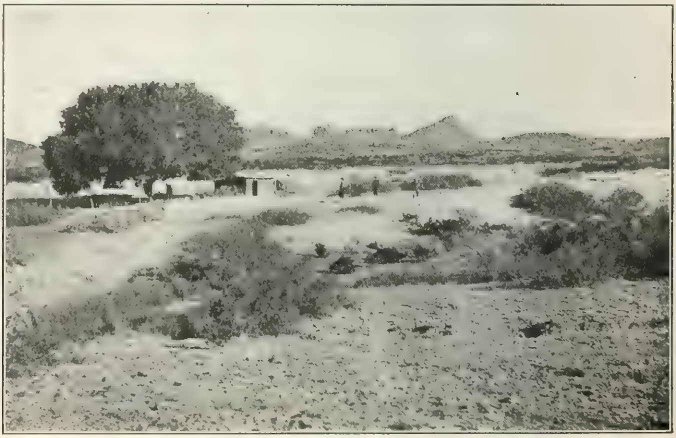
The brothers Ed. and Doc. Clark are responsible for the recent discovery of gold which led to the finding of tellurium ore by Sol Camp a few months later.

WAKE-UP-CHARLEY LOCATION, THE SCENE OF THE FIRST RICH TELLURIUM ORE DISCOVERY

About one year ago Doc. Clark, while assisting in some assessment work in the Eureka district, is said to have discovered accidentally a fine particle or two of gold in some gravels. This incident was made known some weeks afterward to Ed. Clark, his brother. Thereupon Ed. began a systematic search for placer gold, which he discovered about the latter part of February, 1908. About three weeks later the secret of the discovery of placer gold in the Little Hatchet mountains leaked out and considerable excitement prevailed during the early spring months of the present year.

The Clark brothers took out several hundred dollars of placer gold, as did a number of others who had located placer claims. It is estimated that nearly $2000 in placer gold has been taken from these diggings since the discovery last spring. This gold was mostly recovered by dry washing; but some gravels were prospected by wet panning. The ground, which proved the best and was first worked, lies in the north central part of the range west from Howell's well and south of the main traveled Hachita wagon road. Below the townsite of Sylvanite and various portions of the mountain range placer gold is also found. The largest nuggets found weighed about 1 pennyweight.

After the placer excitement had subsided, most of the prospectors quit the district. Those who remained devoted their time to prospecting for the source of the gold, and a number of lode claims were located early in the summer. The Clark brothers located several claims among which was the Wake-up-Charley. It was on this claim that tellurium ore was first discovered by Sol Camp, an experienced miner from Cripple Creek. In August, Camp notified his partner, who was in Mexico, to come to Hachita forthwith, and apprised him of his find. On Oct. 8 the discovery of tellurium ores high in gold became known in Douglas, Ariz., and the secret was out. A few days later Sylvanite was placed on the map.



SUNNY SLOPE SPRING, NEAR SYLVANITE

At this writing the town of Sylvanite with its environs contains about 500 people; the average influx is perhaps 20 each day.

GEOLOGY

The Little Hatchet range of mountains is characteristic of the desert basin ranges of central Arizona, Nevada and southern California. The range forms a portion of the continental divide and is surrounded by vast stretches of Quaternary plains.

In all probability the general uplift of the mountain range took place in the early Tertiary. Subsequent faulting and a readjustment in the rock formation resulted from acidic intrusives and from still later eruptives of a somewhat basic character. Induced mineralization occurred during this latter interval and may have extended into the late Pleistocene. The whole of the rock aggregation is generally silicious, indicating intense hydrothermal activity. Owing to the appearance of stratification in the now wholly silicious rocks, we are led to believe that metasomatism in the limestone is responsible for this alteration.

Limestone occurs near the northeast and southwest extremities of the range, perhaps representing portions of both Devonian and Carboniferous rocks. No definite demarkation between the two series of rocks was observed; the absence of fossils and lack of time leaves the age and probable division of the limestone in doubt.

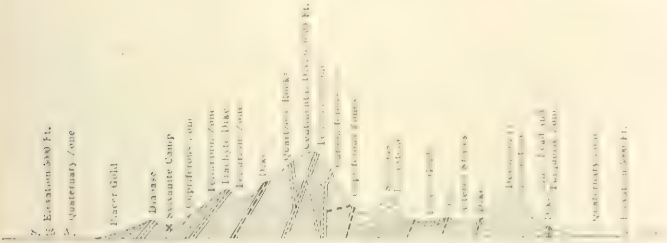
Near the southwest portion of the range is a small core of reddish rock, apparently granitoid in its nature, the only rock of the kind observed in the region.

ORE OCCURRENCE

In the central part of the district there is a prominent dike of a porphyritic nature, and denominated by the miners as trachyte, having an east and west strike; on each side of this occurs a parallel zone of tellurium ores in which gold is intimately associated. The gold and tellurium ores so far as our present knowledge extends do not occur along the contact; neither does the dike seem to be mineralized. Development is not yet sufficiently advanced to determine the relation existing between the ore zones and the dike. The mineral gangue in the vicinity of this dike is of a chloritic quartzy composition, containing tellurium and free gold, and has a slightly schistose structure.

Toward the south end of the district the tellurium occurs in a sort of lime-spar and serpentine gangue, as on the Nederland location.

Again, gold is found associated with tellurium to a less degree in certain quartzose dikes, having a strike about north 25 deg. west, on which is the Clemmie location toward the south end of the district. In this latter dike it was noted that where it was shattered most the larger proportion of the gold seemed to be confined to the crevices in the rock; as the compactness of the dike increased, the gold apparently decreased. This would seem to indicate that the gold came from some other source than from the dike itself. On the other hand the metal may have come from the depth below through zones of fracture in the dike.



DIAGRAMMATIC SECTION ACROSS THE RANGE OF THE LITTLE HATCHET MOUNTAINS

But few veins in the district are well defined, and many of them appear to be composed chiefly of small seams and stringers, or of an aggregation of stringers. Development alone must be the medium through which a correct knowledge of the district can be obtained.

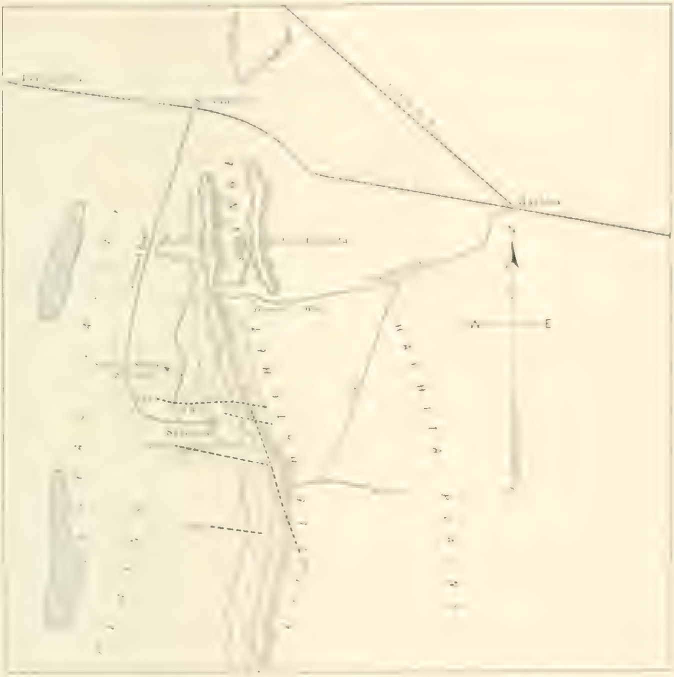
Evidently the source of the placer gold is the gold-bearing zones. The gradual disintegration of the mineral-bearing rocks freed the gold and it accumulated below its source in the usual manner. The placer gold is rough, rusty and generally flaky, indicating that it has not been transported from a distance; it is usually fairly pure; it is said to average about 930 fine.

The accompanying generalized diagrammatic section running north 25 deg. east approximately through the center of the range, gives some idea of the rock system.

Nature of the Ore

Much speculation and considerable controversy has arisen as to the exact name and classification of the gold-bearing mineral. All seem to agree that the mineral contains tellurium; some report bismuth, while others do not. Some of the mining fraternity have classed the ore as calaverite; others call it sylvanite, and still others pronounce it tetradymite. From preliminary tests of some selected samples, I am inclined to class the mineral as tetradymite. The gold appears to be free and not in combination with tellurium or other elements The appearance of the mineral is much like sylvanite, but it cannot well be classed as that mineral, either chemically or physically. Possibly it may be a new mineral species, but this is scarcely probable.

Many assays run phenomenally high in gold, while other tests from apparently similar material give astonishingly low results. However, the general run of assays are fairly good and are encouraging for the district.



SKETCH MAP SHOWING THE [illegible], N. M.

General Information

Since but little development has been done, it would be premature for anyone to attempt to predict the future of the district. That gold is found and that the ores in various localities of the mountain range give splendid assays, would alone seem to be sufficient to justify the expenditure of a reasonable amount of capital in proving the district. The surface showing is sufficiently good to warrant this conclusion. The time is now ripe for capital to take hold and to determine the permanence or fickleness of the find.

The leasing system, similar to that in vogue in Nevada, has been inaugurated, and a number of leases have been given. The size of a lease is 250 ft. along the vein and extending the full width of the claim. Only white miners are employed, no yellow or colored people being allowed to remain in the district. Miners get $3.50 and muckers and top men $3 per day. The region is well watered and has good grass, but wood is very scarce. The climate is excellent and railway transportation facilities are convenient.

Only four carloads of gold ore have thus far been shipped from the district; this ore was mined during the summer before the excitement; it is claimed to have averaged about $40 per ton.

For melting brass the most satisfactory fuel is anthracite, with which the temperature of the melting pots can be controlled better than with bituminous coal or petroleum.

Most of the lead ore mined in the United Kingdom comes from rocks of the Carboniferous age.

Coal Cutting in Northern Coalfield, England

Mining Machines Have Increased the Earning Power of the Men and Made Their Work Less Arduous. Comparison of Mining Costs

BY GEORGE R. DIXON

In my last article, published in the JOURNAL, Nov. 14, I described the labor details of a longwall face. An estimate of the cost of working was also included, and I ended with the query, "would the introduction of coal-cutting mchines pay?" The face was stepped, each gateway leading by a few yards the following one. This necessarily entails the production of small coal, as previously pointed out. Moreover, under the conditions of working detailed, a large quantity of explosives must be used.

If a disk coal-cutting machine is introduced, the face must be straight. A second free face would be formed by the machine undercutting, say, 4 ft. 3 in. Probably the cut could be made in the stone. If the seam comes down easily from the top stone, a bar machine would have to be used, so that the sprags could be placed close together. If the conditions would permit, I would prefer using a disk machine. With a framey roof such as we have in this case, there would not be any difficulties introduced by adopting a straight instead of a stepped face.

DRIVE GATEWAYS IN ADVANCE OF THE CUTTER FACE

The length of face taken in my previous article, I would divide, as shown in Fig. 1. I would drive the gateway on the extreme right, also the gateway on the extreme left, and the central mothergate in advance of the cutter face. The 400 yd. of face would thus be divided into two separate faces.

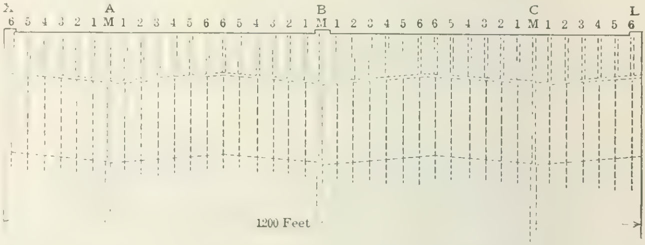

X
A
B
C
L
6 5 4 3 2 1 M 1 2 3 4 5 6 6 5 4 3 2 1 M 1 2 3 4 5 6 6 5 4 3 2 1 M 1 2 3 4 5 6
1200 Feet

FIG. 1. GENERAL LOCATION OF GATEWAYS AND METHOD OF DIVIDING THE COAL FACE

The places *X* and *L* on Fig. 1 would be driven 18 ft. wide, and the place *B* 30 ft. wide. The machines would not cut always one way, being flitted after each cut, but would cut backward and forward. On faces of this description, it is a mistake to try to be too clever. The fillers should not follow directly on the heels of the machinemen. Moreover, the cuttermen will be in the mine at the same time as the stonemen engaged at the face canches, and as the latter workmen will fire a great many shots, the safety of the men is, of course, a prime consideration.

My experience would suggest employing three shifts of cuttermen every day, to cut the two faces. It would take them three days to do this. The quantity of coal filled off the face each day would be one-third of the product of the 400 yd. of coal. The output from 400 yd., 2 ft. 10 in. high, and undercut 4 ft. 3 in. at 19 cwt. per cu.yd., would be,

$$\frac{400 \times 94 \times 1.42 \times 19}{20} = 512$$

tons.

Of the 400 yd., a total breadth of 22 yd. would be attacked by hand. This would produce, taking 4 ft. 3 in. of advance,

$$\frac{22 \times 94 \times 1.42 \times 19}{20} = 27.89$$

tons. This is 5.6 per cent. of the output from the 400 yd. of face, showing, therefore, that this quantity would be hand-hewed. Furthermore, there will be filled each day a total of

$$\frac{512}{3} = 170$$

tons, and of this,

$$\frac{27}{3} = 9$$

tons would be obtained by hand hewing, and 161 tons by machines.

The length of the face to be cut, therefore, is 400 — 22 = 378 yd., so on each of the two faces, 189 yd. must be undercut. My estimate of the time required to cut over the two faces (three days) may seem excessive. I am guided in this, however, by my experience.

RATE OF CUTTING

Three shifts per day for three days is equal to nine shifts cutting. The rate of cutting allowed for is

$$\frac{378}{9} = 42$$

yd. per shift. The shifts are of eight hours each, a total of 72 hours. The rate of cutting allowed per hour is

$$\frac{378}{72} = 5.25$$

yd. Two men per shift, a timberman and a machineman, will be required. That is, six men will be employed three days cutting the 378 yd., and they will put in 18 shifts to do so. There will probably be five small cleaners required, and they will put in 5 × 3 = 15 shifts, in cleaning after the 378 yards.

I do not want the fillers to turn up some morning to find that there are only a few hours filling for them, and the cutting machine in the hands of the fitters. Again, I do not want the fillers to delay the machine getting started on its return cut. I therefore suggest that if it is arranged for the 378 yd. to be cut, and the coal cleaned off in three days, much trouble will be avoided.

HOW MANY FILLERS WILL BE REQUIRED?

The rate of pay per ton may be taken at one-half of the rate for hewing and filling. In this case it would be 31c. per ton. Assuming as before a wage of $1.92 per shift, a filler would have to lift

$$\frac{96}{15\frac{1}{2}} = 6.2$$

tons of coal per shift. The number of fillers to produce 161 tons of coal would be $\frac{161}{6.2}$, or say, 27. Three hewers would be required for the nine tons secured in the leading places. Two deputies would be required, one in the foreshift, and one in the backshift.

If we allow 60 cars per putter as before, then the number of putters equals

$$\frac{170 \times 20}{9 \times 60}$$

or, say, six putters. The stone canches will be thicker, as the rate of advance of the face is only half what it was with hand hewing. If the gateways were only made 5 ft. 6 in. high, the cross-headings would have to be put in nearer than 50 yd. apart, as the gateways would get so low. Every night 13 gateways must be followed. The width of canch in each gateway being 6 ft., there will be a total width of 13 × 6 = 78 ft. The advance is to be 4 ft. 3 in., or 4.25 ft., and the thickness of canch 3.16 ft. The cubic contents of the stone shot down in the 13 gateways equals 78 × 4.25 × 3.16 = 1047 cubic feet.

The Length of Cross-heading

The length of cross-heading to cut off the gateways every 50 yd. would be 1200 ft. for the 39 gateways, minus 234 ft. (the total width of stone shot down in the gateway), or 966 ft.; adding 24 ft. to make allowance for the angling of the cross-headings, we have the length of cross-heading as equal to 990 ft. The cubic feet of stone to be shot down is, 990 × 6 × 3.16, or equal to 18,770 cu.ft. This rock is prepared during the time the face takes to travel 150 ft., or $\frac{150}{1.42}$ equals, say, 106 working days.

The amount to charge, therefore, to each working day is $\frac{18,770}{106}$ equals 177 cu.ft. The total cubic feet of stone to shoot and stow each night is 1047 + 177 or 1224 cu.ft. Allowing 75 cu.ft. per shift worked, the men required will be $\frac{1224}{75}$, or, say 16 men. Of these, 8 will be first-class stonemen, and 8 will be second-class stonemen.

To keep the face roads in repair, a changeman, and a third-class stoneman, will have to be employed in each of the three districts each night. Four first-class stonemen will follow the three mothergate back canches.

Official Supervision and Cost of Production

Suppose the total output to be 1000 tons costing $9.60, then the 170 tons will cost

$$\frac{9.60 \times 170}{1000} = \$1.63.$$

I will now make out an approximate cost per ton on one day's work.

27 hewers getting 161 tons @ $0.31	$49.91
3 hewers getting 9 tons @ 0.56	5.04
Official supervision	1.63
2 deputies @ $1.68	3.36
6 putters @ $1.38	8.28
3 changemen @ $1.[illegible]	4.[illegible]
3 third-class stonemen @ $1.08	3.24
8 first-class stonemen @ $1.92	15.36
8 second-class stonemen @ $1.[illegible]	10.[illegible]
4 first-class stonemen @ $1.92	7.68
2 stone putters @ $1.20	2.40
Cutting and Cleaning	
6 men @ $1.92	11.52
5 men @ 1.[illegible]	[illegible]
77 shifts	$1[illegible]

The total cost per ton $= \frac{\$1[illegible]}{170} = \$0.[illegible]$

The cost per ton for cutting and cleaning $= \frac{\$18.[illegible]}{170} = \$0.10$

The cost of hewing and filling $= \frac{\$5[illegible]}{170} = \$0.[illegible]$

The tons per shift in the face $= \frac{170}{77} = [illegible]$

In my previous article, I found the face cost for hand hewing to be 92c. per ton. Comparing that with the cost for coal cutting just found, or 76c., there is on first sight a saving on the labor bill of 16c. per ton. There are several items in labor cost which have not yet been considered. There is the cost of sharpening picks for the cutting machines, and of cutter repairs, also the cost of pipe laying if compressed air is the motive power, and of cable laying if electric current is used. Other additions we must make are, cost of power, interest and depreciation of the machines and feeding mains, and cost of material and stones both in the pit and in the repair shops. The total of all these items was placed by the committee upon mechanical cutting of the North of England Institute of Mining and Mechanical Engineers at 8 to 12c. per ton, and I would be inclined to accept the larger figure.

Since estimating a saving on labor at the face of 16c. per ton, I have already lost 12c. per ton and have only 4c. per ton left. Now the face roads in the case of coal cutting stand very much longer than with hand hewing. For that reason the gateways have to be made higher. The props in the gateways will also be longer. The amount of broken timber will undoubtedly be greater.

Again from this 400 yd. of face, only 170 tons are produced per shift with coal cutting, against 350 tons with hand hewing. The amount of capital tied up in tramway plates will be the same in the two cases.

The pit area for a given output, say 1000 tons per day, must be much greater in the case of coal cutting. Hence the cost of upkeep of main rolleyways, and the cost of haulage will be greater for the coal-cutting conditions. It is practically impossible to put the above considerations into so much per ton, but I ask, if one could do so, how much would then be left of the 4c. per ton.

It is usually stated that the rate of advance when using coal-cutting machines is greater than when hand hewing. I can only say that the figures given, practically embody my experience. If one could arrange to cut a certain length of face and load the coal off it every day, the rate of advance would be quicker. It could easily be arranged on paper, but this kind of theoretical work and pit work have a way of disagreeing. I will now present the other side. Suppose the selling price for large coal is $3.36 per ton and for small coal $1.68 per ton.

With hand hewing, suppose the yield of large coal to be 60 per cent. The average [illegible] of $1.68 equals $2.69 per ton.

If with coal cutting we increase the percentage of large coal to 70 per cent., the average selling price will be 7/10 of [illegible] $1.68 [illegible] There is thus a gain of 16c. per ton when the latter method of mining is used. It is this consideration, and this only that makes coal cutting by machinery as I know it, worth while from the colliery owner's point of view, and, of course, is worth striving after. In the case of a colliery producing coke, when the small coal is as valuable as the large coal, I cannot see what advantage can accrue.

There is certainly an increased output per miner at the face, but this consideration alone is seldom pressing enough to be a deciding factor. It is also true that the workmen benefit most decidedly by the introduction of cutting machinery.

In most cases, the colliery owners have been anxious to allay any suspicion that the introduction of coal cutters would lower the earning power of the men, and as a result, in practically all cases, the men get more money, although the most ardous part of their work has been taken away. In a later article, I will discuss coal getting by cutting machines and face conveyers.

The Largest Coalfield in the United States

According to the press bulletin of the United States Geological Survey, the largest coalfield in this country is that which extends from Casper and Douglas, Wyo., northward to the Canadian boundary. The townships included in this great coalfield were withdrawn from entry three years ago, and the secretary of the Interior instructed the Geological Survey to classify and value the land. All of the coal in this field lies nearly flat, and in what are commonly known as "blanket seams."

The classification and valuation of coal land depends on three factors—the distance from the railroad, the character of the coal, and the depth at which it occurs below the surface or distance from outcrops. The two general classes of coal land, according to the law, are, (1) coal land within 15 miles of a railroad in actual operation or under construction; (2) coal land more than 15 miles from a railroad. Also by the terms of a scheme of classification and valuation approved by the Secretary of the Interior, April 15, 1908, the coal is divided into four groups, according to its character, ranging from anthracite and coking coals in the first group to lignite and low-grade sub-bituminous coal in [illegible] Powder river field seems to be low-grade sub-bituminous, and the land is, therefore, given the minimum value, $20 per acre if within 15 miles of a railroad and $10 per acre beyond that limit. The scheme further specifies that this classification of coal land applies only to land underlaid by coal beds from their outcrops or points of accessibility to a depth of 1000 feet.

The classification of these Powder river lands as coal lands is made simply in accordance with the Federal land laws, and relief from hardships that may seem to be imposed upon those who wish to gain title to land for agricultural uses, can be obtained only by revision of these laws [illegible] tion of surface and coal rights.

Electricity in Modern Coal Mining

By Harvey J. Nelms*

In some of the recent laws passed by the different States in regard to electricity in connection with mining coal, it seems as if the chief mine inspector has not even consulted an electrical engineer to see whether his new law is practical, or only technical in its proposed good effects. Following is one of the laws recently put into effect Aug. 9, 1908, which to a certainty is anything but beneficial in its effects:

"In no case shall trolley wires be extended into rooms or working places, or track rails be bonded in these places for the use of gathering locomotives, or for any other purpose." This law to be effective should read: In no case shall trolley wires be extended into rooms or working places, nor shall track rails in rooms be used for an electrical return of any kind; also, said track shall not be connected in any metallic circuit which would connect it with any track that is bonded and used as an electrical return for locomotives and mining machines.

Even as revised, I do not believe the above law is justified; however, where the use of electricity is permitted by the mining department of a State, the use of bonds should be compulsory.

Rails Should be Bonded

Where a mine uses electric motors for gathering purposes, the locomotives generally run in the rooms over iron rails to get the loaded cars, the trolley line in this case is used for both a trolley circuit for locomotives and also as a feeder for the mining machines. The rails certainly should be thoroughly bonded if the locomotive runs over them, for if the joints are only fish-plated here and there, the resulting fireworks produced at these joints when the locomotive starts out with the car is enough to often cause an electric arc from ½ to ¾ in. long across every joint where the rails are not connected together.

Where mining machines and locomotives get their current off the same wire, and where locomotives run in rooms, only one wire should be used on the machine cable which carries the positive electromotive force to the machine, the return from the machine being a short cable which is connected onto the rail; again, the rails should be carefully bonded. The danger of using insulated wire with two cables, one being for the positive and the other for the return, lies in the fact that when both a machine and a locomotive are equipped with this double wire, the danger of short-circuit is increased 100 per cent. It is also true that the machine will often run over its own cable causing a bad short-circuit; furthermore, if the double wire is overlooked even for a short period, it will burn through the insulation between the wires and cause a short-circuit. This cannot happen when only one cable is used, as it will simply burn off at its connection, hardly ever causing anything but a small arc.

Liability to Shock is Greater when a Double Cable is Used

When reeling up a double cable, a short-circuit may occur while the cable is passing through the hands of the operator; not only does the mechanic receive a shock, but he will be painfully and severely burned, which is tenfold more harmful than the shock which would be received from handling only one wire under the same circumstances. Therefore, after considering all sides of the question, I believe single cables and bonded tracks in rooms should be used where the machine and locomotive feed off the same circuit.

Again, if you have iron track in rooms, and this track is connected with fish-plates to a bonded track on the entry, then if some of the fish-plates are left off the track in the room, a bad ground on a locomotive and machine, or a short-circuit on either, ahead of the room, will cause arcs across the points that are not bonded; consequently, why not fish-plate every joint, and then the return current will simply run to the end of a track in a room and go out again making no arc at all.

A Direct Wire from the Generator to the Fan

Another law states that "all fans operated by electricity shall have a direct wire from the generator." To comply with this law, an operator would simply have to run his fan line from the main busbars, when in reality he should connect his fan line on the inside of his main switch; also, two switches and two circuit breakers should be installed so that nothing but a complete shutdown of his plant would stop his fan; otherwise his ventilator would stop every time his main circuit breaker went down. Where generators are operated in parallel there should be separate busbars and an equalizing bus to connect the fan to, so if the one machine stopped, the fan would still run.

Another law is to the effect that "where gathering locomotives are used on entries, the trolley wire must be placed on the opposite side from the room neck." In this case a motorman must use two trolley poles; the swinging around from one trolley pole to another increases his danger of being severely shocked. Also it makes the machine man carry his cable across both entries; when wire is strung for only one trolley pole, on one entry, he would be able to connect to the trolley wire inside of his room.

Machine Wires are Dangerous when Taken Across the Entry

Where machine wires are taken across the entry to cut a room the cable is usually put on the bottom and then run up along the rib and connected onto the trolley wire. You can't keep the men from walking on this cable where it crosses the track, and even if you put a board on it, they will take this latter off and use it to make caps for props. If you take the cable overhead it is liable to lag down and catch the motorman, or man passing under it; so it seems to me if danger of shock is to be avoided, it is the safest plan to have but one trolley pole.

---

*Mining engineer, Bentleyville, Penn.

Overcasts in Coal Mines

Among the many varieties of overcasts used in the anthracite field, Figs. 1 and 2, show a style that is a comparative improvement over some of the common types of air bridges. The construction is simple and relatively inexpensive as it may be built by unskilled labor. The foundation walls are the same as those used for any air bridge, but instead of arching, as in the case of concrete overcasts, old 6-in. pipes are used, this material being abundant as a result of flushing operations. These pipes are placed parallel on the walls, as shown in Fig. 2; on top of them is placed 2 in. of concrete of the usual proportions to fill up the space between the pipes if there is any, while both ends of the pipes are open so that the air travels through, as well as over them.

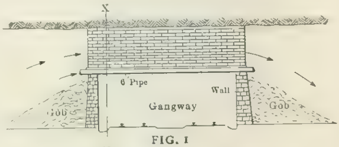


FIG. 1

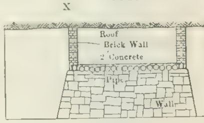


FIG. 2
Section through X-X

GENERAL DESIGN FOR OVERCAST IN A COAL MINE

Brick walls are built on both sides of these pipes, as shown in the illustration. The pipes upon which these walls are built are often reinforced by heavy rails and the walls are sometimes built of concrete instead of brick. This style of overcast has the following advantages over concrete air bridges: 1. It is at least 20 per cent. cheaper than concrete overcasts. 2. There is no arching, therefore the sectional area over the bridge is greater and offers less resistance to the air current. 3. Foremen claim that it can be repaired more easily than any other style of construction.

Dust As a Factor in Mine Explosions

Watering Our Mines Is Said to Be Dangerous. It Is Recommended That We Split Our Air Currents and Use Auxiliary Fans

BY WILLIAM N. PAGE*

After a careful study of the excellent paper of Mr. Haas, read before our Charleston meeting of October 7, the report of Messrs. Desborough, Meisner and Watteyne, to the Secretary of the Interior, an article in the *Colliery Guardian*, by James Ashworth, of Edgecroft, England, and many other similar reports and experimentations, two facts seem to be fairly well established, to which I wish to direct the attention of our West Virginia mine owners and operators as of vital importance in connection with dust explosions:

1. Dust, as dust, is not explosive.
2. It is a physical impossibility to moisten dust to the point of safety, in high velocity currents.

In reference to the first, dust being simply a mechanical division of coal, a chemical alteration must be essential to an explosion, but the division may be so fine as to render the chemical reactions practically instantaneous; I am satisfied that a mine entry filled with a whirling mass of dust in suspension is a dangerous element, which will augment, or produce an explosion, when in contact with the requisite temperature and flame areas. The explosion is due to the gases generated by the rapid flaming of the dust, it follows that the danger lies with this dust in suspension over large areas, and that the dust is harmless when at rest.

In reference to the second point, Mr. Ashworth, quoting freely from Mr. Stokes, H. M. inspector of mines for Great Britain, and referring to particular disasters, shows from hygrometric observations, that neither complete saturation of the air currents, nor wet walls, roof and floor, nor all combined will remedy the danger. Mr. Ashworth says: "A practical demonstration of the correctness of these experiments was afforded by the Universal colliery explosion, where the flame of the explosion traversed the whole of the east side districts, although this side of the colliery was naturally wet and the air saturated with moisture; and this proved that the saturation of the roof, floor and sides will not reduce or prevent the extension of an explosion in a mine, as Messrs. Scholz and Stokes appear to have concluded. It has, however, been proved by German experiments that if water is used for the purpose of restricting or preventing explosions, it must be so considerable in quantity that it may be squeezed out of the dust with the clenched hand, etc." I think we must all admit that it is a practical impossibility to keep mine dust in such a state.

Slow Currents are the Safest

In olden times, when we had to depend on gravity and slow currents for ventilation, no one ever heard of dust as an element in explosions, and even now, I know of no disaster remotely attributable to dust, where high-pressure fans were not employed. Until comparatively recent times, all explosions were attributed to firedamp, and to guard against this danger, we have created a new danger in the enormous volumes of air traveling at high velocities through restricted channels; these currents of air pick up every particle of dust within reach and keep it in suspension. Just as the remedy for firedamp has developed the more serious problem of dust, so will the remedy now universally proposed for dust result in a greater danger from water, because water will not only affect the health of the miner, but it is the indirect cause of every death from roof falls.

According to the U. S. Geological reports, 66 per cent. of all underground fatalities is attributable to the fall of roof and coal, and only 34 per cent. to all other causes; I presume it would be fair to assume that not more than 5 per cent. of deaths can be traced to dust explosions. It would seem, therefore, that the remedy of water proposed in the effort to save five lives is now the death portion of sixty-six, and any increase of water in the mine must necessarily add to roof fatalities.

Spraying with Water Causes Roof Falls

Slate or fire-clay probably constitute over 90 per cent. of the mine roofs in West Virginia, and every practical miner knows that these slates and clays disintegrate rapidly when exposed to atmospheric air and weather on the dumps or spoil banks, and when we force two or three hundred thousand cubic feet of air per minute through the mine at high velocities, we are simply introducing outside conditions underground; consequently, the roof constantly disintegrates, crumbles and falls as it would do if the same material was exposed outside. The more water introduced either by sprinkling or saturation of the air, the more deadly will be the consequences. We had a single-phase danger with firedamp a two-phase danger with dust, and we will have a three-phase danger with water, more deadly than the other phases combined.

Slowing Down the Ventilation Is More Effective than Water

In my opinion, the proper remedy for dust is not the application of water in any form, as it is not only of doubtful value in relation to the dust, but is unquestionably far more dangerous to life and the mine than all other elements combined. The only effective remedy is the slowing down of the ventilating currents to a velocity at which they will not carry dust in dangerous quantity, and this I believe can be done, and still supply the mine with all the air necessary for the dilution of the gases, respiration and combustion. A greater quantity than is necessary for these purposes must be a positive evil through both roof and dust. The tendency heretofore has been to regulate by statutes the specified volumes of air per minute for each man, animal, and light, without any limit beyond the statutory specifications; the mine inspectors have all considered high velocities as the most desirable attainment, the higher the better, with an eye single to firedamp and pure air for the miner. It seems to me however, that the time has come when the law makers and mine experts should study consequences, as too much of any good thing must always be harmful

Split the Currents and Use Auxiliary Fans

Instead of forcing 200,000 cu.ft. of air per minute through restricted airways and passages by a single fan, under sufficient pressure to permeate every part of a tortuous mine, necessitating high velocities in many passages, I would suggest that the current be split as often as possible, and a number of auxiliary fans be substituted for one powerful single unit. Five fans delivering 40,000 cu.ft. will be preferable to one delivering 200,000 cu.ft., not only because of the slower velocities, but from an actual saving of power through less friction. Such small units placed within the mine will operate as force and suction at the same time, and since electricity is now almost universally employed underground, there is no mechanical or other difficulty in the way of installation. The cost of the small units combined will be little, if any greater than a single unit of equal capacity.

Where there is more than one intake and outcast, there is no problem involved,

---

Note.—An open letter to the mine operators of West Virginia.

*President, West Virginia Mining Association, Charleston, West Virginia.

and in shaft mines with limited entrance, the difficulties would be neither great nor costly, as the necessary intake and outcast where the velocities might be high, could be easily isolated from all danger. In other words, the currents could be passed through auxiliary fans and slowed down, just as an electric force can be stepped up or down through a rotary converter. With such arrangement a uniform volume of air, under slow velocity, could be more satisfactorily distributed across all working faces, as a small motor-driven fan could be moved from place to place, with little loss of time or money.

I make these suggestions simply to direct the attention of our mine managers to the subject, being fully convinced that water is not an effective remedy for the prevention or restriction of explosions attributable to dust; granting, however, for the sake of argument, that it is a preventive, and that dust can be settled by a spray or humidity, its application is too expensive, uncertain, and dangerous, for practical purposes. Death from roof falls is like the falling of leaves one by one, making no disturbance, but an explosion, which kills in groups, though only one-thirteenth as deadly, is like a conflagration which fires the imagination of the public.

In our efforts to protect life and property, we must look to the falling leaves as well as to the burning bush, and the men who die one by one under roof falls are as much entitled to protection, as are those who lose their lives in a spectacular disaster.

Colliery Notes

During the 10 years preceding 1905 there were 183 fatal firedamp and coal-dust explosions at the mines in England; in these disasters the sacrifice of life totaled to 720. Of the various explosions, 131 were due to unprotected light; defective or opened safety lamps were responsible for 17 disasters, while 29 of the explosions were attributed to shot firing. The influence of coal dust in extending the explosions was marked in 21 instances, and included the more serious explosions with a correspondingly high death roll, amounting to a total of 476 out of the 720 deaths.

The difficult problem of determining when wire hoisting rope has depreciated beyond the limits of safety has recently occupied the attention of many engineers. It is certainly true that many ropes have been discarded while still in good condition. A novel method of testing such ropes is accomplished by the use of electric induction. The ropes are passed through a coil of copper wire, traversed by an alternating electric current, and the variations of induced current—which exactly correspond to changes in the thickness of the ropes—are recorded on a suitable instrument. Dangerous wear or broken strands cause the indicator to give warning.

The question of installing gas engines as against steam depends principally upon the amount of power required and the quantity of gas given off. If the former is small, so that there is a quantity of gas to spare, then the steam plant is preferable, on account of its well tried and proved qualities and greater simplicity. For gas engines, the consumption may be taken as 40 to 50 cu.ft. of gas per horse-power-hour, though, of course, this will depend upon its calorific value. From 10 to 15 per cent. of gas will be given off per ton of coal coked in the ovens, which, taking the gas as weighing 0.03 lb. per cu.ft., will be equivalent to about 7500 to 11,000 cu.ft., and of this quantity, 30 to 50 per cent. will be available for driving gas engines.

There is still much mystery in connection with spontaneous fires underground and on board ships. We are still in need of information as to what is the nature of the physical or chemical property of a particular coal which renders it liable to spontaneous combustion. The rapid rise of temperature which takes place where radiation is prevented can be simply shown by covering an electric light with material such as fine coal, when it will be found that in the course of an hour or so, the heat is so great that the glass of the lamp melts and collapses. It was shown by Henry Hall, inspector of mines for Liverpool district, England, that timber will ignite in an atmosphere at a lower temperature than coal or cannel; that partially decayed timber, such as old pit props ignites most readily of all. It is possible that fires underground would not be so frequent if care were taken to clear out all old or used timber from seams where heating takes place.

It is not the normal voltage of the electrical system that has caused so many of the serious accidents from shocks, but rather the very high pressures which are set up on suddenly breaking the circuit; this is especially true in the field coils of a motor. One instance is cited of a man who took hold of the terminals of a motor at a colliery, thinking the current was off; the field circuit, however, was connected up. The victim could not get away and a miner who was with him switched off the current, with the result that the induced discharge passed through him, and he was killed. Had the rescuer known, a better plan would have been to seize the arm of the victim and try to pull it off the terminals. Dry clothing is a good insulator, and a man in contact with live metals may safely be seized thereby; it is, however, dangerous to take him by a bare part, or under the armpits where the clothing is likely to be damp. When current is being switched off a machine, it is a good plan to keep clear of the frame, as that is a time when an incipient fault may develop and an existing fault becomes most dangerous.

When the recent fire at the Hamstead colliery had been raging from six to seven hours, the inspector decided to descend into the mine upon an exploratory trip. It was suggested that a small bird or a mouse be taken along to act as a guide to the safe condition of the air. The grounds for this practice are based on the fact that the circulatory system of the bird and the mouse is so small that their blood becomes saturated with CO in a shorter time than would be required for that of a man. The descent was made and the men took with them a linnet. The party was underground more than an hour, and on reaching the surface, two of the inspectors had to be assisted from the cage; a third did not recover from the effects of CO for over a week, yet the bird, when brought out of the pit, was quite cheerful and was used by a subsequent party. During this later descent, the bird was alleged to have fallen from its perch, so the party stopped and returned to the surface, but the bird survived even this and was alive after the exploration of the mine was concluded. It should be remembered, however, that when explorers take a bird with them, the bird is at rest while the explorers may be working hard, and for this reason the effects on bird and man are somewhat equalized.

The dangers of the carbonic-acid gas (CO_2) when present in mine air are not realized by the general run of underground workers. This gas is present in air to the extent of 0.04 per cent. under normal conditions; however, CO_2 forms from 13 to 15 per cent. of a blackdamp mixture. No very noticeable effect on the breathing is produced until the quantity of CO_2 in the air reaches 3 per cent., when, if a blackdamp mixture exists, the miner's light will be extinguished. The great danger from this gas, however, results from the constant presence of small quantities of CO_2 in the atmosphere, thus causing a general deterioration in health and physique. The general opinion of the best authorities is that mine air should not contain more than ¼ per cent. of CO_2. One of the simplest tests to determine whether more or less than this latter quantity of CO_2 is present in mine air is as follows: Measure ½ oz. of clear limewater and pour it into a 5-oz. bottle, fill the bottle with distilled water, giving a solution of 10 per cent. strength. Add a drop or two of a phenol-phthalien solution, and the limewater assumes a pink color. Now fill an 8-oz. bottle with mine air from a sample flask which has been obtained from the mine, add ½ oz. of the colored solution, and shake. If the pink color disappears quickly, the air contains more than ¼ per cent. of CO_2. If the color fades only after repeated reshaking, the quantity of CO_2 in the air is approximately ¼ per cent.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings, 33 marks, or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for November, 1908, was 42,500 *copies.*

Dec. 5 12,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
The Marianna Explosion.......... 1109
Copper Statistics.................. 1110
Coal Cutting vs. Pick Mining 1110
Alleged Oil Prospects in Nevada 1110
Foreign Trade in Iron and Steel..... 1110
William Page 1107
*Iron Operations in Northeastern Alabama...............*Edwin Higgins* 1083
Revival of Hydraulic Mining in California.....*Special Correspondence* 1087
Magnesite Brick.................. 1087
Prevention of Mine Accidents........ 1088
Mineral Production of Japan 1095
Nevada Consolidated Copper Company 1095
*The Goldfield Type of Ore Occurrence *Robert T. Hill* 1096
Pension Fund for Indiana Coal Miners. *Special Correspondence* 1099
The Rare Metals. IV. Tantalum *Charles Baskerville* 1100
Sylvanite, New Mexico, the New Gold Camp ......*Fayette A. Jones* 1101
*Coal Cutting in Northern Coalfield England ....*George R. Dixon* 1104
The Largest Coalfield in the United States 1105
Electricity in Modern Coal Mining. *Harley J. Nelms* 1106
*Overcasts in Coal Mines............ 1106
Dust as a Factor in Mine Explosions *William N. Page* 1107
Colliery Notes 1108
Correspondence:
Alumina in Copper Blast Furnace Slags...........*Harley E. Hooper* 1111
Loading of Blast Holes. *E. A. Colburn* 1111
Sampling by Machine. *T. R. Woodbridge* 1111
An Electric Coal Puncher *John L. Wayne* 1112
Monthly Advance in Mine Drifting *Wm. H. Sheakley* 1112
Railroad Grants on Mineral Lands *Thomas L. Kegoe* 1113
Questions and Answers............... 1114
New Publications 1115
The Business of the Standard Oil Company 1116
Chronology of Mining in November.... 1116
The Tariff Hearings. *Special Correspondence* 1117
November Dividends 1118
Prayers for Zinc Ore 1118
Personals, Obituaries, Societies and Technical Schools 1119
Special Correspondence 1120
Mining News 1122
Markets, etc.......................... 1128
Mining Index 1134
Chemicals, Minerals, Rare Earths, etc. 1140
**Illustrated*

The Marianna Explosion

After a feeling of security and relief that has been fostered by the absence of mine disasters for several months, we are again aroused by the catastrophe that has just occurred at the Marianna mine near Pittsburg, in which about 130 men have been lost. The serious and startling fact concerning this latest disaster is that the Marianna mine was planned by our most competent engineers and has been considered a model operation of its kind. No expense was spared in constructing the surface plant or in laying out and carrying forward the underground development.

This is the first serious accident the Pittsburg-Buffalo company has experienced, and it was believed by the officials of the company that so many precautions had been taken that the chances of such a disaster in one of its mines, and especially in its best mine, were as few as modern practice would permit. The mine had been examined by the district mine inspector only a few minutes before the explosion occurred, and the origin of the explosion is a mystery. It will be several weeks before sufficient investigation will have been made to justify the officials in making a statement as to the cause.

If we were to make a list of the mines in which disasters of this sort occurred during the last two or three years, it would appear that those which have suffered such accidents have not been the mines where coal is won in an unsystematic manner, nor those whereof the ventilation was deficient. The worst disasters have occurred in mines which we have been accustomed to regard as the most nearly ideal. The Monongah mines were probably the best planned operations controlled by the Fairmont Coal Company, just as the Marianna mine is one of the model plants in western Pennsylvania. In the latter the miners themselves were of the more intelligent class, so that the danger from disobedience and neglect of orders was minimized. Can anything be more discouraging to mine managers and engineers than the recurrence of such terrible accidents?

At a recent meeting of the West Virginia operators in Washington, Samuel Dixon, one of the most experienced, called attention to the fact that in the earlier days of mining when the workings were ventilated by furnaces and such crude devices, explosions were less frequent and not so disastrous. In the letter of Mr. Page, another of West Virginia's oldest operators, the same point is brought out, and it is further asserted that we are passing too much air through our mines, and that watering our entries and rooms to lay the dust does greater harm than good. This is a radical and highly important criticism of modern coal-mining practice.

High-pressure fans driving immense volumes of air through our mines, especially during the winter months, do indeed remove much moisture from the mines and also tend to keep large quantities of dust suspended in the air; however, to say that before large currents of air were used in ventilation no explosions were remotely attributable to dust is a broad statement that will be opposed by many practical engineers. For our own part we do not believe there was ever an explosion of great magnitude at any time, in any mine, in which coal dust was not a factor. The ignition of any large quantity of gas in a coal mine is certain to produce a terrific explosion; but it would probably be confined to a restricted area were there no dust upon which the flame could feed, thus generating more gas and causing additional explosions on the advance.

Mr. Page's argument, however, is not intended to belittle the problem of coal dust as a factor in mine explosions, but rather to show that in curing this evil we are introducing a danger even more serious in its result. There is no question as to the accuracy of Mr. Page's figures, which show that 66 per cent. of all underground fatalities is attributable to falls of roof, while perhaps only 5 or 10 per cent. can be traced to explosions where dust has been a factor. However, it is not stated what proportions of the deaths due to falls of roof and side are caused by the additional water introduced into the mine, and we do not believe that a large proportion of these accidents is caused by the water that is introduced to moisten dust. The system of spraying our mines and introducing steam into the intakes to furnish moisture in the air are practices approved only in recent years; in looking back over past records we find that the greatest number of fatalities even then resulted from roof falls before this plan of watering was an accepted practice.

No other problem of mining is accompanied by a greater diversity of opinion than the question of mine explosions. We sincerely hope that every engineer interested in coal mining will carefully read the letter written by Mr. Page, and we urge mining men to present their views and experiences so that all available evidence will be contributed to the solution of the problem. Every mining man in America who has been engaged in the production of coal for even a short period of time has undoubtedly had experiences that have caused him to form definite opinions respecting coal-mine accidents. We have recently received letters asking as to whether we desire a critical discussion of the various articles we publish, and we can say only that by such discussions, more than in any other way, will the greatest knowledge be gained. Mr. Haas, Mr. Ashworth, Mr. Page and many other experienced coal men have presented their ideas in a forcible manner; every other engineer who is interested in the safety of his brother miner and in the solution of this important question should add his individual effort to the discussion of this important subject.

Copper Statistics

In revising the tariff, there is one matter which certainly should be attended to. This is the classification of the imports and exports of copper and copper-bearing materials, which are now entered in such a way that it is impossible to determine precisely the amount of copper exported from the United States. In the case of the imports, it is possible to arrive at the whole amount of copper brought in, but not the proportion thereof that is refined metal.

Inasmuch as unmanufactured copper is free of duty, the classification has no bearing upon the tariff question. Consequently there is no reason why a more scientific classification should not be made. The U. S. Geological Survey, which in its statistical work upon this subject has experienced the same difficulty that we have, is now urging before the Ways and Means Committee that a classification be made according to the principal copper-bearing materials, namely, ore, concentrates, matte, blister copper, refined copper, old copper and alloys. In the case of all which are not essentially 100 per cent. copper, the gross weight and copper content are to be recorded. This is a logical classification, although for "blister copper" it might be well to substitute "pig copper" and ore and concentrates might well enough be grouped together. Cement copper (precipitate) which is occasionally imported also should be specified. It is to be hoped that the Ways and Means Committee will adopt this suggestion in drafting the new tariff bill.

Coal Cutting vs. Pick Mining

In this issue of the JOURNAL, Mr. Dixon ably discusses the subject of coal-cutting machines as compared with hand hewing. This question is not only one that appeals to every colliery operator, but also is one as to which there is both a diversity of opinion and a lack of precise information. The article in question deals principally with mining in England, but it is also applicable to conditions in our own country.

When mining machines were first introduced in our coal mines, the majority of the miners opposed them on the ground that they would not only reduce wages, but also would do away with many of the men previously employed. That such machines have not lessened the demand for miners is well known to all who are familiar with labor conditions. As to a decrease in the earning power of the men, Mr. Dixon in concluding his article states that the miners not only earn more money, but also that the machines have done away with the most arduous part of their work. As to the economy of cutting machines, it is shown that the cost of production per ton is about the same with each class of mining; however, the advantage of coal cutting results from the increase in the percentage of large coal, which commands a higher price in the markets.

Alleged Oil Prospects in Nevada

During the early part of November, 1908, a brief examination of the oil prospects in Nevada was made by Robert Anderson, a geologist of the U. S. Geological Survey. On Nov. 29 we received for publication a preliminary statement of the results of his investigation. So far as we can recollect, this is the quickest action of the Geological Survey in the publication of its work. Mr. Anderson reports that the chances for finding petroleum in the region investigated are slight. The matter is of so little importance that it does not deserve much consideration. Our real text is the great service that the Geological Survey can do for the mining industry by sending its scientists to new mining districts and promptly communicating their reports. It is just as important to know where not to spend money as where chances may reasonably be taken. Mr. Anderson spent only a few days in his examination of the oil prospects in Nevada, but these appear to have been sufficient to disclose the fundamental facts as to the geology of the region. It is to be hoped that the Geological Survey will further pursue this policy, and when a Tonopah, Goldfield, or Sylvanite is first heralded to the world will promptly send its scientists to the scene and make a quick report as to the general conditions. It is not to be expected that from such reconnaisances they will be able to say the last word about the subject, but their trained observation is vastly superior to the untrained which usually communicates the first information about such new districts.

Foreign Trade in Iron and Steel

At different times in the past we have heard a great deal of the possibilities of foreign trade in iron and steel products. This trade was to act as a balance wheel, maintaining production at an even level when the home demand was slack. Much was said of organizations promoted by the larger steel companies for the purpose of handling and extending sales abroad. In the present period of depression, however, these agencies have not worked, apparently. During the nine months ended Sept. 30 of the present year, which certainly covers a period of depression and light home demand, the exports of iron and steel products did not increase; on the contrary, they showed a decrease of 21 per cent. as compared with the corresponding period of 1907, when trade activity here was at its hight.

The fact is that, in all the talk about foreign trade, no account was taken of the fact that under modern conditions a trade depression is not confined to one important country. It extends to others in greater or less degree, even spreading through the entire commercial world. When we have a large surplus to sell abroad, the demand there has fallen off, almost on parallel lines to our own. Other countries may be willing to buy our products at a low rate, but the purchasing and consuming capacity has been reduced.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Alumina in Copper Blast Furnace Slags

In an article in the Journal of Aug. 8, on alumina in copper blast-furnace slags, analyses of four slags from the Champion Copper Mining Company are given. The most striking feature of these is the high alumina content, i.e., 27.8, 26.4, 22.9, and 31.2 per cent. This last particularly attracted my attention as being practically an impossibility for copper smelting. If it has actually been run it is a fact of much importance to copper metallurgists, but from the following facts I am afraid it is misleading and inaccurate, and its circulation may cause young metallurgists infinite trouble.

Since the Champion Copper Mining Company went into liquidation the Maoriland Copper Company started working the same mines and smelting on the same site formerly operated by Mr. Heinrich. Six ore sacks of the clean slag from his dump was taken and crushed to pass a ⅛-in. mesh screen for use in the new furnace construction. I got an accurate sample of these, and on analysis they returned the following results:

	Per Cent.
Silica	33.6
Iron oxide	32.2
Lime	10.6
Magnesia	14.3
Alumina	3.6
Sulphur	2.0

The copper was unusually high. A hand-picked sample of the whole dump (about 100 tons), rejecting anything that contained shot matte was then taken, and this gave a very similar result, with slightly higher iron and lower copper and sulphur.

With the permission of the present general manager, I give five analyses of the slags at present being run, on charges made up partly from Mr. Heinrich's old ore-charge heaps and kilns, and partly from the same mine workings.

PERCENTAGE COMPOSITION OF FIVE SLAGS.

	1	2.	3.	4.	5.
Silica	40.5	37.5	34.5	30.6	34.3
Iron oxide	32.1	39.8	42.9	42.6	37.5
Lime	12.4	5.6	4.7	2.5	6.1
Alumina	6.0	6.7	6.3	7.6	6.8
Magnesia	8.8	9.7	10.5	10.2	8.8
Copper	0.15	0.85	0.6	0.7	0.75
Magnetic iron oxide				5.8	3.9

It will be noticed that the alumina is very constant, although the ore mixture has been changed about completely.

The ore consists of a massive pyrrhotite occurring in serpentine and carrying copper pyrites, native copper and copper glance. The alumina in several analyses was as follows: 2.04, 3.1, 1.5, and 0.9 per cent.

In Mr. Heinrich's analyses practically no lime is given, 1.5 being the highest, whereas in both cases I found his dump to contain over 10 per cent. That he added limestone was almost certain, for his old charge heaps contain about 20 per cent. by volume of spalled limestone flux.

I should like to express my appreciation of Mr. Shelby's able and instructive article and to ask him if he has ever run a 31-per cent. alumina slag and what in his opinion is the highest alumina content allowable for economic working under favorable conditions?

The magnetic oxide of iron has given us a great deal of trouble in the reverberatory smelting, settling on top of the charge as a thick, infusible scum, and greatly retarding the working of the furnace. I attribute its formation to the oxidation of the pyrrhotite ($Fe_{11}S_{12}$) during pot sintering, since the ore carries practically none, and the sintered furnace charges up to 15 per cent. On roasting the ore by other methods I find the magnetic oxide still forms to practically the same extent. I should be very grateful for any suggestion in regard to the removal of this trouble.

Harley E. Hooper.

Nelson, New Zealand, Oct. 5, 1908.

Loading Blast Holes

In regard to the discussion on the proper position of the primer in loading holes, by Mr. Hay in the Journal of Nov. 14, 1908, I wish to give my view on the other side of the subject, i.e., the advisability of placing the primer at, or as near as possible to the bottom of the hole.

In cutting the fuse for a round of from 8 to 16 holes, 6-ft. fuse being used, it is rarely possible to give each hole a lead over the next hole to be fired of more than from 2 to 4 in. on the fuse, since sufficient fuse has to be left in the first hole to allow time enough for the men to reach a protected place in safety. This being the case, by the time the first hole "goes" the other lengths of fuse have all burned pretty well down in the hole, if the primer is placed in the bottom, and consequently the danger of a fuse being cut off or pulled out is greatly lessened as the process of burning so weakens the fuse that it will, in most cases, break before pulling out the primer in a properly loaded hole.

On the contrary, if the primer is put on top of the charge, the primer and perhaps part of the "powder" might be cut off and exploded in the muck pile, leaving part of the dynamite still in the hole. Then there is the added danger of flying rock cutting or pulling out the unburned fuse exposed at or near the collar of the hole. It is not an unusual occurrence for holes to be cut off and to fall more than 50 ft. into the chute, the fuse and cap breaking away from all powder and not exploding until the fuse has burned down to the detonator. Is it well to place so much confidence in the sensitiveness of a cap?

I do not agree with Mr. Hay's statement that, "if the round is drilled properly there is little likelihood of the cutting off of a hole." In volcanic rocks, especially in shattered zones, there are often seams and "slips," of which the drill operator has no knowledge and which very often cut off holes in a manner which could be foreseen by no man.

The formation of air spaces in the charge can easily be remedied by splitting the paper cartridge lengthwise of the stick of dynamite and tamping into the hole lightly with a wooden stick. Any dynamite which is "soft" enough to explode readily will fill all open spaces if this rule is followed.

In conclusion I wish to say that if a person wants to know how many holes miss fire from loading the primer on top of the charge, he should follow, in either shaft or drift, a man who follows this system.

F. A. Colburn, Jr.

Cripple Creek, Colo., Nov. 19, 1908.

Sampling by Machines

John A. Church's comment in the Journal of Nov. 21 on my criticism of his paper on machine sampling makes it necessary for me to clear up some misunderstandings he seems to have of my statements.

In the first place he entirely misquotes me concerning the use of "perforated shaking aprons put in the Cripple Creek mill under Mr. Argall's management several years ago." Mr. Argall did not as I remember operate a mill in Cripple Creek, and I did not state nor do I now remember whether or not he used any such device in his mill at Cyanide, Colo. I did distinctly say, however, that all Taylor & Brunton sampling mills had been partially or completely equipped with shaking tray feeds, and emphasized this condition by stating that this plan was adopted in order to give uniform feed and even wear on the rolls, while it incidentally prevented danger from synchronism of motion between any two consecutive samplers. The mills so equipped were one in Aspen, Colo., one in Salt Lake City, Utah, two in the Cripple Creek district, Colo., one in Butte, Mont., and will include one now being built in the Tintic district of Utah. Whether these can be called "modern mills" I will leave to the general mining and smelting fraternity to decide.

Again, there is nothing in my statement which can be twisted into a slur on the management of sampling works connected with smelters or mills. There is this difference, however, between reduction works samplers and public samplers, more particularly purchasing samplers, which seems to me too plain to call for more than a mere statement. Ore sampled by the reduction works is for the most part immediately bedded, and, except by special arrangement, only from 1/5 to 1/125 or even less of each lot is held intact for possile later readjustment. In such cases checks of sampling made by the reduction works are for the most part but resamples of this small portion held, and as this is usually coned and quartered or riffled and is not rehandled through the mechanical part of the mill, such a resample furnished no check on the mechanical system.

Causes of Variation

The real check the reduction works has on its sampling is the balancing of the metals bought during any certain period of a month or a year, with the metals recovered plus the slag, dust, etc., and plus an estimated amount held in the furnace bottoms, tanks, etc. That is to say, the reduction works check is on the average of the sampling for a certain period rather than on the sampling of individual lots. On the other hand the public sampling works, with some exceptions, have a separate and independent check on the sampling of every lot or mixture of lots handled and forwarded by them to perhaps a dozen reduction works which may use nearly as many variations of sampling methods. In a well regulated sampling works the study of these check samplings, and the hunting down of causes of variations, form the most important and intensely interesting part of the business and, in my opinion, have been the principal cause of the gradual improvement in sampling methods. Therefore I reiterate that such public sampling works are in the better position to keep informed of differences in sampling and sampling methods and to hunt down causes for variations which may occur.

Mr. Church seems astounded that I have known of differences of 30 per cent. occurring in duplicate samplings of small amounts of ore, though I venture to say that most managers of mines, reduction works and samplers have had the same experience. I did *not* say, however, that these differences occurred in the *mechanical* part of the sampling. On the contrary such differences are mostly due to the use of faulty coning and quartering methods succeeding the mechanical process, and to insufficient crushing at this stage of the work. Naturally it is not always feasible to give the details of such differences in sampling owing to the difficulty of obtaining the consent of all interested parties to their publication. I mentioned this matter merely as an argument against blaming the mechanical part of the sampling mill for careless work occurring at later stages of the process, and to emphasize that any comparison of theory and practice in mechanical sampling mills was useless unless the system in use at these later stages and in the bucking room had been perfected.

My main criticism was and is that Mr. Church has not proved his principal claims: first, that retardation of coarse or fines precludes the correctness of the mechanical sampling; and second, that the accuracy of mechanical sampling is greatly influenced because the 9.9 lb. of ore taken by the sample spout does not accurately represent in value the 60.6 lb. of ore presented to the machine during a single revolution. T. R. Woodbridge.

Salt Lake City, Utah, Nov. 24, 1908.

An Electric Coal Puncher

In an article which appeared in the Journal of Sept. 12, 1908, entitled, "The Operation of Coal Mining Machinery," by George E. Lynch, the author states, in referring to the kind of power used in connection with the operation of the puncher type of machine: "The motive power is always compressed air, for there is as yet, no practical electrically driven puncher on the market." I desire to take issue with the author and to correct his statement, although I believe it was not made with the intention of misleading those who may have read the article.

Evidently Mr. Lynch was not aware of the existence of the Pneumelectric coal puncher, or if he was, he did not make an investigation of it before writing his article. This is an electrically driven machine, although the blow is struck by compressed air. As its construction has been described in the columns of your paper, it is probably well understood and the only relevant point to be considered at this time is as to whether or not the results obtained from its operation are of such a nature as to make Mr. Lynch's statement misleading.

In view of the fact that this electrically driven machine is in operation, and has been for a period of at least two years, in nearly every bituminous coalfield in the United States, it would appear from that, if for no other reason, that it is practical. Another point which bears directly on the practicability of the machine, is the amount of work which it can do, and in this a comparison can be made between the work of the compressed-air-driven machine and the Pneumelectric, by using the figures given by Mr. Lynch. In this connection he makes the following statement: "Each puncher in the hands of an efficient runner will average 60 to 70 ft. of face undercut per 10-hr. shift. The power consumption is from 100 to 150 cu.ft. free air, compressed to 80 lb. gage per minute." According to this the average cutting would be 65 ft. face in 10 hours, and the air consumption 125 cu.ft. at 80 lb. gage pressure, the latter being equivalent practically to 23½ horsepower.

Comparing this with well substantiated results which are being daily obtained from the Pneumelectric machine, it is found that the usual cutting of the Pneumelectric is from 80 to 100 lineal feet face in 10 hours, or an average of 90 ft., an excess in cutting capacity of practically 33 1/3 per cent. This amount of work is done with a power consumption of but 7½ h.p., which is less than one-third of that required by the air machine of less cutting capacity.

In the light of this information it can be truthfully stated that there is a practical electrically driven puncher on the market.

John L. Wagner, vice-president,
Pneumelectric Machine Company.
Syracuse, N. Y., Nov. 21, 1908.

Monthly Advance in Mine Drifting

In the editorial in the Journal of Oct 17, it is stated: "We believe that this is the best on record for drifts or crosscuts of this size." The reference is to an advance of 263 ft. in a month in the Hot Time Lateral from the Newhouse tunnel under the management of S. H. Knowles This is certainly excellent work. I think, however, that it is by no means the best on record, for I note, in a late number of the *Mining and Scientific Press*, that a drift on the 3100-ft. level of the Chollar Potosi, in Virginia City, was "abandoned in the black dike on the footwall for week after week at the rate of 80 ft. per week." This would give a monthly advance of 340 ft. Even in Europe, which we are apt to look upon as a very slow country, they make holes in the ground rather rapidly. I had occasion to study this question in 1905 and found that the firm of R Meyer, a German contractor of Mülheim, claimed a progress of 294 ft. monthly for several months in limestone, and a record of 465 ft. for a single month in trachyte; both of these were ordinary mine tunnels. In the Journal of June 20 I see that a drift on the Simmer reef, on the Rand, made 294 ft. in 61 eight-hour shifts. Here, in Tonopah, a progress of 150 ft. in a month is thought good.

I think I have reported the record slow progress in my article on the Bogoslovsk Estate (*Trans.*, A. I. M. E., 1908). This was at the Frolovsky mine in the Urals, where two machine drills with six men in the face, for two eight-hour shifts made an average of 25 ft. monthly in pure, crystalline, white limestone.

WM. H. SHOCKLEY.

Tonopah, Nov. 21, 1908.

Railroad Grants on Mineral Lands

The following excerpt is made from the JOURNAL of Nov. 7, 1908, page 92[illegible]: "Investigations made by the United States Government have disclosed the fact that about 300,000 acres of land valued at $100,000,000 have been wrongfully acquired and now held by Harriman for the Southern Pacific system. * * * The railroad company's agent filed a non-mineral affidavit in taking up the land. Some of the richest mineral territory in the State (Nevada) is involved." I think the JOURNAL's correspondent labors under a misapprehension regarding the law applicable to the above facts, as indeed mining men generally do.

During the years 1862 to 1866, Congress granted[1] to certain private corporations, to aid in the construction of railroads, approximately 150,000,000 acres of public lands, and of this amount about two-thirds were within the limits of the precious-metal-bearing States and Territories[2]. These acts granted to the corporations, commonly referred to as the "Pacific Railroad Companies," rights of way over the public domain 200 ft. in width on each side of the track, together with all necessary ground for stations, buildings, workshops, machine shops, depots, turntables, switches, side tracks, and water stations. So far as the right of way is concerned, these grants have been held to be present, absolute, and subject to no conditions except that the road be constructed and used for the purposes designated; the reservations of "mineral lands" found in these acts has no application to the right of way.[3] There was also granted every alternate section of public land not sold, reserved, or otherwise disposed of, designated by odd numbered sections, to the amount of 10 alternate sections per mile on each side of the respective roads, on the line thereof, and within the limits of 20 miles on each side of said roads, "provided, that all mineral lands shall be excepted from the operation of this act."[4]

These acts, then, apply in terms only to lands other than mineral; and as if to cut off every possible contention that mineral lands might be reached under the legislation giving vast tracts of public lands to private corporations, under the pretense of aiding public improvements, a joint resolution was passed by Congress on Jan. 30, 1865, declaring that these acts shall not be so construed as to embrace mineral lands, "which in all cases are reserved exclusively to the United States."[5]

No part of the contemplated railroad from the Missouri river to the Pacific had been constructed at the date this joint resolution of Congress was approved, and "its provisions are to be deemed an amendment of the original acts, and as operative as if incorporated therein."[6]

Ever since the organization of the mineral division of the Land Department in 1867, it has been "the uniform practice to allow and maintain mineral locations within the geographical limits of railroad grants, based upon discoveries made at any time before patent."[7] The practice has been accepted for so long a time that no departure from it will probably ever be sanctioned, and it has, in effect, become a rule of property. And it would seem to be the policy of the Government to allow and maintain mineral locations within "the geographical limits of railroad grants," after patent, because the patents issued under or in pursuance of these grants uniformly contain the reservation, "yet excluding and excepting from the transfer by these presents 'all mineral lands,' should any such be found to exist in the tracts described in the foregoing." The Supreme Court of California has held in several cases that such a patent could be attacked and its effect as a conveyance defeated, in an action at law, by showing that the lands in controversy are mineral in character.[8]

The late Judge Sawyer held this provision of a patent void,[9] and in subsequent cases the California court has followed the ruling of the Federal judge. Nevertheless, the Land Department has continued to insert that provision in all patents issued to the railroad companies, and until the Supreme Court of the United States decides otherwise the validity of the reservation clause should be assumed. And the effect of such clause would seem to be that lands embraced within the geographical limits of railroad grants are free and open to exploration and location under the laws of the United States pertaining to mineral lands.

The purpose of Congress in making these vast concessions to private corporations should also be borne in mind when the grants are the subject of interpretation. Millions of acres of the public domain were given to the Central Pacific railroad companies. Why? The acts themselves answer in language too clear and forceful to be misunderstood: *To* [illegible] to prevent the companies from permanently holding the lands granted for spec[illegible] inserted in the granting clause of the act providing that: "All such lands, so granted by this section, which shall not be sold or disposed of by said company within three years after the entire road shall have been completed, shall be subject to settlement and preëmption, like other lands, at a price not exceeding $1.25 per acre, to be paid to said company."[10]

It would seem that this provision is mandatory. But be that as it may, so far as other States are concerned, mine owners and operators in the State of Nevada are not without a remedy. Our State legislature has declared that, "the production and reduction of ores are of vital necessity to the people of this State; are pursuits in which all are interested, and from which all derive a benefit; so the mining, milling, smelting, or other reduction of ores are hereby declared to be for the public use, and the right of eminent domain may be exercised therefor."[11] The constitutionality of the act has been affirmed.[12]

In a later act it has been provided that "lands held in private ownership, excepting property already occupied for mining purposes, may be prospected for gold, silver, and other valuable minerals, and upon discovering a ledge or deposit of gold, silver, or other valuable mineral, the same may be located "in accordance with the laws of the United States and of this State."[13]

The statute makes full provision for the condemnation of such property and defines the manner in which compensation shall be determined. The trend of recent decisions leaves no room for doubt that the constitutionality of this statute will also be sustained.[14]

It seems clear, therefore, that the Southern Pacific system cannot hold these mineral lands, if the miners and mine [illegible] rights.

THOMAS E. KEPNER.

[illegible]

---

[1] "Statutes at Large," Vol. XII, p. 492; 13 Id. p. 358.

[2] "Public Domain," pp. 273-287.

[3] Montana Central Railroad Company, 25 L. D., 250; St. Joseph & Denver City Railroad Company vs. Baldwin, 103 U. S., 426.

[4] Statutes at Large, Vol. XII, p. 494, sec. 3.

[5] Statutes at Large, Vol. XIII, p. 567.

[6] Barden vs. Northern Pacific Railroad Company, 154 U. S. 288, 320; [illegible]

[7] Central Pacific Railroad Company vs. Valentine, 11 L. D. [illegible]

[8] McLaughlin vs. Powell, 50 California 64; Chicago Quartz Mining Company vs. Oliver, 75 id. 194; Hunt vs. Steese, 75 California, 720.

[9] Cowell vs. Lammers, 21 Federal Reporter, 200.

[illegible]

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Market for Marble Dust or Flour

Marble flour is quoted at $8.50 to $10 per 2000 lb. Is this the price delivered at New York? What is the demand for this substance, and what are the uses?

C. D. W. C.

The demand for marble dust is small. Business is not done by jobbers on a carload scale. Five barrels is considered a good order. The chief consumers are manufacturers of carbon dioxide, most of whom have their own source of supply and do not buy in the open market. Marble dust is used also as a filler for cheap cements and as a substitute for silex as a filler. Ship chandlers buy a small quantity. The quoted price is for delivery at New York, and represents what dealers ask of consumers; not what producers can realize in selling their output, which would doubtless be a matter of private contract. It is to be understood, of course, that in the case of substances like this in which the market is small and limited, there is apt to be a wide difference between buyers' price and sellers' price.

Determining Depth of a Shaft

I once read of a method of determining approximately the depth of a shaft by dropping a stone and timing its fall. I should like to have further information respecting this method. T. A. D.

We recollect no such description, but, of course, with the aid of a stop-watch the depth of a shaft could be so determined approximately, computing it by the ordinary formula for a falling body, $S = \frac{1}{2} g t^2$; where S is the depth in feet of the shaft, g is accelerating force of gravity or 32.2 ft. per second, and t is the time in seconds of falling. This formula will give a rough estimate for shafts of moderate depth. But, owing to air currents in the shaft and the difficulty of not giving any lateral impetus to the object when dropping it, the falling object would probably strike the sides of the shaft before reaching the bottom, if the shaft was more than a few hundred feet deep. To be entirely accurate, the time taken by the sound in traveling from the bottom to the top should be introduced into the formula. This is at the rate of approximately 1100 ft. per second.

Mineral Land in New York

Can I take mineral in a town or village if it be on land owned by the town or county without making a regular claim on the property, even though blasting may have to be done?

B. R. A.

The above inquiry is indefinite. If it refers to blasting by the owner of the property, he may have to obtain permission from the local authorities, just as he might have to secure a license before erecting a building on his land. If the inquiry refers to the discovery and location of mineral, the latter in New York belongs to the owner of the land, with certain exceptions. Thus, it is declared by statute that all mines of gold and silver in any land, and all mines of any metal in lands belonging to all persons not citizens of the United States, "are the property of the people of the State in their right of sovereignty." Also all mines of other metals in land owned by citizens of the United States, the ore of which, on an average, shall contain less than two equal third parts in value of copper, tin, iron, lead, or any of these metals. The statute contains provision for obtaining the right to prospect and work precious metals, etc., in private lands, when the owner thereof refuses his consent. Inasmuch as there are no economic gold or silver deposits in New York, this statute is of theoretical rather than practical importance, although applications have been made for the right to prospect for supposed gold and silver deposits

Treatment for Electrcial Shock

Is there any definite minimum voltage above which electric shock will prove fatal? What is considered the best practice in treating a person who has been exposed to contact with an electrical conductor?

W. O. K.

There is no definite voltage above which the electric shock may be considered as always fatal. The effect depends not only on the strength of the current passing through the body, but the time for which it is maintained. The results also depend largely on the physical condition of the subject. As a general rule, a high potential shock is more dangerous than a low potential shock, but other conditions, such as the moisture of the skin and clothing, may enter into the results and make a low-potential shock produce a greater flow of current, and, therefore, become more dangerous. A person who has received a severe shock may exhibit the following systems: (1) Unconsciousness. (2) Cessation of breathing. (3) Cessation of the heart's action. (4) Turning blue and green in the face. Although life may appear extinct, remedial measures should never be given up until a doctor has pronounced the victim dead. There is no doubt that many people have been given up for dead after an electric shock, when proper measures would have restored them. In treating the victim, artificial respiration should be applied. The lower limbs and trunk of the body should be elevated. It is also well to apply rythmic action on the tongue; some doctors also advise a smart tap over the region of the heart, repeated a few times in the course of the first half minute. The elevation of the body and legs is to send the blood to the brain as a remedy for syncope; a blow over the heart may start that organ again if it has stopped beating, and the drawing in and out of the tongue is a form of artificial respiration. Hypodermic injections of ether and alcohol are also advocated as a means of distending the arteries and so helping the heart's action.

Chinese Miners in the Transvaal

I have been much interested in the possibility of employing Chinese laborers and miners in an enterprise in which I am interested—not in the United States. Can you tell me why the employment of Chinese in the Transvaal mines has been practically given up? I see that the laborers of that nation are being sent back to their own country at a rapid rate.

P. W. F.

The testimony of mine managers and others concerned in the Transvaal is generally to the effect that the Chinese employed there made good mine laborers, learning their duties readily and doing the work well. There was a certain tendency among them to shirk and to limit the amount of work done, but this did not exist to a greater degree than would probably be found among an equal number of laborers of the same class from any other nation. The mines employing them were fairly well satisfied with the result. The reasons for the deportation of the Chinese were social and political rather than economic. There was always a strong prejudice against them among the white people of the country; and when the Transvaal became a self-governing colony after the Boer war settlements were completed, this found free expression. Moreover, some of the abler of the ruling party considered that the country had a sufficiently difficult problem to deal with in its large negro population, without complicating it by the introduction of a considerable Asiatic element.

It is also inevitable that among 60,000 laborers picked up in the Chinese ports there should be some bad men. A number of these escaped from the mine compound, and sought to lead a predatory and nomadic life. This much increased popular prejudice against the race. What became of these men is not altogether clear; it is altogether probable that many of them were summarily dealt with, after the Boer fashion. This was only a side issue to the main question, however. On the main point of the efficiency of the Chinaman as a mine laborer the opinion seems to be favorable. The introduction of a Chinese element into a foreign community, however, is a matter which requires very careful consideration.

New Publications

Audel's Gas-engine Manual. Pp. 469, illustrated, 5½x8½ in.; cloth, $2. New York, 1908: Theo. Audel & Co.

Water Power Engineering. By Daniel W. Mead. Pp. 787, illustrated. 6x9¼ in.; cloth, $6. New York, 1908: McGraw Publishing Company.

Bridge Engineering Roof Trusses. By Frank O. Dufour. Pp. 96, illustrated. 6½x9¾ in.; half leather, $3. Chicago, 1909: American School of Correspondence.

Optical Mineralogy a Guide to Microscopic Petrography. Advance Pages. By N. H. Winchell and Alex N. Winchell. Pp. 134, illustrated. 6x9 in.; paper. October, 1908.

Illinois State Geological Survey, Bulletin No. 8. Year-book for 1907. H. Foster Bain, Director. Pp. 391, illustrated. 6x9 in.; cloth. Urbana, 1907: University of Illinois.

The Miners' Pocketbook. Fifth Edition, Revised. By C. G. Warnford-Lock. Pp. 624, illustrated. 4x6½ in.; leather, $4. New York, 1908: Spon & Chamberlain; London, E. & F. N. Spon, Ltd.

Report of the Chief Inspector of Mines in India for the Year Ending December 31, 1907. By J. R. R. Wilson. Pp. 122, illustrated. 8½x13 in.; board covers Calcutta, India, 1908: Department of Mines.

The Design of Highway Bridges. By Milo S. Ketchum. Pp. 544, illustrated. 6x9 in.; cloth, $4. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

Le Marche Charbonnier Belge. By Georges de Leener. Commission D'Enquête sur la Durée du Travail dans les Mines de Houille. Pp. 294, illustrated. 8½x11 in.; paper. Bruxelles, 1908: Goemære.

Economic Geology of the Kenova Quadrangle, Kentucky, Ohio and West Virginia. By William C. Phalen. U. S. Geological Survey, Bull. No. 349. Pp. 158, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

Smoley's Parallel Tables of Logarithms and Squares. Fifth edition, Revised. By Contantine Smoley. Pp. 448, 4¾x7 in.; leather, $3.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.

The Geology of the Cromwell Subdivision, Western Otago Division. By James Park. New Zealand Geological Survey, Bulletin No. 5 (New Series). Pp. 92, illustrated. 9x11 in.; paper. Wellington, 1908: Geological Survey of New Zealand.

Commission D'Enquete sur la Duree du Travail Dans les Mines de Houille Pays Etrangers Donnees Statistiques et Mesures Legislatives. By A. Delmer. Pp. 119; illustrated. 8¼x11 in.; paper. Bruxelles, 1908: Goemaere, Imprimeur du Roi.

Geology and Mineral Resources of the Western Coalfield, with Maps and Sections. By J. E. Carne. Memoirs of the Geological Survey of New South Wales. Geology No. 6. Pp. 264; illustrated. 9½x12 in.; board covers, 15s. Sydney, 1908: Departments of Mines and Agriculture.

Investigations of the Coal Fields of North Dakota and Montana By the United States Geological Survey. By A. G. Leonard, C. D. Smith, A. J. Collier, L. H. Woolsey, R. W. Stone, E. G. Woodruff and W. R. Calvert. U. S. Geological Survey, Bull. No. 341-A. Pp. 120, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

The Water Power of Wisconsin. By Leonard S. Smith. Pp. 354, illustrated, 7x10 in.; cloth. Madison, Wis., 1908: Wisconsin Geological and Natural History Survey.

This report is the result of surveys undertaken under a special act of the State legislature. It is preliminary, the work being still unfinished. Its topography and generally large rainfall, with numerous rivers and streams have resulted in supplying Wisconsin with a large number of water powers. Already those utilized are furnishing a total of 130,000 h.p., and the number can be largely increased. The report gives valuable data as to the rivers of the State, their flow, fall and other conditions. It is illustrated by maps and many reproductions of photographs.

The Chemical Analysis of Iron. Seventh Edition. By Andrew A. Blair. Pp. 334, illustrated. 6½x9 in.; half leather, $4. Philadelphia and London, 1908: J. B. Lippincott Company.

The former editions of this work and the standing of the author as an analyist are too well known to require any comment. The seventh edition of this valuable contribution to the analysis of iron, steel and blast-furnace materials differs from previous editions by the addition of methods for the separation of vanadium, molybdenum, chromium and nickel in steel; an account of the volumetric method for nickel, and some changes in the methods for gas analysis. The table of factors has been recalculated from the values for 1908, as given by the International Committee and the corrected factors have been substituted throughout the text.

Competitive Designs for Concrete Houses of Moderate Cost. Pp. 56; 15x22½ in. Illustrated. Price, $1. Philadelphia; the Association of American Cement Manufacturers.

The Association of American Cement Manufacturers last year offered a number of prizes for designs and plans for concrete houses which could be built at moderate cost, ranging from $2000 to $4500. The object, of course, was to aid in extending the use of cement or concrete in the construction of dwelling houses. In response to this offer over 200 designs were received, and submitted to a jury of architects and experts in concrete construction. In all 26 were selected either as the recipients of prizes or for honorable mention. These designs and plans are published in the present volume—or rather album—with the accompanying specifications. The publication is in a complete and handsome form. The designs cover a wide range, and should suit almost all situations and tastes. They show what can be done with concrete construction for small dwelling houses of many different classes. They are attractive, and should be studied carefully as they show the advantages which concrete possesses over the usual frame or brick construction. The use of concrete is extending rapidly, and the circulation of these designs will certainly help its growth in small constructions.

Manual of Underground Surveying. By Loyal W. Trumbull. Pp. 251, illustrated; 6¼x9¼ in.; cloth, $3. New York and London, 1908: Hill Publishing Company.

Contents: Instruments. Meridian. Underground practice. Carrying the meridian underground. Survey of secondary openings. Record of the survey. Uses of the mine maps. Making the map. Map filling. Bore-hole surveys. Methods of various engineers. United States deputy mineral surveyor's examination.

This is a good book. The author evidently lacks experience in literary work, which deprives his book of the scholarly effect that such a treatise ought to have. His long quotations from other writers, however pertinent and satisfactory in their instruction as to the subject, are apt to be somewhat irritating to the reader. But these are trifling criticisms. The essential thing is that we have here a complete, intelligent and practical treatise on mine surveying, especially as practiced in America, that is in all respects uptodate. It comprises many novel features that will be warmly appreciated, some of which are mentioned in the table of contents, summarized above. The author is an engineer who has done personally the things that he writes about. His book smells of the field, of the mine and of the drafting room. But in this branch of engineering grime, mud and candle-grease do not conceal or belittle theory and mathematics, and as it ought to be, the present book is strong in the purely scientific direction. It is a contribution to technical literature that will be welcomed by the surveyors

The Business of the Standard Oil Company

The following is from the testimony, Nov. 25, of John D. Archbold, vice-president of the Standard Oil Company, of New Jersey, before the referee in the case of the U. S. Government against the company.

"A great many more wells are usually drilled than are necessary. There is generally an unnecessary expense because of this. I have made it a practice in dealing with intelligent producers to ask them not to drill within so many hundred feet of each other. In Oklahoma the Government has a regulation in this regard.

"Sometimes a man drills as near the stipulated boundary as he can and the result of this is that the other man's territory is drained.

"Through the early years of the business there was an anxiety as to the continuation of the resources of the fields. In the late '60s this was especially noticeable, and it continued to the '80s. It affected investors to a large extent. And I say, to my own criticism, that in the earlier years of the business I could not avoid feeling this same apprehension.

"There is no way by which the possible production from a given well can be measured. The geologists have been of little help to us. They can tell us where oil is not, but they can't tell us where it is. You cannot send experts to examine an oil well as you can to examine a silver mine.

"In 1882 the Standard Oil Company's consumption of crude petroleum was 16,000,000 bbl. This had increased to 64,958,301 in 1906 and to more than 72,000,000 in 1907. In 1882, the refineries that consumed the 16,000,000 bbl. of oil were those of the Atlantic Refining Company, three in number; the Standard Oil Company, of New Jersey, four in all, and the refineries of the Standard Oil Company, of New York, with three separate plants, as well as the plants of the Standard Oil Company of Ohio and the Acme Oil Company. These refineries were all improved or rebuilt in the years that followed. By 1906 a number of additional plants, including those of the Standard Oil Companies of Indiana and Kansas and California, had been put up. The valuation of the properties of the companies that went into the Oil Trust in 1882 was $17,000,000. By 1906 it had become $57,000,000 due to the construction of new refineries and improvements. Since 1882, the Atlas of Buffalo has been the only refinery purchased by the Standard Oil Company. That was purchased in 1882, and cost $84,000."

Answering further questions, Mr. Archbold told about the reasons for establishing refineries at certain points. It was the custom, he explained, to pick a situation convenient to a large center of population, surrounded by good transportation facilities. The Standard Oil built in Kansas, for instance, in order to get a chance at the trade of the Southwest. A refinery near Kansas City had all the railroads which enter that place at its disposal. "We had no other thought" said Mr. Archbold, "than to pick our situation with a view to cheapening the price as much as possible.

"At present the Bayonne refinery has a capacity of more than 13,000,000 bbl. The seaboard refineries have increased much in importance. This has been especially true of recent years. The automobile business and the manufacture of gas have had much to do with this. Practically all the oil brought to the seaboard refineries is conveyed by means of pipe lines.

"At first the manufacture of by-products did not figure large. Of late they have come to be an extremely important branch of the business. Among the articles we make are naphtha, gas oil, fuel oil, paraffin oil, compounded oil, filtered cylinder oils, unfiltered cylinder oils, waxes, candles, greases, coke, pitch, road oils, asphalt and paving residuums, roofers' wax, soap stock, cordage oils, acid oil, turpentine and substitutes, engine, petrolatum, and vaseline. These articles have come to be more important than the illuminating oil itself.

"The work of developing these articles has been one of the most important branches of the Standard Oil business. We have spared no efforts to discover new uses to which to put our crude supply. Scientists and experts have been procured, not only from home, but from abroad. In the early days I can remember seeing the naphtha distilled from the oil run into the nearby creek or burned. The uses of naphtha and gasolene were not appreciated then. Now the lighter grades of gasolene bring three or four times the price of the oil. Some of our discoveries have been patented. But we haven't relied much on patents in our business."

Chronology of Mining, November

Nov. 5—Very large sales of copper at advancing prices. Nevada Consolidated, at annual meeting announced that production Jan. 1, 1909, will be at rate of 35,000,000 lb. copper, and by April from 50,000,000 to 55,000,000.

Nov. 6—Great activity in stocks and sharp rise in prices followed reassuring statements of President-elect Taft.

Nov. 7—Excitement in copper market with violent advance. Estimated sales, 10,00,000 to 12,000,000 pounds.

Nov. 10—Tariff hearings began before Ways and Means Committee. Property of Consolidated Arizona Smelting Company bought by Hooley, Learned & Co. at trustees' sale in Arizona, as preliminary to reorganizing the company by the stockholders and creditors. Rand output in October announced as 617,000 oz., the best on record. Western Pacific railway open for passenger traffic from Salt Lake City to Ely, Nevada.

Nov. 11—Violent break in stocks. Homestake declared regular monthly dividend of 50c. per share and extra of 25 cents.

Nov. 12—Firedamp explosion at Radbod colliery, Hamm, Westphalia, Germany, killed 300 men and wrecked mine. Rumor that U. S. Steel Corporation would reduce prices on finished products, rails excepted. Extraordinary buying of U. S. Steel common at highest prices in history. January Mining Company sued Bunker Hill & Sullivan for $7,300,000 for ore taken from disputed vein.

Nov. 13—U. S. Steel Corporation announced the intention to spend several millions on plant for production of steel car wheels.

Nov. 14—El Oro, Mexico, partially destroyed by fire.

Nov. 15—Collapse of attempts to reorganize the four pig-iron syndicates of Germany, and demoralization in the German pig-iron market.

Nov. 16—Four plants of the Illinois Steel Company resumed operations. Announced that three blast furnaces at Gary, Ind., will be blown in Dec. 15, and that steel making will begin Jan. 1. Fire of incendiary origin in No. 3 mine of Tennessee Coal, Iron and Railroad Company, at Ensley, Ala., killed 13 convict miners.

Nov. 17—Reported that Mexican Petroleum Company has merged with Waters-Pierce Oil Company, to fight S. Pearson & Sons. Stockholders of Virginia-Carolina Chemical Company approved issue of $15,000,000 15-year 5 per cent. bonds, of which $12,000,000 have been sold.

Nov. 18—John D. Rockefeller testifies in case of the U. S. Government vs. Standard Oil Company. James Gayley, first vice-president, U. S. Steel Corporation, resigned.

Nov. 19—Utah Consolidated announces contract with a new smelting company and abandonment of its own plan to build works.

Nov. 20—Organization of Independent Fertilizer Company, capital $50,000,000, which makes a long-time contract for the sulphuric acid of the Tennessee Copper Company.

Nov. 23—Andrew Carnegie declares that American steel works can produce more cheaply than all competitors and require no tariff protection.

Nov. 28—Explosion in Marianna mine of Pittsburg-Buffalo Coal Company killed 130 men.

Correction

In the table in the third column of the article, "Notes on Air Agitation," by Mark R. Lamb, in the JOURNAL, Nov. 7, 1908, p. 901, the horsepower required to compress 38 cu.ft. of free air to a pressure of 35 lb. per sq.in., should be 4 h.p. instead of 6 h.p., as printed.

The Tariff Hearings

Special Correspondence

Hearings on the metal schedules in connection with the proposed revision of the tariff were undertaken by the Ways and Means Committee on Nov. 25 and continued during Nov. 27. The principal part of the discussion related to steel and its manufacture.

Willis L. King, vice-president of the Jones & Laughlin Steel Company, of Pittsburg, suggested that the duty on steel bars be advanced from 0.3c., on a minimum of 1c. value, to 0.4c. per pound. He further urged that there is no valid reason for a difference between steel and iron bars, the latter being assigned (paragraph 123 of the present tariff) a duty of 0.6c. per lb. J. H. Nutt, of Youngstown, Ohio, on behalf of the Western Bar Iron Association, recommended the maintenance of the differential between steel and iron bars established in the present tariff act. James Lloyd, president of the American Iron and Steel Manufacturing Company, Lebanon, Penn., in behalf of the iron-bar interests both East and West, recommended the reduction of duty on iron bars to 0.5c. per lb. On iron and steel rivets he suggested a reduction to 2c. per lb. In behalf of George Nash & Co., J. Wilckes & Co., and Hermann Boker & Co., importers, J. B. Wilkinson requested that paragraph 135 be left as already modified by judicial decisions; an average rate, except on the cheaper grades, of 25 to 30 per cent. instead of the 45 per cent. rate which the Treasury some years ago sought to impose on certain of the steel covered by this paragraph. The importers, however, want grades valued at less than 4c. assessed on a plane with grades valued at more than 4c. As to paragraph 141 the importers asked that no additional duty be imposed upon steel strips, plates, or sheets that have been blued, brightened, or polished. In paragraph 132 they request a reduction of the 45 per cent. duty on iron or steel sheets or wire plated with copper or nickel to 20 per cent., and in lieu of paragraph 185 a duty of 6c. per lb. on nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars, rods, plates, sheets, and strips, all other forms to take a duty of 30 per cent. ad valorem.

Frank S. Witherbee, Port Henry, N. Y., for the iron-ore producers, urged that any reduction on ore be limited to not more than 15 per cent. of the present 40c. a ton duty. William G. Mather, Cleveland, Ohio, for the Lake Superior iron-ore producers, favored a maximum reduction of 20 per cent., amounting to 8c., in the 40c. duty.

Joseph G. Butler, in behalf of the merchant blast furnaces of the United States, requested that ferro-manganese be placed on the free list and that the remainder of the pig-iron schedule be left as it stands. Everit Brown, of New York, in behalf of the Electro-Metallurgical Company and other manufacturers, requested that ferro-silicon, ferro-molybdenum, ferro-titanium, ferro-vanadium, ferro-chromium and ferro-tungsten, not now mentioned in the tariff, be given a new classification with 20 per cent. duty, the same as now imposed through executive order of the Treasury Department pending judicial determniation. Mr. Brown added that the manufacturers would prefer 30 per cent. John L. Cox, of the Midvale Steel Company, of Philadelphia, recommended that the ferro-alloys (silicon, chronium, etc.) be made dutiable at $4 per ton, the rate originally fixed by the Board of Appraisers, or removed entirely.

John A. Topping, Pittsburg, for the Republic Iron and Steel Company, offered to accept reductions on steel where possible to do so "without abandoning the protective system." E. C. Felton, Harrisburg, for the Pennsylvania Steel Company and the steel-rail producers of the United States, asked that the present duty on steel rails be retained. William U. Follansbee, of Follansbee Brothers, Pittsburg, for twelve independent tinplate manufacturers, said that a reduction of 20 per cent. on tinplate, cutting it from $1.50 to $1.20 per box would be accepted by the producers. J. A. Shimer of the Dunbar Furnace Company, Philadelphia, urged a reduction of $4 a ton in the duty on pig iron and the retention of the tariff on iron ore. J. A. Campbell for the Youngstown, O., Sheet and Tube Company suggested on behalf of the wrought-iron and wrought-steel pipe interests the reduction of duties on those articles to less than half their present rate ($40 per ton) or $20 as a maximum (paragraph 152). On round iron or steel wire (paragraph 137) Mr. Campbell suggested a reduction from 1.25c. per pound (not more than 13 wire gage) to about 1c. a pound, with other grades of wire similarly reduced. H. J. Bailey, of the Broderick & Bascom Wire Rope Company, St. Louis, asked revision of schedule C, paragraph 137, making the duty on round iron or steel wire not smaller than No. 13 0.6c. per pound, with grades below No. 13 and not smaller than No. 16 0.8c., smaller than No. 16 being 1c. per pound, provided that all such wire valued at over 6c. shall pay 30 per cent. ad valorem. Other changes in the duty on wire and its manufactures of like character were recommended. William G. Park, chairman of the Crucible Steel Company, Pittsburg, recommended a reduction of 10 per cent. from the present duty on iron and steel ingots, cogged ingots, blooms, and slabs (paragraph 135).

F. P. Cullen, Oswego, for the Fitzgibbons Boiler Company, recommended that welded cylindrical furnaces be cut to 80 [illegible] or about 1c. per pound, present duties being estimated at 100 per cent. Joseph L. Gitterman, a manufacturer of bottle caps, recommended in addition to the present 45 per cent. on such caps, 10 per cent. extra for each color enameled thereon plus the duty charged on pig lead, the latter to be imposed upon the caps by weight.

George H. Large, Flemington, N. J., representing the Taylor Iron and Steel Company, suggested 30 per cent ad valorem on railway bars, girder rails, frogs, switches, castings, etc., containing at least 7 per cent. of manganese. F. W. Collier, Worcester, Mass., a manufacturer of wire goods, speaking for the National Manufacturing Company, the H. & R. Parker Wire Goods Company, of Worcester, and the Woods Strainer Company, of Lowell, recommended 60 per cent. ad valorem plus 20c. per pound in lieu of the present duty of 40 per cent. ad valorem plus 1.25c. per pound plus 0.2c. per pound. Thomas Prosser, Prosser & Son, New York, importers, recommended reductions on forgings of iron or steel to 20 per cent. (instead of 35), steel forgings machined to 35 per cent. (instead of 45), locomotive and car tires and wheels to 0.75c. per pound (instead of 1.5c.), boiler and other tubes to 20 per cent. ad valorem (instead of 35), bar steel to rates varying from 0.8c. to 4c. per pound according to value, a cut of from 0.1c. in the first three classes of the present act upward according to value.

Jesse F. Orton, of New York, in behalf of the tariff reform committee, of the New York Reform Club, recommended the entire wiping out of the steel schedule and the elimination of some other schedules. John Williams, of Pittsburg, in behalf of the Amalgamated Association of Iron, Steel and Tin Workers, recommended the abolition of the drawback privilege on imported tinplate and the maintenance of other duties on tinplate at their present level. John W. Walton, Cleveland, O., a dealer in wire rope, recommended the reduction of the duty on wire rope to a more reasonable figure. Nelson Lyon, Tarrytown, N. Y., recom- [illegible] iron. Samuel S. Eveland, of Philadelphia, a manufacturer of steel balls and ball-bearings, requested the retention of present duties on steel. Dwight Divine, of Ellenville, N. Y., a manufacturer of cutlery, recommended the maintenance of present rates of duty on such articles. H. F. Mattern, of Lebanon, Penn., representing the Lebanon Chain Works, requested the reclassification of the chain schedule, a reduction on the large sizes and an advance on the small sizes, retaining the present tariff from sizes under 2 in. down to ⅞ in., inclusive. Thomas T. Woodhouse, of Trenton, N. J., representing the Woodhouse Chain Works supported Mr. Mattern.

Charles H. Sherrill, representing importers of automobiles recommended a reduction in the tariff from the present rate of 45 per cent. to 30 per cent.

T. D. Bradstreet for the clockmakers, chiefly in Connecticut and New York, asked for a moderate increase in the present tariff and this view was supported by Walter Camp.

Albert H. Washburn, of New York City, asked a duty of 30 instead of 40 per cent. on bronze powder, adding to the classificatory words the words "and flitters."

C. W. Jefferson, for the Mica Insulator Company, Schenectady, N. Y., asked a duty of 20 per cent. ad valorem on mica, cutting off the additional duty of 6c. per lb. now levied (paragraph 184, Schedule C). F. W. Webster, of Boston, for the American Mica Company, asked that the duty be made entirely specific, estimated at 65c. per lb. on the most expensive grades. H. H. Ward, Cleveland, Ohio., for the Great Southern Mica Company, operating in Alabama and North Carolina, asked a clearer classification of mica and an increase of the ad valorem rate to 40 per cent., the present specific duty to remain the same. W. V. Brown, Asheville, N. C., representing the Asheville Mica Company, asked that the proposed 40 per cent. duty be made specific on a basis of 6c.per lb., with an additional duty of 2c. per lb. for every square inch of area surface. B. C. Grindstaff, of Buchanan & Grindstaff, of North Carolina, indorsed this suggestion. L. W. Kingsley, of Eugene Munsell & Co., of New York, asked that amber mica be made free and small sizes reduced, the duty being raised on larger sizes to a countervailing sum.

Arthur B. Davis, Pittsburg, for the Aluminum Company of America, asked the retention of the present duty on aluminum.

Charles W. Lefler asked that pyrites be allowed to remain on the free list. Samuel O. Barbour, representing the International Silver Company, requested the retention of present rates on silver hollow ware. C. E. Allen, of Salt Lake City, in behalf of the Commercial Club of that place, requested the maintenance of present rates on lead. Melton L. Lissberger, of Long Island City, N. Y., for 51 manufacturers of lead goods, asked a reduction on pig lead to a maximum of 1c. per lb. (instead of 2⅛c. as now), with corresponding reductions on lead manufactures

At the zinc hearings on Nov. 25, S. Duffield Mitchell, Carthage, Mo., in behalf of Missouri zinc producers, asked that calamine be taken from the free list (paragraph 514) and made dutiable in the same section with lead (paragraph 181) at 1½c. per lb. on its metallic contents. Axel O. Ihlseng, Joplin, Mo., made the same request.

At the pottery hearings on Nov. 23, W. C. Neilson, representing the Bauxite Mining and Manufacturing Company, of Philadelphia, asked that the duty on bauxite be made $2 per ton instead of $1 as at present. John Richardson, for John Richardson & Co., Boston, and S. T. Warren & Co., paper manufacturers, asked that china clay or kaolin be placed on the free list. Harry A. Auer, Cleveland, for the Standard Reduction Company, of Alabama, asked that the present duty on fuller's earth be continued ($1.50 to $3 per ton). H. L. Shepherd, of Rockport, Me., representing the lime manufacturers of Maine, asked that the present duty on lime (5c. per 100 lb.) be retained. Orin F. Perry, New York, took the same view. Edward Cary and Hugo Reisinger, New York City, requested that the present rate of 90c. per 100 lb. on carbons for electric lights be changed to 25 per cent. J. S. Crider, Cleveland, Ohio., asked for the National Carbon Company that the present rate on carbons be made 90c. per 100 ft. instead of 90c. per 100 carbons. Fillmore Condit, of California, for the local producers, asked a rate of $3 per ton on all asphalt containing less than 60 per cent. bitumen and $5 on all containing over 60 per cent. (in lieu of $1.50 and $3, respectively), both crude and refined. Frank C. Partridge, of Proctor, Vt., in behalf of the general marble industry, asked that the present duties on marble be retained and that the classification of breccia and decorative limestone be rectified. Montague Lessler, New York City, at the hearings before the committee on Nov. 26, asked in behalf of nine users of gypsum that that product be placed on the free list. George E. Roberts, of Chicago, and a committee representing domestic gypsum interests, asked that the present tariff of 50c. per ton be raised to $1. Clarence W. De Knight, Washington, D. C., for the Association of Portland Cement Manufacturers, asked that the present duty of 7 to 8c. per 100 lb. be retained.

November Dividends

The accompanying table shows the dividends paid by mining and industrial companies in the United States during the month of November, 1908. The table also includes the dividends paid by some forforeign mining companies.

NOVEMBER DIVIDENDS.

U. S. Mining Companies.	Location.	Date Paid.	Amount per Share.	Amount Paid.
Amalgamated...	Mont.	Nov. 30	$0.50	$769,439
Benton M. & D., pf	Wis.	Nov. 20	0.01½	2,949
Bost. & Mont...	Mont.	Nov. 30	3.00	450,000
Bunker Hill & Sull	Ida.	Nov. 4	0.25	75,000
Camp Bird	Colo.	Nov. 7	0.24	196,800
Colorado	Utah	Nov. 25	0.03	30,000
Elkton, Con........	Colo.	Nov.	0.01½	37,500
Florence	Nev.	Nov. 2	0.10	105,000
Homestake	S. Dak.	Nov. 25	0.75	163,800
Intern'tl. Nickel, pfd	N. Y.	Nov. 1	1.50	133,689
Sioux, Con	Utah	Nov. 20	0.06	45,000
Snowstorm	Ida.	Nov. 20	0.03	45,000
Uncle Sam.........	Utah	Nov. 20	0.03	15,000
Utah (Fish Sp'gs)...	Utah	Nov. 7	0.03	3,000
Total....	..	....	.....	$2,072,177

U. S. Industrials.	Location.	Date Paid.	Amount per Share.	Amount Paid.
Lehigh Coal & Nav...	Pa.	Nov. 27	$2 00	$764,520
National Carbon, pfd..............................	U. S.	Nov. 14	1.75	78,500
New River Coal, pfd	W. Va.	Nov.	1.50	188,085
Penn. Steel, pfd	Pa.	Nov. 1	3.50	577,500
U. S. Steel, pfd....................................	U. S.	Nov. 30	1.75	6,304,919
Warwick I. & S	U. S.	Nov.	0 30	44,601
Total	..	.		$7,958,125

Foreign Mining Companies.	Location.	Date Paid.	Amount per Share.	Amount Paid.
Dolores	Mex.	Nov. 25	$0.15	$60,000
Mines Co. of Am	Mex.	Nov. 27	0.02	40,000
N. Y. & Hond Ros...	C. A.	Nov. 21	0.10	15,000
Total....................................	....		....	$115,000

Prayers for Zinc Ore

Prayers that Congress will be moved in the proposed revision of the tariff to increase the duty on zinc ore were offered on Thanksgiving day, in Joplin, Mo., by ministers of all the churches in the 25 towns in Jasper county and throughout the Kansas-Missouri mining district.

This prompted a poet in the New York *Evening Post* to express himself as follows:

O Lord, we humbly ask Thine aid
To tariff raise on Zinc,
Because our infant trade now stands
Close on to ruin's brink.
We do not ask Thee "mountains move
And cast into the sea."
That deaf may hear, and dumb may speak,
Or that the blind may see.
For things like these we have no use;
We need substantial "chink."
We must have help and have it now,
Good Lord, remember Zinc.
We know 'twill raise the price of paint,
Of mat, and tub, and sink,
But other people pay the bill;
Good Lord, protect our Zinc.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

George W. Wilkins sailed from New York, Nov. 23, for British Guiana.

J. Morgan Clements, of New York, has gone to Canada on professional business.

David W. Brunton, of Denver, Colo., has been a visitor in New York this week.

S. S. Lang, formerly at San Luis Potosi, Mexico, is doing some geological work in the State of Chihuahua.

F. W. Linck is visiting London, after spending some time in the Ural district, Russia, for the Platinum Corporation.

S. F. Shaw, of Pasadena, Cal., has returned from Bodie, Cal., and is now examining copper claims in Sonora, Mexico.

Joseph Irving, general manager of the Mono-Baltic company at Ironton, Colo., is at present in the East, on business for the company.

F. Burns, formerly at the Alaska Treadwell mine, has gone to Ecuador for the South American Mines Development Company.

Spencer W. Clawson, formerly superintendent of the Copper Queen mine of Arizona, is a visitor in the Lake Superior district.

Edwin Shapley, of Guanajuato, Mexico, is examining the San Rafael and other mines in the State of Jalisco for a Philadelphia syndicate.

J. B. Tyrrell recently returned to Toronto from Sturgeon Lake in northern Ontario, where he examined several gold-mining claims.

Harold Boericke, of the Primos Chemical Company, Primos, Penn., has been in Boulder, Colo., looking after the tungsten interests of his company.

E. P. Mathewson is at Salt Lake City inaugurating preliminary work in connection with the new smeltery, for which he is the consulting engineer.

James Humas, recently at Butte, Mont., has been appointed general superintendent of the Austin-Manhattan Consolidated Company, at Austin, Nevada.

B. H. Bennetts, who has been smelter superintendent for the Alaska Mines Securities Company, at Hadley, Ketchikan, Alaska, is now at Seattle, Washington.

J. W. H. Hamilton, of Hamilton & Hansell was in San Francisco last week, and on his way back to New York will visit Goldfield, Nevada, on professional business.

H. Hasegawa, of Japan, a mining engineer in the employ of the Furukawa Copper Company is a visitor in the Lake Superior copper district, studying the mining methods.

Edward Blake Wyman, representing a British syndicate, is in Ottawa, Canada, negotiating for the purchase of the Right-of-Way and Cobalt Station Grounds mining companies.

Hon. Wm. Templeman, Canadian Minister of Mines, having failed to carry his constituency at the recent Dominion elections, must either find a seat elsewhere or resign his portfolio.

Norman W. Haire, general manager of the Bigelow group of mines, and Wm. Uren, general superintendent, are at Milwaukee looking into milling machinery for the new Ahmeek stamp mill.

C. H. Fergie, at one time connected with the Dominion Coal Company, is examining coal lands in southern Cape Breton, in the interest of the Canadian Pacific Railway Company, which is anxious to secure its own coal deposits in eastern Canada.

Godfrey D. Doveton is now associated with the firm of Spurr & Cox, Inc., as metallurgical engineer. He will, as formerly, devote special attention to economic process devising and the design, erection and supervision of reduction works for the treatment of difficult and low-grade gold and silver ores.

Obituary

Alexander Dron was suffocated, Oct. 11, by a rush of foul air in the Frost shaft of the Austin-Manhattan Consolidated Company, at Austin, Nev. He was born in Scotland, 67 years ago, and had passed many years in Nevada, where he was well known as a mining captain.

Colonel William H. Zimmerman, of Brazil, Ind., died suddenly Nov. 22, while on his return from a trip to Florida. He was born in Ohio in 1836; after serving in the army during the Civil War he removed to Indiana, where he engaged in coal mining. He was one of the first operators in the block coalfields. For some time past he had been president of the Block-coal Operators' Association.

J. Smith Talley died at Terre Haute, Ind., Nov. 23, aged 68 years. He was born in Delaware, but went to Illinois about 1865, engaging in coal mining near Litchfield. He removed to Indiana 10 years later and organized the Coal Bluff Mining Company, of Terre Haute, which he had managed ever since. He was president of the Indiana Operators' Association for 15 years and was largely instrumental in bringing about the annual wage conferences between miners and their employers.

Herbert Percy Seale, assistant general manager of the Mount Morgan Gold Mining Company, died at Rockhampton, Queensland, Sept. 21, aged 36 years. He was born at Maitland, N. S. W., and graduated from the University of Sydney. After doing some railroad work he went to Mount Morgan in 1896, where he was placed in charge of construction of the West works. In 1901 he was made mine manager and in 1906 assistant general manager. In 1903 he visited the United States on a trip of inspection, accompanying the general manager, A. C. Richards.

Eli Morcom died at Tower, Minn., Nov. 26, aged 74 years. Captain Morcom was one of the pioneer miners of the Lake Superior region. He was a resident of the Menominee range for a number of years. He was superintendent of the old Quinnesec mine, operated by the Menominee Mining Company, and was also associated with Capt. John Wicks in the discovery of the Chapin mine. Some 25 years ago he was made superintendent of the Minnesota Iron Company. He was in charge of the work of developing the first iron mine in Minnesota—the Minnesota at Tower on the Vermillion range. Captain Morcom also developed mines for the company at Ely and on the Mesabi range. He took a prominent part in local affairs and had held several important local offices.

Societies and Technical Schools

Coal Mining Institute of America—The winter meeting was held at Pittsburg, Dec. 1. The program was arranged for one day, in order to give the members opportunity to attend the meeting of the American Mining Congress.

Thomas S. Clarkson Memorial School of Technology—The 12th anniversary of this school at Potsdam, N. Y., was held Dec. 1. The Founders' Day address was delivered by S. W. Stratton, director of the Bureau of Standards at Washington.

American Institute of Chemical Engineers—The first annual meeting of this institute is to be held in Pittsburg, Dec. 28 and 29, in the buildings of the Carnegie technical schools. Papers of general chemical engineering interest are to be presented. Among these will be the first technical statement by the inventor, James Gayley, regarding the process for dehydrating air to be used in blast furnaces, and other metallurgical apparatus. Other papers on the use of fuels and power production are to be presented. The measurement of high temperatures, dryer calculations and dryer design are the subjects of two other important papers. One interesting feature of the Pittsburg meeting will be the exhibition by manufacturers of novel plants and machinery, partly by drawing and partly by the actual installation for tests in the presence of the institute. These exhibitions and tests are in no way official [illegible] to pass official judgment upon any of the exhibits. All communications from those desiring to attend the Pittsburg meeting, or from manufacturers who desire to exhibit, should be addressed to the secretary, Dr. J. C. Olsen, Polytechnic Institute, Brooklyn, New York.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Denver, Butte, Goldfield, Wallace and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 20—The new railroad of the Stone Cañon Coal Company, of Monterey county, has been put in operation. It extends from Bradley, on the Southern Pacific coast line, to the Stone Cañon coal mines, 22 miles. The mines have been developed to such an extent in the past few years that a large daily supply of coal can now be shipped to San Francisco and other California cities. This coal is the best thus far found in this State, and the quantity available is large. It is bituminous, and can be used either for domestic or steam purposes. Before the completion of the railroad only small shipments had been made.

W. P. Hammon, of San Francisco, the "dredge king" of California, has acquired what is supposed to be a controlling interest in the Truckee River General Electric Company, which has two large power plants on the Truckee river and a large distributing system, carrying electric power into Reno, Carson, Virginia City, the copper mines at Yerington, and other mining districts of Nevada.

Two new quicksilver mines are being opened on this coast. One is the Florence Mack mine in the hills west of Coalinga, in Fresno county, where a new vein has recently been struck. The other is near Ione, Humboldt county, Nev., where a reduction plant is now being installed.

The Four Metals Mining Company has started its smelter at Keeler, Inyo county, and has its aërial tramway almost ready for operation. The old dumps of the once-famous Cerro Gordo mines are being utilized. Electric- and water-power plants are being installed on Lone Pine creek. In days past the Cerro Gordo mines were great producers, but they have been idle for many years.

Wallace, Idaho

Nov. 23—With positive assurance that the Idaho Northern railroad will be in operation to the terminal point at the town of Paragon by the beginning of the year, and in view of the statement of Senator Donlan, of Missoula to the effect that the big power project at Thompson Falls will be carried into execution, the big operators of the north side have taken the preliminary steps toward putting the Murray tunnel scheme into operation. This tunnel will be more than 1¼ miles in length and will aid in the development of some of the best mines of the district. The consideration will probably resolve itself ultimately into a vast merger including the Jewell group, Chicago-London, Black Horse, Paragon and Bear Top mines, operating 61 mineral claims, all extensively developed and all ready to ship as soon as the railroad is in operation.

Close estimates show that such a tunnel would have to be driven from its entrance on the Jewell group a distance of 1000 ft. to the Chicago-London, on which property it would give a depth of 500 ft.; a distance of 3500 ft. to the Black Horse mine on which it would give a depth of 1250 ft.; a distance of 5000 ft. to the Paragon giving a depth of 1800 ft.; and then of 7000 ft. to the Bear Top, giving a depth of 2800 feet.

It is figured that the cost of the tunnel will be in the neighborhood of $100,000 and it is believed that this expense would be more than covered by the discovery of blind leads.

Goldfield, Nevada

Nov. 26—There is considerable oil excitement in Nevada. A party of Goldfield men, among whom are Frank Oliver, F. A. Farnum and C. C. Stanley, has acquired a large tract of land near Indian Springs, in Lincoln county. Mr. Oliver has just returned from San Francisco, where he closed a tentative option with de Bertodano and Sartorius, both prominent in the California oilfields. On this Indian Springs property, oil indications are said to be exceptionally good. The odor of gas can be detected at surface, and in sinking such a quantity of gas is met with that it is impossible to sink a shaft or well to a depth of more than 18 or 20 ft. Drilling and prospecting outfits will be put to work as soon as possible.

The oil well which is being sunk near Blair, 23 miles west of Goldfield, has reached a depth of 225 ft. It is believed the stratum of quicksand which caused so much trouble has been passed. The drill was making progress at the rate of 30 ft. per day when the engine broke down. Drilling has stopped, awaiting the arrival of new parts from Los Angeles. A member of the United States Geological Survey, who has had experience in oil-producing districts, is expected in Nevada during the present month to make a thorough investigation of the Indian Springs and Blair fields, as well as the Mono, Cal., field, which extends into Esmeralda county, and possibly reaches Blair.

During the week, two cases against high-graders were argued in the State Supreme Court on appeals from the district court. The two defendants are now serving terms of 3½ and 5 years, respectively, in the penitentiary. They were arrested in a Goldfield mine at night, but at the moment of arrest they had no high-grade ore about them, so they are fighting for their freedom on the ground of insufficiency of evidence. F. J. Haugs, counsel for the defendants, is also counsel for the Miners' Union.

The Mohawk Mining Company has been awarded a decision in the Federal court at Denver by which it recovers $20,000, the value of ore stolen from its mine and later hauled to Bullfrog, whence it was shipped by express to Pueblo, Colo., where the ore was identified by the mining company's detective, who was trailing it. The Wells Fargo Express Company was the defendant in the suit.

George Wingfield, vice-president of the Goldfield Consolidated Company and one of the controlling factors in Goldfield's largest bank, has been sued for $75,000 damages by F. A. Attinger, a local stock broker. Attinger alleges in his complaint that in the presence of a large number of the members of the local stock exchange, of which he also is a member, Wingfield accused him of high-grading. Attinger sues for $50,000 on account of injury to his reputation and business and for $25,000 as exemplary damages, making a total of $75,000. F. J. Haugs is attorney for Attinger.

Squatters who occupy portions of the surface ground of the Gold Coin Mining Company are beginning to move their effects. The Gold Coin corporation is believed to be the only one in the camp which charges ground rent for squatters on its surface. The squatters having no desire to pay rent when they can get quarters elsewhere for nothing, are beginning to move.

Butte

Nov. 26—Joseph O. Morris, who has been in Butte several weeks in the interests of the North Butte Extension Copper Company, left for New York last week to complete the arrangements for the company's reorganization. Before leaving, Mr. Morris stated that a number of the company's creditors had been paid, and that arrangements would be made for the payment of the balance within 10 days. According to Mr. Morris the company now owns the Overman claim, adjoining the Black Crow claim and deeds to the Occidental and Free Trade claims have been deposited in escrow. It is understood that operations will be resumed by the middle of December. The hearing of the petition for the appointment of a receiver has been continued until Nov. 30, and may possibly be dismissed by agreement before that time.

Last week in the State District Court, John O. Evans secured a judgment against the Butte Central & Boston Copper Corporation for $1217. The action was begun before the bankruptcy proceedings were instituted against the company and was, therefore, not affected by the company's insolvency.

The Hodgens brothers, of this city, have recently secured a 90-day option on a controlling interest in the stock of the Butte & Ely Copper Company at $1.00 per share. The stock is to be placed in the Daly Bank and Trust Company, in Butte.

Denver

Nov. 28—The Carbon Lake mine, of the San Antonio Company, operating in the Red Mountain district of the San Juan region, is attracting a great deal ot attention owing to the size of the orebody, and the results of its shipments, and is doing much to encourage the renewal on a large scale of mine operations in that district, once celebrated as the location of the Yankee Girl, Guston, Congress, National Belle, Silver Bell and other rich mines. Since July 10 last, there have been shipped from workings not over 200 ft. deep 122 cars of 25 tons each, which netted $35,181 at the smelter—an average of about $300 per car. I saw returns from one carload which gave $2 in gold, 12 oz. silver, 27 per cent. copper and 7 per cent. arsenic. The ore is a very peculiar one (enargite), and has the appearance of sulphide of antimony, showing no sign of copper; it is associated with iron pyrite and galena in small quantities, in a lime-spar matrix. A tunnel is being driven which, at a distance of 2300 ft. from the portal, it is estimated will intersect the lode 500 ft. from the surface, and 300 ft below the present workings. The country rock through which it is passing is the hardest kind of syenite-porphyry; the tunnel is 5½x8 ft. in the clear, and two shifts with Rand machine drills are making 6 ft. a day. The mine is located on the Silverton railway half way between Silverton and Ouray. Electric power and light is supplied by the Animas Power Company.

Calumet, Michigan

Nov. 28—The E. I. Du Pont de Nemours Powder Company, of Wilmington, Del., has secured a site, consisting of 2500 acres, on Portage lake and will erect a large dynamite factory at a cost of about $1,000,000. It is expected that this plant will be completed next spring. There is only one competing plant in this district. The Hancock Chemical Company, of Dollar Bay, is a subsidiary of the Tamarack Mining Company, and has supplied explosives to that company for many years.

London

Nov. 12—The prospectus of the new Russian mining company, called the Kyshtim Corporation, Ltd., has been advertised. The company will acquire from the Perm Corporation, Ltd., the entire share capital of the Kyshtim Mining Works, a company registered in Russia, in 1900, with limited liability.

The property consists of estates in the southern district of the Ural mountains, containing iron, copper and gold mines. There are also extensive forests and a large revenue is expected from the sale of its timber.

The copper and gold mines in the Soimonovsk valley, about 29 miles from the town of Kyshtim, have been reported on by Messrs. Knox and Allen, mining and metallurgical engineers of New York. H. H. Knox estimates the cost of producing electrolytic copper at £32 per ton, and that for an expenditure of £103,000 the output should be 4500 tons per annum, with the prospect of returning ultimately a net profit of £976,100, an estimate which is subject to increase as the work advances.

The electrolytic copper refinery is now under construction and should be at work before the end of the year. The purchase consideration is £924,000, payable as to £174,000 in cash and £750,000 in fully paid shares, out of a capital of £1,000,000 shares of £1 each. The capital now offered for subscription is £250,000 ordinary shares and £250,000 in 6-per cent. debentures. After making provision for new capital expenditures, as recommended by the copper and iron experts, and after meeting the cash purchase consideration, the company will have approximately £125,000 working capital.

The *South African Mining Journal*, published in Johannesburg, has now arranged for the issue of a London edition, with Kendall Robinson as editor. The paper will be posted to subscribers as soon as possible after the arrival of the South African mail boat, which is due on Saturday mornings. The London edition will contain the latest cables.

The Victoria Falls Power Company, Ltd., to which reference was made in the Journal of Oct. 31, is bringing an action against the Rand Mines, Ltd., with regard to preferential rights for supplying power in bulk at rates equal to those quoted by any competitor.

The action brought by the Ore Concentration Company, [illegible] the Elmore patents, against certain persons [illegible] Minerals Separation, Ltd., to recover damages for an alleged breach of agreement, has been settled out of court. The defendants had obtained from the Ore Concentration Company an option to purchase the patent rights for Australasia of a process for separating minerals by the use of oil, and in one clause of the agreement it was provided that any improvements made should be communicated to and become the property of the Ore Concentration Syndicate, the parent company of the Ore Concentration Company. The plaintiffs claimed that certain discoveries had been made and had not been communicated. The terms on which the dispute was settled have not been disclosed.

A meeting of the South African Option Syndicate was held on Nov. 3, in London, under the presidency of Sir John Willoughby. The syndicate owns diamondiferous alluvial deposits in Rhodesia at Somabula and Bembesi. From the Somabula wash some 6636 carats of diamonds and some 100,000 carats of miscellaneous stones have been recovered. The value of the diamonds sold together with the value of those still on hand is £22,482. A large amount of work has been carried on in the attempt to discover the source of the diamonds, but without success. The gravel washing has not proved profitable and the ground is now being offered to tributors. The company is now occupied with the development of a newly discovered diamond mine at Bembesi, some 38 miles northeast of Buluwayo. This discovery is called the Colossus mine, owing to the large area over which diamondiferous ground is supposed to occur. The estimated area of the pipe puts the Premier and De Beers mines in the background. But this is not all. There is another mine some five miles off, from which a small test washing of mere surface soil gave diamonds at the rate of 30 carats per 100 loads, while a third pipe has also been located, and there is, according to the chairman, a considerable probability of a fourth mine being located farther on. If all these mines turn out to be the real thing, diamonds will soon be a drug on the market. The shareholders are now asked to provide the funds necessary to develop these promising properties, and it would be surprising if, in spite of their disappointment at Somabula, they did not respond to their enthusiastic chairman.

The Bembesi deposits are reported on by W. Nichol, a former employee of the De Beers company, who expresses the highest opinion of the prospects of the properties.

The report of the Consolidated Goldfields of South Africa, Ltd., for the year ending June 30, 1908, has been issued. The realized net profit allows the directors to recommend the payment of a dividend of 20 per cent. on the £2,000,000 ordinary shares, leaving £68,260 to be carried to the credit of the current year's profit and loss account. The report is, as usual, full of interesting statistics as regards the mines. Schedules of the company's principal share holdings and of unfloated properties are attached

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

RANDOLPH COUNTY

Gold Ridge—The old mine at Gold Ridge, which has been worked in a desultory way for gold and copper for many years, is to be systematically developed by W. L. Ernest & Son, who now control it. Preparations are being made to install machinery, and to work on a large scale.

WALKER COUNTY

Gamble—The lease of this coal mine to the Tennessee Coal, Iron and Railroad Company has expired, and the mine has been turned over to the Pratt Consolidated Coal Company, the owner. The Pratt company has its office in Birmingham, the officers being G. B. McCormack, president; Erskine Ramsey, vice-president; H. E. McCormack, general manager; E. A. Rosamond, general superintendent.

Arizona

COCHISE COUNTY

Gold Treasure—In this mine, near Bisbee, gold ore has been found in sufficient quantity to induce a new company to push development work.

Warren—This mine, Bisbee, has shut down. The company refuses to give any explanation for so doing.

GRAHAM COUNTY

Morenci Water Company—This company which furnishes water for the Detroit Copper Mining Company and the Arizona Copper Company, both of Morenci, is installing a new pumping plant on Eagle creek about six miles southwest of Morenci.

MOHAVE COUNTY

Gold Road Mining and Exploration Company—This company, of Kingman, has installed a new mill with a capacity of 300 tons daily. Since the shutdown of the mill one year ago good orebodies heretofore unknown have been opened up. The ores are of a higher grade than that formerly produced.

California

AMADOR COUNTY

Potazuba—This company has levied a small assessment and it is supposed will start up again, after several years idleness. The mine is in the town of Sutter Creek and was originally opened by E. C. Voorheis of that place.

BUTTE COUNTY

Francisco—In this mine, where three ledges have been opened up, a gasolene motor has been installed and an option taken on a 30-stamp mill. The ledges were struck after a 600-ft. tunnel had been run.

CALAVERAS COUNTY

Hamby—At this mine near San Andreas a new and valuable shoot of ore has been found, and 15 of the 20 stamps of the mill are being kept busy. Another level will shortly be opened.

Kenross—The storage reservoir has been finished on this San Andreas mine and men are now repairing the ditch, after which the débris dam will be built, so that hydraulicking can begin when water is available.

EL DORADO COUNTY

Geo. M. Mitchell and James W. Ward have bonded for $75,000 the Murderer's Bar, Texas Bar and Brown's Bar mines, including the Little Kennebec claim, with machinery tools, etc.

Prevolcanic Channel Gold Mining Company—At this property at Pacific, T. G. Patton, of Placerville, manager, the new mill has started and is expected to handle 50 tons of cemented gravel daily. The gravel channel is about 600 ft. wide as far as known.

INYO COUNTY

Crooked Cañon—A small ledge of gold-bearing ore found at this place has started a new camp without a name as yet. A number of locations have been made. Such ledges as have been found are small. The cañon is on the east side of the White mountains north of Laws station and is reached by the toll road which crosses the range near there.

St. Ives—The Unthank & Shive lease on this property in Chicago district has some ore that will run as high as $80 per ton, while the rest of it is of $15 per ton milling grade. Some sulphuret ore is being sacked for shipment.

MADERA COUNTY

Hildreth—This old and long abandoned camp is becoming active again. The Volcano No. 2 has 14 men at work and a small mill with concentrator is being installed. The old Hanover mine is being worked by Williams Brothers. The Norton is a new claim being opened; and another is that owned by Frank Haneck who has some rich rock at 60 ft. depth.

MARIPOSA COUNTY

Virginia—The power is virtually cut off by the lowness of water at the Nameless dam from which this mine near Coulterville gets its current. Other properties in that section which rely on electric power are about in the same condition.

NEVADA COUNTY

Colling—The Colling ranch, in Rough and Ready district, has been purchased by Mr. Rogers, of Goldfield, who will develop the ledges known to exist there.

Dana—In this mine, at Grass Valley, adjoining the old Idaho, Superintendent Burgess has uncovered a ledge about 8 ft. wide, showing some free gold; a new hoist has been ordered, and shaft sinking will shortly commence.

PLACER COUNTY

Paragon—At this mine both the upper and lower leads are being worked. The Breece & Wheeler ditch has been cleaned out and water turned in at the head.

PLUMAS COUNTY

Bullion—This old mine, at Clio, has been reopened by Daniel Edwards, of Reno, Nev., and some high-grade ore has already been found, carrying both gold and copper.

RIVERSIDE COUNTY

German-American—New machinery will shortly be installed on this mine, at Pleasant Valley, and a new road is being built to it.

SHASTA COUNTY

Simona—A deal has been closed with San Francisco men for the purchase of this mine in Lower Springs district in the western part of the county.

SIERRA COUNTY

Sierra Buttes—It is expected that this old mine at Sierra City will shortly commence operations again. Labor troubles last summer brought things to a standstill, and there was much feeling displayed. The mining company even cut off the water supply for power in the town, though letting it be used for domestic purposes. Now a new superintendent, Jay C. Folsom, has taken charge and has arranged with the citizens so that they have electric lights again. Machinery and provisions are being hauled in for the winter, so that affairs in that locality should soon become active again.

SISKIYOU COUNTY

Hardscrabble—The new mill for this mine, on French creek, has been started up.

TRINITY COUNTY

Golden Jubilee—This mine, at Coffee creek, has 60 men at work. A stamp mill is being installed.

Bonanza King—At this mine, Trinity Center, Joseph Porter, superintendent, it is intended to keep 20 stamps at work all winter. A tunnel is being run to tap the ledge at lower depth.

TUOLUMNE COUNTY

Kline Ranch—On this ranch, near Stent, a rich strike has been made. The ledge is small, but of high-grade ore. F. J. Young and others have leased the property and are developing it.

Nonpareil and Longfellow—These mines have been sold at sheriff sale to satisfy judgment and costs in the case of H. M. Street against the Nonpareil Gold Syndicate and Longfellow Mining Company.

YUBA COUNTY

A pit is being dug at Marigold, near Marysville, for launching the largest gold dredger yet built in the Yuba field.

Colorado

BOULDER COUNTY

Celura—This company is resuming work on its holdings at Sunshine, and it is reported that a mill will be built.

CLEAR CREEK COUNTY

Banner Consolidated—Plans are being prepared for this company by the Newbury Machine Company, of Denver, for the erection of a mill at the portal of the Rockford tunnel, the first unit to have a capacity of 250 tons per day. Fred H. Nye, Idaho Springs, Colo., is manager.

Mammoth—B. J. Martelon, of Silver Plume, Colo., has taken a lease and bond on this property on Brown mountain, and it is planned to have the aërial tramway reconstructed for the conveyance of ores and supplies.

GILPIN COUNTY

Eagle Mill—This rapid drop 35-stamp mill at Black Hawk has been purchased by the Great Bonanza Mining Company, Ltd., with G. H. Ellis Smith, Central City, Colo., as manager. The mill is to treat the ores of the Next President mine of this company.

Frank Augustus Mining Company—Centerville, Iowa, men are interested and have purchased the Tanner & Dunn and the Wilson & Ogilvie groups of tungsten claims, on North Beaver creek, on the Boulder-Gilpin county lines. Arrangements are being made for the electrical equipment of the property and for the erection of a large concentrating mill on North Beaver creek next spring. Frank Augustus, Rollinsville, Colo., is manager.

Argo Leasing Company—A local pool has taken a five-year lease and bond on the Argo group in Russell district, has installed a 40-h.p. boiler and will do liberal development on a reported promising showing. Harry Willis, Central City, Colo., is superintendent.

Belcher—Malet & Co., have opened up pitchblende or uranite ores at a depth of 140 ft., the mine being located in the Nevada district. The streak of pitchblende is between 4 and 12 in. wide and the mineral runs from 40 to 60 per cent. The ores are being carefully cobbed and sorted for shipment to New York where representatives of the German buyers will bid on them.

Cashier—The third quarterly dividend has been paid by this company and it is figuring on the installation of an electric plant during the winter season. William Auger, Central City, Colo., is superintendent.

Carroll—This property in Eureka district has been sold to the Lusitania Mining Company with I. F. Dawson, Mercantile building, Denver, as manager. New machinery will be installed.

Jefferson Company—Pennsylvania capital is interested in a lease and bond on the Ralls County mine on Quartz hill and they have already opened up 4 ft. of milling ores in the 300-ft. workings, and will have the tramway tracks extended for cheaper hauling of ores and supplies. J. F. Shaw, Central City, Colo., is manager.

Parole—Toledo, Ohio, capital is interested with W. H. MacFarland, Central City, as general manager, and a contract has been let for new shaft-building, and machinery is to be installed. The company owns the Parole and Morning Star mines in Gregory district.

Pewabic Consolidated—The mill known as the New York mill has been remodeled, and a new set of boilers with furnace for burning western lignite attached has been installed. John C. Fleischhutz, Central City, Colo., is manager.

LAKE COUNTY—LEADVILLE

A. Y. & Minnie—This property in California gulch, after being closed down for a year, has resumed operations. At present a force of men is employed in repairing the shaft and when this is completed the different drifts will be cleaned out. This work will take to about the middle of December when the breaking of ore will commence, and 75 tons will be shipped daily to the Western Chemical Company, Denver. By the first of the year the tonnage will likely be doubled, and in all probability the mill will resume operations and handle the low-grade product.

Big Six—From time to time rich ore has been found in this territory, Breece hill, but this week some of the richest ore, with the exception of the Little Jonnie, ever taken from the hill was found in a streak of talc embedded in a body of ore; the talc runs 300 oz. gold per ton; the body holds up to 2.35 oz. gold per ton. The ore was caught at the 750-ft. level and 210 ft. from the shaft; a small streak has been followed for several days and led to the rich streak that is about 3 in. wide. The talc is freely spattered with native gold; it is being sacked. The discovery was made in virgin territory.

Iron Silver—The work of cleaning up at the Moyers and Tucson is about completed, and shipments will start soon. No large force of men will be put on either of the properties until after the first of the year. The present tonnage from the two properties will be the neighborhood of 250 tons daily.

Jolly Shaft—A good grade of iron is being shipped from this property, East Fifth street, averaging 30 tons daily. Work is being carried on in new territory.

Matchless—A rich vein of silver ore has been opened in No. 7 shaft, Fryer hill, drifting for which has been in progress for some time. Work has been carried on from No. 5 shaft, in new territory, and it is expected that vein will turn into a large body. Iron is being sent out from both shafts.

Idaho

SHOSHONE COUNTY

Caledonia—Within the next 10 days the first shipment of about 40 tons of ore will be made. The management has decided to sink the shaft another 200 ft. and then to crosscut to the ore.

Hecla—This company has announced its regular dividend for the month of November at the rate of 2c. per share. The dividend involves the distribution of $20,000, making a total paid for the year of $160,000, and a grand total of $1,680,000.

New York Group—This property has been bonded by a syndicate of New York capitalists, and a stamp mill will be erected next spring. The property was formerly owned by the Wake Up Jim Mining Company and consists of five claims.

IDAHO COUNTY

Buster Mine—Drifting and crosscutting at the 400-ft. level has resulted in the finding of the vein which was lost some weeks ago. Development will now be continued below this level.

[illegible] *Mining Company*—[illegible] have been purchased for immediate shipment to the mine at Elk City, and development work will start at once.

Crackerjack—Fifteen men are at work taking out ore and developing. The [illegible] time and will remain shut down until several months' run is on the dump. Supplies are now being taken to the mine.

Espey—A four days' run of the five-stamp mill on this property has given a gross cleanup of $5400, according to Alfred A. Adams, the present owner. Mr. Adams has purchased repairs and a small amount of additional machinery and the mill will be started in a short time.

United Placers Company—Surveys for an 8-mile flume were completed some time ago, and as soon as patents are issued for the land, applications for which have been made, the work of constructing the flume will begin. The company also is planning a power plant from which power will be sold to other companies. Manager W. H. Hill states that in one year from date he will be handling gravel. The property comprises 1100 acres of placer ground.

Ohadi Mining and Milling Company—Supplies and equipment for driving 500 ft. of tunnel have been ordered for the company's property in the Cave gulch district. Work will begin in December. This is brought about by the opening of the Upper Snake to navigation by small steamers.

KOOTENAI COUNTY

Green Monarch Mining and Milling Company—Frank C. Lavigne, manager, is engaged in transporting a new air compressor and other machinery to the mine at Hope. Five drills will be put in commission as soon as the plant is installed. The company has shipped two carloads of ore to the Panhandle smelter.

Illinois

MARION COUNTY

Marion County Coal Company—Arrangements have been made to push the work on this company's mine at Centralia, and to make it one of the largest mines in the State. F. Kohl, Jr., of Centralia, has been elected president.

Indiana

GIBSON COUNTY

David Ingle, an Oakland City coal operator has leased 600 acres of land east of Princeton, near Francisco, and will try to develop a new coalfield. Work has already begun with a core drill and there is every indication of profitable development.

GIBSON COUNTY

Peacock Coal and Mining Company—The new mine of this company, near Oakland City, is now in full operation. This mine is in an 8-ft. vein of coal, and will have a large output and a large complement of employees.

KNOX COUNTY

Big Muddy Coal and Coke Company—The property of this company, comprising 10 acres of ground near Bicknell, and a complete coal-mining plant, has been sold to Fred. C. Hunold, of Chicago, and A. B. McLaren, of Marion, Ill. The deal involved over $75,000 in all.

SULLIVAN COUNTY

J. W. Broddy, of Indianapolis, is at the head of a company to select a site near the Linton fourth-vein mines upon which to erect and equip a large central power plant. The purpose is to mine coal and generate electricity, and to transmit it to the manufacturing centers of central and eastern Indiana. Work is to begin on the sinking of a shaft and the construction of the plant next spring.

VIGO COUNTY

The judgment convicting John Hewitt of the offense of failing to provide a wash room with lockers for clothing at Lost Creek mine, near Terre Haute, where the coal miners could wash themselves and change clothing, has been reversed by the Indiana Supreme Court. Hewitt contended that the act passed by the last legislature requiring wash rooms was unconstitutional, and when the lower court held it to be valid and assessed a fine against him he appealed. The Supreme Court declined to pass on the constitutionality of the law and decided that the affidavit on which Hewitt was convicted was defective, because it did not state that he had charge of the mine, since the law holds only the person "in charge" subject to a fine for failing to provide a wash room.

Kansas

ZINC-LEAD DISTRICT

Ore has been found in croppings on Brush creek, 2½ miles north of Baxter.

Michigan

COPPER

Wyandot—This company has begun drifting on the amygdaloid formation that was recently encountered in the crosscut driven from the exploratory shaft. The formation at the point of intersection carried a small seam of copper-bearing rock and its extent and value is now to be fully determined.

Ojibway—Sinking has been resumed at No. 1 shaft of this property and the next level will be established at a depth of 650 ft. The crosscut from the 500-ft. station has passed through one of the beds of the Kearsarge series, which was 30 ft. wide and highly mineralized and is now entering another bed after passing through about 15 ft. of trap. The crosscut from this same level at No. 2 shaft has entered the formation and it is well charged with copper. The crosscut will be extended and the other beds encountered.

Copper Range—This company has begun diamond drilling on sections 7 and 8, which lie to the west of Atlantic's section 16 property. This land is owned by the St. Mary's Mineral Land Company, and the Copper Range has secured an extended option on it and will fully explore it. This tract in all probability carries the southern extension of the main working lodes of the district.

Mass—This company is diamond drilling from two separate points underground at "A" shaft, but nothing authentic can be learned concerning the results being obtained.

Ahmeek—The two new shafts of this company have reached the bedrock after passing through about 70 ft. of overburden; sinking will proceed at the rate of about 100 ft. per month. The drift south from No. 2 shaft is entering exceedingly rich ground in proximity to the North Kearsarge boundary line.

Victoria—This company has curtailed the number of men employed, due to lack of water necessary to operate its hydraulic plant. Explorations continue by means of a crosscut from the shaft in the southern portion, and to the north two diamond-drill outfits are in operation.

Calumet & Hecla—This company has again taken up exploratory work on the Nonesuch property in Ontonagon county.

Superior—No. 1 shaft will soon be in condition to accommodate two skips. The intervening space has been widened out and the retimbering is practically completed. The crosscut at the 10th level has penetrated the lode and at this point it is 80 ft. wide and shows a uniform grade of stamp rock for nearly the entire distance. At No. 2 shaft the work of enlarging to two compartments is progressing satisfactorily. The additional surface equipment is rapidly rounding into shape and in a short time this company will be on a producing basis.

Seneca—A temporary shaft house is being erected at this property and will soon go into commission; everything at the property is in such condition that the progress of sinking the shaft will not be interfered with during the winter months. The shaft is equipped with hoisting and compressing facilities capable of meeting all requirements for more than a year. This shaft is going down in the footwall about 60 ft. behind the lode, and as the levels are established crosscuts will be driven to cut the lode. The Kearsarge lode upon which this property is being opened is supposed to be composed of several series of amygdaloid and trap alternating; one authority gives it at seven, four of which are known to carry copper in commercial quantities, and in driving the crosscut from the footwall side these various beds will be penetrated. Diamond drilling continues and a complete cross-section of the tract will be made from east to west.

Missouri

ZINC-LEAD DISTRICT

Kelly Land—Sheet ore has been struck

in drilling on this land, near the Frisco station at Webb City.

Murabe—This company, at Spring City, has reached the ore with its shaft and is planning the erection of a mill.

Midway—This camp, situated between Joplin and Webb City, has 12 companies at work, where a year ago there was not one. The Kalitan, Osyka, Florence and Snyder & Watkins are already large producers. The ore is free jack and lead, found in open ground, and strong water is encountered.

Plata—McKee & Co., of Joplin, have got into the ore at 170 ft. with the shaft at Spring City. This mine adjoins the Delta and has the same blanket lead formation. This same orebody is being developed in the McKee mine and a shaft is soon to be sunk to strike it on the Alladin lease by the Don McRiver company. The Plata Mining Company will erect a mill on its strike.

United Zinc Company—The Highland mill of this company, at Prosperity, has been destroyed by fire. The loss was $40,000 in all.

Montana

Butte District

Anaconda—Operations in the Anaconda and Never Sweat mines of the Anaconda company have been almost at a standstill for several weeks owing to the trouble occasioned by the smoke and fumes from the fires in the mines.

Davis-Daly—About 40 men are now employed digging the foundations for the hoisting engine which is to be installed at the Colorado shaft. The engine to be used is one formerly at the Rarus mine, and is good for a depth of 2500 ft. The shaft is down 1500 ft. Although no development work has been done below the 100, a crosscut will be driven on the 1425-ft. level.

Butte Montana—Operations have been resumed on the Alex Scott under the direction of C. J. Stone, a mining engineer, of Duluth, who arrived here a few days ago. On the 900-ft. level drifting westward is in progress.

Jefferson County

Columbia Butte Mining Company—This company's property is situated near Whitehall. H. T. Huyder, general superintendent, has brought an action to set aside the conveyance made by him to the company on the ground of failure of consideration. He alleges that the company has failed to make the payments agreed upon for the claims and that it is in debt and unable to make any further payments.

Missoula County

Iron Mountain Tunnel Company—The United States Government has instituted an action in the Federal Court at Helena against the company for $707.85 for the alleged conversion of timber on the Lolo National Forest Reserve.

Fergus County

[illegible] Gold Mines Company—In the action of J. W. Lusk, of St. Paul, as trustee, against the company, Joseph Meredith has been appointed receiver. The action was instituted to foreclose a mortgage given to secure the payment of 366 bonds for $500 each.

Madison County

Prospect Mine—This mine is situated just west of Virginia City. An electrically driven air compressor is being used to operate several drills in sinking the shaft. J. H. Panky, of Virginia City, is in charge of the work.

Carbon County

Northwestern Improvement Company—Six men lost their lives in a fire last Friday in the company's East Side coal mine, near Red Lodge.

Nevada

Esmeralda County—Goldfield

Florence Annex No. 2—The first shipment, consisting of 40 tons, valued at $100 per ton, has been made. On the 350-ft. level, the face of the drift being driven under the hill and toward the Engineers lease, looks more promising. Two drifts are being driven to the south and west on the 150-ft. level and have passed through a fault.

Silver Pick—The only work being done at the Silver Pick is that of the Goldfield Golden Pick lease. The 250-ft. level driven by former leasers, has been cleaned out, the shaft has been sunk to a depth of 340 ft., and will be continued to the 350-ft. level where a station will be cut and extensive lateral work done.

Goldfield Mining and Reduction Company—Work has been resumed and a gasolene hoist is being installed. The two-compartment shaft, now 70 ft. deep, will be sunk to a depth of 500 feet.

Zinn-Florence—On the 185-ft. level, in following a well defined talc seam, a vein of low-grade ore 8 ft. wide and assaying from $4 to $12 per ton has been opened up. Two feet of the ore is oxidized; 10 in. of the ore carries gray copper. This vein has a north-south strike and dips to the west.

Portland Florence—This lease working the ground included in the old California Florence lease has made its initial shipment this week. It consisted of 20 tons of ore assaying $80 per ton, and came from the 200-ft. and 300-ft. levels.

[illegible]—At this property, [illegible] west of town and near the [illegible] of unpleasant memory; the shaft is 127 ft. deep; the crosscut driven from the bottom is 127 ft. long.

[illegible]—This lease on the Last Chance claim of the Laguna group, one of the Consolidated Goldfield properties, has encountered at a depth of 717 ft. what is supposed to be the Red Top vein. High assays are obtained from streaks and bunches of ore in a vein of solid quartz; indications show the approach to a body of ore. The shaft has now reached a depth of 734 feet.; its total cost to this point is about $55,000.

Combination Fraction—It is reported unofficially that no effort is being made toward a heavy production at this time, as the Fraction ores will be treated at the new Consolidated mill when it is completed. This gives color to the rumored acquisition of the Fraction by the Consolidated, which latter almost entirely surrounds the former; both are controlled by Nixon and Wingfield.

Black Butte Consolidated—Work has been resumed after a shutdown of 10 days, due to broken machinery; a carload of ore is ready for shipment.

Begole Syndicate—The dump of the Begole Syndicate lease, which contained 1200 tons, on the Mohawk Combination, and which was sold to the Nevada Goldfield Reduction Works to be run through their mill with high-grade rock, has averaged about 4 oz. gold per ton.

Precious Metals Company—This lease in the Atlanta has resumed sinking from the 350-ft. level. The shaft will be continued to a depth of 500 feet.

Florence—It is stated that the Florence mill will begin operations Dec. 15.

Railroad Florence Mining and Leasing Company—This new company has been formed by local officials of the Tonopah & Tidewater railroad to take over the Review lease on the Red King claim of the Florence upon which $35,000 was formerly spent. The lease has a shaft 335 ft. deep and considerable lateral work.

February Premier Mining Company—This lease on a block of ground 400x600 ft. on the south end of the February claim of the Consolidated holdings has made a record for the camp by sinking and timbering the first 100 ft. of its shaft in 18 days.

Nevada Eagles—Shipping ore has been found in this property located three miles west of town. At a depth of 250 ft. stringers [illegible] pinched out in the raises driven on them. The [illegible] and new hoisting machinery will be installed.

Consolidated Mill—The structural-steel work of the mill will be completed by Dec. 1; the placing of all the corrugated sheeting and roofing will be finished in another week. [illegible] except for the piping and launder systems. [illegible] concentrates has been started, and some [illegible]

Esmeralda County—Montezuma

Buckeye Mining Company—Shaft sinking has been completed and drifting will be started either from the bottom or the 300-ft. level. Stringers of copper sulphide ore have been cut in the shaft; it is expected to cut the main vein in about 20 ft. if it has not changed its dip.

Esmeralda County—Cuprite

Ellsworth Oldt has just purchased a group of six claims adjoining the sulphur group now being exploited by Los Angeles men. Oldt will start an adit immediately.

Nye County—Tonopah

Production for the week ending Nov. 14 amounted to 5393 tons, having a value of $134,825. The Tonopah Mining Company mined 3300 tons; Belmont, 650; Montana-Tonopah, 708; Midway, 100; MacNamara, 300; West End, 85; Jim Butler, 250 tons.

Tonopah Mining Company—The sinking of the Mizpah shaft has been resumed, as the air hoist formerly on the 900-ft. level has been installed in the new 1200-ft. station. The shaft is 1253 ft. deep and will be sunk to a depth of 1500 ft. without any further lateral work. The drill hole from the 740-ft. level of the Silver Top shaft is now 87 ft. deep, and as yet shows no change in the rock formation.

Belmont—The winze on the 1000-ft. level to the north of the Mizpah fault is now down 95 ft., and shows a well defined vein containing 4 ft. of fairly good milling ore. On the 1100-ft. level the vein was crosscut and found to have a width of 38 ft., but it has since been discovered that the supposed hanging wall was not the true hanging, but a thin slab of country rock beyond which was quartz and vein matter. Consequently this crosscut is being driven farther.

Tonopah Extension—The 30,000 tons of ore in the company's dumps is to be treated in a local mill. A station has been cut in the shaft at the 35-ft level and drifts will be run out under the dumps; then raises will be driven to tap the dump.

MacNamara—All hand drilling is to be abolished at the mine, and the number of air drills is to be increased. For this purpose the air line from the Tonopah Extension compressor plant is being enlarged.

Nye County—Berlin

Goldfield Blue Bell—The old Berlin mine, 10 miles south of Austin, recently purchased by the Goldfield Blue Bell company has made a good showing the last 30 days. The old mill has been closed for 25 years, but with little renovating it was started up by the new owners, and 1500 tons of dump rock and slimes were treated. A recovery of $15,000 by amalgamation alone was obtained.

Nye County—Round Mountain

Sunnyside Extension—Gordon and Garrecht have acquired a lease on the Sunnyside Extension claim of the Blue Jacket group, and are now working it with dry washers. The top soil which carries little or no gold for about a foot in depth has been swept aside by means of plows and scrapers; under this is about 3 ft. of pay dirt.

Nye County—Bellehelen

Nevada Bellehelen Company—The Comforth mine of this company is being developed by an adit now 600 ft. long which has cut three veins. The third vein contains about 10 ft. of high-grade shipping ore. A mill will be built on this property during the winter.

Nye County—Bullfrog

Bullfrog Gold Bar—This property, by order of the court, will be sold at sheriff's auction on execution of a debt to the Nevada Exploitation Company, amounting to about $40,000.

Lincoln County—Searchlight

Quartette—A high-duty pump is being installed at the 10th level of the mine in order to permit exploration at greater depth and to provide more water for the mill. From 30 to 35 stamps are running, and about 100 tons of ore are crushed in 24 hours.

Nye County—Manhattan

Panion-Faulkner Group—Hoisting machinery is being installed at the old shaft of this group now owned by the Manhattan Sunshine Mining Company. A road has been built to the property and the new company will thoroughly explore the northern porphyry and rhyolite belt of the camp.

Veith Mill—The five stamps recently added are running, and custom ore is being treated. A 100-ton lot from the Crescent is being milled. A 20-ton lot from the Toro Blanco is to be milled next and then a 100-ton lot from the Veith-Plamenez lease.

Churchill County—Wonder

Nevada Wonder—The company intends to build a mill to treat its own ore. Contracts are being negotiated with the water company and several trial shipments of ore have been made to F. L. Bosqui, of San Francisco, to determine the proper treatment for the ore.

Esmeralda County—Hawthorne

Lucky Boy—This group has been turned over to J. D. Hubbard, of Chicago, as the final payment of the total $80,000 has been made. During the few days prior to this settlement, owing to a misunderstanding between the vendor, the vendee and the bank, the vendor has held possession of the mine with shotgun guards. The mine is on the old Bodie road eight miles from Hawthorne, and is producing a good grade of silver-lead ore.

Humboldt County—Seven Troughs

George and English Lease—This lease on the Fine Gold property has been extended and the leasers are erecting a 40-ton milling plant.

Mazuma Hills—A large pump has been installed and the mine will be explored at greater depth.

Oklahoma

Ottawa County

Consolidated—This company at Miami has an 18-ft. face of ore in its shaft, and is erecting a 150-ton mill.

Oregon

Coos County

It is announced that the Libby coal mine, at Marshfield, on Coos bay, has been sold to parties interested in the Great Northern railroad. The output of the mine is to be increased.

Pennsylvania

Bituminous Coal

Milford Coal Company—This new company has bought 3000 acres of coal land in Somerset county, near Casselman. There are several small mines on the tract, one or more of which will be enlarged. Albert C. Ritchie, of Baltimore, is president of the company.

South Dakota

Custer County

Saginaw—Development work on the new orebodies by Superintendent Herber, shows them to be the largest in the southern Hills. The mine force is to be increased.

Lawrence County

Branch Mint—Test runs of ores from various properties in the Galena district will be made under the direction of Superintendent Michael Hecht, of New York, and the district is to be generally sampled.

Clover Leaf—Affairs have been wound up, the company dissolved and the property turned over to the former president, Pierre Wibaux, of Paris. The property at Roubaix showed very rich specimen gold ores.

Gilt-Edge-Maid—N. E. Hiltner is the new mill superintendent of the plant at Turner, succeeding L. B. Eames. Mr. Hiltner came from the Wasp No. 2 mine.

Golden Reward—The Moore process for slimes will be installed and the slime-plant capacity increased to 250 tons daily by Superintendent Henry Schnitzel in the Deadwood mill. The Moore will be used in conjunction with the Chamberlain process.

Gold Mountain Mining and Developing

Company—This new company has just been organized to operate the Russell & Higbie ground in the Two Bit district. M. R. Russell, of Deadwood, with Chicago and Kansas City men, are behind the enterprise.

Ohio-Beaver Creek—Reorganization is to be effected and the receiver discharged. President T. C. Lentz, of Columbus, O., retires and is succeeded by Charles Hayden, of the same place. Work will be resumed on the ground near Tinton in the spring.

PENNINGTON COUNTY

Black Tom—Officers were elected at the annual meeting at Hill City as follows: President, W. A. Ford, Hill City; vice-president, C. A. King; secretary-treasurer, Walter Burden; superintendent and general manager, William Barnes, Hill City. Operations are to be commenced again next month and later the 10-stamp mill opened.

Continental Copper Company—Sinking in the shaft, now down 500 ft., will be continued at once by Superintendent Overpeck. At the 700-ft. level drifting will again be commenced. New pumps are being installed in the mine preparatory to deeper work.

Francis—A new find of wolframite ore has been made on Spring creek by Harry Francis, of Custer.

North Star—Coughran & Son are operating the small mill treating free gold ore from a small vein near Rochford

Tennessee

POLK COUNTY

Tennessee Copper Company—The contract for the acid output with the Independent Fertilizer Company is said to be for 40 years at $3 per ton. The copper company received $250,000 in cash and on Dec. 4 will receive $2,250,000 additional. This is based on an acid output of 100,000 tons per annum, the present capacity of the plant. The plant is to be increased to 300,000 tons annual capacity. With the addition of each pair of 25,000 ton units the mining company will receive $625,000 cash, wherefore the total cash bonus for the contract will amount to $5,000,000

Utah

BEAVER COUNTY

Majestic Mining Company—The smelter of this company, comprising a copper furnace and a lead furnace, has been leased to the Miners' Smelting Company, a Heinze interest, for five years with privilege of extension or purchase. It is understood that this smelter is to be used to treat ores of the Silver King Coalition Company and the Ohio Copper Company

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Nov. 21, were as follows: Crown Reserve, 116,000 lb.; Cobalt Central, 40,860; La Rose, 217,990; McKinley-Darragh, 180,700; Nipissing, 299,680; Nancy Helen, 41,500; O'Brien, 127,600; Right of Way, 62,150; Silver Cliff, 60,000; Temiskaming, 60,000; Tretheway, 64,000; total, 1,270,480 pounds.

Chambers-Ferland—During the last five months more than 1000 ft. of underground development has been done and also 1814 ft. of surface trenching. Eight new veins have been discovered. Of the 124 acres of the property only about 30 so far have been prospected. A Taylor hydraulic air system is being installed.

Green-Meehan—A syndicate, headed by Robert T. Shillington and Mr. Ferland of the Chambers-Ferland mine, has secured a controlling interest in this company, and has assumed its management.

Great Northern Silver Mines, Ltd.—This company is an amalgamation between the Cleveland-Cobalt and Clear Lake Mining Companies, and the Cobalt Light, Heat and Power Company. The stock of the latter company is principally held by the Cleveland Cobalt company The new concern is capitalized at $1,500,000. The property will consist of approximately 500 acres of mining locations in the Coleman, South Lorraine and Montreal river districts.

Temiskaming—The main shaft is down 220 ft. and a station is being cut at this level. On the South property adjoining the Silver Queen a shaft is down 30 ft. on a vein of calcite and decomposed mineralized matter. The shaft will be sunk to 100 ft. and drifting and crosscutting will be done on an extensive scale.

Mexico

CHIHUAHUA

Gold Discovery—S. L. and C. E. Pearce, until recently of the Durazno Mines Company, report the discovery of a rich telluride-gold deposit in an almost inaccessible bluff on Tetamoa creek in the Arteaga mining district in the extreme western part of the State. Specimens giving remarkably high assays are reported to have been removed from a vein 8 ft. wide on a limestone-phonolite contact. Five claims were located. The district is reached from Alamos, Sonora.

SONORA

Nacozari Consolidated Copper Company—Ore is beginning to show in the rock in the face of the main working and drainage tunnel. No change had been anticipated for at least 200 ft. This property adjoins the ground of the Moctezuma Copper Company on the south.

[illegible] Shipments from this property are being brought to the railroad at Nacozari at the rate of about a ton daily. The ore is a high-grade copper carrying some gold and silver, and is only what is being taken out in development work The main orebody opened up in the lower tun- [illegible] considerable portion of which is shipping ore.

El Refugio—This property has been taken under bond and lease by Mildon & Russell, of Nacozari and development work has been commenced by them and by leasers. The ground covers a vein of copper-silver ore and lies about half a mile southwest of the Pilares shaft.

Filadelfia—This mine, located on the line of the Southern Pacific branch about 12 miles below Nacozari, is reported under option to the Calumet & Arizona Mining Company and the engineers are expected to make the examination early in December. Only surface work has been done by the owners but this shows a considerable body of low-grade copper ore. The entire workings, consisting of 400 ft. of drifts and tunnels, all show some chalcocite, bornite and chalcopyrite; but the flow of water has thus far interfered with development work at depth.

Promontorio—This property which has lately been under option to the Southwestern Development Company of the Eppes Randolph interests and which has recently been examined by the company's engineer, W. N. Cummings, is reported to have been taken over. The mine lies about 40 miles southeast of Moctezuma to which it is connected by wagon road and mule tram. The price is not known but it will involve the payment of $250,000 within the next 90 days.

Santa Rosalia—Development work in this mine has been greatly stimulated by recent strikes. The old machinery has been repaired and the pumps start this week. There are four boilers, a good hoist and a 10-stamp mill on the ground. High-grade ore is being hoisted from above the water level. At present the ore is being shipped but the company will in a short time treat the ore at the mine, first by amalgamation and then cyaniding. The property is 50 miles from Cananea in a very thinly inhabited district.

[illegible] was recently visited by a number of prominent mining and metallurgical engineers including Dr. James Douglas, president of the Phelps-Dodge western interests, Wal- [illegible] per Queen Consolidated Mining company, Norman Carmichael, general manager of the Arizona Copper company, C E. Mills, general manager, of the Detroit Copper Company of Arizona, Geo B. Lee, super- [illegible] Works, J. S. Douglas, general manager, of the Montezuma Copper Company, and the representing directorate of the Arizona Copper company, besides many others. Prominent metallurgical machinery manufacturing concerns have also had their engineers on the ground President W. D. [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 2—Coal trade in the West shows little change. Demand increases slowly and there has been no special incident during the week. There is still a tendency to ship freely to the larger consuming centers, which keeps prices down. Domestic trade continues light, on account of the weather. Steam coal is a little better, but the advance from week to week is small.

The Seaboard bituminous trade is quiet, recent activity having generally subsided. There is considerable irregularity about the demand.

Throughout Pennsylvania mines are still having a good deal of trouble on account of the drought and short water supply. If trade were more active, this would be a serious drawback. As it is, most mines are able to keep up with present demand, but at some increase in cost.

Anthracite trade is quiet, the mild weather keeping down sales. While no official announcement has been made, it is said that the anthracite companies are determined not to grant the demands recently formulated by the miners. This has given rise to some talk of a possible strike. It must be remembered, however, that it is four months before the present agreement will expire, and a good many things can happen in that time. The present strike talk is rather premature.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 21, in short tons:

	1907.	1908.	Changes.
Anthracite......	5,049,291	4,605,743	D. 443,548
Bituminous.....	35,497,082	30,085,114	D. 5,411,968
Coke............	12,402,440	6,292,746	D. 6,109,694
Total..........	52,948,813	40,983,603	D. 11,965,210

Total decrease this year to date was 22.6 per cent.

New York

Anthracite

Dec. 2—The demand for prepared and small steam sizes, with the exception of No. 2 or rice, is good and considerable coal is moving.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The soft-coal market has been subject to periods of activity and depression for some time past, and this week the dull period was in evidence. In all consuming territories there has been no activity and consumers seem to be waiting. In New York harbor conditions are extremely dull and prices remain unchanged at $2.45@2.65 per ton. Transportation is fair and cars are in good supply. In the Far East and along the Sound little coal is being taken.

In the Coastwise vessel trade orders are scarce and boats seem to be in good supply. Freight rates remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, $1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Nov. 30—An increased production of coal in Alabama is finding a ready demand and there is no accumulation. Some of the railroads are already finding some trouble in furnishing all the cars that are needed for the prompt handling of the product. The railroads continue to increase their orders. There has been no change in prices for coal lately, though much talk is to be heard in that direction. Preparations are being made for further development in the coalfields in Alabama and shortly after the new year starts in it is announced that miners will start on several new openings.

Coke is a desirable product. During the past week the Birmingham Coal and Iron Company gave instructions to fire up the Bradford ovens, recently leased, 106 in number. The Sayre Mining Company is also increasing its production of coke as much as possible. The larger companies, the Tennessee and the Sloss-Sheffield, not to overlook the Woodward and Republic companies, the Alabama Consolidated and Yolande, are working their ovens steadily. Good prices obtain for coke and the needs are going to be strong all through the coming year. Large piles of coke are being stacked by some of the larger concerns, in the belief that there will be need for it soon.

Chicago

Nov. 30—Comparative steadiness exists in the coal market for all grades of products, shipments being fairly well restricted to the consumptive capacity of the Chicago district. There is still some enforced cutting of prices to escape demurrage charges on some consignments of Western lump and egg and on smokeless run-of-mine. Screenings also are depressed because of large supply and decreasing consumption.

Sales of domestic coals continue light in the absence of cold weather. Steam coals show a perceptible though slow increase. With increased shipments from the mines no kind of coal will continue stable as to prices and dealers fear any tendency to send in more of any kind until conditions of consumption improve.

Illinois and Indiana lump and egg being $1.65@2.55; run-of-mine $1.65@1.75; screenings, 95c.@$1.55, car prices. Coals from east of Indiana are all in fair demand. Hocking sells for $3@3.15; Youghiogheny for $3.15 for ¾-in. gas; and Pittsburg No. 8 for $2.65@2.85. Smokeless run-of-mine is still somewhat shaded from the circular prices of $2.85@3.30, with Pocahontas and New River comparatively firm around the higher quotation. Lump and egg smokeless at $4.05@4.30 are firm. Anthracite is quiet though sales are steady and well distributed.

Indianapolis

Dec. 1—The strike at the Hudson mine in Vigo county has been settled at last. Thomas Haggerty and Harry Moore, arbitrators selected to decide the case, have rendered a decision in favor of the miners who went out on a strike because of the discharge of a driver. The arbitrators held that the driver was justified in refusing to haul coal because the evidence showed the entry, as he claimed, was in an unsafe condition. The arbitrators decided that the driver be reinstated, with pay for time lost, and that the miners who went out be supplied with places in the mine.

The case has attracted the attention of miners and operators all over the country. President Lewis, of the Mine Workers, attempted to make a decision and ordered the men back to work pending settlement. They refused, and he suspended their charter, and this matter will come up in the national convention in January.

Pittsburg

Dec. 1—Production at the railroad coal mines continues to decline and considerably less than 50 per cent. of the mines are running. The warm weather so far has lessened the demand and the mills are not consuming as large a tonnage [illegible] from railroad mines. The Jones & Laughlin Steel Company and other large manufacturing establishments obtain their supplies from the river mines. The pools and harbor are now filled with accumulated stocks. All the river mines are down owing to a lack of empty boats and barges. Late reports from the Marianna mine of the Pittsburg-Buffalo Company, where fully 135 miners lost their lives on Nov. 28, indicate that the damage to the mine was not as great as at first supposed, and that it is probable operations may be resumed in a few weeks. Prices remain unchanged and $1.15 a ton for mine-run coal is still being quoted by the large producers. Slack is firm at around 65c. per ton.

Connellsville Coke—There is no material change in the coke situation. Operations in the Connellsville fields continue at about 50 per cent. of capacity. Some contracts have been made for delivery of furnace coke for the entire year at $2 and more, but few of the large producers care to sell beyond the first half as they are confident that better prices will be obtained later on. For prompt shipment furnace coke has sold as low as $1.85, but no business for the first half has been done at less than $2. Foundry coke is firm at $2.25@2.40 for any delivery. The *Courier* in its weekly report gives the production in both fields at 220,145 tons. The shipments were 8105 cars as follows: To Pittsburg district, 3188; to points west of Pittsburg, 4450; to points east of Connellsville, 467 cars.

Foreign Coal Trade

German Coal Production—Coal production of German Empire, nine months ended Sept. 30, metric tons:

	1907.	1908.	Changes
Coal	[illegible]	[illegible]	I. [illegible]
Brown coal......	[illegible]	[illegible]	I. [illegible]
Total mined	[illegible]	[illegible]	I. [illegible]
Coke made	[illegible]	[illegible]	D. [illegible]
Briquets made...	12,121,710	[illegible]	I. [illegible]

Of the briquets made this year 10,619,023 tons, or 77.9 per cent., were from brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, nine months ended Sept. 30, metric tons:

Imports	1907	1908	Changes
Coal..................	10,005,328	8,774,420	D. 1,230,908
Brown coal.......	6,687,729	6,505,442	D. 182,287
Total coal ...	16,693,057	15,279,862	D. [illegible]
Coke.	120,351	[illegible]	D. [illegible]
Briquets. ..	134,106	[illegible]	I. [illegible]
Exports			
Coal.....	14,840,124	[illegible]	I. [illegible]
Brown coal. ..	15,164	[illegible]	I. [illegible]
Total coal. ...	14,855,288	[illegible]	I. [illegible]
Coke	2,801,194	2,771,444	D. 29,750
Briquets ...	[illegible]	[illegible]	I. [illegible]

Coke exports this year included 10,500 tons to the United States.

French Coal Trade—Imports and exports of fuel in France, nine months ended Sept. 30, metric tons:

	Imports	Exports	Excess
Coal ...	[illegible]	[illegible]	Imp. [illegible]
Coke	[illegible]	[illegible]	Imp. [illegible]
Briquets	[illegible]	[illegible]	Imp. [illegible]
Total	[illegible]	[illegible]	Imp. [illegible]
Total, 1907..	[illegible]	[illegible]	Imp. 11,878,380

Exports this year included 128,280 tons furnished to steamships in foreign trade.

Belgian Coal Trade—Imports and exports of fuel in Belgium, nine months ended Sept. 30, metric tons:

	Imports	Exports	Excess
Coal	[illegible]	[illegible]	Imp. 500,821
Coke	[illegible]	[illegible]	Exp. 440,218
Briquets	[illegible]	[illegible]	Exp. 240,285
Total	[illegible]	[illegible]	Exp. 179,482
Total, 1907......	4,298,293	4,467,060	[illegible]

The changes reported this year were unimportant.

Spanish Coal Imports—Imports of coal into Spain, nine months ended Sept. 30, were 1,426,857 metric tons, a decrease of 6729 tons; imports of coke, 216,795 tons, an increase of 22,761 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 21: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.80; seconds, $1.44. All per long ton, f.o.b. shipping port.

Iron Trade Review

[illegible] There is a [illegible] the iron and steel trades which is attributed in some quarters to the discussion of tariff changes, though others believe that the recent buying movement has supplied consumers' needs for the present, and that activity is not to be expected before the new year.

Basic iron sales have been light, but some large contracts are said to be pending. Sales of foundry iron have also been small, but it is said that orders to deliver on contracts are larger.

In finished material there has been some activity. The retail demand for bars and plates is improving. Structural steel still shows a good deal of activity, a few large contracts and a number of small ones having been placed. There is said to be more firmness in this market, and fewer concessions are being made. The total volume of structural orders is considerable. Lake shipbuilding shows some activity and several railroad-equipment orders are reported. Rail business is still very much in the future; there are reports of large orders to be placed for 1909 delivery, but they do not appear to [illegible]

On the whole, the volume of trade is growing, but advances are slow.

Baltimore

Dec. 1—Exports for the past week included [illegible] 5,038,600 lb. steel billets to Liverpool; 671,707 lb. tin scrap to Rotterdam.

Birmingham

[illegible] producing companies in the Southern territory have practically withdrawn from the market as far as iron for delivery during the first three months of the coming year goes. The companies which are still handling business are firm at $13 per ton, No. 2 foundry, and reports are current that some sales have been made at 50c advance, delivery on demand. The make in this territory has changed but little recently. Two furnaces, according to the calendar, are to go into operation during the present week, while two others are being gotten in readiness hastily and will be ready before the middle of the month. There has been but little business transacted for delivery during the second half of the coming year. The starting in of the last month of the year may bring about a better price and active selling for delivery during 1909. The furnace companies in the Southern territory are confident that every ton of iron that can be manufactured during the coming year can be disposed of. The throwing of some 37,000 tons of iron on the market immediately on the turn of the new year is not going to have much effect on the general market

Chicago

Dec. 1—The iron market continues firm, with something of quietness, but an optimistic tone among sellers and buyers Sales are for the first and second quarters of the next year; for the second half a few inquiries for good sized tonnage are out and occasionally a sale is made, but neither buyers nor sellers are considering second-half requirements at all generally as yet. Lots sold run up to 1000 tons with occasionally one for 1500 or 2000 tons and the greater number small. There is little demand for quick-shipment iron and substantially no difference in prices between iron for delivery within 30 days and that for the first quarter. On second-quarter deliveries 25c. premium over first quarter quotations obtains.

Southern iron holds to $13@13.25 Birmingham for first-quarter sales, making Chicago prices $17.35@17.60. Northern local output is apparently being steadily absorbed at $17@17.25. Lake Superior [illegible]

Iron and steel products are quiet but firm, with prospects of continued quiet in many lines, but no relapse for the coming month. Coke is strong and shows increasing sales at $5 for the best Connellsville, with lower grade cokes 25@35c. less.

Cleveland

[illegible] in November has shown a marked falling off. There were pretty high expectations [illegible] promises during the last week and sales have somewhat diminished. It seems as though all the foundries had covered expected requirements for the first quarter of 1909. One of the Cleveland steel companies has purchased 2000 tons of basic within the last few days.

Bessemer is quoted at $16.90@17.90; No. 1 foundry $17.50@17.75; No. 2, $17@17.25; No. 3, $16.50@17; No. 2 Southern, $16.85 @17.35; gray forge, $15@16; Lake Superior charcoal, $19.50@20, Cleveland.

Philadelphia

Dec. 2—Sales of pig iron have fallen off, most of our foundrymen, apparently, having gotten under cover for the present. The recent buying has cleared out stocks pretty well, and furnace people are stiffer in their ideas about prices. Some basic is being asked for, and most of this business is going to Virginia furnaces. No. 2X foundry is about $17.50; No. 2 plain, 50c. less; basic $16.75@17; forge $15.75 and rather scarce.

Steel Billets—There is some inquiry for large lots, but only small orders have been placed, at unchanged prices.

Bars—Bar iron is firmer, and an advance is expected. Refined iron is in more demand, but steel bars are quiet. Store trade is improving.

Plates—Small orders are increasing, but large contracts are held back. Prices unchanged.

Sheets—Current orders are small, but in greater number than recently, and the mills are not worrying.

Structural Material—Several large contracts are pending, but the negotiations seem to hang fire. Bridge work is looming up, and there is a fair volume of miscellaneous orders for building. Prices are firmer, less cutting being done.

Rails—Business on heavy sections is still mostly in the future. Light rails are in some demand. Talk of trolley orders is heard, but they are not coming as yet.

Scrap—Scrap dealers are feeling chipper, and are not inclined to take any but good offers. Buyers want scrap cheap, but are not getting much. For heavy steel $16.50@17 is asked; $20 is talked of for No. 1 railroad wrought, and $16.25@16.75 for good cast scrap.

Pittsburg

Dec. 1—The iron and steel markets are quiet this week as to sales, but remarkably strong in quotations on prices. There is a bullish tone, but no transactions of any consequence are noted. In pig iron sales were in small lots only. In finished lines there is the general run of orders but no heavy tonnages have been booked recently. The Pressed Steel Car Company has taken an order from the United States Steel Corporation for 250 steel cars for the American Steel and Wire Company, for delivery at Cleveland. This will mean 2500 tons of plates which will be rolled by the Carnegie Steel Company. The Car company expects to book several large orders shortly as negotiations are progressing satisfactorily.

There are still many reports as to what the railroads will do in the way of placing orders for steel rails. Estimates vary as to the probable requirements but it is believed that fully 3,000,000 tons will be placed after terms have been arranged and active buying begins. There is some hope that after the meeting of steel representatives in New York on Dec. 10 the question of steel-rail requirements for next year will be definitely arranged and buying likely will begin soon after the opening of the new year.

Operations of the large mills in the Pittsburg and surrounding districts show but little change compared with a week ago.

Pig Iron—The market is decidedly quiet this week and sales of all grades will not exceed 2000 tons, chiefly for December delivery. In some instances prices paid were higher than were quoted a week ago. Standard bessemer is stronger, one sale being at $17 and another at $16.50, Valley furnaces. It is reported that less than $16.50 cannot be done for any delivery. In some quarters predictions are made that prices will advance fully $1 a ton and remain at that figure for the rest of the year and through 1909. Others believe, however, that the high point has been reached and that a decline is probable. The general impression among producers and dealers is that the iron market will continue strong. Malleable bessemer is quoted at $15.75@16; basic at $16@16.25; No. 2 foundry at $16@16.50; gray forge at $14.75@15.25, all f.o.b. Valley furnaces.

Steel—The only business in bessemer and open-hearth billets is on sliding scale contracts. The price remains at $25, Pittsburg. Sheet-bars and tinplate-bars are firm at $27.50; plates at 1.60c. and merchant steel bars at 1.40c.

Sheets—Conditions in the sheet market are unchanged. Production is at the rate of about 60 per cent. Prices remain the same, black sheets being quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—There have been several sales at prices ranging from $46.50 to $47.50. It is reported that much higher prices are likely to prevail after Jan. 1. Some dealers have refused business for prompt shipment at $47 per ton.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie canals, to and from Lake Superior, in October, was 7,351,082 tons, an increase of 169,652 tons over September. For the season to Nov. 1 the total freight passing was, in short tons:

	1907.	1908.	Changes.
East-bound	39,552,112	24,734,614	D. 14,817,498
West-bound	10,923,579	9,341,730	D. 1,581,849
Total	50,475,691	34,076,344	D. 16,399,347

The number of vessel passages this year was 12,909, showing an average cargo of 2640 tons. The mineral freights included were as follows, in short tons, except salt, which is in barrels:

	1907.	1908.	Changes.
Coal	9,844,344	8,434,745	D. 1,409,599
Iron ore	35,036,614	20,953,638	D. 14,082,976
Pig and manuf. iron	259,281	235,607	D. 23,674
Copper	63,767	75,708	I. 11,941
Building stone	898	1,019	I. 121
Salt, bbl	417,960	467,777	I. 49,817

Iron ore was 61.5 per cent. of the total freight this year, and coal 24.8; against 69.4 and 19.5 per cent., respectively, last year.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports pig-iron production in October at 941,582 metric tons, or 12,853 tons more than in October. For the 10 months ended Oct. 31 the production was, in metric tons:

	1907.	1908.	Changes.
Foundry iron	1,873,127	1,859,395	D. 13,732
Forge iron	647,487	540,875	D. 106,612
Steel pig	849,150	764,615	D. 84,535
Bessemer pig	395,770	318,439	D. 77,331
Thomas(basic)pig	7,061,626	6,382,923	D. 678,703
Total	10,827,160	9,866,247	D. 960,913

All classes of iron showed decreases, the smallest being in foundry pig. The total loss this year was 8.9 per cent.

Metal Markets

New York, Dec. 2—The metal markets have been generally quiet and with little incident. Silver has reached the lowest point in seven years.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1908..	$ 1,952,574	$ 3,782,705	Imp. $ 1,830,131
“ 1907..	3,716,258	4,512,466	“ 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
“ 1907..	53,596,071	35,374,686	“ 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
“ 1907..	5,053,997	3,599,695	“ 1,454,302
Year 1908..	43,159,395	34,536,867	“ 8,622,528
“ 1907..	53,024,790	38,087,919	“ 14,936,871

Exports of specie from New York week ended Nov. 29: Gold, $23,900, to the West Indies; silver, $592,431, chiefly to London. Imports: Gold, $158,668, chiefly from Cuba: silver, $55,641, from Central and South America.

Treasury Department estimate of money in the United States, Nov. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 188,480,313	$ 610,060,562
Gold certificates	43,571,480	807,246,389
Silver dollars	21,567	74,740,245
Silver certificates	4,893,158	483,899,842
Subsidiary silver	19,272,269	131,663,701
Treasury notes of 1890	13,775	4,691,225
U. S. notes	3,686,960	342,994,056
Nat. bank notes	22,642,191	643,202,001
Total	$282,581,713	$3,098,498,021

Population of the United States estimated at 87,971,000; circulation per capita, $35.22. Total amount in circulation $20,198,660 more than on Oct. 1; and $222,129,325 more than on Nov. 1 last year.

Movement of gold and silver in Great Britain, 10 months ended Oct. 31:

	Imports.	Exports.	Excess	
Gold..........	£38,710,965	£39,885,[illegible]	Exp.	£1,174,[illegible]
Gold, 1907.	47,980,302	40,789,650	Imp.	7,190,652
Silver	8,798,269	11,178,436	Exp.	2,380,167
Silver, 1907	13,810,099	11,779,880	Exp.	[illegible]

Of the silver imported this year a total of £6,987,905 is credited to the United States.

Movement of gold and silver through the port of San Francisco, nine months ended Sept 30:

Imports	Coin.	Bullion.	Total.
Gold..........	$1,675,000	$1,796,[illegible]	$3,[illegible]
Silver......	18,110	2,030,[illegible]	2,048,[illegible]
Exports			
Gold....	17,240	1,903	19,143
Silver....	6,374	1,158,[illegible]	1,164,710

The larger part of the gold exports came from Australia; of the silver from Mexico.

Gold—Bar gold is quoted in London at 76s. 11¼d. per ounce. American gold eagles are 76s. 6½d. Sterling exchange in New York is higher, offerings of bills being small. Today engagements of $6,000,000 gold for Paris are reported, although none has yet been actually shipped.

Platinum—Dealers continue to quote $24 per oz. for refined platinum, $26.50 for hard and $19 for scrap. Demand is good and the tendency is to higher prices. Some small lots of scrap sold this week at $20@21 per ounce.

Reports from abroad are that crude platinum, assaying 83 per cent., has been selling at 17,300@18,000 rubles per pood—equivalent to $16.75@17.60 per oz.—at the mines in Russia. This shows a strong upward tendency.

An employee of a New York dental company has been arrested on charges of stealing $12,000 worth of platinum, the thefts running over nearly three years. The alleged thief was detected through an offer to sell a quantity of the metal at a figure below the market price.

Silver—Under pressure of bazar sales and speculative operations silver has been depressed to 22d. in London. The outlook for an advance of any importance in the metal is very discouraging for the present as the undigested blocks of silver held in the great eastern centers would indicate that the immediate demand is not likely to be large.

Silver

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.-Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
26	......	...	22⅝	30	4.8665	48⅛	22 3/16
27	4.8650	48⅛	22⅝	1	4.8675	47¾	22⅛
28	4.8665	48	23 1/16	2	4.8675	47⅝	22

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Nov. 19, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.	
India	£10,173,804	£8,[illegible]	D.	£1,[illegible]
China......	277,450	510,400	I.	[illegible]
Straits	615,950	164,[illegible]	D.	451,[illegible]
Total	£11,067,204	£9,0[illegible]	D.	£2,[illegible]

Imports for the week, £3500 from Chile, £5000 from Mexico, £1000 from the West Indies, £156,500 from New York; a total of £166,000. Exports, £82,000 coin to the Straits, £100,000 bars to India; £182,000 in all.

Copper, Tin, Lead and Zinc

Nov.-Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
26	.....	.....	63¼	.....	.....	.....	.....
27	14¼ @14½	14⅛ @14¼	63¾	30	4.25 @4.30	5.10 @5.15	4.95 @5.00
28	14¼ @14½	14⅛ @14¼	....	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00
30	14¼ @14½	14⅛ @14¼	63⅝	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00
1	14¼ @14½	14⅛ @14¼	63⅞	29½	4.25 @4.30	5.10 @5.15	4.95 @5.00
2	14¼ @14½	14⅛ @14¼	63	29½	4.25 @4.30	5.10 @5.15	4.95 @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market during the week has been quiet, and there has been little change in prices. Transactions have been limited to a certain extent, and buying seems to have subsided for the time. Nevertheless there is a strong undertone apparent. From all attainable information there is little doubt that consumption is increasing steadily, and the indications are that it will continue to enlarge. This feeling has had its effect in supporting quotations; especially as it has been accompanied by the removal of some disturbing influences referred to heretofore. In short, the speculative lots which had a depressing influence on the market in the previous week were readily absorbed, and as a fairly steady, though by no means large, business was transacted from day to day, prices show a slight advance and the undertone considerable strength. At the close Lake copper is quoted at 14¼@14½c.; electrolytic in ingots, cakes and wire-bars 14⅛@14¼c. The average of the week at which business in casting copper has been done is 13⅞@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

In spite of the decrease in the statistics for the second half of November of 800 tons, the London Standard market was depressed throughout the week, owing to the realization of speculative acounts, and closes at the bottom, quotations being cabled as £63 for spot, £64 for three months.

Refined and manufactured sorts we quote: English tough, £66 10s.; best selected, £65 10s.@£66 10s.; strong sheets, £77 10s.@£78 10s.

Exports of copper from New York and Philadelphia for the week were 4390 long tons. Our special correspondent states the exports from Baltimore at 592 tons.

Tin—On account of the unfavorable statistical position of tin which it was expected would be revealed at the end of November, the market throughout the week has been rather soft. The expected happened and tin statistics for last month showed an increase of 1400 tons. The market in London closes somewhat better from the lowest, spot being quoted at £134, and three months at £135 10s. per ton.

The domestic market followed closely that of London, so far as quotations were concerned, but buyers remained shy. The market closes easy at about 29½ cents.

Visible stocks of tin are reported as follows, on Dec. 1, in long tons:

	[illegible]	[illegible]	[illegible]
Great Britain	[illegible]	[illegible]	[illegible]
Holland	[illegible]	[illegible]	[illegible]
U. S., exc. Pacific ports	[illegible]	[illegible]	[illegible]
Total.. ..	[illegible]	[illegible]	[illegible]

This shows an increase of 1427 tons over November.

Lead—On account of the continued absence of demand on the part of consumers, second-hand lots are being forced for sale, and in addition there has been a great deal of pressure to realize by Missouri producers. Prices receded farther, and the close is weak at 4.25@4.30c. New York.

The market abroad is also weak and closes at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—Fair-sized orders are being placed daily both by galvanizers and brass manufacturers, and whatever offerings come on the market are being readily absorbed. Prices are again somewhat higher and the close is firm at 4.95@5c. St. Louis, 5.10@5.15c. New York.

The London market for spelter has fluctuated within narrow limits, but shows a very healthy undertone. The close is somewhat higher at £21 5s. for good ordinaries, £21 10s. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Aluminum—Prices are unchanged. The

to quote 24c. base for No. 1 ingots; 33@34c. base for sheets. Foreign metal is offered at 22c., New York, for ingots. The range is, therefore, 22@24c. per lb. for ingots. Abroad the market is still in a demoralized condition, as low as 13½@14c. being quoted.

Antimony—The market is quiet, and very little business is being done. Quotations are 8.15@8.25c. for Cookson's, 8@8⅛c. for Hallett's, and 7¾@7⅞c. for ordinary brands.

Quicksilver—New York price is steady at $46@47 per flask of 75 lb. San Francisco quotations are $44@45 for domestic business and $42@43 for export. London price is £8 10s. per flask, with £8 8s. 6d. quoted by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Spanish Metal Exports

Exports of metals and ores from Spain, nine months ended Sept. 30, metric tons, as reported by *Revista Minera*:

Metals:	1907.	1908.	Changes.	
Copper	6,592	10,245	I.	3,653
Copper precipitate	14,239	15,715	I.	1,476
Zinc	791	815	I.	24
Lead	140,515	140,145	D.	370
Quicksilver	1,492	1,499	I.	7
Minerals:				
Iron ore	6,870,953	5,758,935	D.	887,982
Copper ore	962,997	893,308	D.	69,689
Zinc ore	120,820	89,677	D.	31,143
Lead ore	4,438	2,493	D.	1,945
Manganese ore	57,717	16,593	D.	41,124
Pyrites	1,000,205	1,088,707	I.	88,502

Exports of salt, 381,565 tons in 1907, and 464,283 in 1908; increase, 82,718 tons.

Zinc and Lead Ore Markets

Joplin, Mo. Nov. 28—The highest price paid was $45, the assay base price on the best grades of zinc sulphide concentrate ranged between $40 and $42, but this ore carrying an excess of 6 per cent. iron commanded a base price of $44 and $44.50 per ton. While a $42 base was the highest settling price for the best grades, on this week's settlements, it is reasonably certain that offerings of $42.50 and $43 have been made for the following week's shipments. According to one buyer, who has been in the field for many years, buying under existing circumstances is the most strenuous it has ever been; competition is so strong that what might be thought an advance sure to get the ore priced is too low for the seller to take into consideration inside of 24 hours. The market has changed first in one and then in another camp every day during the week. Zinc silicate ore was advanced $1 and $2 per ton, the base being $19 per ton of 40 per cent. zinc, with the highest reported price at $25.50. The average price, all grades, is $37.32 per ton. Lead concentrate declined further during the week. The opening price was $54 and the closing price $52. The average, all grades, was $53.08 per ton.

SHIPMENTS, WEEK ENDED NOV. 28

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,012,410	440,440	$91,919
Joplin	2,280,720	251,270	52,270
Alba-Neck	674,610	......	13,492
Galena	538,960	50,070	12,105
Spurgeon	514,100	168,070	11,071
Oronogo	535,260	3,900	10,435
Duenweg	387,250	43,110	8,887
Granby	400,000	146,000	8,400
Aurora	580,840	16,070	7,714
Prosperity	298,930	34,930	6,902
Miami	314,990	64,700	5,493
Carl Junction	193,490	1,440	4,294
Badger	188,850	5,830	4,119
Quapaw	230,440	14,350	4,066
Zincite	147,980	8,220	3,323
Cave Springs	150,670	......	3,013
Carthage	65,830	......	1,381
Sarcoxie	66,240	......	761
Wentworth	46,610	......	535
Totals	11,628,180	1,248,400	$250,180
48 weeks	468,407,120	71,865,730	$9,897,896

Zinc value, the week, $217,043; 48 weeks, $7,920,836
Lead value, the week, 33,137; 48 weeks, 1,977,060

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	53.52	54.59
October	41.75	35.95	39.83	33.28	51.40	52.63
November	38.60	39.13	35.19	35.02	43.40	54.53
December	31.50	......	30.87	......	37.71	......
Year	$44.36	......	$43.68	......	$68.90	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Nov. 28—One choice car of zinc ore brought $42 per ton this week, the base price ranging from $38 to $40 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $54 was paid.

SHIPMENTS, WEEK ENDED NOV. 28

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	1,045,365	....	240,000
Hazel Green	251,400	....	.....
Galena	180,000	......	....
Benton	167,680	82,930	....
Linden	96,700	66,100	....
Days Siding	87,000	....	....
Livingston	80,000	56,000	.. ....
Mineral Point	26,000	....	....
Cuba City	......	38,790	......
Total	1,934,145	243,820	240,000
Year to Nov. 28	101,400,737	9,904,725	4,404,604

Shipment this week was curtailed by the bad condition of the roads; also by a breakdown at the plant of the Highland Mining Company. In addition to the above there was shipped to the Platteville Separating plant, 341,810 lb.; shipped to the Joplin Separator works, 496,400 lb. zinc concentrates.

There was shipped last week, not then reported, as follows: Highland, 255,100 lb. zinc and 50,000 lb. lead; Harker, 117,440 lb. zinc; Linden, 98,000 lb. zinc; Mineral Point, 71,500 lb. zinc and 47,990 lb. lead; total, 542,040 lb. zinc and 97,990 lb. lead.

Chemicals

New York, Dec. 2—The general market is satisfactory, and spot business is gradually increasing. Futures have been contracted for to a considerable extent, but many consumers are still content to purchase for immediate requirements.

Copper Sulphate—The demand seems to be on a smaller scale with prices unchanged at $4.75 per 100 lb. for carloads, and up to $5 for smaller lots.

Nitrate of Soda—The market is quiet and not active. Quotations are unchanged at 2.15c. for spot and futures.

Phosphates—Exports of Florida phosphate rock through the port of Savannah in October are reported by J. M. Lang & Co. as follows: Germany, 9088; Sweden, 3298; total, 12,386 long tons.

Mining Stocks

New York, Dec. 2—A strong and active market early in the week was not carried through, and toward the close movements became rather confused and erratic. The whole course of the general market was evidently professional, and it looks as if prices were worked up to prepare for several large bond issues which are pending. There was no definite tendency apparent at the close, and many operators are inclined to think that the market generally has been worked up to a higher level than is warranted by existing conditions.

On the Curb copper stocks were active, but some of their earlier strength was lost. Sales continued large, but prices were variable, and the tendency was uncertain, as on the Stock Exchange. Ohio Copper was a leader, selling largely and advancing in price. Cumberland-Ely and Nevada Consolidated held their quotations well, but other stocks were weak. The Cobalt shares were generally weak, chiefly on account of the decline in silver. The Nevada gold stocks were irregular, and inclined to go off, with very few exceptions.

One sale of Homestake, of South Dakota, is reported, 100 shares changing hands at $96.25 per share, an advance over the last quotation.

Boston, Dec. 1—Although there has been fair activity in copper-mining shares, prices, with some few exceptions, show slight net changes for the week. Operations have been of a more or less professional character, and profit taking has been freely indulged in, thus giving the market good tone. Money is easy, and it is the general belief that the demand for copper is bound to increase as business mends.

Amalgamated is about where it was a

week ago at just about $85. It has sold both above and below this. The exploration of new territory and development now going on in some of the Lake Superior properties have incited considerable speculation in some of these favorites. Lake Copper has risen $2.25 to $20.75, and there has been more or less activity in Franklin, Isle Royale and La Salle. The latter rose to $16.87½, but is back to $14.75. Superior Copper touched $36.50, but was off to $33.50 tonight. Atlantic touched $19.12½ during the week; Franklin, $19.50; Massachusetts, $7.37½; Michigan, $15.25; Rhode Island, $6.37½; Winona, $7.75, and Wyandot, $3.37½. Adventure spurted $2, and touched $10.50 today.

Parrot rose $2 to $31, on reported favorable development. The Victoria mining management announced a $1 assessment today, payable Jan. 11 next. The King Phillip Copper Company, another Michigan property, controlled by the St. Mary's Mineral Land Company, has also levied a $1 assessment. Keweenaw, Superior & Boston and Batopilas are likely to be listed now on the Exchange within a short time.

Superior & Boston shot up over $3 on the Curb, touching $17.50. National Mining and Exploration, after shooting up from 71c. to $1.25, fell back close to 60c. on the Curb. The failure to consummate a sale of bonds was responsible for the break. The Curb is again to move its quarters, but will likely go indoors, as large quarters have been leased in the financial district.

STOCK QUOTATIONS

NEW YORK Dec. 1		BOSTON Dec. 1	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	1/16	Adventure	10½
Amalgamated	85¼	Allouez	†39
Anaconda	50¼	Am. Zinc	25¾
Balaklala	‡2⅛	Arcadian	‡4¾
British Col. Cop.	8	Arizona Com.	38¾
Buffalo Mines	3½	Atlantic	18¾
Butte Coalition	27½	Bingham	‡.30
Colonial Silver	1/16	Boston Con.	16½
Cum. Ely Mining	8¼	Calumet & Ariz.	121
Davis Daly	3⅛	Calumet & Hecla	685
Dominion Cop.	¼	Centennial	‡35
Douglas Copper	3½	Con. Mercur	‡.42
El Rayo	4⅛	Copper Range	82⅞
Florence	4¾	Daly West	11
Foster Cobalt	.47	Franklin	19
Furnace Creek	.15	Greene-Can.	11¾
Giroux	6⅝	Isle Royal	24¾
Gold Hill	½	La Salle	14¾
Goldfield Con.	7¼	Mass	7¾
Granby	103	Michigan	14¾
Greene Gold	¼	Mohawk	70
Greene G. & S.	7	Nevada	19½
Greenw'r & D.Val.	‡.75	North Butte	87¾
Guanajuato	2	Old Colony	‡45
Guggen. Exp.	185	Old Dominion*	58½
Hanapah	15	Osceola	127
McKinley Dar.	1.02	Parrot	30
Micmac	2 1/16	Quincy*	95½
Mines Co. of Am.	1 1/16	Rhode Island	6⅜
Mitchell Mining	⅛	Santa Fe	2¾
Mont. Sho. C.	1	Shannon	18
Nev. Utah M. & S	3¼	Superior	33¾
Newhouse M. & S	6¼	Tamarack	‡85
Nipissing Mines	9⅝	Trinity	‡17
Old Hundred	1/16	United Cop., com.	‡14⅝
Silver Queen	1.03	U. S. Oil	30
Stewart	¼	U. S. Smg. & Ref.	[illegible]
Tennessee Cop'r	45	U.S.Sm. & Re.,pd.	46
Tri-Bullion	1	Utah Con.	47
Union Copper	¼	Victoria	4¾
Utah Apex	6¼	Winona	17
Utah Copper	49	Wolverine	‡150
Yukon Gold	4 1/16	Wyandot	4½

*Ex. Div. †Ex. Rights ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	34
Am. Smelt. & Ref.	93¾
Am. Sm. & Ref. pf.	10[illegible]
Bethlehem Steel	24
Colo. Fuel & Iron	[illegible]
Federal M. & S. pf.	[illegible]
Inter. Salt	11
National Lead	[illegible]
National Lead pf.	‡10[illegible]
Pittsburg Coal	11
Republic I. & S.	25
Republic I. & S. pf.	87
Sloss-Sheffield	7[illegible]
Standard Oil	[illegible]
U. S. Red. & Ref.	‡13
U. S. Steel	[illegible]
U. S. Steel pf.	112
Va. Car. Chem.	45¾

BOSTON CURB	
Ahmeek	120
Black Mt.	[illegible]
East Butte	7¾
Hancock Con.	10
Keweenaw	[illegible]
Majestic	[illegible]
Raven	[illegible]
Shattuck	‡10
Superior & Pitts.	‡13
Troy Man.	.05

ST. LOUIS Nov. 28		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.00	1.75
Cent. C. & C.	72.00	70.00
C.C. & C. pd.	78.00	[illegible]
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	20.00
Doe Run	1[illegible]	115.00
Gra. Bimet.	.30	[illegible]
St. Joe	15.00	12.50

LONDON Dec. 2			
Name of Com.	Clg.		
Dolores	£1	[illegible]	[illegible]
Stratton's Ind.	0	2	[illegible]
Camp Bird	0	17	[illegible]
Esperanza	3	[illegible]	[illegible]
Tomboy	1	[illegible]	[illegible]
El Oro	1	[illegible]	[illegible]
Oroville	[illegible]	[illegible]	[illegible]

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 2.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.12
Belcher	.21	St. Ives	.20
Best & Belcher	.42	Triangle	.04
Caledonia	[illegible]	BULLFROG STOCKS	
Chollar	.10	Bullfrog Mining	‡.03
Comstock	.32	Bullfrog Nat. B.	‡.04
Con. Cal. & Va.	[illegible]	Gibraltar	.04
Crown Point	.40	Gold Bar	‡.05
Exchequer	.30	Homestake King	.16
Gould & Curry	.10	Montgomery Mt.	‡.05
Hale & Norcross	.42	Mont. Shoshone C.	.25
Mexican	.86	Original Bullfrog	‡.01
Ophir	1.7[illegible]	Tramp Cons.	.12
Overman	.17	MISC. NEVADA STOCKS	
Potosi	.11	[illegible]	.7
Savage	[illegible]	[illegible]	[illegible]
Sierra Nevada	.26	Nevada Hills	1.[illegible]
Union	.41	Nevada Smelting	1.[illegible]
Utah	.04	Nevada Wonder	.40
Yellow Jacket	[illegible]	Nevada-Utah	[illegible]
TONOPAH STOCKS		[illegible]	.17
Belmont	.87	[illegible]	[illegible]
Extension	.40	[illegible]	1.[illegible]
Golden Anchor	.01	Round Mt. Sphinx	.18
Jim Butler	.11		
MacNamara	.40		
Midway	.30		
Montana	.85		
North Star	[illegible]		
Tono'h Mine of N.	[illegible]		
West End Con.	.40		
GOLDFIELD STOCKS		COLO. SPRINGS Nov. 21	
		Name of Comp.	Clg.
Adams	.04	Acacia	7[illegible]
Atlanta	.19	Black Bell	....
Booth	.07	C. C. Con.	23½
Columbia Mt.	.10	Dante	[illegible]
Comb. Frac.	1.[illegible]	Doctor Jack Pot	7
Con. Red Top	.10	Elkton	68
Cracker Jack	.05	El Paso	47½
Dia'dfield B. B. C.	.10	Findley	17
Goldfield Belmont	[illegible]	Gold Dollar	[illegible]
Goldfield Daisy	.87	Gold Sovereign	[illegible]
Great Bend	.28	Isabella	27
Jumbo Extension	.27	Index	....
Kendall	.09	Jennie Sample	5½
Lone Star	.07	Jerry Johnson	[illegible]
May Queen	.04	Mary McKinney	[illegible]
N. Y. Con. D.	.10	Pharmacist	[illegible]
Oro	.12	Portland	1.[illegible]
Red Hill	.20	United Gold M.	4
Roanoke	[illegible]	Vindicator	81
Sandstorm	.20	Work	[illegible]

Assessments

Company.	Delinq.		Sale.		Amt.
[illegible]	Nov.	[illegible]	Dec.	[illegible]	[illegible]
American Fork, Utah	Oct.	[illegible]	Nov.	[illegible]	0.01
[illegible], Utah	Dec.	[illegible]	Jan.	[illegible]	0.01
Cedar, Utah	Nov.	[illegible]	[illegible]	[illegible]	0.03
Con. Cal. & Va., Nev	Nov.	[illegible]	Dec.	[illegible]	0.20
Confidence, Nev	[illegible]	[illegible]	Dec.	[illegible]	0.20
Crown Point, Nev	Nov.	[illegible]	Dec.	[illegible]	0.10
Ely Con., Nev	Nov.	[illegible]	Jan.	[illegible]	0.02
Gould, Mont	Nov.	[illegible]	Dec.	[illegible]	0.05
[illegible]	Nov.	[illegible]	Dec.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.01
Lower Mammoth, Utah	[illegible]	[illegible]	Jan.	[illegible]	[illegible]
[illegible], Nev	Nov.	[illegible]	Dec.	[illegible]	0.01
[illegible], Nev	Nov.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], Nev	[illegible]	[illegible]	[illegible]	[illegible]	0.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Roosevelt Oil, Cal	Nov.	[illegible]	[illegible]	[illegible]	0.03
[illegible]	Nov.	[illegible]	[illegible]	[illegible]	0.03
[illegible]	Nov.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Nov.	[illegible]	Dec.	[illegible]	0.10
[illegible]	[illegible]	[illegible]	Dec.	[illegible]	[illegible]

Monthly Average Prices of Metals

SILVER

Month.	New York		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		[illegible]	
Year	[illegible]		[illegible]	

New York, cents per fine ounce. London, pence per standard ounce.

COPPER

	NEW YORK				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	24.048	12.59[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	22.130	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		[illegible]		[illegible]	....
Year	20.004		[illegible]		[illegible]	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	[illegible]	[illegible]	July	[illegible]	[illegible]
February	42.102	[illegible]	August	[illegible]	[illegible]
March	41.[illegible]	[illegible]	September	[illegible]	28.815
April	[illegible]	[illegible]	October	[illegible]	[illegible]
May	42.[illegible]	[illegible]	November	30.833	30.348
June	42.120	28.024	December	[illegible]	.....
			Av. Year	[illegible]	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	[illegible]	[illegible]	14.469
February	6.000	[illegible]	[illegible]	14.250
March	6.000	[illegible]	[illegible]	13.975
April	[illegible]	[illegible]	[illegible]	13.469
May	6.000	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]
July	5.288	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	13.375
September	4.813	[illegible]	[illegible]	13.125
October	4.750	[illegible]	[illegible]	13.375
November	[illegible]	4.330	17.281	13.538
December	[illegible]		[illegible]	......
Year	[illegible]		19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	6.814	4.788	6.664	4.638	25.[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	4.507	26.094	[illegible]
April	[illegible]	4.645	6.535	[illegible]	[illegible]	[illegible]
May	6.441	[illegible]	6.291	4.458	25.563	[illegible]
June	6.412	[illegible]	[illegible]	4.330	25.469	[illegible]
July	[illegible]	4.483	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		[illegible]		[illegible]	....
Year	[illegible]		5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the Engineering and Mining Journal to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

7902—ALUMINUM CORPORATION, LTD.—The Development of the Aluminum Corporation, Ltd. (Elec. Rev., Nov. 6, 1908; 4 pp.) Reviews the development of the aluminum industry and describes the works of this company which is situated in North Wales. Illustrated. 20c.

7903—ALUMINUM INDUSTRY—The Situation in the Aluminum Industry. (Eng. and Min. Journ., Nov. 21, 1908; ¾ p.) Editorial discussion of the market conditions and the effect the present prices has upon the use and consumption of the metal. 20c.

ANTIMONY

7904—PRODUCTION of Antimony in 1907. Frank L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 3 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

ARSENIC

7905—PRODUCTION of Arsenic in 1907. F. L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 3 pp.) Gives information and statistics relating to production, imports and prices during 1907.

BAUXITE

7906—ITALIAN BAUXITE—I Giacimenti Bauxitici di Civita d'Antino e Balsorano (Abruzzo). C. Martelli. (Rassegna Mineraria, Aug. 1 and 8, 1908; 5 pp.) Describes the occurrence and method of working several bauxite deposits in the province of Abruzzo. 60c.

CEMENT

7907—CEMENT INDUSTRY. Review of the Cement Industry for 1907. R. W. Lesley. (Cement Age, Oct., 1908; 14½ pp.) Reprint from The Mineral Industry, Vol. XVI, reviewing the principal features in the cement industry during 1907 and giving statistics of production in the United States and foreign countries. 20c.

7908—MANUFACTURE—Cement Raw Meal Mixer and Stores. (Engr., Nov. 13, 1908; 1⅔ pp.) Gives information on this subject which was received after the publication of an article in the issue of March 20, 1908. Gives detailed working drawings of the mixer, stores, cement withdrawing mechanism and the delivering and weighing mechanism. 40c.

7909—MECHANICAL EQUIPMENT—The Mechanical Side of the Cement Industry. (Cement Age, Oct., 1908; 44 pp.) A series of short articles, describing and illustrating the various mechanical appliances used in the manufacture of portland cement. The advantages of electricity to drive cement machinery are first discussed by J. B. Porter, and then steam shovels, rock crushers, grinding machinery, cement kilns, pulverizing machinery, screening and packing machines, are taken up in turn. 20c.

7910—PORTLAND CEMENT—The Commercial Value of Fine Grinding of Portland Cement. Ira A. Williams. (Eng.-Con., Oct. 14, 1908; 1½ pp.) Discusses the paper on this subject by Richard K. Meade and gives additional information. 20c.

7911—TESTS OF CEMENT with the Addition of Colloids. M. H. McGee. (Cement Age, Nov., 1908; 4½ pp.) Describes experimental tests conducted by the Ulster & Delaware Railroad Company to determine the impermeability of concrete by the addition of so-called "coloids or clay," and also to determine if increased strength is obtained by such an addition. Illustrated.

7912—WHITE PORTLAND CEMENT—Results of the Use of White Portland Cement. M. M. Smith. (Can. Engr., Oct. 23, 1908; 1¼ pp.) This appeared in the annual report of the Indiana Engineering Society and describes tests made with white portland cement. 20c.

CLAYS

7913—ARKANSAS—The Clays of Arkansas. John C. Branner. (Bull. No. 351, U. S. Geol. Surv., 1908; 247 pp.) Discusses the topography and geology; character, origin, occurrence and uses of Arkansas clays; geologic age and geographic distribution of the clays and a detailed report by counties. Illustrated.

COAL AND COKE

7914—ARGENTINA—El Carbon Argentino. Luis A. Huergo. (Bol. de la Soc. Nac. de Minera, April, 1908; 5 pp.) A review of the past and present condition of coal mining in the Argentine Republic.

7915—AUSTRALIA—Coalfields and Collieries of Australia. F. D. Power. (Aust. Min. Stand., Aug. 26, Sept. 2, 9, 16, 23 and 30, 1908; 8 pp.) Continuation of article previously indexed. $2.

7916—AUSTRALIAN COLLIERIES—Use of Electricity in Australian Collieries. A. S. Brown. (Eng. and Min. Journ., Nov. 14, 1908; 1⅓ pp.) Discusses the work of a commission to investigate the conditions of coal mines in Australia and the results of the investigation. 20c.

7917—BELGIAN COLLIERIES—Some Belgian Electrically Operated Collieries. F. C. Perkins. (Min. Wld., Oct. 17, 1908; 2 pp.) Collieries producing 750,000 tons annually and employing more than 4000 miners operate with electric motors of 1260 h.p. capacity. Illustrated. 20c.

7918—BLASTING—Loading Blast Holes. J. K. Hay. (Eng. and Min. Journ., Nov. 14, 1908; 1 p.) This is a discussion of an article on this subject which appeared in the Journal of November 7, 1908, in which additional information is given. 20c.

7919—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., Nov. 1, 1908; 3½ pp.) Continuation of article published August 15. Describes the Dominion No. 6 colliery, including the surface plant. Illustrated. 20c.

7920—CHARCOAL—The Use of Charcoal in Blast Furnace Practice. (Iron and Coal Tr. Rev., Oct. 2, 1908; 1½ pp.) Describes the kiln for charring timber described by Dr. G. Gröndal, and methods of working, including the recovery of by-products; also gives details regarding the smelting of iron, using charcoal as fuel. 40c.

7921—COAL DUST—The Present Position of the Coal Dust Problem. James and John Ashworth. (Can. Min. Journ., Nov. 1, 1908; 2 pp.) Discusses the phenomena of coal dust explosions. Paper read before the Can. Min. Inst. 20c.

7922—COAL HANDLING.—Immense Grab Buckets Cut Down Handling Costs. (Black Diamond, Nov. 14, 1908; 1⅜ pp.) Describes the method of handling large quantities of coal at the plant of the Astoria Light, Heat and Power Company. Illustrated. 20c.

7923—COAL HANDLING MACHINERY—Simple Forms of Coal and Ash Conveyors. W. O. Rogers. (Power, Nov., 1908; 3¾ pp.) Describes several types, some hand controlled and others requiring machinery, and shows how they are operated. Illustrated. 20c.

7924—COMBUSTION OF COAL—Regulation of the Economical Combustion of Coal. Richard K. Meade. (Min. Sci., Oct. 29 and Nov. 5, 1908 5 pp.) Describes methods for checking improper firing, the excess of air used, the heat carried off by waste gases and the determination of economic conditions. Illustrated. 40c.

7925—ELECTRIC POWER—Development of Electric Power in Coal Mines. George E. Walsh. (Eng. and Min. Journ., Nov. 21, 1908; 1½ pp.) Discusses the transmission of electric power, electrically operated breakers, electric haulage and the use of induction motors. 20c.

7926—EXPLOSION—The Norton Hill Colliery Explosion. J. S. Martin. (Iron and Coal Tr. Rev., Oct. 30, 1908; 1⅜ pp.) This is a report by the Government Mine Inspector upon the circumstances attending the explosion which occurred in the Slyven vein incline of the Norton Hill Colliery in Somerset in April, 1908. Illustrated. 40c.

7927—EXPLOSIONS—Coaldust and Explosions. Victor Watteyne. (Min. Eng., Nov., 1908; 3¼ pp.) Gives a comparison of some facts acquired at Courrières and La Boule. Translation of report published in *Annales des Mines de Belgique*. 20c.

7927-a—EXPLOSIONS—Prevention of Coal Dust Explosions in Mines. William N. Page. (Min. Wld., Nov. 28, 1908; 1 p.) Discusses the explosive power of dust in coal mines and suggests that an effective remedy is to reduce the velocity of ventilating currents. 20c.

7928—EXPLOSIONS—Prevention of Mine Explosions, Report and Recommendations. Messrs. Watteyne, Meissner and Desborough. (Bull. No. 369, U. S. Geol. Surv., 1908; 11 pp.) In this report recommendations are made concerning the selection of explosives, carrying explosives into mines, their use in the mine, the care of roadways, wetting coal dust, special precautions for gaseous mines, use of electricity, precautions against miscellaneous accidents, mine supervision and inspection and training for mine foremen, inspectors, etc.

7929—EXPLOSIONS—The Prevention of Mine Explosions. (Eng. and Min. Journ., Oct. 31, 1908; 2⅓ pp.) This is a report of the foreign experts who visited the United States and discusses precautions as to the handling and use of explosives, wetting the dust and the employment of electricity in underground operations. 20c.

7930—EXPLOSIVES FOR GASSY MINES—Nouvelles Recherches dur L'Emploi des Explosifs en Présence du Grisou et des Poussières de Charbon. H. Schmerber. (Le Gènie Civil, Aug. 15, 22 and 29, Sept. 5, 1908; 11 pp.) Describes in detail the structures and other apparatus, and the methods followed in the experiments at Frameries. $1.40.

7930-a—FIRE—An Underground Fire Disaster. James Ashworth. (Eng. and Min. Journ., Nov. 28, 1908; 2⅓ pp.) This is the official account by the English Chief Inspector of Mines of the disaster which occurred at the Hamstead colliery in England. Describes the cause of the accident, the attemps at rescue and the use of rescue apparatus. Illustrated.

7931—FIRE—Underground Fire at Lochhead-Colliery. (Min. Eng., Nov., 1908; 1⅓ pp.) Describes the workings of this colliery and the fire which took place. Illustrated. 20c.

7932—GAS-HOUSE COKE AND BY-PRODUCTS—Production of Gas, Coke, Tar and Ammonia at Gas Works and in Retort Coke Ovens and of Gas and Tar at Water-Gas Works in 1907. Edward W. Parker. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 34 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

7933—HAULAGE—Underground Haulage in Coal Mines. (Eng. and Min. Journ., Oct. 31, 1908; 1 p.) Discusses the growth of electric haulage in the anthracite field of Pennsylvania and the gradual replacement of horses and mules by electric haulage. 20c.

7934—HYGROMETRIC OBSERVATIONS in Coal Mines. A. H. Stokes. (Iron and Coal Tr. Rev., Oct. 2, 1908; 1 p.) Gives details of experiments made with the hygrometer in coal mines to ascertain the extent of moisture in the ventilating current, together with tabulation of results obtained. 40c.

7935—ILLINOIS—Studies of Illinois Coals. (Paper read before A.I.M.E., Oct., 1908; 72 pp.) This is a series of articles relating to coal in Illinois, having the following titles: Introduction, Summary and Conclusions, by H. Foster Bain; Coal Resources of Illinois, F. W. DeWolff; Sampling and Analysis of Illinois Coals, J. M. Lindgren; Occluded Gases in Illinois Coals, Perry Barker; Mining Waste and Mining Cost in Illinois, George S. Rice; Use of Illinois Coal for Domestic Purpose, J. N. Snodgrass; The Smokeless Combustion of Bituminous Coal, A. Bement; The Weathering of Coal, W. F. Wheeler; The

Modification of Coal by Low Temperature Distillation, C. K. Francis. Illustrated.

7936—LONGWALL METHOD—The Cost of Longwall in England. George R. Dixon. (Eng. and Min. Journ., Nov. 14, 1908; 2½ pp.) Gives details and dimensions of the system, division of labor and wages paid, method of shooting down stone and loading out coal. Illustrated. 20c.

7937—MINE CAGES—The Arrangement of Keps for Modern Collieries. J. S. Barnes. (Iron and Coal Tr. Rev., Oct. 16, 1908; 2½ pp.) Describes methods for bringing a cage quickly to rest and for holding it steady for decking operations. Illustrated by working drawings. 40c.

7938—MINING METHODS at Seaton-Delavel Colliery. L. W. Mayer. (Eng. and Min. Journ., Oct. 17, 1908; 4½ pp.) A thick coal seam with strong cover is mined by longwall, which under similar conditions is considered impracticable in America. Illustrated. 20c.

7939—NORTH DAKOTA AND MONTANA—Investigations of the Coal Fields of North Dakota and Montana. Messrs. Leonard, Smith, Collier, Woolsey, Stone, Woodruff and Calvert of the U. S. Geol. Surv. (Bull. No. 341-A, U. S. Geol. Surv., 1908; 120 pp.) Describes the Sentinel Butte lignite field, the Miles City and Bull Mountain coalfields, the occurrence of coal near Crazy mountains, Mont., the Red Lodge and Lewistown coalfields. Illustrated.

7940—PEAT—The Utilization of Peat for Industrial and Metallurgical Purposes. E. Nystrom. (Journ. Can. Min. Inst., July, 1908; 5 pp.) Describes the investigation which has been carried on to determine the commercial value of the peat bogs of Canada. A commission was appointed to study the peat industry in foreign countries

7940-a—PHILIPPINE COALS. Alvin J. Cox. (Eng. and Min. Journ., Nov. 28, 1908; 1½ pp.) This is an abstract of a paper in "Mineral Resources of the Philippine Islands," Manila, 1908. The development of coal in the Philippine Islands will be of great importance. Although coal occurs abundantly it is used only sparingly as a fuel. Gives data on the composition, steaming ability, fuel temperature and loss of combustible matter in ash. 20c.

7941—SHAFT SINKING AND EQUIPMENT—Re-sinking and Re-equipping the Great Western Colliery Company's Maratine Pits. Hugh Bramwell. (Iron and Coal Tr. Rev., Oct. 23, 1908; 1 pp.) Paper read before the South Wales Institute of Engineers describing the methods used to deepen and enlarge the shafts and to drift across the anticlinal in the "steam coal" measures. 40c.

7942—SHOT FIRING—Science and Art of Electricity. George Farmer. (Sci. and Art. of Min., Oct. 17, 31 and Nov. 14, 1908; 4 pp.) Continuation of article previously indexed. Discusses exploders used for electric shot firing, and the use of high and low tension detonators; also describes the method of connecting the cables and gives general hints for safety. 60c.

7943—SILESIA—Advance Methods of Mining Coal in Silesia. Lucius W. Mayer. (Eng. and Min. Journ., Nov. 7, 1908; 5½ pp.) Describes a system of mining in which filling is flushed into the workings and total extraction of unusually thick seams is accomplished. Illustrated. 20c.

7944—STOWING—The Flushing System of Stowing. (Sci. and Art. of Min., Oct. 31, 1908; 2½ pp.) Notes on the flushing system of stowing coal as adopted in the Pas de Calais coalfield. Illustrated. 20c.

7945 — TIMBERING — Treating Mine Timbers: An Economical Movement. (Black Diamond, Nov. 14, 1908; 1 p.) Suggestions by forestry experts to Illinois coal operators regarding methods for cutting down the expense of supporting the roof. 20c.

7946—TUBBING for Modern Collieries. J. S. Barnes. (Engr., Oct. 23, 1908; 1½ pp.) Describes the construction of the shaft lining at English collieries. Gives the mathematics and formulas used in the design. Illustrated. 40c.

COPPER

7947—ATACAMITE ORE—The Commercial Extraction of Copper from Atacamite Ore. A. J. Evans. (Min. Journ., Oct. 10, 1908; ½ p.) Describes the deposits of atacamite in Chile and gives a resumé of the principal methods for treating atacamite ores as tried up to the present time and then describes the author's process, the main feature of which is the use of hydrogen sulphide as a precipitant. 40c.

7948—BRASS PLANT—The Plant of the Michigan Copper and Brass Company. (Metal Ind., Oct., 1908; 6½ pp.) Describes the new plant which this company has erected at Detroit, Mich. Illustrated. 20c.

7949—CALIFORNIA—Bully Hill Smelter and Mines, Shasta County, California. A. H. Martin. (Min. Sci., Oct. 29, 1908; 1½ pp.) Describes the mining and smelting methods employed at this rich copper producer on the Shasta belt. Illustrated. 20c.

7950—CONCENTRATING PLANT—The Boston Consolidated Company's Concentrating Plant. L. A. Palmer. (Min. Sci., Nov. 5 and 12, 1908; [illegible] pp.) Gives an illustrated description of the construction, equipment, arrangement and methods of this plant at Garfield, Utah. To be continued. 40c.

7951—COPPER CONVERTER PRACTICE—Operation of an Anaconda Copper Converter. C. Offerhaus. (Eng. and Min. Journ., Oct. 17, 1908; 5½ pp.) Reactions of the process, details of lining, charging, blowing, pouring and changing the [illegible] and [illegible]. Illustrated. [illegible]

7952—MATTES—The Constitution of Copper-Iron and Copper-Lead-Iron Mattes. Charles H. Fulton and Ivan E. Goodner. (Paper read before A.I.M.E., Oct., 1908; 37 pp.) The constitution of copper-iron and copper-lead mattes is determined by metallographic and chemical means in the light of recent data supplied by a number of eminent authorities. Illustrated by [illegible] photomicrographs. [illegible]

7953—MEXICO—Growth of the Cananea Copper Smelting Works. Charles F. Shelby. (Eng. and Min. Journ., Nov. 14, 1908; 3 pp.) Describes pictorially some of the changes which have taken place at the smelting plant of the Cananea Consolidated Copper Company at Cananea, Sonora, Mexico. [illegible]

7954—MEXICO—[illegible] a [illegible] Copper Property in Mexico. W. P. [illegible]. (Min. Wld., Oct. 17, 1908; 1½ pp.) Describes cost of treatment, method of handling flue dust, traction haulage and the equipment for a 1000-ton furnace. Illustrated. 20c.

7955—MICHIGAN—[illegible] Copper M[illegible] on Keweenaw Point, Mich. Charles J. Stone. (Min. Wld., Oct. 17, 1908; 1½ pp.) Describes some of the operations at this portion of the Michigan copper district which are attracting the attention of the mining men of Lake Superior. It was on this point that the first discoveries of copper were made and some of the old mines are now being reopened. Illustrated. 20c.

7956—MONTANA—The Relation of Copper to Pyrite in the Lean Copper Ores of Butte, Mont. J. F. Simpson. (Econ. Geology, Oct.-Nov., 1908; 10 pp.) Gives the results of an investigation of these lean pyrite ores which are sufficiently definite to warrant careful presentation. The purpose of the investigation was to determine whether the copper in the Butte ores forms a chemical compound or a mechanical mixture with the pyrite when there is an extremely small percentage of copper present. Illustrated. 60c.

7957—PYRITIC SMELTING—La Fundicion Piritica de los Minerales de la Mina Viuda-Algarrobo-Copiapó. F. A. Sundt. (Bol. de la Soc. Nac. de Mineria, May, 1908; 3 pp.) States results of treating this Chilean ore by pyritic smelting.

7958—RECOVERY FROM MINE WATERS—A Copper Precipitating Plant. H. W. Chittenden. (Eng. and Min. Journ., Oct. 31, 1908; 1½ pp.) Describes a plant for the recovery of copper from mine waters which has been installed by the Copper Queen Consolidated Mining Company at Bisbee, Arizona. Illustrated. 20c.

7959—REFINING—A Technical Method for the Complete Analysis of the Electrolyte in Copper Refining. Robert Kann. (Chem. Engr., Oct., 1908; 2½ pp.) Gives methods for the determination of Cu, Fe, Ca, Ni, Na, As, Sb, Bi, Cl and total H_2SO_4. [illegible]

7960—REVERBERATORY FURNACE—Regenerative Reverberatory Copper Furnace. Fred. A. Leas. (Eng. and Min. Journ., Nov. 7, 1908; 2½ pp.) Gives a description of the furnace at the [illegible] Chemical Company [illegible] [illegible] used at [illegible]. Illustrated. 20c.

7961—SMELTING PLANT—Cost [illegible] of 100-Ton Copper Smelting Plant. C. C. Christensen. (Eng. and Min. Journ., Oct. 31, 1908; 3½ pp.) Furnace capacity depends chiefly upon amount of flux required, volume and pressure of blast and fusibility of charge. The article contains many calculations and is illustrated with working drawings. 20c.

7962—UTAH—The Boston Consolidated Mine. (Min. Journ., Oct. 3, 1908; 2½ pp.) Describes the mining practice, the methods of ore reduction and ore dressing, the power plant and the working cost of this Bingham mine. Illustrated. 40c.

GOLD AND SILVER

7963—AUSTRALIA—Deep Lead Mining in Australia. D. H. Browne. (Min. and Sci. Press, Oct. 24, 1908; [illegible] pp.) Describes deep [illegible] in Australia and some of the [illegible] which have been encountered. Describes also the [illegible] used in connection with shaft sinking through sandy clay. Illustrated. 20c.

7964—BOHEMIA—The Silver Lead Mines of Przibram, Bohemia. H. L. Terry. (Min. Journ., Nov. 7, 1908; [illegible] p.) Describes the mines, principal mills and the smeltery, together with an analysis of the ore smelted. 40c.

7965—CALIFORNIA—The [illegible] Mine. S. E. Montgomery. (Cal. Journ. Technology, Oct., 1908; 4½ pp.) Gives a description of the workings, the value of the ore in the 20 stopes and other openings and a record of the assays of the heads and tailings in the [illegible] from April, 1907 to April, 1908. 40c.

[illegible]—CHLORINATION—[illegible]. W. E. Darrow. (Min. and Sci. Press, Oct. 31, 1908; [illegible] in chloridizing and the present practice in California. 20c.

7967—COLOMBIA—Mining in Narino, Republic of Colombia. Henry Edwards. (Min. Journ., [illegible]

[illegible]

7969—COMSTOCK LODE—Decline and Re[illegible] [illegible] decline, and fina[illegible] [illegible] Also describes [illegible] mines in [illegible]

[illegible]—CYANIDATION—[illegible] Nov. 7, 1908; 1 p.) Describes the method of agitation perfected by F. C. Brown and used at the plant of the Waihi Grand Junction Gold Company, Ltd., in Auckland, New Zealand. Illustrated. 20c.

[illegible]—CYANIDATION—[illegible] Practice at Pachuca. E. O. Daue. (Mex. Min. Journ., Oct., 1908; 1½ pp.) Describes the prep[illegible] obtained. 20c.

7972—CYANIDATION—The New [illegible] Mill at El Oro, Mexico. [illegible] (Eng. and Min. Journ., Oct. [illegible] slimes and a new meth[illegible] slimes in Merrill presses. [illegible]

[illegible]—CYANIDATION—The Zinc Dust Precipitation at [illegible] Prieto. [illegible] Linton. [illegible] Sept., 1908; [illegible] Black Mountain M[illegible] plant in Mexico [illegible] dust for precipitation. 60c.

[illegible]—CYANIDATION—[illegible] A. G. Baldwin. (Mex. Min. Journ., Oct., 1908; [illegible] oxidation and briefly describes a plant in Mexico City [illegible]. Illustrated. 20c.

7975—CYANIDE MILLS, Guanajuato Development Company.—I. Claude T. Rice. (Eng. and Min. Journ., Nov. 14, 1908; 4 pp.) Describes the operation of the Nayal and the San Prosperó mills. Gives the consumption of chemicals and details of sand and slime treatments. Illustrated. 20c.

7976—CYANIDE MILLS, Guanajuato Development Company.—II. C. T. Rice. (Eng. and Min. Journ., Nov. 21, 1908; 5 pp.) At Pinguico the slime is concentrated on an immense cement table; at Peregrina slime in discharging washes away the accumulated sand. [illegible]

[illegible]—DREDGING—[illegible] United States Circuit Court [illegible] in the suit of the Risdon Iron and Locomotive Works [illegible]

[illegible]—DREDGING—[illegible] Dredges as Practiced in California. A. H. Martin. (Min. Sci., Oct. 8, 1908; 2½ pp.) Gives a [illegible] in the great placer fields of California. Illustrated. 20c.

[illegible]—DREDGING—[illegible] bucket and the elevating bucket. Gives costs and [illegible]

[illegible]—HYDRAULIC MINING—[illegible] average being only 3c. per cu yd. Describes [illegible]

7981—HYDRAULIC MINING—The Ruble [illegible]

[illegible]—HYDRAULIC MINING—[illegible] Yukon. [illegible] W. H[illegible] 1908

3¾ pp.) Describes placer mining, sluice boxes, thawing by steam, dredging, hydraulicking and hydraulic and mechanical elevators. Illustrated, 20c.

7983—IDAHO—Central Idaho Gold Districts —II. S. P. Jellum. (Northwest Min. News, Oct., 1908; 7¾ pp.) Gives the history and a description of the mines in and about Elk City, Idaho. Illustrated. 20c.

7984—IDAHO—Central Idaho Gold Districts.—III. S. P. Jellum. (Northwest Min. News, Nov., 1908; 5 pp.) Describes the location and history, topography, geology and the mines of the Dixie district. Illustrated. 20c.

7985—IDAHO—The Coeur d'Alene Mining District, Idaho.—I. J. P. Rowe. (Min. Wld., Nov. 14, 1908; 1¾ pp.) Gives the location and geology of the district and describes shipping facilities, history of early mining and the development of the ore deposits. Illustrated. 20c.

7986—IDAHO—The Coeur d'Alene Mining District, Idaho.—II. J. P. Rowe. (Min. Wld., Nov. 21, 1908; 1¾ pp.) Continuation of article previously indexed. Describes the location and geology of the district, shipping facilities, history of early mining and the development of the ore deposits. Illustrated. 20c.

7987—MALAY STATES—Mining and Milling Practice at the Raub Mine, Pahang. H. F. Lofts. (Min. Journ., Oct. 10, 1908; ¾ p.) Describes the mine and cyanide practice at the oldest mine in the Malay States. 40c.

7988—METALLURGICAL PRACTICE at Hacienda de la Union. F. Narvaez. (Eng. and Min. Journ., Nov. 21, 1908; 3¼ pp.) Barrel amalgamation is to be replaced by cyaniding with tank agitation, the same improved Chilean mills being improved for fine grinding. Illustrated. 20c.

7989—METALLURGY in Western Chihuahua. Mark R. Lamb. (Mex. Min. Journ., Nov., 1908; 1 p.) The mining companies of Western Chihuahua are forced to treat all but the highest grade of ore on account of the high transportation charges. Describes the methods used at the various mills. 20c.

7990—MEXICO—Hinds Consolidated Mines, Mexico. S. F. Shaw. (Min. and Sci. Press, Oct. 31, 1908; 1½ pp.) Describes the property which is situated in the Santa Barbara district in the state of Chihuahua, Mexico. Gives also the steps in milling the ore. Illustrated. 20c.

7991—MEXICO—Las Chipas Mines, Sonora, Mexico. B. E. Russell. (Eng. and Min. Journ., Nov. 21, 1908; 2 pp.) Describes the rich silver veins of Minas Pedrazzini Company and gives their history and geology. Gives methods of mining and ore treatment and describes ore stealing. Illustrated. 20c.

7992—MEXICO—On the Trail Through Western Chihuahua. C. McC. Anderson. (Mex Min. Journ., Nov., 1908; 3¾ pp.) Describes some of the conditions met with on a journey through Western Chihuahua, including costs of transportation and supplies. Some of the camps in this section of Chihuahua are briefly described. Illustrated. 20c.

7992-a—MEXICO—Some Features of Mining at Pachuca, Mexico. (Eng. and Min. Journ., Nov. 28, 1908; 1⅓ pp.) Describes the Contra-Tiro system of shaft sinking, the electric sinking pumps at Pachuca and gives a brief description of the conditions in the district. Illustrated. 20c.

7993—MILLING—The Chilean Mill in Africa. (Am. Min. Rev., Oct. 31, 1908; ¾ p.) Abstract of an article by H. E. Jones in the So. African Min. Journ. giving results obtained at the Gaika mine in Rhodesia. Capacity and costs of operating per ton of ore. 20c.

7994—NEVADA—Chafey, One of Nevada's New Gold Producers. W. C. Higgins. (Salt Lake Min. Rev., Oct. 15, 1908; 5 pp.) Describes this new gold camp of Nevada and some of its mines. Illustrated. 20c.

7995—NEVADA—Gold Mining on Kramer Mountain, near Golconda. W. C. Higgins. (Salt Lake Min. Rev., Oct. 15, 1908; 1¼ pp.) Briefly describes the camp and some of the leases. Illustrated. 20c.

7996—NEVADA—Manhattan, Nevada. (Eng. and Min. Journ., Nov. 21, 1908; 1¼ pp.) Describes the mineral belts and the reduction plants of the district. Illustrated. 20c.

7997—NEVADA—Mining and Milling at Virginia City, Nevada. G. E. Walcott. (Min. Wld., Nov. 21, 1908; 3½ pp.) Gives reminiscences of this once famous mining camp and describes the rejuvenation of mining on the Comstock lode by unwatering the lower levels. Describes the Butters cyanide plant and the Yellow Jacket mill. 20c.

7998—NEVADA—The DeLamar Mines, Lincoln County, Nevada. G. W. Miller. (Min. Sci., Oct. 29, 1908; 2 pp.) Describes the ore deposits, the mine workings and the mill as well as the geology and history of the district. Illustrated. 20c.

7999—NEW MEXICO—Sylvanite, New Mexico. G. A. Martin. (Eng. and Min. Journ., Nov. 14, 1908; 1¼ pp.) Describes the conditions and methods of reaching this New Mexico gold camp to which a rush has recently started. 20c.

8000—NEW ZEALAND—Quartz Mining in New Zealand During the Year 1907. Frank Reed. (N. Z. Mines Rec., Aug. 17, 1908; 3¼ pp.) This is the most productive branch of gold mining in New Zealand and during 1907 was more prosperous than ever. Gives statistics of tonnage, value per ton, cost per ton, dividends paid and workmen employed, and describes the mines of the Hauraki, Marlborough, Nelson, West Coast, Otago and Southland districts. 40c.

8001—NEW ZEALAND—The Gold Mines of Blackwater and Reefton Districts, New Zealand. (Min. Journ., Oct. 31, 1908; 1¾ pp.) Describes the history, geology, methods of mining and treating the ore at a number of mines in the district. Illustrated. 40c.

8002—ONTARIO—Cobalt Profits which Make Time Precious. Alex. Gray. (Min. Journ., Oct. 17, 1908; 1⅓ pp.) Describes the Drummond, O'Brien, La Rose mines of Cobalt and compares the operation of the Nipissing and La Rose companies from 1904 to date. 40c.

8003—ONTARIO—Cobalt's Pros and Cons. Alex. Gray. (Min. Journ., Oct. 3, 1908; 1 p.) Discusses conditions in Ontario before and after the discovery of Cobalt. Gives lists of dividend-paying companies and shipping companies, together with other data of the camp. 40c.

8004—ONTARIO—Origin of Cobalt-Silver Ores of Northern Ontario. R. E. Hore. (Econ. Geology, Oct.-Nov., 1908; 11½ pp.) Discusses the genesis of the ores in and about the town of Cobalt, together with a discussion of the rocks found in the district. 60c.

8005—ONTARIO—Temiskaming and Hudson Bay Company of Cobalt. Alex. Gray. (Min. Wld., Nov. 14, 1908; 1¾ pp.) This company has the smallest capital of any company in Cobalt and has been very successful in locating and disposing of valuable claims. 20c.

8006—ONTARIO—The Present Position of Cobalt, Ontario. H. P. Davis. (Eng. and Min. Journ., Oct. 31, 1908; 1¾ pp.) Gives statistics of production and shipment and dividends paid by 29 mining companies in this famous Canadian silver district. The annual silver production of Canada has increased from 3,000,000 to 13,000,000 oz. in four years, most of which came from Cobalt. Illustrated. 20c.

8007—ONTARIO—The Production and Dividends of Cobalt Mines. Alex. Gray. (Min. Wld., Oct. 17, 1908; 1¼ pp.) Gives the record of production and dividends of 15 Cobalt mines. 20c.

8008—ORE TREATMENT—The Treatment of the Gold-Ores of Hog Mountain, Alabama. T. H. Aldrich, Jr. (Paper read before A.I.M.E., Oct., 1908; 6 pp.) Gives a preliminary account of the experiments made and the conclusions reached concerning the treatment of certain refractory low-grade gold ores in the gold-bearing belt of Southern United States.

8009—PERU—The Mineral Resources of the Department of Apurimac, Peru. A. Jochamowitz. (Min. Journ., Nov. 7, 1908; 1¼ pp.) Describes the mines and methods of mining in the districts included in the provinces of Antabanba and Contabanbas. The progress of the department will depend chiefly on the exploitation of gold mines. 40c.

8009-a—PRODUCTION AND VALUE OF GOLD—Has the Value of Gold Depreciated? Walter R. Ingalls. (Eng. and Min. Journ., Nov. 28, 1908; 6 pp.) This is a subject which has frequently been discussed and is of special importance in view of the steady increase in the production of gold and in the prices of commodities. Charts are given showing the relative production of gold and prices of commodities and the relative production of gold and pig iron. Among other information the figures of the world's production of gold and pig iron are given for a period of nearly 60 years, as well as the index numbers compiled by several authorities. 20c.

8010—QUEBEC—Gold in the Eastern Townships. J. Obalski. (Journ. Can. Min. Inst., July, 1908; 6 pp.) Discusses the occurrence and distribution of gold in the eastern part of Quebec and describes some famous nuggets which were once found. Illustrated by a map and photographs.

8011—QUEBEC—Report on a Recent Discovery of Gold Near Lake Magentic, Quebec. John A. Dresser. (No. 1028, Can. Dept. of Mines, Geol. Surv. Branch, 1908; 13 pp.) A description of the above district in which gold was recently discovered. Describes briefly the occurrence of gold, the geology and gives some data on the district. Illustrated by a geological map.

8012—RAND MINE WATERS. F. W. Watson. (Journ. So. African Assn. Engrs., Sept., 1908; 20 pp.) Discusses the analysis of Rand water and gives much valuable data thereon. Much information has been added to this paper through discussion by the members. 80c.

8013—RAND MINING—Notes on Rand Mining. Tom Johnson. (Journ. Chem., Met. and Min. Soc. of So. Africa, Sept., 1908; 11 pp.) Reply by the author to the discussion of his paper read at the March meeting, gives much additional information. Illustrated. 60c.

8014—RAND MINING—Present-Day Rand Reviewed. (So. African Min. Rev., Sept., 1908; 2¼ pp.) Profits have increased 30 per cent. in a year and costs have been reduced 2s. in eight months.

8015—REFINING—Electrolytic Gold Refining. Emil Wohlwill. (Electrochem. and Met. Ind., Nov., 1908; 2 pp.) Discusses the paper of J. W. Richards in the March issue of this journal and supplies much additional information on the subject of electrolytic gold refining. 40c.

8016—RHODESIA—Small Mines of Rhodesia. B. I. Collings. (Journ. Chem., Met. and Min. Soc. of South Africa, Sept., 1908; 5 pp.) The subject is discussed under the heads of geology, economics, mining and metallurgy. 60c.

8017—SOUTH AFRICA—The Robinson Mine. J. B. Pritchford. (Min. and Sci. Press, Oct. 31, 1908; 2½ pp.) Describes this famous gold mine at Johannesburg, South Africa, which has produced nearly 3,000,000 oz. of gold and has paid more than $30,000,000 in dividends since 1888. 20c.

8018—WEST AUSTRALIA—The Gold Fields of West Australia. A. S. Brown. (Eng. Mag., Nov., 1908; 11 pp.) Reviews the development, geological features and production of the principal fields. Illustrated. 40c.

IRON AND STEEL

8018-a—ALABAMA—Iron Operations of the Birmingham District. Edwin Higgins. (Eng. and Min. Journ., Nov. 28, 1908; 6 pp.) Describes the iron ore deposits and the ores of the Birmingham, Alabama, district. Gives the methods of working, the equipment and the cost of producing pig iron at the works of the Tennessee Coal and Iron Company. Illustrated. 20c.

8019—ALABAMA—The Clinton Iron-Ore Deposits in Alabama. Ernest F. Burchard. (Paper read before A. I. M. E., Oct., 1908; 59 pp.) Describes the geology and gives an account of the Birmingham and Northeastern Alabama districts, together with a discussion of the possible origin of the ore and relation of origin to quality and extent of ore; gives estimates of ore reserves, and figures of production and consumption of iron ore. Illustrated.

8020—BLAST FURNACE—An Oval Blast Furnace at the Newport Iron Works, Middlesbrough, England. F. C. Coleman. (Iron Tr. Rev., Nov. 5, 1908; 2 pp.) Describes the construction of a furnace of oval shape intended to obtain an increased tonnage without incurring the increased cost of the plant. Illustrated. 20c.

8021—FURNACE PLANT—The New Blast Furnace Plant of the Wickwire Steel Company. (Iron Tr. Rev., Oct. 29, 1908; 1½ pp.) Describes the first of the new industries to locate along the ship canal now being created in the Niagara river. Illustrated. 20c.

8022—BRIQUETTING SOFT ORES—L'Agglomération des Minerais de Fer Pulvérulents. E. Lemaire. (Le Gènie Civil, July 25, 1908; 1¾ pp.) A general discussion of the subject and a description of four different processes in use in Europe for facilitating the smelting of friable iron ores. 40c.

8023—BRITISH STEEL WORKS—Leading Firms in the Middlesbrough District. (Iron and Coal Tr. Rev., Oct. 2, 1908; 44 pp.) Illustrated descriptions of the works of the principal firms engaged in the iron and steel industry of the Middlesbrough district. 40c.

8024—CAST IRON—Carbon and the Properties of Cast Iron. Henry M. Howe. (Eng. and Min. Journ., Nov. 14, 1908; 4 pp.) This is another of the author's contributions to the metallurgy of iron, in which he discusses the division line between steel and cast iron; the hardening effect of inclosed cementite; the changes in the properties of cast iron; the weakening effect of graphite skeleton; hardness, ductility and porosity and the influence of sulphur, manganese and phosphorus. Illustrated. 20c.

8025—CHARCOAL—The Use of Charcoal in Blast Furnace Practice. (Iron and Coal Tr. Rev., Oct. 2, 1908; 1⅓ pp.) See under COAL AND COKE.

8026—CHINA—Iron, Steel and Fuel in China. W. D. B. Dodson. (Min. and Sci. Press, Oct. 10, 1908; 1½ pp.) Briefly describes the conditions existing in these industries in China and also mentions a number of amalgamations of steel plants. 20c.

8027—CUPOLA—Distribution of Temperatures in the Cupola. J. de [illegible]. (Trans Am. Foundrymen's Ass'n.) Discusses the various temperatures produced by the reactions of the air and the gases on the fuel [illegible] the different zones of the fusion bed in a cupola. Illustrated.

8028—ELECTRIC FURNACE—Steel Making by the Girod Electrical Process. (Iron Tr. Rev., Nov. 12, 1908; 1¾ pp.) Describes the construction of this furnace, giving detailed drawings. 20c.

8029—ELECTRIC FURNACE PRACTICE—Progress in the Electric Steel and Ferro Alloys Industry.—II. J. B. C. Kershaw. (Iron Tr. Rev., Nov. 5, 1908; 3⅓ pp.) Describes some of the characteristics of the ferro alloys of chrome, silicon, vanadium, aluminum, tungsten, molybdenum, titanium, silico spiegel, ferro-nickel and ferro-chrome nickel. 20c.

8030—ELECTRIC SMELTING—Ingot Iron from the Electric Furnace. B. Osann. (Iron and Coal Tr. Rev., Nov. 6, [illegible] pp.) This is an abstract from *Stahl und Eisen* and describes the production of mild, malleable ingot iron at

Bonn. Describes the Stassano furnace and gives the method of working and the costs of production. Illustrated. 40c.

8031—ELECTRIC STEEL—A New Electric Furnace Steel Plant. (Electrochem. and Met. Ind., Nov., 1908; 1½ pp.) Describes the electric steel plant of Oehler & Co. at Aarau, Switzerland. Describes the method of operating the furnaces and gives a typical charge with the analysis of the steel. Illustrated. 40c.

8032—ELECTRIC STEEL—The Development of the Lash Process for Making Soft Steel in the Electric Furnace. (Can. Min. Journ., Oct. 15, 1908; 3½ pp.) This process consists of making a mixture of concentrated magnetic ores, or iron or sands, granulated pig iron and carbon, and charging them into either an electric or open-hearth furnace and producing steel. Illustrated. 20c.

8033—FOUNDRY—Systematic Foundry Operation and Foundry Casting. C. E. Knoeppel. (Eng. Mag., Nov., 1908; 15 pp.) Discusses the materials which go to make good castings, labor conditions and general expense. Three cases are discussed which involve varying weights and labor conditions. 40c.

8034—GENESIS OF ORES—A New Theory of the Genesis of Brown Hematite Ores, and a New Source of Sulphur Supply. (Bi-monthly Bull., A. I. M. E., Nov., 1908; 4 pp.) Discussion by Charles Catlett of paper previously mentioned in this Index.

8035—MALLEABLE CASTINGS—Production of Malleable Castings.—IX. Richard Moldenke. (Iron Tr. Rev., Nov. 12, 1908; 3 pp.) Continuation of article previously indexed. Describes the construction of the open hearth and discusses the heating of the furnace and gas and oil fuel. Illurtrated. 20c.

8036—MINE METHODS and [illegible]. W. H. Storms. (Am. Min. Rev., Nov. 14, 1908; 1¼ pp.) Describes the method of [illegible] filling as practiced at the Vermillion Iron Range of Minnesota. Illustrated. 20c.

8037—ORE REDUCTION—The Jones Step Process of Reducing Iron Ores. E. A. Sperry. (Min. Sci., Oct. 8, 1908; 2 pp.) Describes a new process now in use at Iron Mountain, Michigan, which aims to produce an impure iron directly from iron ore by simple reduction without fusion. Illustrated. 20c.

8038—PENNSYLVANIA—The Clinton Iron-Ore Deposits of Stone Valley, Huntingdon County, Penn. J. J. Rutledge. (Paper read before A. I. M. E., Oct., 1908; 31 pp.) Describes the Clinton ores and associated rocks, the origin of Clinton iron ores and the original source, of the iron. Illustrated.

8039—RUSSIA—Iron and Steel Industries of Russia. (Iron and Coal Tr. Rev., Nov. 6, 1908; ¾ pp.) This article is compiled from the reports of British Consuls in Russia and describes the production of iron ore and of iron and steel covering 1906 and 1907. 40c.

8040—STEEL PLANT—The Equipment of the Indiana Steel Company's Plant at Gary, Ind., for the Utilization of Blast Furnace Gas and Electrical Operation of Machinery. (Eng.-Con., Oct. 14, 1908; 4½ pp.) Gives an account of the construction of this plant, which is the latest installation by the United States Steel Corporation. Illustrated. 20c.

8041—STEEL WORKS—The Darlington Forge Company, Ltd. (Iron Tr. Rev., Oct. 15, 1908; 1¼ pp.) A description of these works which commenced operation in 18[illegible] and which turn out large castings for Atlantic liners. Illustrated. 20c.

8042—TUNGSTEN IN STEEL—Ueber die Bestimmung von Wolfram im Stahl bei Gegenwart von Chrom. G. V. Knorre. (Stahl u. Eisen, July 8, 1908; 4¾ pp.) Describes and compares several methods for making this determination. 40c.

LEAD

8043—FRANCE—The Mining and Milling of Silver-Lead- and Zinc-Ores at Pierrefitte Mines, France. William W. Van Ness. (Paper read before A. I. M. E., Oct., 1908; 23 pp.) Describes the Estaing mine, giving the methods of [illegible] transporting the ore, concentration, and cost of mining, milling and transportation.

8044—SMELTING PRACTICE—Removing Accretions in Crucibles of Lead Furnaces. J. N. Goddard. (Eng. and Min. Journ., Oct. 17, 1908; 1 p.) Describes and illustrates the use of a dynamite bomb to keep the crucibles of lead-furnaces in satisfactory condition, as practiced by the St. Joseph Lead Co. 20c.

MAGNESITE

8045—GREECE—The Magnesite Industry of Greece. F. Meijnan. (Eng. and Min. Journ., Nov. 14, 1908; ½ p.) Gives a brief description of the three companies operating magnesite quarries on the island of Euboea. Gives the analysis of crude magnesite and current prices at Grecian ports. 20c.

8046—PRODUCTION of Magnesite in 1907. Charles G. Yale. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 6 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

MANGANESE

8047—PRODUCTION of Manganese Ores in 1907. E. C. Harder. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 28 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

8048—RUSSIA—Manganese in Russia During 1907. I. I. Rogovin. (Eng. and Min. Journ., Oct. 17, 1908; ¾ p.) Describes the manganese industry and market conditions and gives figures of production for the last three years. 20c.

NICKEL AMD COBALT

8049—PRODUCTION of Nickel and Cobalt in 1907. F. L. Hess. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1907; 2 pp.) Gives statistics of production, imports and exports.

PETROLEUM

8050—NEW ZEALAND—Mud and Gas Blow-Out at Waimata, Gisborne. W. E. Akroyd. (N. Z. Mines Rec., Sept. 17, 1908; 1½ pp.) Discusses the bearing of this recent blow-out upon prospecting for petroleum. Gives an analysis of the saline water obtained in the vicinity. 40c.

8050-a—OKLAHOMA—Notes on the Oil and Gas Industry of Oklahoma. Charles N. Gould. (Min. Wld., Nov. 28, 1908; 2¼ pp.) Describes the history and development of the oil industry of Oklahoma, which reports about 26 per cent. of the United States annual production. Illustrated. 20c.

8051—PRODUCTION of Petroleum, 1907. David T. Day. (Advance Chapter from Mineral Resources of the United States, Calendar Year 1907; 133 pp.) Gives statistics of the production of petroleum in the oilfields of the United States and a history of the industry in foreign countries, together with statistics of trade prices and other valuable information.

8052—ROUMANIA—The Steaua Romana. (Petrol. Rev., Oct. 24, 1908; 2 pp.) Describes the operations of this oil refining company during the fiscal year 1907-8. Illustrated. 40c.

8053—RUSSIA—The Petroleum Deposits in the Kuban and Taman Districts of the Coucasus. (Petrol. Rev., Nov. 7, 1908; 2 pp.) Describes the history and prospects of the districts. 40c.

8054—SHALE OIL INDUSTRY of Scotland. D. R. Steuart. (Econ. Geology, Oct.-Nov., 1908; 26 pp.) Describes the nature, extent, origin and locality of the industry, together with the processes for extracting the oil and an account of the geology of the district. Illustrated. 60c.

PLATINUM

8055—OREGON—Platinum at the Cracker Jack Mine, Douglas County, Oregon. H. B. Pulsifer. (Eng. and Min. Journ., Nov. 21, 1908; ¾ p.) Describes the method of saving the platinum and of treating the platinum-bearing black sand. 20c.

PHOSPHATE ROCK

8056—FLORIDA—The Phosphates of Florida. (Am. Fertilizer, Oct., 1908; 4½ pp.) Describe the early history of the boom and prospecting and mining conditions. Discusses the origin of the deposits and tells how the finding of gypsum lead to the discovery of phosphate in Florida. 20c.

8057—MINING PLANTS—Modern Land-Pebble Phosphate Mining Plants in Florida. H. D. Mendenhall. (Eng. News, Oct. 15, 1908; 5 pp.) Discusses the occurrence of phosphate and the overburden which is removed. Describes the mining operations and the methods of washing, milling and drying. Illustrated. 20c.

PRECIOUS STONES

8058—DIAMOND MINING—Mine Methods and Timbering. W. H. Storms. (Am. Min. Rev., Oct. 31, 1908; 1¼ pp.) Describes the methods used for [illegible] in the Kimberley diamond mines of South Africa. Illustrated; to be continued. 20c

8059—SOUTH AFRICAN DIAMONDS—Ueber die Südafrikanischen Diamantenlagerstätten. F. W. Voit. (Reprint from Monatsberichten der Deutschen Geologischen Gesellschaft, No. 5, Band 60, 1908; 14 pp.) A discussion of the occurrence and probable origin of the diamond bearing rocks of South Africa.

8060—TURQUOISE MINING, Burro Mountains, New Mexico. E. R. Zalinski. (Eng. and Min. Journ., Oct. 31, 1908; 3½ pp.) Country [illegible] well defined walls in a zone of alteration. Mining is conducted in open cuts. Illustrated. 20c.

QUICKSILVER

8061—PRODUCTION of Quicksilver in [illegible]. H. D. M[illegible]. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 18 pp.) [illegible]

RARE METALS

8062—BERYLLIUM—The Rare Metals.—I.—Beryllium. Charles Baskerville. (Eng. and Min. Journ., Nov. 7, 1908; ¾ p.) Gives the composition and characteristics of beryl, chrysoberyl, phenacite, danalite, herderite and beryllonite. 20c.

8063—[illegible]—The Rare Metals.—II. [illegible] (Eng. and Min. Journ., Nov. [illegible] [illegible] sonite. 20c.

8063-a—MOLYBDENUM—The Rare Metals, III.—Molybdenum. Charles Baskerville. (Eng. [illegible] the composition and principal characteristics of [illegible] minerals of the molybdenum group. 20c

8064—PRODUCTION [illegible] Uranium and Titanium in 1[illegible] the production, imports, exports, etc., of these various metals.

SALT

8065—MANUFACTURE—Salt Manufacture. G. E. Willcox. (Journ. A. S. M. E., Mid-Oct., 1908; 17½ pp.) Describes the mechanical meth[illegible] Illustrated.

8066—PRODUCTION [illegible] Mineral R[illegible] features in [illegible]

SULPHUR AND PYRITE

8067—PRODUCTION of Sulphur and Pyrite [illegible] from Mineral Resources of U. S. [illegible] principal features in the industry, together with other statistical data of interest.

TALC AND SOAPSTONE

8068—VERMONT—Talc and S[illegible] (Eng. and Min. Journ., Oct. 17, 1908; 1 p.) Ment[illegible] ties at which these two materia[illegible] describes the deposits and gives brief account of development work. 20c.

TIN

8069—ASSAYING Tin Ores. W. Bettel. (So. African Min. Journ., Sept. 12, 1908; 1½ pp.) Discusses the various methods for the assay of tin and compares the merits of the Cornish wet and dry methods. [illegible]

TUNGSTEN

8070—PRODUCTION of Tungsten in 1907. F. L. Hess. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1907; 6½ pp.) Deals with the production of tungs[illegible] notes on probable future production and describes tests for tungsten minerals.

8071—PRODUCTION [illegible] ten ores in recent years. Condit[illegible] affect the price. 20c.

ZINC

8072—EXTRACTION [illegible] tracting Zinc in Australia. John Plummer (Min. Wld., Nov. 7, 1908; 1½ pp.) Describes [illegible] Hill silver-lead mines. [illegible]

8073—FRANCE—The Mining and Milling of Silver-Lead- and Zinc Ores at Pierrefitte Mines, France. William W. Van Ness. (Paper read before A. I. M. E., Oct., 1908; 23 pp.) See under "Lead."

8074—FURNACE—A [illegible] Met. Ind., Nov., 19[illegible] [illegible]

[illegible]

the Ozark uplift and the mining districts of this region. 20c.

8078—MISSOURI—Joplin, Missouri. E. W. Buskett (Min. Sci., Nov. 19, 1908; 2¼ pp.) Gives a short account of this famous zinc camp, its location, characteristics and methods. Illustrated. 20c

8079—OKLAHOMA—Miami Lead and Zinc District in Oklahoma. Otto Ruhl. (Eng. and Min. Journ., Nov 7, 1908; 2⅔ pp.) Describes the most recently developed addition to the Missouri-Kansas zincfield, in which the ore is richer than that of the Joplin district, and much of it is heavily coated and even impregnated with asphaltic oils. Illustrated. 20c.

8080—WISCONSIN—Lead and Zinc Fields of Southwestern Wisconsin. Robert B. Brinsmade. (Min. Sci., Oct. 15 and 22, 1908; 2 pp.) Discusses stoping, surface equipment, labor, royalty, milling, buildings, crushing and sizing, concentration, magnetic separation and costs. Illustrated. 40c.

8081—ZINC SMELTING for Pigment. Evans W. Buskett. (Min. and Sci. Press, Oct. 31, 1908; 1½ pp.) Describes the method of smelting zinc in order to produce the oxide which is used in pigments. Illustrated. 20c.

ECONOMIC GEOLOGY—GENERAL

8082—ALASKA—The Ketchikan and Wrangell Mining Districts, Alaska. F. E. and C. W. Wright. (U. S. Geol. Sury. Bull., No. 347, 1908; 210 pp.) Gives the results of a study of these districts in Southeastern Alaska. Deals mainly with geologic relations and characteristics of the ore deposits, although the principal mines and prospects are described. Illustrated by maps and photographs.

8083—BRITISH COLUMBIA—Topographical Methods Used for the Special Map of Rossland, B. C. W. H. Boyd. (Journ. Can. Min. Inst., July, 1908; 13 pp.) Describes the details which were carried out and the records which were made in preparing this map which covered an area of about 1.9 square miles. Illustrated.

8084—BRITISH COLUMBIA—Preliminary Report on a Part of the Similkameen District, British Columbia. Charles Camsell. (Bull. No. 986, Geol. Surv. of Can., 1907; 41 pp.) This is a preliminary report of investigations of the Similkameen mining district of Columbia which was carried out during the season of 1906. A topographic map, geologically colored, of a portion of the district, accompanies the report.

8085—BRITISH COLUMBIA—Preliminary Report on a Portion of the Main Coast of British Columbia and Adjacent Islands. O. E. Leroy. (Bull. No. 996, Can. Dept. of Mines, 1908; 56 pp.) This is a report on a geological reconnaissance of that portion of the main coast of British Columbia and adjacent islands included in the mining districts of New Westminster and Nanaimo. Illustrated by photographs and maps

8086—CLASSIFICATION OF MINERALS—A Genetic Classification of Minerals W. H. Emmons. (Econ. Geology, Oct.-Nov., 1908; 17 pp.) Indicates the principal conditions under which the most important minerals are formed. 60c.

8087—KENOVA QUADRANGLE—Economic Geology of the Kenova Quadrangle, Kentucky, Ohio and West Virginia. W. C. Phalen. (Bull. No. 349, U. S. Geol. Surv., 1908; 158 pp.) Describes the topography, general geology, mineral resources of which coal, clay and iron ores are the most important. Illustrated by sketches, photographs and a map.

8088—MAPS—Note on a System of Conventional Signs for Mineral Occurrence Maps. E. D. Ingall. (Journ. Can. Min. Inst., July, 1908; 16 pp.) Gives a set of signs and symbols used to represent metallic and non-metallic minerals which has had the indorsement of the Canadian Geological Survey. Illustrated.

8089—MONTANA—Some Economic Geology of Montana. J. P. Rowe. (Univ. of Mont., Bull. No. 50, Geol. Series No. 3, March 10, 1908; 67 pp.) Describes the locality, uses and geology of some of the natural non-metallic economic deposits of Montana. Illustrated.

8090—NEVADA—Amarilla Iron and Phosphate Deposits. O. H. Hershey. (Min. and Sci. Press, Oct. 17, 1908; 1⅔ pp.) Describes a group of seven claims in Eureka county, Nevada, the geology of the district and the occurrence of iron ore and apatite. 20c.

8091—NEW JERSEY—Franklin Furnace Folio, Geologic Atlas of the United States. (U. S. Geol. Surv., 1908; 28 pp., 6 maps.) Topographic, surficial geology and areal geology maps of a section of New Jersey, together with descriptive text treating the geography, general and economic geology, including the occurrence of magnetite iron ores and zinc-bearing ores; also non-metallic resources. 40c.

8092—OREGON—Geology and Water Resources of a Portion of South-Central Oregon. Gerald A. Waring. (Water Supply Paper No. 220, U. S. Geol. Surv., 1908; 86 pp.) Describes the geography, geology, hydrography, hydrology and reclamation projects of this district. Illustrated by maps, sketches and photographs.

8093 — OREGON-CALIFORNIA — Unexplored Part of Oregon-California Divide. D. H. Stovall. (Min. Wld., Oct. 24, 1908; 1¾ pp.) Describes the work done in the Blue Ledge and Siskiyou districts. The country is said to be rich in gold and copper and mine timber. Illustrated. 20c.

8094—PROSPECTS—Notes on Prospects. Gordon Surr. (Am. Min. Rev., Oct. 17, 1908; 1¼ pp.) Comparison between undeveloped and developed mines. Geology on important factor in determining the value of a certain prospect. 20c.

8095—QUEBEC—Report on the Landslide at Notre-Dame de la Salette, Lièvre River, Quebec. R. W. Ells. (Bull. No. 1030, Can. Dept. of Mines, 1908; 10 pp.) A landslide which occurred on April 6, 1908, caused a greater loss of life than any other on record in Eastern Canada Illustrated.

8096—SOUTH AFRICA—Mineral Prospects of Northern Marico.—III. (South African Mining Journ., Sept. 12, 1908; ½ p.) Continuation of article previously indexed. 20c.

8097—YUKON—Report on a Portion of Canada and Whitehorse Mining Districts, Yukon. D. D. Cairnes. (Bull. No. 982, Can. Dept. of Mines, 1908; 38 pp.) This is a report on a portion of the Southern Yukon, mainly included in the Conrad mining district. Contoured topographical and geological maps accompany this report, which is also illustrated by many photographs.

MINING—GENERAL

8098—BOLIVIAN NOTES. L. F. Vargas. (Mex. Min. Journ., Oct., 1908; 2½ pp.) This is a description by one of the officials of Bolivia of the general condition of the country, including the mineral resources and the production of tin. 20c.

8099—CANADIAN MINING TAXES—Incongruities of Canadian Mining Taxes. Alex. Gray. (Min. Wld., Nov. 7, 1908; 1¾ pp.) Discusses the proposed legislation in Ontario in regard to allotting mineral lands and collecting taxes, royalties and property holdings of operating companies. 20c.

8100—CAR DUMP—A Remarkable Car-Dump. F. A. Ross. (Eng. and Min. Journ., Oct. 17, 1908; 1⅓ pp.) Describes a car-dump or tipple, designed to do away with the necessity of gates on the cars by automatically receiving the car, turning it upside down and delivering it to a side track for empties. Illustrated. 20c.

8101—DRILLING—Notes on Machine Rock Drilling. George C. McFarlane. (Min. Sci., Oct. 8, 1908; 1⅓ pp.) Gives a number of experiences in the use of rock drills and includes some data taken from actual practice. 20c.

8102—EXCAVATION—Method and Cost of Moving Earth and Loose Rock in Small Cars. (Eng.-Con., Oct. 14, 1908; ½ p.) Gives a brief account of some excavation which was made from a borrow pit alongside a railroad track. Gives an itemized cost per cubic yard compiled from the total cost. 20c.

8103—FLOW OF WATER in Pipes and Flumes. Franklin Van Winkle. (Power and Engr., Nov. 10, 1908; 6 pp.) Discusses the drop in pressure in water pipes and mains due to friction, and gives practical charts for determining the size of pipe for a given flow. Illustrated. 20c.

8104—GREAT BRITAIN—Twenty-five Years of Mining. Edward Ashmead. (Min. Journ., Oct. 17 and Nov. 7, 1908; 4 pp.) Continuation of article previously indexed. Gives the capitilization, etc., of the mining companies (registered in Great Britain) in Rhodesia, Bechuanaland, Natal, Swaziland, Mozambique, Zambesia, West Africa, Egypt and Algeria; also the Dominion of Canada. 60c.

8105—HAULAGE—Electric Haulage at Dos Estrellas Mine. C. V. Allen. (Mex. Min. Journ., Oct., 1908; 1 p.) Describes the electrical equipment for hauling ore at the mines of this company. Illustrated. 20c.

8106—HAULAGE—Some Economies in Underground Ore Haulage. G. E. Walcott. (Min. Wld., Oct. 31, 1908; 3 pp.) Discusses the cost of tramming when track and cars are not in good order and mentions difficulties experienced by trammers and machine men. Describes methods of track laying. Illustrated. 20c.

8107—HOISTING—Steam Winding Engines in English Coal Mines. T. Hinton. (Eng. and Min. Journ., Nov. 21, 1908; 1¼ pp.) Discusses the relative merits of electric and steam hoists, but takes up principally the use of a steam engine for hoisting. 20c.

8108—HONDURAS—Mining in Honduras. E. de Montis. (Mex. Min. Journ., Nov., 1908; 1⅓ pp.) Briefly describes topography, geology and the occurrence of gold, platinum, silver, copper, iron, lead, zinc, tin, quicksilver and coal. Illustrated. 20c.

8109—LABOR—The Kafir Mine-Laborer. Thomas L. Carter. (Paper read before A. I. M. E., Oct., 1908; 32 pp.) Discusses the conditions under which the Kafir mine-laborer works, his value as a miner, mortality among the natives employed in South Africa and other interesting details. Illustrated

8110—MARYLAND MINERAL INDUSTRIES, 1896-1907. W. B. Clark and E. B. Mathews. (Maryland Geol. and Econ. Surv., March, 1908; 122 pp.) Describes the coal, clay and clay products, stone, lime and cement, flint and feldspar, sand and gravel, ores, mineral water and miscellaneous materials found in the State of Maryland. Describes also the coal operations of the companies operating in Allegheny and Garrett counties, Md. Illustrated.

8111—MEXICO—Developments at Ejutla, Oaxaca. C. G. Steinmann. (Mex. Min. Journ., Nov., 1908; ½ p.) Briefly describes the occurrence of ores, coal and oil. 20c.

8112—MEXICO—Methods of Hoisting and Pumping in Mexico. Mark R. Lamb. (Min. Wld., Nov. 7, 1908; 1¼ pp.) Describes the *malacate* and other hoists. The use of compressed air and producer gas power and the unfairness of the peak-lode contract is discussed. Illustrated. 20c.

8113—MEXICO—The Almoloya District. (Mex. Min. Journ., Oct., 1908; 1½ pp.) Describes the geology and ore occurrence in this district in the southern part of the State of Chihuahua, with brief accounts of a number of mines in that district. Illustrated. 20c.

8114—MINE MANAGEMENT. Courtenay De Kalb. (Mich. Miner, Nov., 1908; 4¾ pp.) This is an informal address delivered before the mining students at the University of California and takes up, in a practical way, certain elements of success in mining engineering. The advice is especially applicable to recent graduates and mining students. 20c.

8115—MINE SIGNALING—A New Signaling System for Mines. D. C. J. Enzlin. (Journ. Transvaal Inst. Mech. Engr., Sept., 1908; 3 pp.) Describes the system which indicates visually to the driver the points in the mine where the signals are rung. The indicator will show only the level from which the bells are operated and these cannot be rung except by the use of a key, thus preventing unauthorized signaling. Illustrated. 60c.

8116—MINE SIGNALING—An Interlocking System of Mine Signaling by Means of One Wire. L. B. Woodworth. (Journ. Transvaal Inst. of Mech. Engr., Sept., 1908; 7¾ pp.) Describes the magneto and battery systems and gives the methods of operating, testing and constructing these systems. Illustrated. 60c.

8117—MINE SIGNALING by Compressed Air. (Eng. and Min. Journ., Oct. 31, 1908; 1 p.) The pneumatic system of signaling of the Westinghouse Air Brake Company which has long been in use on passenger trains, has been introduced at various mines to replace the pull bell or electric systems. Illustrated. 20c.

8118—MINE SIGNALING—Mine Bell Signals. G. T. Plumb. (Journ. Transvaal Inst. of Mech. Engr., Sept., 1908; 7½ pp.) Discusses the danger of earth contacts, the advantages of the three-wire parallel system and describes the construction and operation of the signaling system installed in the shaft of the Ferreira Deep Gold Mining Company of South Africa. Illustrated. 60c.

8119—MINING LAW—Short Talks on Mining Law.—XII. A. H. Ricketts. (Eng. and Min. Journ., Oct. 31, 1908; 1⅔ pp.) Continuation of article previously indexed, discusses eminent domain, the statute of limitations and legal proceeding. 20c.

8119-a—NEVADA—Prospectors and Prospecting in Nevada. Robert T. Hill. (Eng. and Min. Journ., Nov. 28, 1908; 1¼ pp.) Definite classified information is hard to get, and precedent is of little help in searching the State for its mineral deposits. 20c.

8120—NEW SOUTH WALES—Cobar Gold and Copper Field, New South Wales. G. W. Williams. (Eng. and Min. Journ., Nov. 14, 1908; 1⅓ pp.) The oxidized gold ores near the surface become refractory and copper-bearing with depth, presenting difficulties in treatment. Illustrated. 20c.

8121—NEW ZEALAND—Mining Industry of New Zealand. (N. Z. Mines Rec., Aug. 17, 1908; 4 pp.) Deals with the production and export of metals and minerals during the year 1907, the statistics of quartz and placer mining, coal mining and the economic minerals. 40c.

8122—ORE HANDLING—The Finger-Chute. T. A. Rickard. (Min. and Sci. Press, Oct. 17, 1908; 2⅓ pp.) Describes a method used at the mines of Treadwell, Alaska, for expediting the descent of ore into cars. Describes the construction of the chute. Illustrated. 20c.

8123 — ORE HANDLING — Underground Transport of Material. J. B. Wilson. (Aust. Stand. Min. Stand., Sept. 16, 1908; 1 p.) Describes various methods of underground transportation, together with the advantages and disadvantages of the various methods. 40c.

8124—PRODUCTION—Summary of the Mineral Production of the United States in 1907. W. T. Thom. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 45 pp.)

Describes the production and principal features in the industry, together with other statistical data of interest.

8124-a—PROSPECTING on the Government Reserves. (Eng. and Min. Journ., Nov. 28, 1908; 1½ pp.) Describes some of the [illegible] to take advantage of the laws relating to location on Government ground for the purpose of mining. 20c.

8125—PROSPECTING BY ELECTRICITY—El Estudio de Criaderos Metalíferos por Medio de la Electricidad. V. Pérez. [illegible] July 8, 1908; 4 pp.) Describes apparatus and methods for locating ore deposits by the electric current. 40c.

8126—QUEENSLAND—Northern Mineral Fields of Queensland. (Queensland Govt. Min. Journ., Sept. 15, 1908; 1¼ pp.) Brief accounts of the Chillagoe district, the Etheridge [illegible], Cloncurry, Charters Towers and Ravenswood districts. Illustrated. 60c.

8127—RESCUE METHODS—Das Rettungswesen im Modernen Bergbaubetriebe. [illegible] Okorn. (Oest. Zeit. f. B. u. H., Aug. 1 and 8, 1908; 6 pp.) Describes the early attempts at the design of rescue apparatus.

8128—SHAFT SINKING—Note on a Problem During Shaft Sinking. C. B. Saner. (Journ. Chem. Met. and Min. Soc. South Africa, Sept., 1908; 4 pp.) Gives an account of how a difficult and dangerous stage in vertical shaft sinking was passed through in the shaft of the [illegible] Mines, Ltd., without loss of life and without undue loss of time. Illustrated. 60c.

8129—SHAFT SINKING PRACTICE. C. B. Saner. (So. African Min. Journ., Oct. 10, 1908; 1 p.) Compares skips and buckets and suggests how accidents may be minimized. Discusses footages and fatalities. 20c.

8130—SOUTH AMERICA—Through the South American Republics. T. M. Fletcher. (Mex. Min. Journ., Oct., 1908; 1¼ pp.) Briefly describes a trip through the Andean Republics from Chile to Colombia and thence to Mexico. The mineral industries of these countries are briefly touched on in a general way. Illustrated. 20c.

8131—SURVEYING—Determining the True Meridian. A. W. Warwick. (Min. and Sci. Press, Oct. 17, 1908; 3½ pp.) Describes a simple and accurate method for the determination of the true meridian, which does not involve the use of watches and clocks, nor is a knowledge of geographical position necessary. 20c.

8132—TIMBERING—Mine Methods and Timbering. W. H. Storms. (Am. Min. Rev., Oct. 17, 1908; ½ p.) Continuation of article previously indexed. Describes some of the modifications of the square-set system of timbering introduced into California mines, and compares these modifications with the standard set. 20c.

8133—TUNNELING—Advancing the Hot Time Lateral of the Newhouse Tunnel. H. M. Adkinson. (Eng. and Min. Journ., Oct. 17, 1908; 2¼ pp.) Describes some of the details of the work, including drilling, blasting, mucking and tramming and other important factors. Illustrated. 20c.

8134—TUNNELING—Speed in Small Drifts. Editorial. (Eng. and Min. Journ., Oct. 17, 1908; 1¼ pp.) Discusses the methods which enhance speed in small drifts and discusses the article by H. M. Adkinson in same issue of the JOURNAL. 20c.

8134-a—UNDERGROUND WATER—Methods Used in Sealing Off Underground Water. E. D. Kirby. (Min. Wld., Nov. 28, 1908; 1½ pp.) The method described consists of injecting clay or other solid matter into the flowing water and by pressure forcing the saturated material to the exits of the mine where it will check the passage of the water. Illustrated. 20c.

8135—VENTILATION—The Ventilation of Mines, I, II, III and IV. J. Sarvaas. (Aust. Min. Stand., Sept. 9, 16, 23 and 30, 1908; 6½ pp.) Discusses the factors controlling the necessary quantity of air to be put into circulation, together with tests of standard quantity and quality; describes the anemometer and its use to measure the quantity of air passing through pipes and airways, also deals with natural ventilation, the amount of air required therefor, and the friction of air in pipes and pipe systems. $1.40.

8136—VIRGINIA—Iron and Zinc in Southwestern Virginia. (Eng. and Min. Journ., Nov. 7, 1908; 1½ pp.) Describes the operations of the Virginia Iron, Coal and Coke Company which furnishes an idea of conditions in the iron industry of Southwestern Virginia. Illustrated.

8137—ZAMBESIA—The Mineral Prospects of Zambesia. L. de Fries. (So. African Min. Journ., Sept. 19, 1908; 2½ pp.) Describes the principal mines in Portuguese Zambesia and discusses existing conditions. Illustrated. 20c.

ORE DRESSING

8138—CONCENTRATION—Experimental Work in Ore Concentration. John A. Davis. (Eng. and Min. Journ., Nov. 7, 1908; 2½ pp.) Describes the construction and operation of a glass table, which was used to determine the proper adjustment of the quantity of water, the amount of slope and the size of ore grain to secure the greatest efficiency in concentrating a classified product upon a glass table. Illustrated. 20c.

8139—ORE DRESSING by Adhesion of Liquid Films. R. Stören. (Eng. and Min. Journ., [illegible] tension and the property of minerals to attract or repel different liquids. 20c.

8140—SAMPLING [illegible] Zwaluwenburg. (Eng. and Min. Journ., Nov. 21, 1908; 2 pp.) A discussion of the article by John A. Church, together with a reply by Mr. Church to a letter by Mr. Woodbridge upon the subject of mechanical sampling. 20c.

8141—SAMPLING [illegible]

8142—SAMPLING—Principles of Machine Sampling. John A. Church. (Eng. and Min. Journ., Nov. 14, 1908; 3 pp.) Discusses the elements which govern the operation of automatic samplers; inherent defects and possible methods for remedying their faults. Illustrated. 20c.

8143—SLIMES CONCENTRATION—Concentration of Slimes—IV and V. E. A. Sperry. (West. Chem. and Met., Oct., 1908; 14½ pp.) These sections describe methods of dewatering and the final treatment of slimes. 60c.

METALLURGY—GENERAL

8144—AMERICAN SMELTING AND REFINING COMPANY—The Policy of the American Smelting and Refining Company. (Eng. and Min. Journ., Nov. 14, 1908; 1½ pp.) Discusses the attitude of the American Smelting and Refining Company toward the mine owners as given in a letter to the public by Franklin Guiterman, general manager of the Colorado department of that company. 20c.

8145—CONVEYING MATERIALS—The Elements of Chemical Engineering—III. (Chem. Engr., Oct., 1908; 11 pp.) Continuation of article previously indexed and describing further methods for conveying liquids. Illustrated. 40c.

8146—ELECTROLYSIS—The Conductivity and Ionization of Electrolytes in Aqueous Solutions and Conditioned by Temperature Dilution and Hydrolysis. H. C. Jones and C. A. Jacobson. (Am. Chem. Journ., Oct., 1908; 54 pp.) The purpose of the investigation was to supply data upon the influence of temperature upon dissociation. Illustrated. 60c.

8147—MAGNALIUM—Magnalium: Its Strength, Weight and Uses. (Am. Machinist, Oct. 8, 1908; 2¾ pp.) Give rules for molding, forging, rolling and machining this alloy of aluminum and magnesium. Illustrated. [illegible]

8148—MEASUREMENT OF WATER—Orifices for the Measurement of Water. Franklin Van W[illegible] and under water, suppressing contraction and the actual discharge from differently formed apertures [illegible] Illustrated. [illegible]

8149—NEW SOUTH WALES—Metallurgy of Broken Hill, New South Wales. G. W. Williams. (Eng. and Min. Journ., Nov. 7, 1908; 5 pp.) Describes the methods of treating the ore and the recovery obtained, together with costs and descriptions of the mills in this district. 20c.

8150—SMELTER FUMES—Baghouse of United States Smelter in Utah. H. E. Benedict. (Min. Wld., Oct. 24, 1908; 1¾ pp.) Describes the construction and arrangement of the baghouse [illegible] the dust-laden fumes from the smeltery. Illustrated. 20c.

8151—SMELTER FUMES—Device for Shaking Bags of Smelter Baghouses. (Eng. and Min. Journ., Nov. 21, 1908; ⅓ p.) Describes an invention by means of which the bags may be shaken more efficiently by hand from the outside without opening the room. A large number of bags may also be shaken at one time. 20c.

8152—SMELTERY FUMES—Their Condensation and Utilization. F. R. Carpenter. (Proc. Colo. Sci. Soc., Vol. IX, Oct., 1908; 14 pp.) Describes various methods which have been used for collecting smeltery smoke and gives the author's methods for condensing the fumes. The paper includes a discussion by C. W. Comstock and a reply by Mr. Carpenter. [illegible]

MINING AND METALLURGICAL MACHINERY

8153—AIR COMPRESSORS. C. S. Vesey Brown. (Cassier's Mag., Oct., 1908; [illegible]) Gives a [illegible] description of the construction of air compressors and the parts composing them. Profusely illustrated. 40c.

8154—CONDENSER—An Improved Air-Cooled Surface Condenser. (Min. Wld., Oct. 24, 1908; 1¾ pp.) Gives the advantages of the Harbison air-cooled surface condenser in mining localities where water for the steam plant is scarce or impure. Illustrated. 20c.

8155—TESTING OF METALS. (Journ. A. S. M. E., Mid-Oct., 1908; 5 pp.) [illegible] Society.

8156—DERRICKS [illegible] ham Reed. (Indu[illegible] 20c.

8157—ELECTRIC POWER for Quarrying Marble. C. T. Maynard. (Power, Oct. 13, 1908; [illegible] the Vermont Marble Co. at Proctor, Vt. 20c.

8158—GAS ENGINE [illegible] Engine. G. W. Malcolm. (Power, Nov., 1908; [illegible] single-acting type embodying interesting departures in the application of standard principles of design. Illustrated. 20c.

8159—[illegible] producer design. Illustrated. 20c.

8160—GAS PRODUCERS—The Reliability of the Producer Gas Plant. T. L. White. (Cassier's Mag., Oct., 1908; 5¼ pp.) Describes a test made upon a producer gas plant and discusses gas plants from the view point of reli[illegible] 40c.

8161—GAS PRODUCERS for Bituminous [illegible]

8162—HOIST—High-Power Electric Hoist at Elizabeth Mine, Belgium. Frank C. Perkins. [illegible] method of applying electricity to large hoisting plants and gives a description of the equipment. Illustrated. 20c.

8163—OIL ENGINE PLANT—Large Oil-Engine Electrical Plant. (Elec. Wld., Oct. 3, 1908; 2¼ pp.) Describes the new power plant of the Prairie Pebble Phosphate Company at Mulberry, Fla. Illustrated. 20c.

8164—ROASTING FURNACES. Oskar Nagel. (Electrochem. and Met. Ind., Nov., 1908; 2½ pp.) Describes the Brown, Wethey, White-Howell, McDougall, Herreshoff and Wedge roasting furnaces. Illustrated. 40c.

8165—SAFETY DEVICE for Mine Cages. [illegible] Counties (Eng.) Institution of M[illegible] September, 1908, describing a sa[illegible] important feature of which is the [illegible] cage as well as contact with the guides. Illustrated. [illegible]

8166—SUCTION GAS PLANT—New Chum [illegible] mine, and states the results obtained. 40c.

8167—TRANSIT SUPPORT—Universal-Grubenspreize and Zentrierapparat der Gebrüder [illegible] walls. 60c.

8168—WATER ANALYSIS—The Mineral Analysis of Water for Industrial Purposes and Interpretation by the Engineer. Herman Stab[illegible] nable information regarding water softening, boiler waters, etc.

8169—WATER SOFTENING and Practice at Broken Hill Proprietary. Leslie Bradford. [illegible] giving the reactions involved and the theoretical amounts of chemicals to be added. Illustrated. 40c.

ANALYTICAL CHEMISTRY

8170—BRASS ANALYSIS—The Complete [illegible]

INDUSTRIAL CHEMISTRY

8171—NITRIC ACID—Manufacture of Nitric [illegible] manufacturing nitric and mixed acids used in the [illegible]

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—	
Bort, good drill quality, carat	$85.00
Carborundum, f.o.b. Niagara Falls, powd. lb.	.08
Grains "	.10@.17
Corundum	.07@.10
Crushed Steel, f.o.b. Pittsburg	.05¾@.06
Emery, in kegs; Turkish flour	.01¾@.02½
Grains	.03½@.04½
Naxos flour	.01¾@.02½
Grains	.03½@.04½
Chester flour "	01½
Grains "	.03½@.04½
Peekskill, f.o.b. Easton, Pa., flour "	.01¼@.01½
Grains, in kegs "	.02¾@.03
Garnet, per quality sh. ton	25.00@35.00
Pumice Stone, Am. Powd., 100 lb.	1.60@2.00
Italian, powdered "	.01¼@.01½
Lump, per quality "	.03@.20
Rottenstone, ground "	.01⅞@.04
Lump, per quality	.05@.25
Rouge, per quality "	.05@.30
Steel Emery, f.o.b. Pittsburg "	.07½@.07¾
ACIDS—	
Acetic 28% lb.	.021 up
Boric "	.07
Hydrofluoric, 30% "	.02¾@.03
" 48% "	06
" 60% "	10
Hydrochloric acid, 20°, per lb.	1.25@1.50
Nitric acid, 38° per lb.	4.25@4.62½c.
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.25
66°, bulk, ton	18.00
Oxalic	06½@.06¾
ALCOHOL—Grain 95% gal.	2.63
Denatured "	.45@.49
Refined wood, 95@97% "	49@.55
ALUM—Lump 100 lb.	$1.75
Ground	1.85
Chrome Alum	.04¼@.04¾
ALUMINUM—Sulphate, com'l. lb.	1.10@1.75
AMMONIA—24 deg. lb	.04½@.05½
" 26 deg. lb.	.04¾@.05¾
AMMONIUM—	
Bromide lb.	23
Carbonate "	.07⅝@.08
Muriate grain	.05⅝@.06¼
Lump	.09¼@.09½
Sulphate, 100 lb.	3.05@3.10
Sulphocyanide com	.30
" " chem. pure	40
ANTIMONY—needle, lump "	.03¼@.03¾
ARSENIC—White	.03@.03¼
Red	.07½@.07¾
ASPHALTUM—	
Barbadoes per ton.	40.00@80.00
West Indies "	20.00@60.00
Egyptian lb.	.10@.11
Gilsonite, Utah ordinary per ton.	32.00
Trinidad "	22.50@30.00
California	21.00@27.00
BARIUM—	
Carb. Lump, 80@90% lg. ton.	30.00@35.00
Precipitated 96@98%	36.00@40.00
Powdered, 80@90% lb.	.02@.02¼
Chloride com'l ton.	39.00@41.00
Nitrate powdered, in casks lb.	.05½@.06
Blanc Fixe per lb.	.02¼
BARYTES—	
Am. Ground sh. ton.	14.00@17.50
Floated "	18.00@21.00
Foreign floated	19.50@22.50
BISMUTH—Sub-nitrate lb.	1.50
BLEACHING POWDER—35%. 100 lb.	1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	4.75
BONE ASH lb.	.02¾@.04
BORAX, sacks "	.04¼
CALCIUM—Acetate, gray, 100 lb	1.50@1.55
Acetate, brown lb.	1.00@1.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton.	65.00
Chloride, f.o.b. N. Y. "	11.00@14.00
CEMENT—	
Portland, Am. 500 lb bbl.	1.55@1.60
Foreign "	2.25@2.90
"Rosendale," 300 lb	85
(in sacks)	65
Slag cement	.75@1.25
CHROME ORE—	
New Caledonia 50% ex. ship N. Y. per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, M ton.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y. ton.	8.00@9.00
Foreign "	10.00@17.50
COBALT—Oxide lb.	1.40

COPPERAS—Bulk 100 lb.	$0.55
In bbls. "	.65@.75
In bags "	.60@.70
CRYOLITE lb.	.06½@.06¾
FELDSPAR—Ground best sh. ton.	10.50@15.00
FIRE BRICK—	
American per M.	30.00@40.00
Imported "	30.00@45.00
St. Louis No. 1 "	18.00
" No. 2 "	15.00
Extra "	20.00@23.00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality per ton.	5.00
" ordinary "	2.50
Dowestic f.o.b. shipping port:	
FLUORSPAR—	
Domestic f.o.b. shipping port:	
Lump lg. ton.	8.00@10.00
Ground "	11.50@13.50
Foreign crude ex. dock	8.00@10.00
FULLER'S EARTH—Lump, 100 lb.	.75@.85
Powdered "	.75@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best lb.	.02¼@.04
Dust "	.02½@.05
Chip "	.04@.08
Lump "	.05½@12
Large lump "	.08¼@.10½
GYPSUM—	
Feritlizer sh. ton.	5.00
Ground "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best lb.	.01¾
German lb.	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, lb.	07¾
Nitrate, com'l "	08¼@.08¾
MAGNESITE—Greece.	
Crude (95%) lg. ton.	8.00@10.00
Calcined, powdered sh. ton.	26.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg M.	160@200
MAGNESIUM—	
Chloride, com'l 100 lb.	.90@1.25
Sulphate (Epsom salt) 100 lb.	.85@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide lb.	.01@.01¼
75@85% binoxide "	.01¼@.01½
85@90% binoxide "	.01½@.05
90@95% binoxide "	.06½
Ore, 80%-85% sh. ton.	16.00@32.50
MARBLE—Flour sh. ton.	8.50@10.00
MINERAL WOOL—	
Slag, ordinary sh. ton.	19.00
Selected "	25.00
Rock, ordinary "	32.00
Selected "	40.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, nominal lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single lb.	.09@.11
Sulphate, douhle "	.06½@.08
NITRATE OF SODA—100 lb. 95% for '08	2.15
95% for 1909	2.15
95% for 1910	2.15
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered lb.	.06¾@.07
English glassmakers' "	.08¼@.08½
Lithopone "	.03¾@.07
Metallic, brown sh. ton.	16.50@22.00
Red "	14.00@18.00
Ocher, Am. common "	8.50@9.00
Best "	16.00
Dutch, washed lb.	.02½@.03
French, washed "	.01½@.02½
Paris green, pure, bulk "	.21½
Red lead, American "	.06¾@.07
Foreign "	.08¼@.08½
Turpentine, spirits bbl., per gal.	.43
White lead, Am., dry lb.	.05⅜@.05½
American, in oil "	.06¾@.07
Foreign, in oil "	.10⅛@.10⅜
Zinc white, Am. extra dry "	.05⅛@.05⅝
French, red seal, dry "	.08⅜@.08⅞
French, Green seal, dry "	.10⅜@.10⅝
PHOSPHATES—Acid	60c. per unit
*Fla., hard rock	10.00@10.25
land pebble 68%	4.25@4.50
†Tenn., 78@80%	6.00@6.50
75%	5.00@5.50
68@72%	4.00@4.50
‡So. Car. land rock	6.75@7.00
" " river rock	5.00@5.50

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—	
Bicarbonate crystal lb.	$.08½@.09
Powdered or granulated "	.09@.09½
Bichromate, Am. "	.08⅝@.09
Scotchfl "	.10¾
Bromide "	.13@.14
Carbonate (80@85%) "	.03⅝@.04
Caustic, ordinary "	.04½@.05¾
Elect. (90%) "	.05½@.06
Chloride (muriate), 100 lb.	1.90
Chlorate, powdered "	.09¼@.09¾
Crystals "	09@09½
Cyanide (98@99%)	
Carloads (30,000 lb.) "	18c.
5-ton lots	18½c.
Less than 5 tons "	19c.
Kainite, long ton, bulk, 8.50; bags, 9.50.	
Permanganate lb.	.09½@.10
Prussiate, yellow "	.13@.13¾
Red "	.30@.33
Sulphate 100 lb.	2.18½@2.21½
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. mines per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines	10@10½c.
Imported non-arsenical, furnace size, per unit	.12½
Imported, arsenical, furnace size, per unit	.12
Imported fines, arsenical, per unit.	.08½@.09
Imported fines, non-arsenical, per unit	10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural sh. ton.	3.80@4.50
SALTPETER—Crude 100 lb.	4.00@4.50
Refined, crystals "	5.50@6.00
SILICA—	
Ground quartz, ord'ry lg. ton.	10.00@15.00
Silex, ground "	13.00@15.00
Silex, floated "	35.00@40.00
Lump quartz "	5.00@6.00
Glass sand "	2.75
SILVER—Nitrate, crystals oz.	.37½@.40
SODIUM—	
Acetate lb.	.04@.04¼
"Alkali," per 100 lb., 58/48	.80@.87½
Bicarb. soda, per 100 lb	1.00@1.30c.
Soda, caustic, per 100 lb., 76/60	1.75@1.85
Soda, caustic, powdered	.02¾@.03¼
Salt cake, per 100 lb., bulk	.40
Salt cake, bbl	.65@.85
Soda, monohydrate, per lb.	1.4@1.75c.
Bichromate lb.	.07⅛@.07½
Bromide "	.13@.14
Chlorate, com'l "	.09@.09½
Cyanide ("100% KCN")	
Carloads (30,000 lb.) "	18c.
5-ton lots "	18½c.
Less than 5 tons "	19c.
Hyposulphite, Am. "	1.35 up
German "	1.60@1.70
Phosphate 100 lb.	2.10@2.30
Prussiate "	.08@.08¼
Sal soda, f.o.b. N. Y. "	.65@.70
Foreign, f.o.b. N. Y. "	.80@1.00
Silicate, com'l "	.80@1.15
Sulphate, com'l (Glauber's salt) 100 lb.	.60@.75
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate lb.	.07½@.08
SULPHUR—	
Louisiana (prime) to New York, Boston or Portland lg. ton.	22.50
To Philadelphia or Baltimore "	22.50
Roll 100 lb.	1.85@2.15
Flour "	2.00@2.40
Flowers, sublimed "	2.20@2.60
TERRA ALBA—French & Eng. 100 lb.	.85@1.00
TALC—Domestic sh. ton.	15.00@25.00
French "	16.00@25.00
Italian, best "	35.00@40.00
TIN—Bi-chloride, 50% lb.	.09¼ up
Crystals "	.21 up
Oxide, lb "	.33@.35
URANIUM—Oxide "	3.50
ZINC—	
Chloride solution, com'l 20° "	.02¼
Chloride, granular "	.04½@.05
Dust "	.04½@.05
Sulphate "	.02@.02¼

NOTE—These quotations are for ordinary wholseale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, DECEMBER 12, 1908. NO. 24.

The Hand Drill in Prospecting Placer Deposits

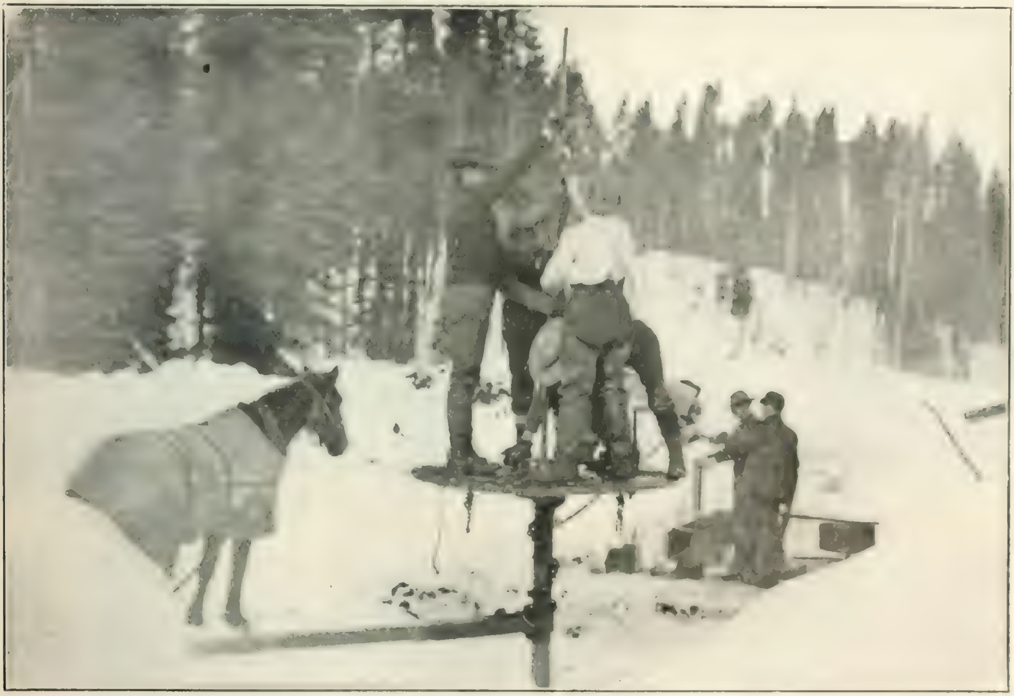
Methods of Drilling, Especially with Rotation of Casing, and the Advantages and Disadvantages as Compared with Steam-drill Prospecting

BY JOHN POWER HUTCHINS[*]

There are many areas in regions so inaccessible that reaching them with a steam prospecting drill involves an almost prohibitive expenditure of time and money. There are also numerous placers, the surface conditions of which are such that moving the heavy power drill over them is a costly and slow process. Under these conditions, which prevail in the swamps of the more inaccessible arctic and tropic zones, it is often preferable to use a hand drill, the cost being lower and the speed greater than with a power drill. The same is true of other places, where fuel, water, skilled labor, repairs and renewals are matters of difficulty and expense, or where unhealthful climate, heavy rain, and unfavorable weather prevail.

The advantages of hand drills as compared with steam drills are obviously those of mobility, although the possibility of operating with cheap, acclimated, unskilled labor, with very little wear, tear, and breakage, where no machine shops are available, is also an important consideration. There is also another extremely important advantage and that is the accuracy of the core obtained. One type of hand drill is so designed and manipulated that it produces cores probably more accurate than those of any drilling method which uses driving as a means of sinking drive pipe. Inasmuch as the object of the whole drilling operation is to get a correct idea of the value and the character of the mineral deposit, this advantage in the matter [illegible] prime importance.

There are two kinds of hand drills, one which does what the steam prospecting drill accomplishes in the same way, except that hand power is used instead of steam, and another which achieves the same result as the steam drill, but in an essentially different way.



LOWERING THE DRILL ROD. WASHING PUMP IN BACKGROUND.

HAND DRILLS EMPLOYING DRIVE PIPE

These drills resemble the steam drill in that they employ a pipe driven into the deposit. The means used for driving are somewhat varied, depending upon different arrangements for delivering the blow. The means employed vary in mechanical detail, but the principle of striking a heavy [illegible] all. The simplest method is to strike the pipe with a heavy hammer or maul. Inasmuch as only a comparatively light blow can be struck in this way, only drive pipe of small diameter can be used, and only shallow depths can be attained. A heavier blow can be obtained by hanging a hammer on a tripod by means of a rope and a single sheave, several men raising and dropping the weight alternately. Still greater power can be secured by using a weight, hoisted by a mechanical device worked by hand to a hight of more than 10 ft., and dropping it like the hammer of a pile driver. By this means 2-in. pipe can be sunk more than 100 ft.

---

[*] Mining engineer, 52 Broadway, New York.

The limit of depth is not always that to which pipe can be driven. Any driven pipe is harder to pull than to drive into the ground, and the capacity of the pulling arrangements therefor, frequently limit the depth that can be reached. Frequently when pipe is driven hard, it cannot be pulled without extreme difficulty, if it can be recovered at all. This is true in steam drilling as well as in hand drilling. With the limited power of hand drills, the diameter of the pipe must necessarily be small, and the deeper the hole the smaller the diameter that can be used. As a result the samples obtained are small.

Pipe sunk by driving must be heavier than that used by drills which rotate the pipe. That used by the first type of drills is called in this article drive pipe, that used in the second method of drilling is called casing.

The operation of drive-pipe hand drills, generally consists, as with the steam drill, in the following three consecutive and separate operations: Driving pipe, drilling the core and pumping the drillings. These operations are in the two methods of prospecting generally done in the same way, using a rope to suspend the tools. A hollow drill rod may be used with a current of water forced to the bottom of the drill hole to wash up the drilled material and its mineral content to the surface of the ground.

Inasmuch as the hand drills which drive by percussion have difficulty in driving and pulling and thus make slow progress and get small samples, they are inferior to those which use the rotation method for sinking the pipe.

Drilling with Rotated Casing

There are two types of hand drills which employ rotated casings. One uses a platform on the top of the casing for the men to stand upon while drilling, their weight aiding in forcing the casing down as it is rotated by man or animal power. The other has no platform, the men who do the drilling standing on the ground. The pipe is rotated only when it is being driven or pulled and not while drilling is going on. Pipe wrenches are used in forcing the pipe around in its hole.

The hand drill which employs rotation as a means of sinking its casing was evolved more than 25 years ago in testing the tin placers of the Dutch East Indies. This work was done by the Dutch government under the supervision of its engineers, and the drill is the result of keen observation and ingenious improvement extending over a number of years. Its uses as a means of investigating metalliferous alluvion antedates the introduction of the steam churn drill for this purpose by several years. A drill very similar in construction and operation was used contemporaneously in this country in drilling wells and in testing phosphate deposits.

At present no other drill is used in the Dutch East Indies and on its results the government determines the value of the stanniferous placer deposits, a value which is accepted by the leasers who work them. I used the drill in conjunction with shafts in examining placer ground in tropical South America and found it admirably suited to the hostile environments of the tropical regions.

The drilling outfit is similar to that used with other systems. It consists of a casing with a shoe, bits, pumps, augers, drill rods, etc. The method of operation in brief is as follows: Drilling is accomplished with one of several tools, adapted to the peculiarities of the material to be penetrated. The tool, screwed to a solid or hollow drill rod, is operated like a churn drill inside the casing by the men who stand on the platform. The casing is rotated by men on the ground, or by means of a horse walking around in a circle. The lower end of the casing has a toothed cutting shoe, which aided by the weight of the apparatus and that of the men upon the platform and the rotary motion imparted to the whole, cuts and sinks into the ground inclosing a core. The core is drilled and at the same time forced up into a tool, which drills and pumps simultaneously. The tool is oc-

STARTING HOLE IN OVERBURDEN

DRIVING PIPE IN INDURATED GRAVEL

casionally lifted out of the casing and emptied.

Drilling With the Auger Bit

Suppose, as is often the case, a barren overburden covers the gravel to be drilled. This material can often be bored without casing, thus permitting of greater speed than when casing is used, for in the absence of casing there is no need of coupling and uncoupling rods. The tool generally used in this work is a spoon drill, which, as its name indicates, can be used as an auger in loose material, and to a considerable degree as a drill in harder soil, in stiff clay and when roots are encountered. The drill-rod handle is attached to the rod at a convenient hight. Two, three or four men manipulate the auger drill, one or two steadying the rod and holding it upright while the others rotate it. The barrel of the tool tapers toward the bottom, and other features of its design also help to hold excavated material; when the overburden is sandy or clayey soil possessing even a slight amount of cohesion it can be worked rapidly with this tool.

When the barrel is full the tool rod and drill-rod handle are lifted bodily out of the hole without uncoupling and emptied, a sharp stick being used to scrape out the barrel. The tool is then put back in the hole and the operation repeated. When material is encountered firm enough to make boring slow work, the men use the spoon drill somewhat like a churn drill, raising it and driving it down into the material with considerable force, and rotating it. Very stiff clay and roots of trees can be penetrated in this way at a rapid rate, the bit being designed for rough use of this kind.

A hole 6 in. in diameter can often be sunk 10 to 15 ft. in much less than one hour. If water is encountered this tool cannot always be used, for excavated material, if very wet, is likely to slip out and back into the hole. There are other tools that can be used under such circumstances, designed to work below water level.

Introducing the Casing

When the overburden has been penetrated and gravel containing gold has been encountered, casing sections, the lower one having a cutting shoe, may be screwed together and lowered into the hole, which has been made of sufficient diameter for this purpose. Enough casing is used to have several feet projecting above the ground when the cutting shoe is resting on the bottom of the hole. The top-head is screwed on the top of the casing and the platform placed on the top-head. Two to four men now mount the platform and connect to the rod sections a drill, a pump, a small spoon drill, a drill-auger pump, a helical-auger pump, a jar pump or some other tool.

While this is being done, two to four men slip poles (like capstan bars which may be as much as 15 ft. long) through chain loops on the periphery of the platform and walk around in a circle on the ground heaving on the bars as at a capstan. They thus rotate the casing which usually sinks several inches into the ground yielding several inches of core. As soon as sufficient core is inclosed, which is indicated by comparing the total length of the rod and tool in the casing with that of the casing, the men on the platform begin churn drilling. The boring action of the cutting shoe usually sinks the casing considerably ahead of the tool operated by the men on the platform and loosens the core somewhat, thus preparing it for easier working. Generally a tool is used which is so designed that it drills and pumps or bores and pumps, as it is churned up and down.

In this process the casing is sunk, and the core is drilled and pumped simultaneously. On the other hand in the operation of the churn drills with drive pipe, the procedure is to drive the pipe, then drill the core, and later to pump the drilled material. These are separate and consecutive operations, and each of them requires changes of tools and manipulation, all of which consumes time.

When the pump barrel is filled, the tool [illegible] into a receptacle. While the pump barrel is being cleaned and washed, another tool, either of the same or of a different type is screwed on and lowered into the casing; rotating and drilling are resumed and thus the work goes on; more drill-rod and casing sections are added with greater depth until the hole is finished.

[illegible]

When hard boulders, too large to go into the casing, are encountered, it is necessary to use a plain drill bit and to drill below the casing until the boulder is crushed. As a matter of fact, egg-shaped boulders, longer on one axis than the inside diameter of the casing, are often forced into the casing by the action of the teeth of the cutting shoe. I have found boulders wedged in this way after pulling casing with a 12-in. core from a finished hole to examine the material from bedrock in an undrilled condition. I think that the rotation of the casing twists such boulders until they slip into it. The rotation of the casing is here described as being done by men. Animal power of any kind may be used instead with a saving of about 30 to 40 per cent. in labor expense.

The rotation of the casing is a feature essentially different from that of any other churn drill, and it offers a number of important advantages as has been pointed out. It is seldom necessary to resort to driving to sink the casing, and even indurated material can be penetrated at a surprisingly rapid rate. Buried timber, if not in a good state of preservation, can be penetrated without resort to other means. There is considerable weight on the platform varying from 300 to 600 lb., according to the number of men detailed to handle the drill tools. The platform itself weighs about 200 lb., and the total [illegible] weights and by causing the men, who walk around in a circle rotating the cas- [illegible]

PULLING CASING WITH LEVER

RAM USED IN DRIVING PIPE

casing ahead of the tool and to maintain an ample core.

If for any reason the casing does not go down when subjected to combined pressure and rotation, it can be driven by means of a timber weighing over 200 lb. and handled by four men like a paving ram, or by means of a heavier timber, suspended from a tripod and worked by a rope over a single sheave and operated like a pile driver. While driving is going on, the casing is constantly rotated and thus kept loose, a maximum of sinking being thus accomplished with a minimum of driving. As driving casing by a series of blows tends to push material away from the cutting shoe and thus to give incorrect cores, this hand drill gives better results when a minimum of driving is required.

Tools Employed

The tools used with this drill merit special comment. In the 25 or more years during which this drill has been used peculiar and ingenious appliances have been evolved. A spoon drill, which drills or bores and holds the material which it excavates, is one of the most effective of the tools employed. It is useful particularly in sinking in barren overburdens which will stand without casing as already described. After the casing has been started in a hole, a combination tool which works as a drill and auger, or as a drill and sand pump may be used. As it is churned up and down it loosens material from the core and catches it in the pump barrel where it is held by a valve.

The use of this drill pump offers several advantages. Drilled material is picked up by the pump as soon as it is detached from the core, and does not accumulate as sludge, with the result that no work is wasted in drilling loose material, and the drill pump is constantly striking a comparatively clean surface. Then also the core is removed with a minimum amount of change from its original characteristics and contents. This is an important point, for when the material is long subjected to the churning action of the drill, there is a loss due to attrition of the metallic content and its suspension in the muddy water. There may also be a change in the characteristics of the material penetrated, if it contains rotten boulders which may appear as clay after being subjected to the puddling effect of the drill.

Pulling the Casing

In pulling and recovering the casing after a hole has been finished, the platform and top-head are removed and a pulling cap is screwed on the top of the casing. This device permits the use of two levers, one to twist the casing forward and backward, and the other to lift by placing it on a fulcrum, near the casing, some of the men bearing down on the power arm. With a long stick a force 20 or more times the weight of the men can be exerted. As a matter of fact, it is seldom necessary to use any great effort. The casing is kept loose by the rotation of the casing while the hole is sunk, and it is also loosened by the same means during the pulling. The casing is usually removed at a rapid rate, and generally only part of the crew is needed. It is then customary to use the other men in preparing for and starting a new hole. This also increases the aggregate speed.

Accuracy of Core

The core secured by means of this drill is probably more accurate than that of any drill that uses driving methods to sink the casing. Much has been said of the tendency of material to be forced away from the drive shoe. This is particularly likely to occur in drilling alluvion which has hard and soft strata in juxtaposition. The drive pipe, in passing from a hard to a loose stratum is likely to contain several inches of hard core, or possibly a boulder the full size of the pipe, and to force the loose gravel out of the path of the shoe, and thus material properly belonging to the core will be driven away. Hard and soft strata are encountered in an irregular way in nearly all gravel deposits.

"Running ground" is fine gravel or sand with a large amount of interstitial water. It is likely to run into the casing of a drill hole, and to make a core of many times the depth represented by the distance sunk. When, in either driving, drilling, or pumping, such material is encountered, there are several reasons why the occurrence is much less likely to introduce errors when the casing is rotated. The prime benefit of rotating is in keeping the casing loose. When running ground is encountered, the casing usually sinks into it to such a depth that sufficient core accumulates to prevent running in, or the casing may penetrate entirely through the stratum to a harder layer of material underneath.

Another matter also tends to prevent difficulty. Running ground is, of course, only encountered where there is water to make it run, and it will not run into the casing unless there is considerable difference in the water level of the gravel and the water level inside the casing. The steam churn drill in general has a core in the casing indurated by driving, and this acts as a plug to prevent water from running into the casing; the sand pump removes the water from the casing. Therefore, there is generally hydrostatic pressure at the lower end of the casing tending to wash material into it; when loose material is encountered this water flows in and tends to carry material with it.

The hand drill here described has no such plug, and one effect of rotating the casing is to keep the core loose. Thus water generally flows in freely and to such an extent that the water level in the casing is not much, if any, lower than that of the alluvion outside the casing; for it runs in about as rapidly as it is taken out by the pump. Then also the pumping operation is generally carried on constantly, and there is no action parallel to that of the sand pump of the steam drill. The sand pump of the steam drill is used occasionally, and since it is about 8 ft. long and 4½ in. in diameter, it then lifts a comparatively large amount of material and water. The pump of the hand drill pumps at a slower rate, but continuously.

Mobility

A hand-drilling outfit for use with rotated casing when equipped to drill 30 ft. weighs about 1000 to 1200 lb., and it sectionalizes into one-man packs with a minimum weight of less than 75 lb. No part is bulky; it can, therefore, be transported comparatively easily under extremely difficult conditions. Only one part of the outfit, the platform, needs knocking down for long transport; it is not essential to do this for moves of moderate length, for it weighs only about 200 lb., and can be slung on a pole and carried by two men. In moving from hole to hole in the same area, the platform is easily moved by rolling like a wheel.

The whole outfit can be carried through tropical swamps and jungles, or in small canoes. In one case it was moved through the jungle where we had no trails but the lines for surveying not opened more than necessary for sighting. It was also moved over swampy areas where the men were constantly ankle-deep in a sticky mud, and where it was also necessary to use light corduroy at the working place. It was transported in small canoes over rapids so shallow that it was necessary to drag the canoes when descending as well as ascending. Streams too deep to wade were passed by felling trees for use as bridges, the men steadying themselves with long sticks while carrying the drill parts. Extremely steep hills were negotiated on narrow, rocky trails by the bare-footed men who did the packing. These instances are merely cited to indicate what may be done with a hand drill and to emphasize the advantage of its great mobility. It would have taken more time and money even to transport a steam drill to this area than was spent on the total examination with the hand drill.

Rate of Operation

In one instance the drill was used in alluvion from 16 to 32 ft. deep. The gravel contained boulders about 12 in. thick on the larger axis. Cemented lumps, fragments of laterite, agglomerated in the oxidation of iron by water containing much humic acid and vegetable matter occurred, in some instances 3 ft. or more in diameter. The gravel was of a fine to medium size and sandy to sticky. An average of more than 16 ft. of 5-in. hole per shift of 8.5 hours was made at a cost of about 50c. per ft. for operation. The cost of labor was about $1 per day. Much work is said to have been done by the Dutch government in shallow alluvian, about 10 to 15 ft. deep, at the rate of 45 ft. or more per day at a cost of less than 25c. per ft. drilled, the cost of labor being $1 per day.

Steam or Hand Drill

As a general rule, where skilled labor, fuel, water, repairs, etc., are cheap, and the conditions are such that the steam drill is easily moved, and where indurated gravel and large boulders are found, it is preferable, in consideration of operating cost, to use the heavier power machine. There are many placer deposits in inaccessible regions, where fuel and water are costly and others in which the expense for imported skilled labor would be heavy, and where transport to and over the area investigated is difficult. Repairs may be a serious matter where machine shops are not accessible. Under such conditions the hand drill is preferable. Hostile environment, inaccessibility, bad climate and poor labor that make steam drilling costly may not affect the cost of hand drilling so seriously as that involving the use of a heavier machine. Wherever a supply of cheap, unskilled, accliminated labor is available, cheap work can be done with the hand drill under the conditions mentioned above. No fuel and little water are needed, and transportation, even over surfaces almost impossible for the steam drill, is not a matter of particular difficulty. The expense for repairs and renewals is very small.

First Cost

The first cost of a hand-drilling outfit is less than one-half that of a steam drill. When the investigation involves difficult transportation to distant areas, or where roads are in bad condition, or there are no roads at all, the difference in the respective cost of the drills laid down on the ground is much greater. Some areas practically inaccessible to the steam drill may be tested with a portable drill at a moderate cost. The first cost of a hand drill landed on an area may be so much less than that of a steam drill, that high operating costs for labor, such as are noted in Alaska, may be more than compensated. As a general proposition where wages are high, there are bad transport facilities for a steam drill, high wages being often the direct result of poor transport; so the gain of using fewer men is really less than it may seem, when the lost time and difficulties of transport concomitant with steam drilling are considered.

Inasmuch as the steam drill and equipment weighs about 15 times that of the hand drill with rotated casing considerations of transport are very important in making a choice between the two machines.

A hand drill using 6-in. casing cannot generally be used advantageously to a depth of much more than 100 ft. without using spring poles or other devices. By using smaller casing greater depths may be reached. A hand drill cannot penetrate hard material as rapidly as a steam drill, nor can it operate as well in large and hard boulders. The steam drill actually drills more rapidly when set up and at work, but when considerations of lost time through moving, setting up, breakages, repairs, adjustments, bad weather, waits for fuel and water, etc., are included, and the aggregate results are compared, the hand drill may show more work at a less cost per foot than the steam drill. Of course, the conditions peculiar to the area being investigated govern these results, but there is unquestionably a large field where the hand drill can be used advantageously.

The advantages of a hand drill are principally those of great mobility and accurate results, but the cost of operating is almost all for labor; repair and renewal expenditures are so small that they are practically negligible. I operated one where there was no blacksmith outfit. I did what little sharpening was necessary on a grindstone. A hand drill can be operated more constantly in stormy weather, and in heavy rainfall. I operated while the daily rainfall was more than one in. There is very little lost time. When this feature is compared with the large time losses in steam drilling, it is obvious that, even though the steam drill operates more rapidly while actually at work, the hand drill working constantly, though more slowly, may, in the aggregate, drill more feet in a given time than a steam drill and at a lower cost.

The St. George Amalgamation-Cyanide Mill

Those familiar with mining conditions in the West Australian goldfields will be interested in the description (*Australian Mining Standard*, Sept. 30, 1908) of a plant erected by the Boulder No. 1 Company on the St. George mine at Mount Magnet. The scheme of milling differs in some respects from that common in the northern fields of the region and for this reason merits attention. The method adopted to render mineralized mine water fit for boiler use is also interesting.

The process of milling, a combination of amalgamation and cyanidation of slimes, is somewhat similar to the practice in several of our western regions. The ore, which is practically all mined from the oxidized zone is crushed, milled in stamp batteries in weak cyanide solution to pass through coarse screens and then run over amalgamating plates. These are of copper, 12 [illegible] long with a drop of 1¼ in. to the foot. Thence the pulp is run into Wheeler grinding pans where it is all slimed to 150 mesh or finer sizes. The grinding pans, four in number, are arranged in tandems, two to each five stamps. The pulp is then pumped into condensers consisting of a nest of nine inverted pyramidical spitzkasten 6 ft. square and 6 ft. deep, where it is thickened in the underflow to a specific gravity of about 1.45. The overflow from these settlers goes to the battery supply tank.

The slime is agitated with cyanide solution and then gravitates to a mixer used to feed the filters under a constant head. Two Ridgway vacuum filters are used, the cake being mixed with mine water and pumped away, the gold solution going into zinc boxes for extraction. The zinc boxes are of the usual type. The spent solution is elevated and drawn off to the wash tank of filters to the battery supply tank or to the strong solution tank, as needed.

[illegible]

In connection with the power generation the water softener is of especial interest. A 105-h.p. producer gas engine provides all power for the plant except for the crusher and pumps. For these a steam engine is used, the steam being generated in Cornish boilers from mine water previously treated to remove impurities. These impurities consist principally of salts of lime, magnesium and sodium with some aluminum silicate and organic matter. The water softener precipitates and removes these harmful calcium and magnesium salts, which would otherwise form scale in the boiler. This is automatically accomplished by introducing soda ash into the boiler supply in the proper proportions to precipitate any calcium or magnesium present as sulphates. The equation expressing this is:

[illegible] Na_2SO_4.

The precipitated insoluble carbonates are removed by filtration through wood wool. Then by utilizing exhaust steam to raise the temperature of the water the soluble acid carbonates of lime and magnesium are decomposed into water, carbon dioxide, evolved as gas, and into the insoluble normal carbonates which are again removed by filtering through wood wool. The reaction in this last case is of this nature:

[illegible]
$CO_2 + CaCO_3$

This plant was designed and erected under the supervision of W. G. Manners, of Kalgoorlie.

Air-hammer drills are being tried in stopes at Butte, Montana. The small or "chippie" piston drills have never been a success at Butte, partly owing to the miners' prejudice against them. Another peculiarity of Butte practice is the use of tripods for the machines in many stopes.

Tungsten Ore Deposits of the Coeur d'Alene

Scheelite Occurs Associated with Gold, Silver, Lead, Iron and Copper. Ore Carries 25 Per Cent. Tungsten Trioxide. Deposits Undeveloped

BY HERBERT S. AUERBACH*

In the early days of gold excitement in the Cœur d'Alene, prospectors occasionally brought in fragments of a very heavy and brittle brown rock. This was generally assayed for gold, silver, or lead, and upon yielding no returns for these metals, was cast aside as worthless. About 10 years ago this heavy brown rock was found to be scheelite (calcium tungstate), and since that time the deposits near Murray, Idaho, have aroused widespread interest among tungsten-steel manufacturers, and many exceptionally fine specimens have found their way to museums in the United States and Europe.

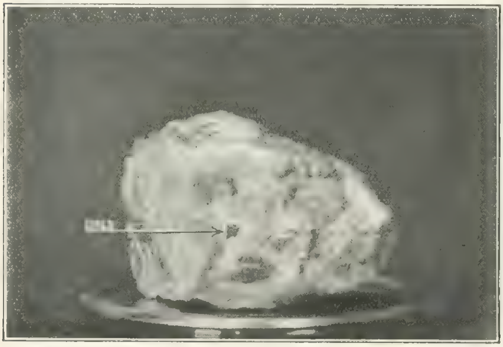


FIG. 1

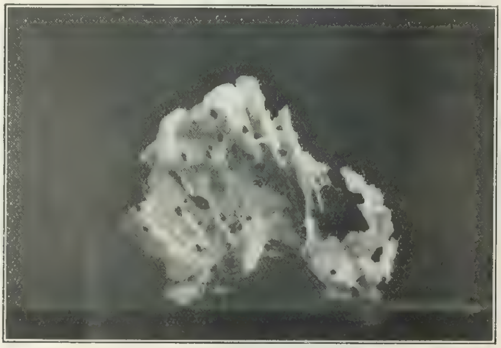


FIG. 2

So far scheelite has been found within a circle of about three miles radius, taking Murray as the center. Its principal occurrence is in the Golden Chest mine and in the Golden Winnie property, but it has been found in other places in small quantities. In the days of the gold rush, a German prospector uncovered a 2-ft. vein in Pony gulch; because of the great weight of the mineral he mistook it for an ore of lead, but when an assay showed none of that metal, he abandoned the vein, which has not been rediscovered. During placer operations in Trail and Pony gulches, scheelite was frequently found on the bedrock, and in Eagle and Tributary gulches it is washed into the sluice boxes. Dunlap and Smith, while placer mining in Eagle creek, uncovered a small vein near the Columbus group.

Golden Chest Mine

In the Golden Chest mine tungsten is found in the Klondike shoot on the Katie and Dora vein. The Klondike, a shattered and mineralized zone about 150 ft. in length by about 40 ft. in thickness, is in many ways an exceptional orebody, and has produced large quantities of rich gold ore. The main Klondike fissure varies from 1 to 20 ft. in thickness. It strikes east-west, and varies in dip between 25 and 55 deg., averaging about 38 deg. Both the hanging- and footwalls are well defined, and consist of black slate. In places a narrow gouge follows along the hangingwall. The country rocks are slates and quartzites. The gold and tungsten were introduced by an intrusion which appears to have been originally a syenite, but owing to metamorphism, it is practically impossible to classify it with exactness. It often occurs as a fine-grained rock resembling quartzite, but in some portions of the vein it shows a porphyritic structure.

The vein filling is bull quartz and ribbon quartz, with abundant iron pyrites and less amounts of chalcopyrite and galena. The scheelite is found in a shoot about 75 ft. long and has been followed to a vertical depth of approximately 350 ft., at which depth its size appears undiminished. In one place there are 5 ft. of excellent shipping scheelite, but the greatest thickness of pure mineral is 3 ft. In another portion of the vein, the concentrating ore is 15 ft. wide.

While the scheelite is found in a well defined shoot, the bodies themselves are irregular, pinching down to streaks, branching out into numerous veinlets, and again uniting to form large and solid bodies. The scheelite is, however, practically continuous from the surface to the lowest level. The ore is rather difficult to save, because of its excessive brittleness. So far about 50 tons of high-grade ore have been extracted, but only 15 tons of this were saved, the remainder having been thrown on the dump before it was known to be of value.

The analysis of ore consisting of quartz, sulphides and scheelite was: Au, 0.56 oz.; Ag, 0.22 oz.; WO_3, 25 per cent.; Pb, 12 per cent.; Fe, 6 per cent.; Cu, 2 per cent. The sulphide concentrates contained Au, 6.84 oz., and Ag, 2.91 oz. Tetrahedrite analyzed Au, 0.08 oz.; Ag, 34.20 oz. and Cu, 8.3 per cent. Four samples of scheelite showed 78.20, 76.59, 60.75 and 30.40 per cent. WO_3, respectively.

Character of the Mineral

The shipping ore is found as pure scheelite, and as scheelite with small stringers of snow-white quartz disseminated through it; also as scheelite intimately associated with a variety of sulphide minerals, such as iron pyrites, chalcopyrite, galena, sphalerite and tetrahedrite. The concentrating ore consists of pieces of scheelite, varying in size from a pin head to a walnut, shot through a gangue of quartz and quartzite. The quartz, however, is the distinctive gangue.

So far only one specimen showing native gold lying directly upon scheelite has been found (Fig. 1). Although free gold and telluride gold occur in the immediate vicinity of the scheelite, they appear to be associated with the sulphides, and not with the scheelite. An interesting specimen is shown in Fig. 2, where the scheelite occurs as a yellowish-brown filling in the cells of honeycombed milky quartz, the scheelite greatly resembling small cubes of American cheese. A section broken from the vein just below the hanging wall is shown in Fig. 3. On the top is slate and below this is quartz, showing iron pyrites at one end and scheelite at the other. In Fig. 4 are sulphides of iron and lead, spattered in the midst of solid scheelite. Fig. 5 shows the crystalline structure of scheelite. It is the best crystallized specimen that has been found in the district. Fig. 6 is a scheelite specimen weighing 62 lb., consisting practically of solid mineral.

---

*General manager, United Golden Chest Mines and Milling Company, Murray, Idaho.

The Golden Winnie Mine

At the Golden Winnie or Arrastra Smith property, on the south bank of Prichard creek, two miles west of Murray, the scheelite also occurs in conjunction with gold ore. The vein strikes east-west with a 45-deg. dip, and varies from 6 in. to 3 ft. in width. The hanging wall is slate and the footwall quartzite. As in the Golden Chest the gold- and tungsten-bearing solutions were introduced by an eruptive which has been greatly altered by metamorphism. No great depth has been attained on the vein, but considerable concentrating scheelite has been exposed and several tons of the mineral are on the dump. While most of the scheelite in this property is of concentrating grade, occasional kidneys of shipping ore are encountered. The vein is badly shaken up and twisted, but the scheelite ore is persistent although the bodies are irregular. Ribbon rock carrying gold often accompanies the scheelite. Edwin Higgins, a mining engineer who examined tungsten deposits in this district, found bar[illegible] associated with the scheelite in some parts of the Golden Winnie mine. To my knowledge the association of these two minerals has not been noted in any other tungsten deposit of the United States.

Mineralogy

The scheelite of the Murray district is of a brown color. The crystallization is tetragonal, but it is difficult to find crystallized specimens, because the mineral generally fractures in an irregular manner, exposing many sharp edges. It is extremely brittle, breaking into a powder which looks like corn meal. After exposure to the air for a time, its brittleness diminishes slightly. It gives a white streak and is nonmagnetic. The Golden Chest scheelite has a hardness of about 4.8 and a specific gravity of 6.1. Its luster varies from translucent to adamantine, and resembles many minerals of the silica group.

Theoretically scheelite consists of 80.6 per cent. WO_3 and 19.4 per cent. CaO, but the best mineral in the Murray district assays 70 to 78 per cent. WO_3. No manganese or molybdenum has ever been found with the scheelite.

Chemistry

All the commercial tungsten minerals are derivatives of tungsten trioxide (WO_3), a bright canary-yellow powder. In a reducing atmosphere the trioxide changes to dioxide, a brown-colored powder, and [illegible] is reduced to dark gray metallic tungsten. If the mineral is fused in a salt of phosphorus bead and the bead is then powdered and dissolved with tin and an excess of hydrochloric acid a deep blue solution is obtained.

Probably the simplest quantitative analysis of scheelite is by the Wohler method as follows: Crush the scheelite to a fine powder and digest with concentrated nitric acid, evaporate nearly to dryness, mix with alcohol and filter. The precipitate is yellow trioxide. Wash with alcohol, ignite and weigh. Evaporate the solution until the alcohol is expelled, neutralize with ammonia and precipitate the lime with ammonium oxalate. Dry and weigh.

[illegible]

If the tungsten is to be alloyed with steel, the sulphides must be removed, since 0.05 per cent. or more of sulphur causes red-shortness in steel. Although the electrostatic machine has successfully separated sulphides from hübnerite, attempts to separate sulphides from scheelite by electrostatic means have so far proved unsuccessful.

In the Golden Chest mill, the gold ore accompanied by scheelite was crushed in a Blake crusher, stamped to 40 mesh, passed over amalgam plates to Wilfley tables and thence to Johnson vanners. The scheelite scoured the amalgam plates and was an annoyance.

One of the greatest difficulties to contend with in milling scheelite is its tendency to slime. In the Golden Winnie mill [illegible] date, however, no serious attempt has been made to concentrate scheelite ores in the Murray district.

[illegible]

It is difficult to obtain trustworthy information concerning commercial reduction processes, which, as a rule, are carefully guarded secrets. The successful method is to heat the finely ground min[illegible] 1500 deg. C., when the trioxide is reduced to metal and the iron, manganese, calcium and oxygen combine with the carbon. Several commercial processes for reducing ore and forming alloys in the electric furnace have been devised.

Uses

Although classed among the rare metals, it is surprising to what extent tungsten is used in the industrial world. In some form or other, it is alloyed with practically all the metals. It finds, however, its greatest application as an alloy of steel, to which it imparts many valuable properties. Foreign metallurgists were the first to recognize and take advantage of this fact. Tungsten toughens steel plate, and renders it less liable to fracture, thus making it highly desirable for the production of armor plate, projectiles and firearms. High-speed tungsten-steel tools retain their temper while red hot. The addition of tungsten to steel car-springs increases their stiffness. Tungsten steel retains [illegible]

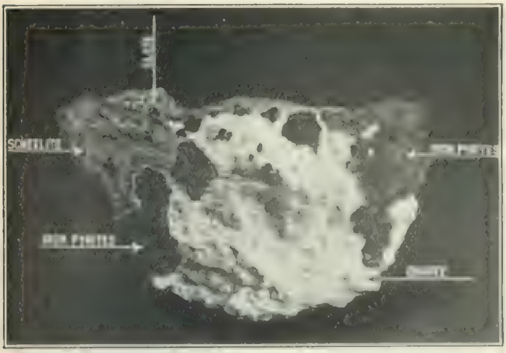
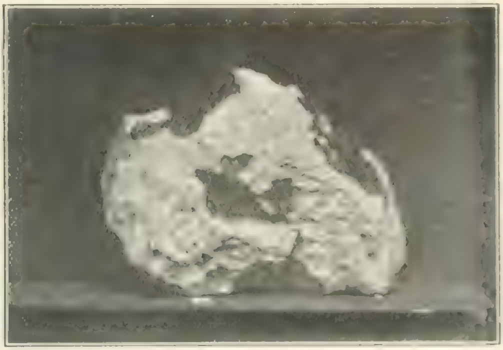


FIG. 3



nary steel, and is much used in the manufacture of electrical apparatus. Alloys of aluminum, tungsten and copper possess great lightness and strength, besides unusual resistance to oxidation. They are used for making novelties, cooking utensils, automobile parts, boat propellers, etc. Filaments of tungsten compounds are finding extensive application in incandescent lighting. They give a superior light to that of the carbon filament, and consume less electrical energy. A bronze powder much used in decorating is made by fusing potassium tungstate and tin. The salts of tungsten are prized as coloring agents in the glass and porcelain industries, while lead tungstate is employed as an adulterant in pigments. Cloth and wood when coated with a solution of sodium tungstate, glue and hydrochloric acid are rendered fireproof. Sodium tungstate also finds application as a mordant in dyeing wool. The fluorescence of calcium tungstate is employed to advantage in the fluoroscope.

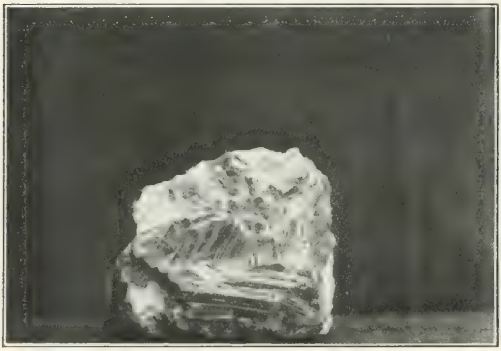


FIG. 5

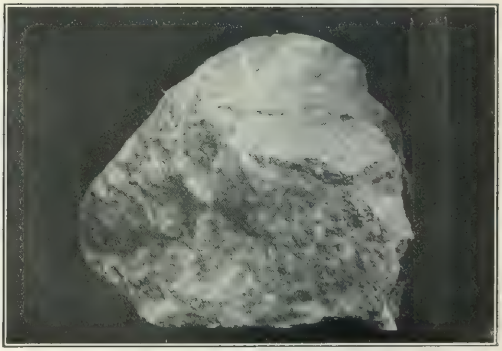


FIG 6

Prospecting for Phosphate Rock

By Francis F. Wilson, Jr.*

While installing a gasolene engine in a tow-boat on the Coosaw river, near Beaufort, S. C., I saw an odd way of prospecting for phosphate rock. This tow-boat, belonging to the Central Phosphate Company, of Beaufort, S. C., was used to serve two phosphate dredges digging rock from the bottom of the Coosaw river, and to convey the dredged and washed rock from the dredge to the mill five miles away. The dredges were of the usual type, with ordinary dip or scoop bucket, and fitted with two spuds for anchoring them when they were dredging. The phosphate rock, which is found at the bottom of the river at various points in flat layers of broken surface and of varying hardness and formation, is full of fossils of various kinds, and yields much bone phosphate. The crude rock is of dark grayish appearance, somewhat resembling limestone.

The beds are irregularly scattered along the river bottom in varying quantity; the manner of locating these beds of rock is interesting. The dredgemen are paid for the output of rock on the tonnage basis, and their working capacity is dependent upon the ability of the "sounder" to readily locate new areas of rock. The most skilful of these sounders that attracted my attention was an old hunchback negro known as Esau. Whenever a bed of rock was almost exhausted, Esau would get into his skiff and start to "sound" for rock by dropping into the river a tightly corked quart-size flask filled with water, and attached by the neck to a light cord or fish line, the free end of which he held to his ear. The bottle gradually descended to the bottom, and the string readily transmitted the vibrations caused by the bottle's striking any rock or other bodies on the bottom of the river, the end of the string being held as far within the ear as possible with the finger. By means of the sound, Esau could tell the quality and judge the thickness of the rock.

After outlining the area of the bed with floats formed by wooden sticks attached by a line to stone anchors, Esau would go over the area thus covered and test for the thickness of the rock by means of his bottle and string, but in order to do this he attached to the end of the string a heavy cardboard disk or diaphragm, about 3 in. diameter. This diaphragm he held to his ear in much the way that a telephone receiver is used.

The ability of this man to locate rich and heavy beds of rock was really marvelous, as he invariably mapped out the actual area covered by the rock and accurately designated the thickness or depth of the phosphate rock at various points in the area.

When the phosphate industry was in its infancy several years ago on the Coosaw, there were no less than 25 dredges operating on the river within a length of 10 miles.

---

*104 Woodland avenue, Coatesville, Penn.

Diamond Production in South Africa

Special Correspondence

Some interesting statistics regarding the diamond industry in South Africa were given by the London *Financial News* in its issue of Nov. 17. These statistics record a remarkable increase in the production during late years, which accounts no doubt for the financial difficulties of the diamond companies. The statistics do not claim to be complete but are probably within 5 per cent. of the total production. The figures include the output from the following mines: De Beers, New Jagersfontein, Koffyfontein, Lace mine, Frank Smith mine, Kamfersdam, Premier, Roberts Victor and Voorspoed. The production for 10 years has been, in carats:

	Carats.		Carats.
1898	3,025,039	1903	2,607,024
1899	3,261,135	1904	3,450,631
1900	1,435,689	1905	3,498,368
1901	2,532,955	1906	3,508,210
1902	2,650,193	1907	5,002,968

The increase in recent years has come from the Premier mine in the Transvaal, which is now the great competitor of the Kimberley mines of the De Beers company. The Premier first became a large producer in 1904, and its output since then has been: 749,643 carats in 1904; 845,642 in 1905; 899,746 in 1906; 1,889,937 carats in 1907. The increase was gradual until last year, when the output was more than doubled.

The Premier company is putting up a plant capable of washing 40,000 loads a day. Taking the average of 0.289 carat per load—shown in the report for 1907—this would give 11,560 carats per day; or for 300 working days 346,800 carats yearly. The average price now secured by the Premier company is stated to be $3.36 per carat.

The James Slimer

By M. T. Hoster*

The great problem in ore concentrating at present, one which is becoming more important every day, is the proper and economical handling of slimes, the finer particles of mineral-bearing pulp. It was with this end in view that the James concentrating table was designed. The general features of construction of this slimer are shown in the accompanying illustration in plan and side elevation. The entire table is about 31 ft. long; it is supported on an open steel frame by means of 44 flexible carriers, and is given a backward and forward bumping motion, of 9/16- to ⅝-in. stroke, by means of an adjustable toggle-joint arrangement, as shown at the extreme left.

The table deck is divided into four working sections, i.e., a longitudinal settling section, a stratifying section, and two finishing sections. The first 18 ft. from the left end of the table constitutes the settling section, a new departure in tables of this class. It is a smooth, flat and slightly inclined linoleum surface 3 ft. wide, with a pulp distributer fastened to its upper end. Directly behind this settling section is the stratifying basin, ⅝ in. deep, 7 ft. long and gradually decreasing in width and depth toward the lower end. The bottom of this basin is provided with centrally diverging parallel riffles ¼ in. deep and 2 in. apart. It is at the beginning of this basin that the material is divided into two equal and similar parts, both to be worked in the same manner, but entirely separate. This gives the table a large capacity. The two finishing sections constitute the remainder of the table, one section being hinged to each side of the stratifying section, and both transversely adjustable by one adjusting lever. The surface of each is of linoleum with riffles decreasing in hight toward the lower end, and bent along a definite line, as shown.

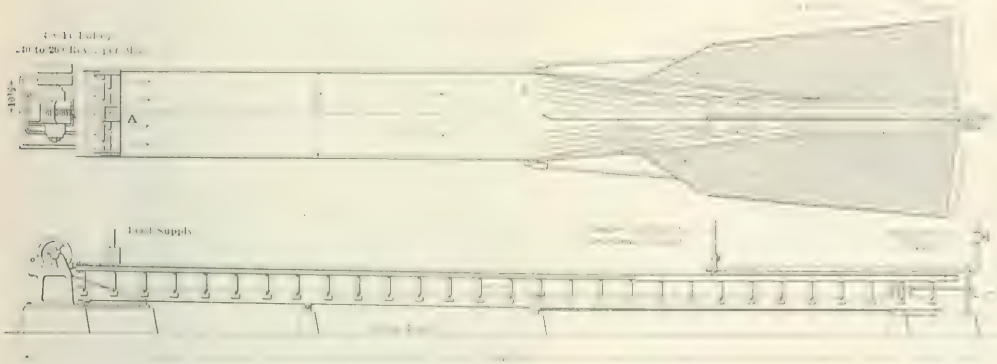
Method of Operation

The thickened pulp of fine particles is delivered into the feed distributer, and is equally distributed transversely across the head end of the table, or settling section. The pulp and slime water slowly flow down the incline, but due to this forward motion combined with the bumping motion of the table, the heavier particles of material gradually collect below and the slime water becomes disturbed just sufficiently to allow the slimes to settle.

On entering the stratifying basin the slime water, which is now clear on the surface, is divided into two streams and flows off over the two finishing sections, while the solid material is retained in the deep basin. The particles of greatest specific gravity will now move along the centrally diverging riffles and toward the center of the table, and, therefore, away from the lightest particles, which will move as shown by the long arrows.

The particles of intermediate specific gravity will move along a path midway between these extremes. By this method the values are most advantageously consolidated and stratified while in a deep basin, practically free from any water currents. As the mineral travels up the inclined and farther end of the stratifying basin it gradually spreads out on the finishing surface and is washed by the dressing water in the usual manner, without any loss of fines. From here on, the mineral follows out the line of the riffles, as is the case in various other types of tables, but as the material on this table has been fully prepared, besides saving the fines, this final separation will be most effective. The concentrates are discharged over the end of the table while the mid- [illegible] as shown in the plan.

This slimer has been in successful operation for some time at various mining camps, including: Bingham Cañon, Utah; Santa Barbara, Mexico; Alaska, and Montana. The table is undoubtedly rather long, but compared with its capacity it requires little space. About 6 gal. of wash water are required per minute at a maximum, depending upon the character of the ore.



PLAN AND ELEVATION, JAMES SLIME CONCENTRATING TABLE

---

*Park City, Utah.

Copper Smelting Suits in California

Special Correspondence

The Keswick smelter case has come to an end. This was the case of the United States against the Mountain Copper Company, of Shasta county, California, in which the Government sought to obtain an injunction against the copper company and prevent it from operating its smelter at Keswick because of injurious effect on timber lands by the fumes. The copper company had many suits pressed against it by local people and bought up many thousands of acres of land in trying to avoid possible litigation. The most pressing suit was that brought by the Government. The Government timber tracts lie many miles from the smelters, in the Pit river section and that of eastern Shasta, and the injury done was doubtful, to say the least. Much expert testimony was used in the case and there was much difference of opinion as to possible damage by smelter fumes. Finally by stipulation between the copper company and the Government the case has been dismissed. But during the long period since the institution of the suit the company has been put to much trouble and expense, which finally ended in the closing down of the smelting plant at Keswick and putting up another [illegible] above Martinez. This action was detrimental to the mining interests of Shasta [illegible]

Stripping Clinton Iron Ore in New York State

20 Feet of Over-burden Removed to Mine a 22-inch Bed of Ore; Waste Bank Carried Sixty Feet High by Means of Conveyer System

BY EDWIN HIGGINS

Within the State of New York the rocks of the Clinton formation, embracing shales, sandstones, limestones and layers of iron ore, appear at the Niagara river, near Niagara Falls, and extend for a distance of about 225 easterly, thinning out and disappearing in Otsego county. In Niagara, Orleans and Monroe counties on the west, and Otsego county on the east, the outcrop is comparatively thin, owing to the steeper dip of the strata, but in the eastern part of Wayne and in Madison and Oneida counties, where they lie almost flat, the formation reaches a width of from four to five miles. From Rochester on the west to the town of Clinton on the east the dip may be said to vary between 40 to 150 ft. to the mile. The dip throughout is toward the south.

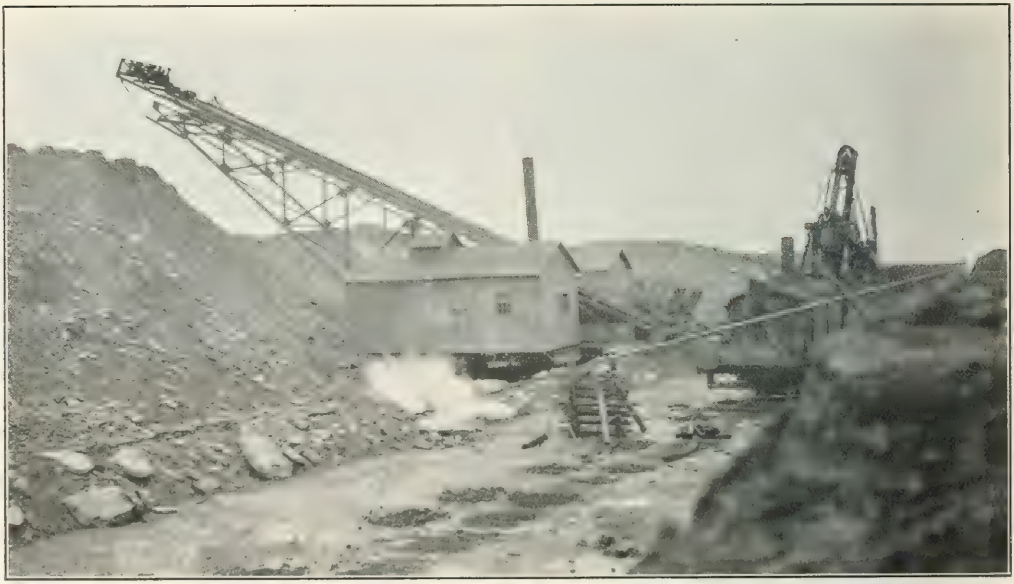


FIG. 1. STEAM SHOVEL WITH CONVEYER USED IN DISPOSING OF WASTE

In Wayne county, where the outcrop lies only a short distance from Lake Ontario, the iron-ore beds lie only a few feet above the level of the lake, which is about 246 ft. The maximum elevation is reached in Oneida county, the highest point being about 1400 feet.

THE ORE

The hematite beds are the essential features of the formation. The overburden varies, as indicated by the dip of the strata, being lightest along the northern border and increasing slightly toward the south. The minable ore varies from 20 to 36 in. in thickness. The ore is a red hematite, both the fossiliferous and oolitic varieties being found. In general they may be said to have the following range of composition: Iron, 35 to 45 per cent.; silica, 5 to 15; alumina, 3 to 8; lime, 6 to 12; magnesium oxide, 2 to 6; sulphur, trace to 0.4; phosphorus, 0.2 to 1.

Mining up to the present time has been prosecuted chiefly along the northern border of the deposits, where the overburden is comparatively light. Although the deposits were discovered at an early date, probably before the year 1800, it was about 25 years afterward that mining operations began with any degree of regularity. During the last few years the output has averaged about 75,000 tons per year. In 1907 it was over 100,000 tons.

For a complete geological and historical discussion of these deposits reference should be made to Museum Bulletin 123, "Iron Ores of the Clinton Formation in New York State," by D. H. Newland and C. A. Hartnagel. The above brief outline is given only as an introduction to the main subject of this article, i.e., the stripping operation conducted at Ontario Center, Wayne county, where the overburden is about 20 ft. in thickness and the ore from 20 to 22 in. in thickness.

FURNACEVILLE IRON COMPANY

The Furnaceville Iron Company owns a large tract of ore land and mineral rights in the vicinity of Ontario Center, Wayne county, about 15 miles northeasterly from Rochester. Here the ore comes to the surface about 1¾ miles south of Lake Ontario. The dip was not determined accurately, but it is probably not more than 40 ft. to the mile. In the present workings the overburden is about 20 ft. in thickness, 10 ft. of which is limestone, more or less shaly, the upper part being soil and glacial material. The ore varies from 20 to 22 in. in thickness, and has the following range of composition: Iron, 38 to 45 per cent.; insolubles, 11 to 16; calcium and magnesium oxides, 10 to 15; phosphorus, 0.4 to 0.6; manganese, trace to 0.05; sulphur, trace to 0.02. Most of the ore is shipped to furnaces at Emporium, Penn., although a small amount is marketed to paint manufacturers.

Early Work

Mining operations were conducted here over 30 years ago. Work was started where the overburden was lightest and the methods used were rather crude, wheelbarrows being used to remove the dirt. At one time the ore was smelted in blast furnaces at Furnaceville, the pig being shipped by way of Lake Ontario.

Up to the time when the present equipment was installed, a little over a year ago, the stripping was done by two Boston steam shovels, made by Souther & Co., of Boston. These shovels were operated more or less continuously for a period of 20 years, and, although somewhat antiquated, they are still used for special work.

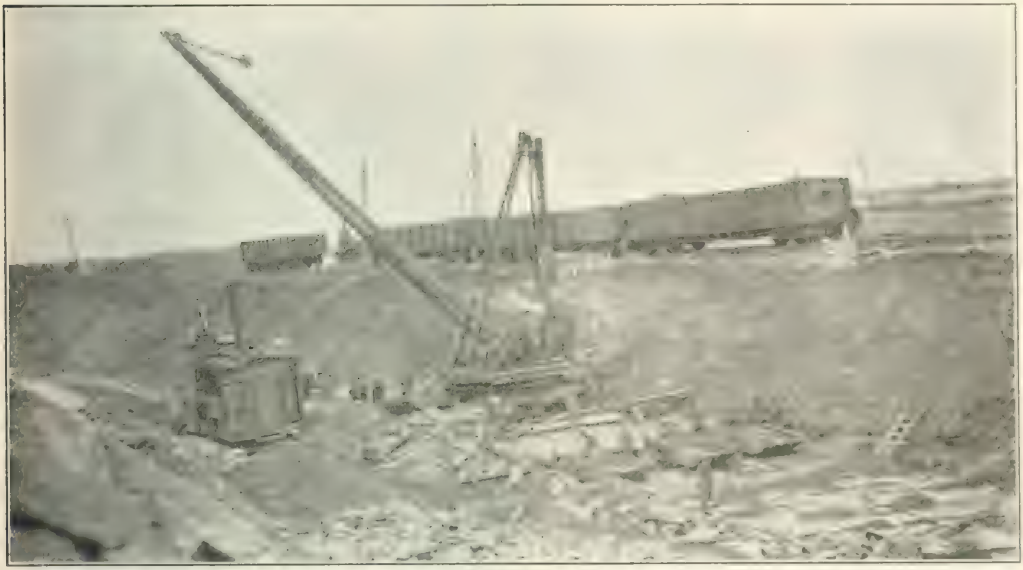


FIG. 2. BREAKING ORE AND LOADING INTO RAILWAY CARS WITH DERRICK [illegible] BOSTON STEAM SHOVEL [illegible]

Method of Mining

The mining operations, as conducted with the old Boston steam shovels, were simple, and do not differ from the practice today, except that more modern machinery has been installed for handling the dirt. A cut is carried through the overburden, exposing the ore. When the old Boston shovels were used this cut was carried 60 ft. in width, each shovel taking 30 ft. At present the cut is about 40 ft. wide, although the shovel in use is capable of taking 56 ft. The waste material is disposed of, as will be explained below, and the ore is broken and loaded into railroad cars on the bank. A spur from the Rome, Watertown & Ogdensburg railroad is carried within a few feet of the cut. When the cut has been carried as far as desired, another one is started, the railroad tracks are moved back, and the work progresses as before.

The overburden, before being removed by the steam shovel, is drilled and blasted, 6-in. holes being put down with churn drills. Two of these drills are shown at work in Fig. 5. These holes are drilled at 15-ft. centers and extend a few inches into the ore; they are loaded with from 50 to 80 lb. of 40 per cent. dynamite.

The steam shovel (see Figs. 1 and 3) discharges its load into two 5-ton skips, which stand at the bottom of the conveyer, shown in Fig. 1. These skips are hoisted to the discharge end of the conveyer, where the rock is dumped onto the waste bank. At the time of [illegible] the shovel and conveyer were not in operation, the men being engaged in breaking and loading ore in another section of the cut, shown in Fig. 2. By the use of the conveyer the waste bank is carried about 60 ft. in hight.

Removing the Ore

The operation described above disposes of the waste material, with the exception of about 8 in. of limestone capping over the ore. This capping adheres persistently to the ore and is usually blasted, although it may sometimes be removed with crowbars.

Holes are drilled through the ore at 3-ft. centers, charged with from 1½ to 1¾ sticks of 17 per cent. dynamite, and blasted. The ore breaks in slabs of varying sizes, the large pieces being broken with sledges. The broken ore is loaded into tubs by a smaller steam shovel and hoisted by means of a derrick into railroad cars on the bank. In Fig. 2 the men are seen loading the ore by hand into the tubs. This is contrary to the regular custom; the work shown was being done at a point some distance from the main operation, as noted above. It was not practicable to move the ore shovel up for this work.

[illegible]

Two churn drills, made by the Austin Manufacturing Company, of Cleveland, Ohio, are used for loosening the overburden. Each drill requires one man and burns about 400 lb. of coal in 10 hours.

The derrick for loading ore requires a [illegible] ton of coal in a 10-hour day. For stripping, a Vulcan giant steam shovel of 2½-yd. dipper capacity is used. This requires a crew of three men and consumes three tons of coal per day of 10 hours.

The conveyer in use, which was made by the Dobbie Foundry and Machine Company, of Niagara Falls, N. Y., is of interest in that the amount of waste handled has been greatly increased since its installation. The incline is 129 ft. in length. The skips are self-dumping, of 5 cu.yd. capacity, and can be hauled to the top of the incline, dumped and returned in 30 seconds. Of course, this speed cannot be maintained in ordinary work. While one skip is being dumped, the other is in place for loading.

This conveyer is equipped with a boiler and a 50-h.p. double-drum hoisting engine, [illegible] the other. There is also a steam winch for moving the machine forward. This is accomplished by attaching a rope to a "dead man" and winding by means of the winch. In the operation of the conveyer four men are required; one fireman, one hoisting engineer, one man for winch, and one topman. The coal burned is two tons per day of 10 hours.

The ore shovel is a Vulcan little giant of 1¼-yd. dipper capacity. It requires a crew of three men and burns 1½ tons of coal in 10 hours. With the aid of this shovel, as much as 300 tons of ore have been broken and loaded in one day.

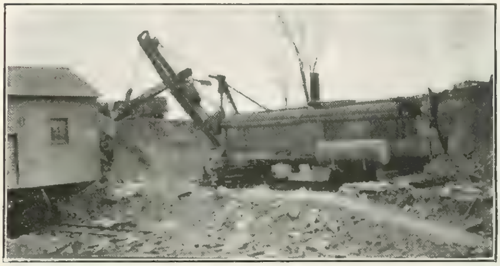


FIG. 3. VULCAN GIANT SHOVEL, WHICH IS MAKING A 40-FT. CUT; OVERBURDEN, 20 FT.

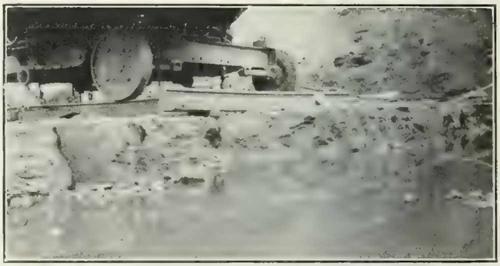


FIG. 4. FROM 20 TO 22 IN. OF ORE EXPOSED AND READY FOR BLASTING AND LOADING

In addition to the men, most of whom are Americans, required to operate the machines mentioned above, there are employed in and about the cut from 10 to 15 Italians for general work. One shift of 10 hours is worked, except in winter, when the shift is cut to nine hours. Work is prosecuted all through the winter, except in case of very severe weather.

Capacity and Cost

Little information was obtained as to production and cost of mining. However, from data at hand it is not difficult to arrive at figures which are reasonably accurate.

For example, an ore bed of 24 in. under a 20-ft. overburden, half of which is hard rock and the other half soil and boulders, will be considered. In this kind of material, where the rock must be blasted, the average steam shovel of 2½-yd. dipper capacity will remove from 1800 to 2500 cu.yd. (equivalent to from 1200 to 1700 cu.yd. in place) in a 40-ft. cut per day of 10 hours. This ore weighs about 225 lb. per cu.ft.

The accompanying table shows the approximate cost per ton of mining corresponding with the removal of varying amounts of loose overburden, and the tonnage of ore which would be developed. The ore developed may be accepted as the average daily output.

PRODUCTION AND COSTS.

Loose Overburden, Cu.yd.	Ore Developed, Tons.	Cost of Mining per Ton.
1500	34	$2.20
1800	40	1.85
2000	44	1.70
2200	50	1.50
2500	57	1.30

In arriving at these figures I have reckoned the labor costs per day as follows: Foreman, $3.50; shovel runner, $2.50; craneman, $2; fireman, $1.75; laborers, $1.30. Coal is reckoned at $3.50 per ton. It is probable that labor costs will vary slightly from these figures in different parts of the district.

Of course, the amount of material which a shovel of 2½-yd. dipper capacity can handle in 10 hours varies greatly, depending on the nature of the overburden and the facilities for disposing of the same. In the case under discussion the facilities for disposing of waste being good, 2200 yd. should be removed in 10 hours. This would correspond to an ore production of 50 tons per day, at a cost of $1.50 per ton. Under adverse conditions the yardage of overburden removed should not fall below 1800; under the most favorable conditions, on the other hand, even better than 2200 yd. could be accomplished.

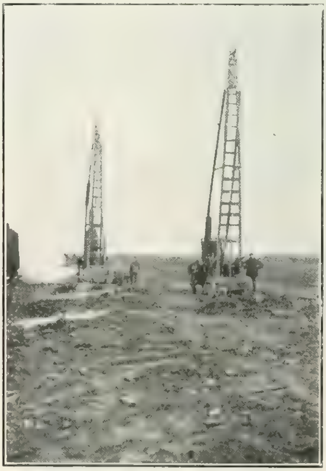


FIG. 5. CHURN DRILLS USED IN DRILLING THROUGH OVERBURDEN

In general, it may be said of mining the thin seams in this district, under an overburden of 20 ft. or more, that it would be well to carefully compare the cost of mining by stripping with that by underground methods. Where the orebed approaches 3 ft. in thickness, the above figures are subject to amplification.

The Necessity of Care in Laying a Compressed Air Pipe Line

By Edward K. Judd*

An example of those unfortunate accidents that will happen in the best regulated mines recently came under my notice.

At a certain group of bituminous mines a very complete and expensive air-compressing plant was erected in a central position, and the compressed air was to be carried to the mine openings through lines of 10-in. wrought-iron pipes. One of these lines, nearly one mile long, was laid for part of its distance in a trench which was dug along the side of the railroad yard. This yard had previously been graded and ballasted with washery waste, consisting principally of slate, but carrying a large percentage of sulphur.

When the compressors were started, about six months later, it was found, on investigation, that the portion of the pipe line through the yards had in the meantime been so completely corroded, in spots, as to be totally useless. The destruction of the pipes is obviously explained by the oxidation of the iron sulphide in the washery waste, with its accompanying liberation of sulphuric acid. Corrosion occurred in spite of the fact that the pipe was carefully bedded in clay.

In replacing this pipe line, the company has wisely laid the pipe, carefully painted with asphalt over the surface, supporting it at intervals on wooden blocks and stones. As a one-mile length of wrought-iron pipe represents an outlay of about $5000, the saving to be effected in this way is quite apparent.

The maximum temperature allowed by law in underground stopes in Victoria, Australia, is 83 deg. F.

---

*Instructor in mining, Columbia University, New York City.

Handling Crushed Rock on San Francisco Bay

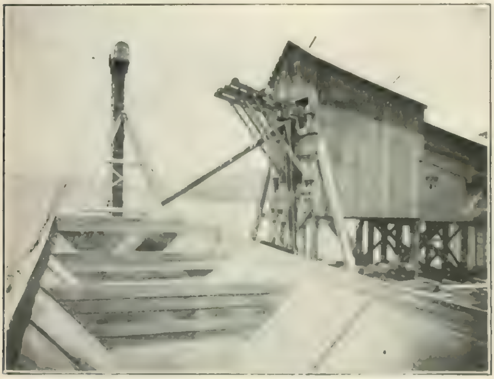
Belt Conveyers and Bucket Elevators Convey the Material to and from the Bins and Load and Discharge the Hopper Barge

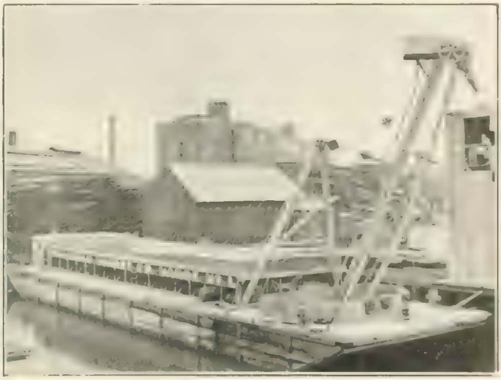
BY F. K. BLUE*

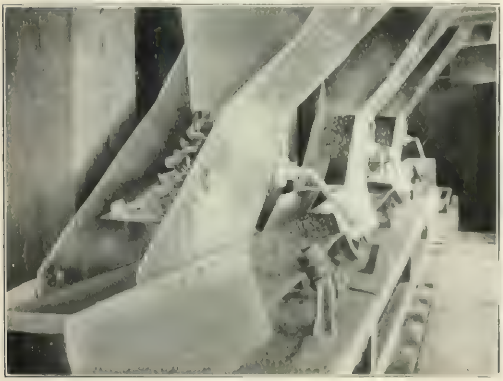
The rebuilding of San Francisco, especially with the greatly increased use of reinforced concrete in construction, suddenly caused a great demand for crushed rock that could not be met by the crushing plants then in operation. All deposits of suitable rock near the city were at once considered with a view of supplying this demand. There are several quarries of splendid rock within the city, but as the city ordinances forbid blasting in the residence district these could not be worked to any great extent, so the supply now comes from several quarries down the peninsula below San Francisco, and from others on the bay shores from which the rock is towed across to the city in barges.

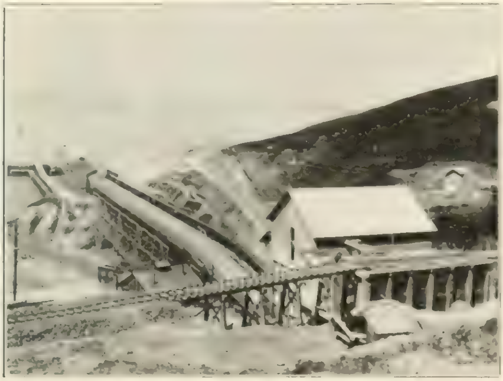
Of these quarries perhaps the most extensive and the best equipped is that of the San Pablo Quarry Company, which shortly after the fire installed a plant across the bay near Point Richmond about ten miles north of Berkeley.

A suitable piece of land on the hills and on the bay shore was secured here for quarry purposes, and operations were begun by stripping the surface of the quarry rock of the overlying coating of soil and clay. This material amounting to about 120,000 cu.yd. was sluiced down from the hillside to an impounding area at the surface of the bay, thus providing about three acres of made ground, at a total cost of about 9c. per cu.yd. The water was pumped from the bay to a hight of 100 to 200 ft. by a three-stage centrifugal pump [illegible] two 50-h.p. motors, the electric current being supplied by the long-distance transmission lines that run down from a hydroelectric station in the mountains. The water was led up the hill through a 9-in. pipe and [illegible]


SELF-DISCHARGING BARGE SHOWING HOPPER BINS


[illegible]


GATES FEEDING ROCK FROM HOPPER TO BELT


CONVEYER SYSTEM TO LOADING WHARF

---

*Mechanical engineer, San Francisco, Cal.

nozzle of an hydraulic giant, such as is used in placer mining. The material loosened up was carried down a 20-per cent. grade in ditches to the impounding area inside the bulkhead, the quantity of material transported being about 14 per cent. of the quantity of water carrying it. This method of preparing the quarry as well as the convenient method of carrying the rock to the bay and distributing it to San Francisco or any other point on the bay was planned by Edwin T. Blake, the superintendent of the company.

Bins and Transportation

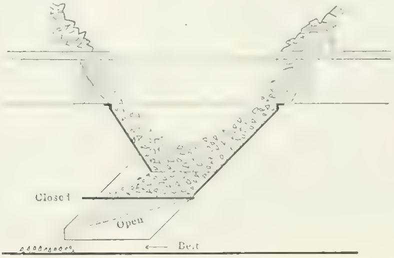
The method used for handling and transporting the rock is shown in the accompanying illustrations. A 9-ton locomotive hauls the rock in 6-ton cars from the quarry face to the receiving bunker. It is little more than a hopper to feed the rock directly into the crushers. The bottom is formed by laying old rails at an angle of 37 deg. on a rock fill. The rock passes through two No. 6 gyratory crushers and is elevated to two 40-inch. x 12-ft. revolving screens in three sections having perforations of ½, 1¼ and 2½ in., with dust rings of ¼-in. holes. The rejections pass through a No. 3 crusher at the lower end of the bunkers and are returned under the bunkers by a belt conveyer and elevated again to the screens. From the screens the rock falls into four compartments containing dust, 1-in. rock, 2-in. rock, and rejections that will not pass a 2-in. ring. In the bottom of each compartment are two feeding hoppers which may be opened to deliver the rock to two belt conveyers which carry it to the four storage bunkers, blasted out of the rock.

The operation of these loading hoppers depends upon the principle that granular material will continue to flow only so long as the surface makes an angle somewhat greater than the "angle of repose" of such material. When the tongue is level the rock can only pile up on it at the angle of repose, but when the tongue is lowered by the lever and held in the required position by the pawl and ratchet wheel the rock will flow gently on the belt as fast as desired, as indicated by the dotted lines in the illustration.

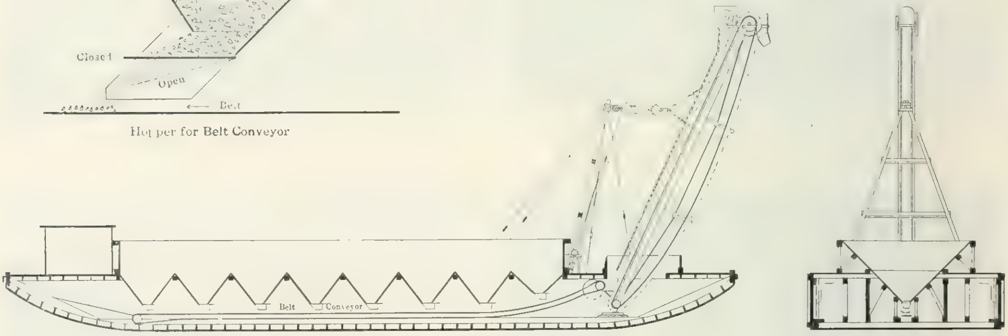
Conveyer System

The two belt conveyers carrying the rock to the storage bunkers are each 16 in. wide and 600 ft. long. They each easily carry 70 cu.yd. of rock per hour at a speed of 320 ft. per minute. The material is lifted about 7 ft. by these belts and they consume 13.5 electrical h.p. each at the motors, which are rated at 15 h.p. To carry these belts over on the bluff a trestle was built which is a little more than 50 ft. high at the highest point. The bents are spaced 16 ft. between centers. The timber is all Oregon pine brought from the mills in boats and laid on the wharf near the work. The 6x6-in. sills are laid on concrete blocks about 12 in. wide and deep. The up-hill post is toe-nailed to a 3x12-in. plank, which is creosoted and then grouted in flush into a concrete pier set in the bank. The posts are 6x6-in., the outer ones having a batter of 2 in. per foot.

Over the storage bunkers in the bluff there is a self-propelling tripper for each belt which discharges the crushed rock into any of the four bunkers. These bunkers were made by blasting conical holes in the rock and increasing their capacity a little by concrete walls between and around them. They hold from 5000 to 6000 tons each. At the bottom there are loading hoppers similar to those in the upper bunkers, which deliver the rock upon two 20-in. belt conveyers carried in a tunnel in the rock underneath the storage bunkers.



Hopper for Belt Conveyor



LONGITUDINAL AND CROSS SECTIONS OF SELF-DISCHARGE BARGE. DETAIL OF HOPPER AND GATE

Self-discharging Barge

These conveyers receive the rock from the storage bunkers, carry it out of the tunnel and over the wharf, and deliver it to a self-discharging barge. The conveyers are each 750 ft. long, and the belts are 20 in. wide of five-ply rubber with ⅛-in. rubber carrying surface. They each easily carry 150 cu.yd. of rock per hour at a speed of 450 ft. per min., and they can be loaded to carry 190 cu.yd. per hour without spilling the rock over the sides. At the outer end of the wharf the belts are curved upward to an incline of 18 deg.; by this means the rock is lifted 27 ft. and discharged into the barge by chutes as shown in the illustration. Each conveyer is driven by a 50-h.p. motor. At normal load the electrical h.p. required to drive each conveyer is about 21, but at the moment of starting 74 h.p. is consumed. When both belts are in use the barge will be loaded in about two hours.

The barge will carry 600 cu.yd. of rock. It is 120 ft. long, 34 ft. wide and 9½ ft. deep between deck and bottom. It draws 18 in. light and 7 ft., 4 in. when loaded with 700 or 800 tons of rock.

The hopper has eight sliding gates in the bottom, which load the rock on a 20-in. belt conveyer situated under the hopper in the middle of the barge as near the bottom as possible. This conveyer carries the rock to one end of the barge and drops it into a hopper which feeds it directly into the buckets of an elevator. The conveyer is driven by a 5-h.p. motor, and the belt runs 300 ft. per minute.

The elevator is of the close-connected bucket type having a belt speed of 145 ft. per min. and set at an angle of 65 deg. The buckets are 24 in. wide by 12 in. long on the belt and project 8 in. from it. It is set on a turntable and can swing on an angle of 170 deg., and discharge at either side of the barge, or at the end as desired. The top is held in position by a tackle swung from an A-frame, and it is handled from the deck by tackle and guy ropes fastened near the top.

The frame is made of two channels each 56 ft. long, braced with 2½x2x5/16-in. angles, latticed and with spreaders of plates and angles. It is also stiffened somewhat by the 1¼-in. truss rods, which are connected with the frames carrying the guide rollers. This construction, though probably heavier than if the frame had been made of angles and lattice bars in place of the channels, has proved very serviceable in resisting the knocks it has had in some pretty rough handling during storms on the bay.

The belt is held in position and kept from swinging on its return to the bottom tail pulley by guide rollers of 2½-in. pipe. These are 2½ ft. long to allow for the change in its hanging position as it stretches during service. There are also leading guide rollers to direct the belt upon its head and tail pulleys.

Method of Drive

The elevator is driven by a 20-h.p. direct-current motor which rests on a platform attached to the upper end of the elevator frame, and transmits its power to the head pulley through two sets of spur gears. It is reached by an iron ladder which passes up from near the deck of the barge just over the elevator buckets. The motor is protected by a wooden box built over it and covered with tar paper.

The illustration shows the barge alongside a wharf in San Francisco discharging the rock into a hopper from which it is distributed by a belt conveyer to receiving bunkers. From these it is discharged directly into wagons which carry it to the work in the city.

The current for the motors which drive the conveyer and elevator is furnished by a 25-kw. generator driven by a 40-h.p. gas engine placed under the deck in one of the side compartments of the barge. They are also frequently driven by current supplied from the dock at places where electric power is available.

The belt-conveying machinery for this plant was furnished by the Stephens-Adamson Manufacturing Company, and the crushing machinery and motors were made by the Allis-Chalmers Company.

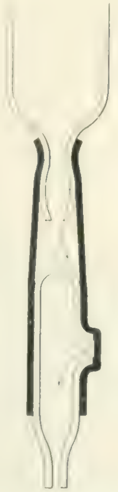
The turbo blowers used to drive the lead-blast furnaces at the Port Pirie works of the Broken Hill Proprietary Company are giving very satisfactory results, but it has been necessary to rebuild the furnaces in order to raise the water jackets, rendered necessary through the more intensive blast from the turbo blower.

Improved Pinchcock for Burettes

By George A. James*

The burette pinchcock, shown in the accompanying sketch, is one that I have used a great many years, and which I consider much superior to anything of its kind, when rubber has no effect on the solution. Based on a principle similar to that involving the use of a bead or shot, it has this advantage, that it does not leak, and it can be used a long time without developing this fault.

To use the cock, the rubber is pressed with the finger and thumb away from the side of the cock, so that the liquid finds a channel through the open teat and out through the open end. The teat or nipple can be so formed that the rubber can be stretched to any degree of tightness, but I find it more handy to use light-walled rubber tubing and a very low nipple.



[illegible]

I find that this is also an improvement on the Bunsen valve, when loose and light rubber tubing is used, and the gases are allowed to escape in the same manner as the liquid. The pinchcock can be made so as to allow the escape of gases under very slight pressure, at the same time preventing any return of gas through the same channel, a thing not easily accomplished with the Bunsen valve.

The production of phosphate rock in the United Kingdom has decreased from a [illegible] 505,671 tons.

---

*Assayer and chemist, San Francisco, [illegible]

Permanganate Method for Determining Copper

By Fred G. Hawley*

The permanganate method for the determination of copper has been in daily use in the assay offices of the Cananea Consolidated Copper Company for the last three years and has proved satisfactory. Where quick results are required and many determinations are to be made it can be used advantageously; but where speed is not essential, or copper is determined only occasionally, this method has few advantages over other standard methods. For accuracy it ranks with the iodide method and has been checked here daily by the electrolytic method; usually within 0.04 per cent. on careful work.

There are quite a number of reagents used but as each operation is very simple and quickly performed; one determination takes about 30 min., and 20 assays can be made in less than 1½ hours.

The method is essentially the same now as when first introduced here by H. A. Guess, formerly in charge of the chemical department, but it has been shortened and changed in some details. It has been thoroughly tested and the conditions under which the best results are obtained have been carefully determined. No metal commonly found in ores will interfere with the accuracy of the results.

Details of the Method

Weigh 0.5 gram of ore, or more if very low in copper, into a tall 250-c.c. beaker and add 10 to 12 c.c. of a mixture of sulphuric and nitric acids (1:3); if the ore contains talc, clay or similar minerals making filtering slow, add 4 to 8 drops of hydrofluoric acid, place on a hot plate and boil rapidly to dense fumes of sulphuric anhydride. Remove from the hot plate and cool slightly. Add 35 c.c. of water and neutralize with ammonia, avoiding excess. Add 4 c.c. of hydrochloric acid; follow this with 10 c.c. of a solution of sodium sulphite (200 c.c. per liter) to reduce the copper and iron salts. Cover with a watch glass and set on the hot plate until the solution begins to boil, when 5 c.c. of a solution of potassium thiocyanate (40 grams per liter) are added to precipitate the copper. Boil for one or two minutes but not long anough to expel all sulphurous acid. Remove from the hot plate and, with the beaker still covered, allow to settle for about five minutes. Filter and wash thoroughly with a mini-[illegible]

Replace the original beakers under the funnels and wash the copper thiocyanate with a boiling hot, 6-per cent. solution of sodium hydroxide, which decomposes the cuprous thiocyanate. The sodium hy-[illegible] and the jet directed on the precipitate in such a manner that it is thoroughly stirred, insuring complete decomposition. The cuprous thiocyanate and sodium hydroxide react according to the following equation:

---

*[illegible]

$$CuCNS + NaOH = CuOH + NaCNS.$$

The soluble sodium thiocyanate goes in the filtrate, while cuprous hydroxide being insoluble remains on the filter. After washing thoroughly, acidulate the filtrate with sulphuric acid and titrate the liberated thiocyanic acid with permanganate.

CORRECTIONS NECESSARY

Unfortunately copper thiocyanate is not absolutely insoluble and allowance must be made accordingly. Under the conditions given above a nearly constant amount of 0.005 gram copper, equivalent to 0.1 per cent. on 0.5-gram assay, remains in solution, lowering the reading by that amount. A partial compensation for this error is made by the small amounts of oxidizable matter in the sodium hydroxide and from the filter paper which raises the result 0.05 c.c. In summing up these two errors, the reading will be only 0.05 per cent. too low on 0.5-gram assay.

The strength of the permanganate solution is such that 1 c.c. is equivalent to 0.01 gram of iron. If the iron value of the solution be multiplied by 0.197 and 0.0025 gram added (for the copper left in solution) the result is equal to the copper content. Thus on 0.5-gram assays, 1 c.c. of permanganate is equivalent to nearly 0.04 per cent. copper, or 0.02 per cent. on 1-gram assays. A table may easily be made to convert the readings for iron to percentages of copper.

Where extreme accuracy is not required the permanganate solution may be so made that each 1 c.c. equals 1 per cent. copper on 0.5 gram; then in standardizing and in regular work add one drop, or about 0.05 c.c. excess to allow for the copper left in solution. This solution requires about 14.5 grams potassium permanganate per liter. Much time is saved by making all solutions of definite strength and keeping them in bulk. These solutions are added to the assays from large 500 c.c. dispensing burettes. With a little practice one can judge the amount used so closely that the reading need not be taken.

PRECAUTIONS

If the amount of hydrofluoric acid used does not exceed a few drops it will not sensibly affect the beaker or larger particles of ore, but will effectually decompose the slimes. I have used it 25 times or more in the same beaker before the glass showed signs of etching. This treatment with hydrofluoric acid lessens the tendency to spit and bump, while boiling off the nitric acid, and leaves the assay in a condition to filter rapidly later on. Under proper conditions, hydrofluoric acid can also be used to advantage in other determinations that are to be made on ores difficult to filter; it is useful in the iodide method for copper and the molybdate method for lead.

If the solution turns red (and stays so) after adding the thiocyanate, it indicates that some iron is in the ferric state, and that more sodium sulphite should be added to reduce it. Ferric salts react with cuprous thiocyanate, oxidizing it and the results are then slightly low.

Five cubic centimeters of potassium thiocyanate solution will precipitate 0.125 gram of copper; therefore, if the ore contains more than that amount more thiocyanate should be used, but a large excess is to be avoided.

Hydrochloric acid may be present up to 4 per cent., but above that amount it noticeably increases the solubility of the cuprous thiocyanate. Free sulphuric acid should not be present except in very small amounts.

When titrating, the solution should have a bulk of at least 100 c.c.; otherwise some of the hydrocyanic acid formed in oxidizing the thiocyanic acid may escape into the room with injurious effect.

When extreme accuracy is desired it is best to measure the reagents as the results are somewhat affected by any considerable variation in the quantity used. In the permanganate method, as in most others, some experience and careful attention to every detail is necessary to secure the best results.

Mine Taxes in California

SPECIAL CORRESPONDENCE

One large mining company in any mining district makes quite a material difference to the locality, and is generally worth a dozen or so small ones. A good instance of this is that of the North Star Mines Company, of Grass Valley, the most productive gold mine in California. This company pays about $16,000 a year taxes to the county of Nevada and in the matter of a special school tax recently paid $1400 of the school district taxes, amounting in all to $6000. The company bears a goodly proportion of the burden of taxation in the district and the county. This is one of the few gold mines of California which annually publishes a complete report of its affairs including its earnings and expenses so the tax collectors are in no doubt as to what to do. Most other companies which are mining in California conceal the figures of output so the tax collector cannot assess them too high. This is one reason why statisticians have trouble in obtaining figures of output, the mineowners supposing that perhaps the figures may be learned by the tax collectors, which is a foolish idea, for such returns are always held confidential, and, in fact, tax collectors never even ask for them, knowing they would be refused the information.

Steel Construction

In all steel-work construction it is the usual and best practice to bring all strain lines to a meeting place in a common point. This, however, is sometimes difficult, and gusset plates of sufficient stiffness to take up the torsion are introduced. This is one reason, but far from the only one, for the economy shown in certain classes of truss work, where the members are built up of two angles and a continuous plate rather than of the usual two angles with gusset plates introduced at the panel points only. The economy of this type of truss is not only in the saving effected in the shop by the handling of a smaller number of pieces, but the purlins resting on the top chords do not have to be brought over panel points. The moment of inertia of the combined section is sufficient in properly proportioned trusses to take care of the bending moment introduced by purlins resting between panel points. The amount of templet making is also reduced, especially of the smaller sizes, and the greater portion of the riveting being done by a multiple punch, otherwise known as a "cosine" punch the work of fabrication is facilitated to no slight extent. Trusses of this type, having more material in them than the ordinary angle and gusset-plate type, ore really cheaper to build than the latter, in most cases.

An excellent arrangement when trusses are brought down on the top of columns in buildings of gable construction is to make the columns of channel sections, with the flanges turned in, and latticed; the cap plate of the column is made the base plate of the truss, and the struts between columns on the side of the building are made of four angles back to back in the "I" section, latticed. Where the struts connect, they straddle the cap plate of the column and the base plate of the truss, whichever the single piece may be termed. The bottom chord bracing is riveted to the same plate, and all strain lines are thus brought together at one common center; in this case, the center line of the column at the cap plate. The top chord bracing in the roof trusses is usually made of sway rods, and for work of the character found about metallurgical plants, they give ample sectional area. Elongated holes are punched through the top chord web plate, and a check washer made up of a bent plate is riveted over this; the sway rod is placed through a hole in the end and drawn up by nuts. No clevises are required, and the threads at both ends of the sway rod can be right-hand.

Irrespective of the load which any column has to carry, if made of channels it should not be constructed of less than the 6-in. size; even this is usually too light for rigidity, and 8-in. channel columns are used in the best practice for the lightest loads.

A Scientific Search for a New Goldfield

By a Study of Ore Occurrence at Goldfield and of the Fault Systems of Nevada a New Alunite and Gold District Was Discovered

BY ROBERT T. HILL

The discovery of the close association of alunite with the gold ores at Goldfield, which had not been recognized in Nevada prior to Ransome's investigation, throws great light upon the origin and nature of the ores, and in seeking other gold localities in that State the occurrence of alunite in association with gold would be a prime desideratum. This belief that we might find another alunite gold locality was inspired by the following extract from Ransome:[1]

"It is not believed that the Goldfield district is unique in the possession of this alunite type. Other examples are likely to be found among the great number of ore deposits associated with Tertiary volcanism, particularly when more investigators of mining districts realize the importance of close studies of rock alteration, such as have been so admirably carried out in this country by Mr. Lindgren and in Europe by the later Professor Stelzner, and when they accept neither kaolinite nor sericite on faith and external appearance."

Having endeavored to assimilate the type of ore occurrence and outcrops at Goldfield and to familiarize myself with the aspects, I resolved to take to the prospecting field and endeavor to find another locality in Nevada similar in its general features to Goldfield.

Difficulty of Distinguishing Alunite

Clearly the task before us was to find another area of igneous rocks approximating those of Goldfield, which had been similarly alunitized by fumarolic action and which carried at the surface prospect similar gold and associated minerals. Now alunite is a rare and not easily distinguishable mineral, and I am frank to say that, after a summer's research for it and the successful finding of it, I would pronounce no rock alunite, except by aid of both careful microscopic examination and chemical analysis.

In fact an eminent authority upon petrography, who has aided us in our researches, has stated that alunite is such a new thing in rock analysis that it emphasizes the necessity of confirming the results of microscopic determination by chemical tests, particularly where the quartz or alunite occurs in crypto-crystalline condition.

In the face of such conditions the finding of alunite would appear apparently a hopeless task; but such is not the case, for the broader principles of geology came to our assistance, and by their aid we were enabled by successive steps from condition to condition to find another locality of the alunite type.

The processes of reasoning which were pursued were as follows: Inasmuch as alunite is an alteration product of the feldspar of certain volcanic rocks, which had been penetrated by fumarolic vapors arising along fractures, and inasmuch as such occurrences of volcanic rocks and fractures usually occur at areas of fault intersections, the problem before us was first to find an area exhibiting the general controling conditions, i.e., altered igneous rocks, evidence of fumarolic action, and good faulting, and then, by the aid of the microscope, chemical analysis and the assay, to determine whether they were alunitized and mineralized.

BLACK ANDESITE FOOTHILLS, AT [illegible]

Prospecting Outfit

My principal equipment consisted of an observing eye, a belief that in nature there is a law for all things, a knowledge of what others had found out about these laws and country before me; and whatever kind of transportation the people of the country used. A gold pan, United States Geological Survey topographic maps, for such areas as are covered by them, and a traverse plane table were also carried.

Of course, one could have added all kinds of things to these essentials sufficient for a completely equipped caravan: Blowpipe outfit, petrographic microscope, field tents, leggings, Piccadilly collars, and everything one could think he might need. It has been my experience, however, that the best way to outfit is to assemble carefully everything one thinks he could need and then to hold an inquest over the pile and throw away everything one can possibly do without. As a result, a good prospecting outfit will reduce itself (aside from transportation) to a cow-boy blanket roll, a coffee pot, a frying pan, a bread pan, a stew pan, one extra canvas for rain or shade, a saddle, something to eat, and a compass.

[illegible]

Another important point in the geology of Goldfield not touched upon in the foregoing descriptions, is that the Goldfield [illegible] faulted area and probably at a point along that fault where there have been great intersections. This fact of broad geology brings the prospector to face some general conditions which must be touched upon.

The broader physiography and geology of Nevada is the simplest thing in nature and the most poorly represented on maps of any part of our country. In general it consists of elongated mountain ranges and stretches of desert. The topography can all be classified into destructional mountain forms and débris-filled valleys. Very rarely there is an originally piled-up mountain in the form of an isolated basal-

---

*Mining engineer, 25 Broad street, New York.

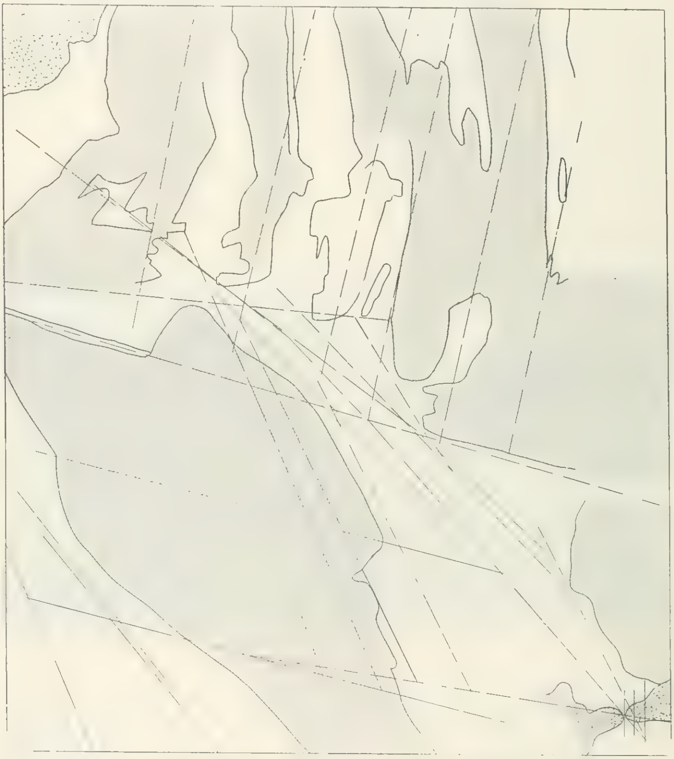
[1] "The Association of Alunite with Gold in the Goldfield District, Nevada." By F. L. Ransome. Economic Geology, Vol. II, No. 7, pp. 667-692; Oct.-Nov., 1907.

[illegible]

tic cone. The formations and material can all be grouped into these three simple categories: The bed-rock complex, later igneous rocks and desert material. The mountains are composed of bed-rock complex and Tertiary eruptives; the desert formations are made of their débris.

The bed-rock complex is composed of three distinct unit groups of rocks: (1) Pre-Cambrian metamorphics and granites; (2) ancient marine sedimentary rocks of Paleozoic age, quartzites, limestones, shales, etc.; and (3) with some few patches of Mesozoic.

This group constitutes most of the mountain masses and, as a whole, it is wrinkled or folded in open anticlines and synclines; and most of these wrinkles were made before the modern eruptives and faulting appeared. As a whole, so far as gold occurrence is concerned, this group may be considered as a unit.



THIRTY-SIX HUNDRED SQUARE MILES OF NEVADA SHOWING REGIONAL FAULTING

The Tertiary igneous rocks include granite (monzonites) "porphyries" (andesites) rhyolite, latite, "malpais" (basaltic lavas), and many other species of intrusives and effusives (igneous rock) of later geologic time, protruding into and through the basement complex.

It is a hopeless task for the prospector ever to learn to distinguish the various species of igneous rock; "granite," "porphyry" and "malpais" as used by him are pretty good field classifications, and about as far as he can go without plunging into error. The best way for him is to learn to tell them as a class and to cut out the other mountain rocks, belonging to the complex basement, from his field of research.

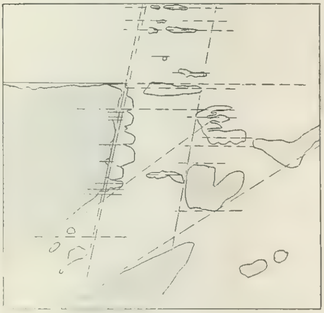
Fault Systems

Of all natural aspects, faults and fault systems are the most important and essential guides and features in mining and prospecting provided mineralization has been determined. Faults are the great channels through which the volcanic magmas and their mineralizing vapors reach the outer crust, and are the accompaniments of the same earth movements which produce folded mountain systems. There are fault systems as well as mountain systems. Sometimes even these fault systems antedate the folding.

The effects of faulting persist in nature longer than the effects of folding, and these effects dominate the topography and geography of the country more permanently, although in a less readily discernible manner than any other structural feature. The mountains will wear away, but the fault fractures preserved in the eroding by the cliff line or adopted by the water courses will persistently impart their presence on all future geography, as the directions of the courses of great rivers or even the desert valleys.

Desert weathering and degradation of the type which I recently described in another article, has dulled the regularity of the fault scarps in some instances, but to one versed in physiography many examples are preserved in southern Nevada where they are astonishingly and overwhelmingly apparent. However faults may be found in social affairs, it is difficult for men to find them in nature. In fact, the talent of geological faultfinding or seeing is often lacking even in professional geologists; and their appreciation comes from long topographic and geologic experience. A knowledge of fault finding is one of the most important equipments to the prospector, for all great ore deposits not only occur in or adjacent to great fault systems, but frequently and usually at their intersection.

Now to the miner it is more important that the fault systems should be unraveled than the folding, for sometimes, as in Nevada, especially at Goldfield, the mines are found in eroded valleys where the faults persist and the mountains do not; and again much of the mountain folding is more ancient than important fault systems.

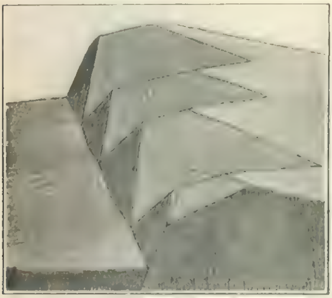


ONE SQUARE MILE OF THE REGION SHOWN IN THE LARGER MAP

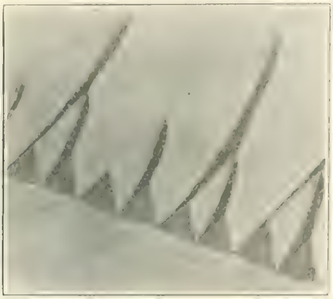
Three great tectonic movements, each accompanied by intense faulting in a characteristic axial direction have left their impression on the topography of Nevada, and have made the channels for the ascending vapors of mineralization. Two of these types, the northwest-southeast and the north-south, are now well known to dominate the American Cordilleran continent. The third, the east-west, which has not as yet been interpreted or described, is also most important and its full significance will become clearer as research progresses. The three major fault systems mentioned are: (1) the Rocky mountain north-south system, (2) the Mexican or northwest system, and (3) the little understood east-west system.

The Mexican, or northwest system, [illegible] obliquely across the north-south and east-west systems, producing along the western border of Nevada nearly parallel to the California-Nevada State line, a series of northwest-southeast ranges and valley deserts of the Death Valley type.

The greater mineral occurrences of southwestern Nevada, as well as of Arizona and the Mexican plateau, practically occur at intersections along this northwest-southeast fracture system. In fact, if one will place a straight edge upon a proper map of North America and draw a line from Comstock, Nev., to Pachuca, Mexico, a distance of 2500 miles, he will find that many of the great modern mining camps of the Cordilleran region lie adjacent to this line, including Comstock, Tonopah, Goldfield, Searchlight, Globe, Clifton, Bisbee, Cananea, Ocampo, Guanajuato, El Oro and Pachuca.



No. 1



No. 2

Relation of Faults to Ore Deposits

The occurrence of the great mineral localities discovered along this zone is a broad generalization which needs refinement, for it is not alleged that the zone is continuously mineralized. It is known that the ore occurs only widely in spots along this zone in southwestern Nevada and elsewhere.

It is the crossing of the north-south Rocky mountain fault trend by the northwest Mexican fault trend that causes some of the greatest and least explained topographic phenomena of the Mexican region, like the sudden transitions in Arizona and New Mexico from the Colorado plateau and Rocky mountain region to the physical characters of the Mexican plateau, in the great bends of the Colorado, the southern scarp line of the Colorado plateau and the remarkable geological crux at El Paso, Texas, and other points which I have lately described.[2]

The effect of these three great intersecting fault systems upon the hard consolidated strata of the folded basement complex in Nevada is a series of elongated mountain blocks (ranges) separated by intervening valleys and deserts, which were developed originally by drainage along the fault lines. In a general way the great fault lines are indicated in the topography on good maps, like the Amargosa and Las Vegas quadrangles of the United States Geological Survey, but are utterly lost on bad maps, like the average commercial map of Nevada. There is no good map of the State. Concerning the "Geological Reconnaissance Map of Nevada, South of the 40th Parallel," by J. H. Spurr, the author, in accordance with a good principle that a bad map is better than no map, frankly confesses that: "Anyone examining it closely will find it nearly all inaccurate."

Unfortunately for the miner, as well as for knowledge in general, the [illegible] sequence and relations of the great fault systems of Nevada have not been clearly mapped and defined. Most of the geologic literature of Nevada, with one or two notable exceptions, seems to be controversal in regard to the fault systems, and the controversy seems to have ended without conclusions. G. K. Gilbert, the dean and master of American physiography, 30 years ago announced his theory that the desert ranges of Nevada were chiefly faulted blocks. Spurr, the young and intrepid, later controverted this theory and concluded that the mountains were mostly residual erosion forms. I am not the umpire in this controversy; but my opinion, based upon my own observations, is that Gilbert's position is in general more nearly correct, and that Nevada is check-boarded with great faults which, when understood, will be found to be the chief key to most of its geographic, geologic and mineralogic features.

Spurr has said that: "The chief faults belong to a north and south and an east and west system."[3] I believe that if he would continue his work farther that he would now say that: "The chief faults of all the faults run in a west of north to south of east direction, and that the north and south and east and west systems are subordinate to them."

Tonopah, Goldfield and Rhyolite are all along a great northwest-southeast fault. [illegible] more northwesterly fault extending toward Searchlight and bleaching out the west side of Spring mountain range, and these faults cut through Railroad pass. Where the east-west faults and north-south faults intersect with the northwest faults, hot springs still frequently exist, and ancient alunitizing fumarolic localities should be looked for. The east side of Spring mountain range and the west side of El Dorado ranges are also bounded by faults parallel to the Rhyolite-Searchlight fault.

APPLYING THE PRINCIPLES DISCOVERED

It is not necessary to weary the reader with the details of how we proceeded to apply these principles in prospecting trips in Nevada. It is sufficient to say that [illegible] pleasant camp experiences, we canceled out as impractical large areas and explored others which seemed probable. The result of our investigations, however, was [illegible] combining all the essentials, features of rock material, faulting, rock alteration, alunitization, surface mineralization and other peculiarities of Goldfield.

The finding of our locality, however, was a simple task in comparison with the [illegible]

No. 3

[illegible]

---

[2] Science, May 3, 1907, pp. 710-712.

[3] [illegible]

rock material. Finally, sites had to be selected for prospect shafts. Today workmen are steadily sinking toward the expected ores of the unweathered zone. The details of this locality which may be called a scientific prospect will be described in a later article.

Gold Dredging in California

Special Correspondence

The dredging industry of California is fast increasing in importance and in output. The new machines recently built are far more powerful and of greater capacity than those first in use, and what is of still greater importance are more cheaply operated and better gold savers. The use of double banks of gold-saving tables on the larger machines gives much more amalgamating surface that was possible by the old plan. The adoption of hydraulic nozzles throwing water under pressure on the hard ground in certain localities, breaking it down into the buckets, relieves the dredges of much work, and increases their capacity for digging in a given time. The rotary screens are also excellent, especially where the gravel is hard to wash. It was this feature which brought about the litigation recently alluded to in The Engineering and Mining Journal, and the courts have decided that the combination involving the rotary screen or grizzly as one of its elements can be used only by permission of the inventor.

Twelve new dredges have been set in operation in this State since the beginning of the year and about a dozen more are being built or are planned for. There are now 69 gold-mining dredges in operation in California. Of these 37 are in Butte county; two in Calaveras county; one each in the counties of Merced, Stanislaus, Shasta, Placer and Siskiyou; 10 in Sacramento, and 15 in Yuba county. The principal fields continue to be at Oroville, Butte county, Marysville, Yuba county and Folsom, Sacramento county, where there are large tracts of available dredging ground at points where the Feather, Yuba and American rivers cease to be torrential streams and widen out as they debouch from the mountains or foothills into the valley sections. It is at points like these, in cases where the streams flow through placer fields, that the best dredging ground is found.

At such points, though the gold is fine, it is pretty evenly distributed through the gravel and the average per cubic yard is subject to little change. At other places in the State small areas of ground available for dredging have been found in isolated spots, generally but a few hundred acres in extent. At such places one or two dredges can be profitably installed. Along the Klamath river in Trinity and Siskiyou counties several dredges are being built, but not more than one at any particular place, the area where dredging may be carried on being usually small.

The most profitable dredging appears to be carried on near to, but away from the rivers themselves and but little is being done in the river beds proper. Those set at work directly in the river beds in most of the counties of the State are liable to be enjoined unless they are "landlocked," that is, throw a rock wall around the pits where operations are carried on, so that the material disturbed in the digging may be confined and not allowed to pass into the running stream. Where this latter occurs, there is liability of damage to the lands adjacent to the streams, and litigation is apt to ensue. The dredge-men perfectly understand this feature and are usually careful to avoid any chance of harming other interests and involving themselves in lawsuits. Moreover, when dredges are operated in the main rivers there is liability of wreck and damage to the machines in case of floods. This was demonstrated at Oroville last year, for the spring floods in the Feather river destroyed several dredges altogether, and damaged several others so that costly repairs had to be made. Operations are now almost entirely confined to places at some distance from the river bed, though some machines are running close to the banks so as to mine certain tracts of land there. Some of the large new dredges are now mining in soft ground at a cost of less than 2c. per cubic yard for operating expenses.

This month the dredge which has been building at Hamburg Bar, on the Klamath river, Siskiyou county, has been launched. The machinery was built by the Byron Jackson Iron Works in San Francisco, and is of the suction type. The principal owners in the company are J. A. Brent and Thomas Bair, of Arcata, Humboldt county.

At Marigold, in Yuba county, a pit is being dug for launching the hull and installing the machinery of the largest dredge in the Marysville field. The big Scott river dredge in Siskiyou county has been started up. The building of this dredge was a difficult undertaking as the heavy machinery had to be hauled over mountain roads a long distance from the railroad station, and even the heavy timbers had also to be transported by team. The Gold Bar Dredging Company, of Chico, Butte county, is building a "dry land" dredge to be used in that county.

The Mokelumne Dredging Company, in Calaveras county, has reconstructed its dredge this year and installed electric machinery. This is a Philadelphia company. The shortness of water this fall has affected the dredging industry in California to some extent, mainly in the way of reduced power available. The search for available dredging ground is still continued, and much prospecting and drilling is going on in different portions of the State.

Gold Production in Australasia

During the third quarter of the present year gold production in Australia and New Zealand has improved. The returns for the first half of the year showed a decrease of 2.6 per cent. in the total output, as compared with 1907; but for nine months, now covered by official returns, the loss is only 1.9 per cent. The table herewith sums up the official returns for the nine months ended Sept. 30, in nearly complete form. It has been necessary only to estimate the comparatively small production of South Australia and Tasmania. The South Australian figures include the Northern Territory:

GOLD PRODUCTION OF AUSTRALASIA, NINE MONTHS.

	1907.	1908.
Western Australia	1,247,153	1,235,367
Victoria	502,084	483,426
Queensland	341,873	338,053
New South Wales	182,473	170,296
South Australia	11,250	10,025
Tasmania	48,100	39,900
Total Commonwealth	2,332,933	2,277,067
New Zealand	359,600	363,533
Total, oz	2,692,533	2,640,600
Total value	$55,675,327	$54,581,202

The total decrease shown this year was 51,933 oz., or 1.9 per cent. Only New Zealand shows a gain.

Western Australia showed an increase of 9450 oz. during the third quarter; this, however, was not enough to offset the loss during the first half of the year. The decrease would have been less, but for a stoppage in the Kalgoorlie mines in July, resulting from short supply of fuel, owing to a strike. The main cause of lower production, however, is the lower grade of ore in some of the chief mines. This State supplied this year 46.8 per cent. of the total Australasian production.

In Victoria, the second State in production, the decrease was due chiefly to the closing down of several of the deep lead mines, and to a reduction in the output of the Ballarat district. The old district of Bendigo maintains its position as a large producer. In Queensland the decline was almost entirely in the gold obtained from the copper smelters. Mount Morgan kept up its record, but several other districts decreased.

New South Wales had the largest proportional decrease, resulting from the temporary closing down of several large mines. Like Western Australia, however, this State increased its production in the third quarter. Tasmania and South Australia are comparatively small producers; the latter is quite likely to show an increase in the fourth quarter from the inclusion of belated returns from the Northern Territory.

In New Zealand the increased production was from the Waihi and the lesser mines in the Ohinemuri district; with some assistance from the mines in the new Tairua district. The dredging returns from the West Coast and Otago districts are declining. The Waihi continues to make good its position as one of the great gold mines of the world.

Indications are that the gold production of Australasia for 1908 will be larger than appeared probable earlier in the year; it may equal that of 1907, and if not, the decrease will be small.

California Quicksilver Mines

Special Correspondence

The closing down of the Great Eastern quicksilver mine, in Sonoma county, California, marks the end of a mine which has been productive for the past 20 years. Under present conditions of the quicksilver industry it is no longer profitable. Indeed, few mines in California are making any money out of cinnabar ore. The exception is the New Idria, of San Benito county, where the operations are conducted on a large scale and under economical conditions. B. M. Newcomb, the manager of that as well as other California quicksilver mines owned by Boston capitalists, has bent all his energies toward reducing expenses, both of mining and reducing the ores, and has installed every labor-saving device possible. He spent much money in overhauling the plant and putting it in shape to handle very low-grade ores, and in this has been specially successful. The mine has been for some time the largest producer in California, taking the place of the old New Almaden in this respect.

Water Power Plants for California Mines

Special Correspondence

On Dec. 10 the new plant of the Great Western Power Company, at Las Plumas, on the Feather river, about 20 miles above Oroville, Butte county, will be put in operation. Work has been going on there for several years, and many millions of dollars have been spent in construction and machinery. It is supposed that this is the largest electric generating plant in the world, as it will produce 144,000 h.p. The whole river will be turned through the three-mile tunnel, gaining a fall of 75 ft., and at the lower end of the tunnel there is a drop of 540 ft. to the power house. The entire tunnel is lined with concrete and smoothly finished inside. An old mining tunnel was utilized, extended and widened for this purpose. There are eight generators of 18,000 h.p. each, four of which will be put in operation next month. The new Cowell cement works in Contra Costa county, 150 miles distant, will start at once as soon as this electric power is turned on. The power will not only be furnished to mines, but small towns and to the cities of Oakland and San Francisco. This new plant is nearly five times as large as that of the California Gas and Electric station at Electra, heretofore the largest in the State.

The Northern California Power Company, which already has three large electric plants in operation, has commenced work on a fourth one, on Battle creek, in the Manton district, Tehama county. Owing to the difficulty of hauling in steel pipe, a boiler and machine shop is being built on the site of the power plant where the pipe will be manufactured. The water of several irrigating ditches will be added to the waters of Battle creek to furnish an adequate supply for the new power plant.

Ore Treatment at Mount Morgan, Queensland

There are three classes of ore at Mount Morgan, Queensland, Australia, (Bull. No. 6, *Mineral Resources*, Department of Mines, New South Wales, p. 68): The oxidized, non-cupriferous, free-milling ore found above the 300-ft. level; the slightly cupriferous pyritic ore, treated by roasting and leaching and found between the 300- and the 600-ft. levels; the cupriferous pyrite ore, treated by smelting and found below the 650-ft. level. The gold in the first class of ore is recovered by ordinary milling and chlorination. The slightly cupriferous ore, which contains about 1 per cent. copper, is treated by roasting, leaching with sulphuric acid, and then by chlorination to obtain the gold. The ore is crushed in ball mills to 20 mesh, and then roasted in reverberatories. After that, the roasted ore is charged into vats of large capacity (several holding 1000 tons). This ore is first treated with a weak solution of sulphuric acid (waste liquor from cementation canals) which dissolves most of the copper. The roasted and washed ore is then treated with chlorine solution so as to dissolve the gold. As this solution dissolves more copper, after the gold is removed by precipitation on charcoal filters, the solution is passed through copper-precipitating canals; the solution is then brought up to proper chlorine strength and used again.

The timbers and ironwork, such as ladder hangers, etc., in the Moruya silver mine, Australia, after being under water for 35 years, according to *Bulletin* No. 6, page 58, Department of Mines, New South Wales, were found to be in good condition. The ore is mainly arsenopyrite with some zinc blende. The preservative agent was, therefore, probably arsenic.

Coniagas Mines, Ltd.

The report of the Coniagas Mines, Ltd., for the fiscal year ended Oct. 31, 1908, states that the concentrating mill has been extended and 20 stamps have been installed together with a gas engine and additional concentrating machinery. Ten more stamps are to be added and the capacity of the mill will be increased from 45 to 90 tons per day. A new shaft has been sunk near the mill and all ore is now hoisted from this shaft and dumped directly into the mill.

During the year development was as follows, the total to date being given in parenthesis: Shaft sinking, 272 ft. (422 ft.); drifting, 2096 ft. (3756 ft.); crosscutting, 96 ft. (641 ft.); winzes, 94 ft. (94 ft.); total, 2558 ft. (4913 ft.).

It is estimated that from these openings the following quantities of rock have been excavated: Crosscutting, 2280 tons; drifting, 12,980; stoping, 13,680; open cutting, 4680; shaft sinking, 1400; winzes, 320; total, 35,340 tons. Of this amount 2530 tons were barren, 14,796 tons are mill rock on surface, 3950 tons are mill rock in stopes and 14,064 tons have been put through the mill. The rich ore was hand-picked from about 33,000 tons and the 14,064 tons milled yielded 297 tons of concentrates. The property has produced 3,444,000 oz. silver to date of which 1,444,229 oz. were produced in the year ended Oct. 31, 1908.

A statement of working expenses follows:

[illegible]	
[illegible]	$[illegible]
[illegible]	15,392
[illegible]	2,388
Total	$[illegible]
[illegible]	
[illegible]	$[illegible]
[illegible]	26,315
Milling and sorting	30,196
[illegible]	24,459
Sale of ore	11,372
[illegible]	[illegible]
Total	$[illegible]
Profit for year to Oct. 31, 1908	$[illegible]
[illegible]	[illegible]
[illegible]	$[illegible]
[illegible]	[illegible]
Surplus	$326,480

The works at Thorold, Ont., are producing silver and white arsenic and the company expects soon to refine and market the oxides of cobalt and nickel.

Correction

In the Journal of Nov. 21, 1908, p. 1006, owing to a mistake in the revision of the article, "Las Chispas Mines, Sonora, Mexico," by B. E. Russell, an incorrect illustration was used. The cut indicated as "Las Chispas Mines, Mexico," illustrates the new concentrator of the Montezuma Copper Company, at Nacozari.

Facts Concerning the Marianna Explosion

The Fan Indicator Diagram Shows That Ventilation Stopped 25 Minutes before the Explosion. Mine Inspector Says the Clock Was Slow

BY FLOYD W. PARSONS

The Marianna explosion will soon be recorded as past history and will only be remembered and referred to, by the general mining fraternity, because of the lessons it has taught. At this writing, the final verdict of the coroner's jury has not been rendered, and as a consequence the greater number of material facts are reserved by the mine officials and the State inspectors for the inquest that will be held. It is, therefore, useless to theorize and attempt to draw conclusions until this important evidence has been heard.

The most unfortunate fact concerning these coal-mine explosions is that we heretofore have benefited so little from each succeeding disaster. At this time last year we were in the midst of a series of frightful mine accidents, from which we emerged with a firm determination to search for enlightenment that once secured would place our coal mines in a position of greater safety and reduce mine fatalities to a minimum. Although the past eleven months has been practically free from explosions of gas and dust, the interest aroused last winter has lagged but little and we are justified in feeling that more progress has been made during the year than in any equal period of time that has preceded.

The United States Geological Survey at its testing station in Pittsburg has installed one of the most complete plants ever designed for the scientific investigation of causes leading to accidents in coal mines. We are also profiting at present by the frank statements of experienced mine engineers who have heretofore either neglected or refused to stand committed, and thus lend their aid to a better solution of the problems involved.

The Marianna Mine is Ideal in Its Plan

If I had been handed the mine maps showing the underground development plans of all the mines in western Pennsylvania, I feel safe in saying that a casual examination of the different drawings would have caused me to pick most any other mine as the probable location of the next mine explosion rather than the operation at Marianna. Mr. Jones, the president of the company, is a man who has spent many years in the operation of coal mines, and being somewhat idealistic in his views, had used his past experience as a guide in creating at Marianna an operation embodying the most modern of approved ideas, both on the surface and underground.

The accompanying map shows plainly the plan of operation here intended for the development of the property. Instead of having two main entries, or even four as was recently considered the best practice, the development scheme here called for six main entries. Two of these are used to take empty cars to miners at the face of the workings; two other entries return loaded cars from the face of the workings to the bottom of the shaft; the two remaining entries are used for special air courses to return the impure air and gases to the air shaft, and deliver this dangerous atmosphere to the outside of the mines in such a way that no person at any time might be injured by coming in contact with this exhaust air. All return airways were separated from the gangways where men were working by brick or concrete walls, or pillars of coal.

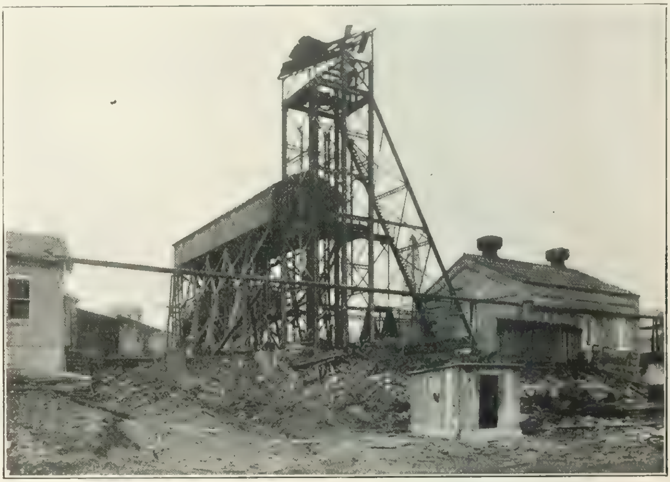


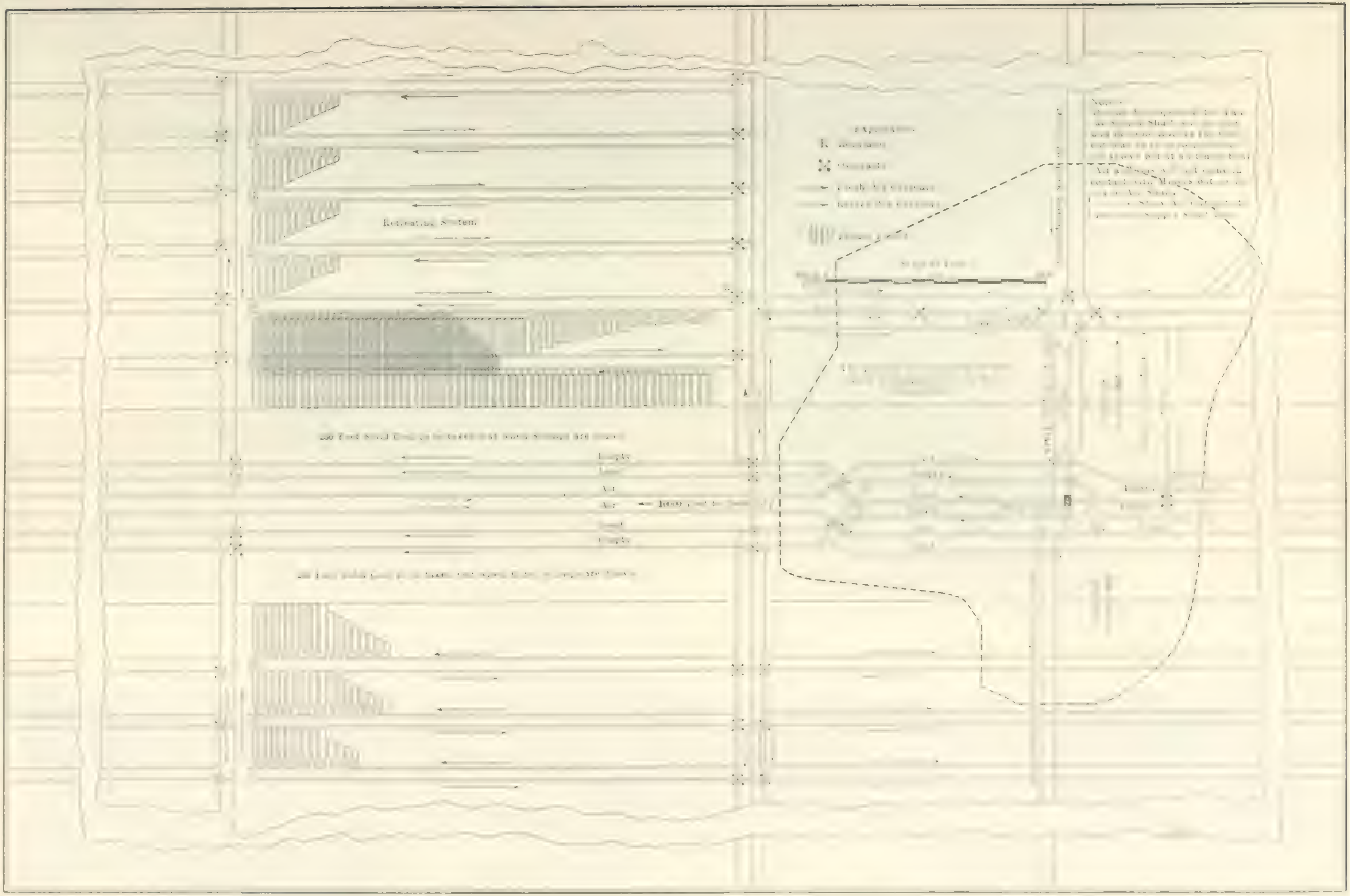
FIG. 1. TEMPORARY TIPPLE AND HEAD FRAME OVER MAIN SHAFT AT MARIANNA. TOP OF HEAD FRAME SHOWS EFFECT OF EXPLOSION

Up to the present point of development, the only work done in the Marianna mine is that of driving entries, which is commonly called "narrow work." Not a single room has been turned and driven. The general scheme of development is to work everything on the panel system retreating.

The entries so far driven are included in the dotted line surrounding the shaft on the drawing. Large barrier pillars have been left between each pair of entries, with still larger pillars protecting the outside entries. As is evident from the map, the development already accomplished extends only a distance of about 1200 ft. from the main shaft.

The System of Ventilation

In planning the ventilation for this mine, trap doors have been entirely eliminated and overcasts are used to carry the currents of air to the return. Overcasts are conceded by all mining men to be safer and eventually cheaper than trap doors. The large fan shown in Fig. 3 is only a temporary installation and will be replaced by a ventilator designed to deliver more than 500,000 cu.ft. of fresh air per minute at the face of the workings. It is the intention of the company to place another fan at the second shaft which is shown fenced in in Fig. 4. This last view was taken immediately after the explosion and the temporary fence was placed around the shaft merely as a safety precaution. The fan at the Rachel shaft, shown in Fig. 3 was operated as an exhaust, the air being drawn in through the shaft in Fig. 4. It is not the ultimate intention of the company to use both fans at the same time, but rather to have one ventilator as a duplicate installation to be used in case of necessity for repairs or for emergencies. The plan inaugurated, is to have not more than 50 men working in each section or panel, and every panel is to be ventilated by one current of air.



[illegible] PLAN OF DEVELOPMENT [illegible] THE LONG [illegible]

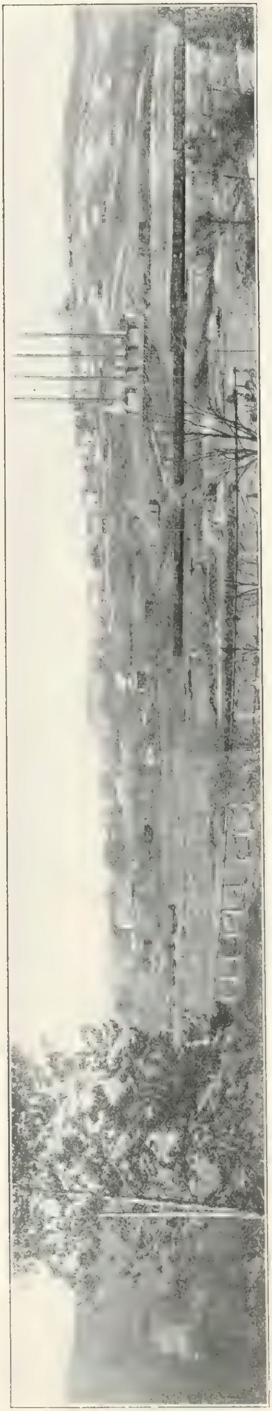


FIG. 2. SHOWING GENERAL VIEW OF MARIANNA PREVIOUS TO EXPLOSION. THE MAIN SHAFT IS AT LEFT OF PICTURE WHILE THE SECOND SHAFT IS JUST BELOW THE POWER HOUSE. A GAS WELL DERRICK IS BEHIND THE LARGE TREE AT RIGHT OF MAIN SHAFT

The First Shaft was Begun in May, 1906

The sinking of the shafts at the town of Marianna was begun in May, 1906, and completed in the latter part of 1907 and the early part of 1908. As an example of the modern and thorough manner in which the company has started to develop this property, I may state that the miners' houses will be built of brick and contain four, six and eight rooms each. Each house is to be electric lighted and furnished with a bath. The town is also to be sewered and lighted by electricity. The mine is designed to give employment to 5000 men, which will insure a population in the town of Marianna of from 10,000 to 20,000 people.

The Rachel shaft is 460 ft. deep and is 20x31 ft. in the clear. The pump and stairways are 4x20 ft., the cageways each 6 ft. 2 in. by 20 ft. in the clear, and the airway is 10x20 ft. It is the intention of the company to hoist two steel mine cars at one time, and with an average of 1250 hoists in eight hours, the capacity will be 10,000 tons daily.

The Mine was Visited this Fall by the Foreign Experts

When the expert engineers from England, Belgium and Germany visited our country this past fall, they included the Marianna mine in their trip of inspection; it having been selected as one of the operations near Pittsburg that was worth seeing. President Jones in receiving this visit of these mining men, presented each member of the inspection party with a detail description of the many advanced plans that were to be followed in the development of the property. This description which is too lengthy to be published here in detail is most convincing proof that the principal aim of the owners of the property was to here complete a mining plant which would be the equal of any similar operation in our country. Electric cutters are to be used in the mine, also electric lighting and haulage with a current of 300 volts. After the construction of the coke ovens is completed, the boilers are to be fired by the gases from these ovens.

The present tipple shown in Figs. 1 and 3, is only a temporary structure to be replaced by a steel building equipped with six dumps and an elaborate system of screens.

In concluding the prospectus before mentioned, which was given to the mine experts, Mr. Jones says: "On the whole, every known precaution will be taken to make the factor of safety a maximum, and in addition thereto many of our newly devised schemes will be added to reinforce the others." I have cited the foregoing to show not only the plan of mining carried on at the time of the accident, but to fully explain that the real keynote most pronounced in the development of the property was the single idea of efficiency and safety.

Details of the Accident

The explosion occurred at 10:52 on the morning of Saturday Nov. 28. Mine Inspector Henry Louttit made a trip of inspection through the mine that morning and came out of the workings about 30 min. before the explosion occurred. Mr. Louttit found everything in the mine thoroughly satisfactory and immediately on reaching the surface made an examination of the fan and the air entering the mine. At the time of this examination the water-gage stood at 3¼ in.; the fan revolved at a speed of 120 r.p.m. The examination of the air at the upcast shaft showed that about 190,000 cu.ft. of air was being drawn through the mine. After completing this examination Mr. Louttit went to the power house to look at the engines and see that all provisions of the law were here being complied with. While in the power house, Inspector Louttit heard the explosion, and immediately hurried from the power house to the shaft; it was readily evident just what had happened and Mr. Louttit's first examination was of the fan.

This inspection showed that the fan had stopped and the problem then was to determine whether the fan should be continued as an exhaust or reversed to blow air into the Rachel shaft. The latter course was decided upon and Inspector Louttit firmly believes from the subsequent results and the saving of the life of one of the miners that this plan of reversing the fan was the proper thing to do.

Efficient Aid Extended by Members of the U. S. Geological Survey Testing Station

Among the first rescuers on the ground were several of the engineers connected with the U. S. Geological Survey Testing Station in Pittsburg. These men were equipped with rescue apparatus of the Draeger type and soon instructed volunteers in the proper use of these safety devices. Great progress in advancing into distant parts of the workings was quickly made by those rescuers equipped with the life-saving apparatus. This is practically the first opportunity offered the experts at the testing station to be of real service, and there is no doubt but that their heroic work resulted in much good and was greatly appreciated by the officials and inspectors in charge of the rescue operations.

The Marianna mine contains small quantities of gas at the face of the workings, but there were no evidences that the property was unusually dangerous. It was also generally known that the region surrounding Marianna was within the natural-gas zone, and one of these wells had been drilled only a short distance from the main shaft of the mine. In Fig. 2, the derrick of this well can be seen through the foliage of the large tree at the left of the picture, and in the foreground. Immediately after the explosion, a story was widely circulated that the mine workings had encountered a large pocket of gas which had been tapped by this well. This theory, however, like many other early surmises, has yet to be proved. It was also stated that the explosion was caused by a windy shot, which story if true, will probably be brought out in the coroner's inquest.

The greater number of recent coal-mine explosions have shown clearly that dust has been the principal factor in sustaining and carrying forward the force of the initial explosion. In this accident, however, from preliminary and incomplete facts, it seems that gas has played the more important part, although dust has perhaps added somewhat to the force generated.

Conflict of Opinions

As is always the case in the event of such a disaster, there are any number of conflicting statements. Several witnesses who were present on the surface at the time of the accident differ in their opinions as to the number of reports that were heard. One man with whom I talked stated that he distinctly heard three successive rumblings, while other witnesses are as positive in their statements that but one report occurred.

It was the custom in the mine to use safety lamps at all dangerous points, while naked lights were largely used in other parts of the workings. This practice of requiring safety lights in a mine where electricity is used has been frequently condemned as most inconsistent; this question, however, was well answered by one of the inspectors with whom I talked when he stated that "electricity exists only where you put it, while a naked light exists where you take it."

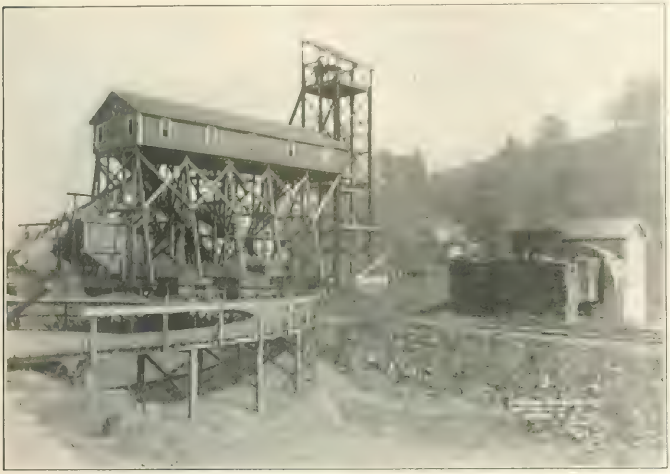


FIG. 3. TIPPLE AND TEMPORARY FAN AT THE MARIANNA MINE

The Statement that the Fan was Stopped Prior to the Explosion

On November 30, it was stated by one of the company's employees that a 2-in. steam pipe which operates a ring-pump 80 ft. down the main shaft, burst at the top of the shaft at an "ell" connection. It is asserted that the mine superintendent ordered the power shut off until the break could be repaired. I immediately dismissed this theory as being unworthy of consideration as several of the com- [illegible] no basis for the belief. On Friday, December 4, I saw the fan indicator card which plainly showed that the fan stopped [illegible] ing, Nov. 28. A careful investigation also showed conclusively that the explosion occurred about 10:52 Saturday morning. This indicated that the fan stopped 25 min. before the explosion occurred.

My notes, as before stated, showed that Mr. Louttit, the mine inspector, came out of the workings about 30 min. before the explosion was heard, so that if the ventilation was shut off before the accident, as the indicator diagram showed, the fan must have been stopped immediately after Mr. Louttit's inspection on the surface had been completed.

At a subsequent interview I was positively assured by those in authority that although the indicator card showed that the fan had stopped 25 min. before the explosion, that the clock governing the indicator diagram was about 25 min. slow, and that ventilation had not stopped until the explosion occurred. I also learned from the same reliable source that the indicator card was held by but one thumb tack, placed in the center of the card, and that for this reason it was possible the card had slipped a sufficient distance to account for the interval of 25 min. between the stopping of the fan and the occurrence of the explosion. The indicator card that was used at the time of the explosion was removed immediately after the explosion and a new card inserted in its place.

If the fan did stop 25 min. before the explosion, this would probably have given sufficient time for the mine atmosphere in some entries to have reached a dangerous point, and the gaseous mixture could then have been ignited by a naked light or perhaps from one of the mining machines. [illegible]

FIG. 4. [illegible] THE SHAFT

have confined myself solely to facts about which there is not the slightest doubt, I will refrain from theorizing in the hope that the evidence presented to the coroner's jury will clear up all disputed points.

In conclusion, I may say that the location of the victims who perished in the explosion will be of considerable importance in substantiating or disproving that the fan was stopped. It seems incredible that the ventilation could be shut off for 25 min. before the accident without many of the miners noticing the lack of air and leaving their working places to investigate the cause. It is to be sincerely hoped that all charges of negligence and other criticisms of the company will be thoroughly dismissed when the correct evidence is presented. There is absolutely no doubt but that the highest officials of the company had endeavored to make the Marianna mine a safe operation. Mine foremen, in their eagerness to make a good showing, sometimes take chances in rushing entries too far ahead of crosscuts, just as miners themselves often face unnecessary danger in neglecting precautionary measures, so that they may get the maximum tonnage for the day. In the case of the Marianna mine, the entries were, in some instances, considerably ahead of the crosscuts; however, the mine inspector himself is authority for the statement that brattices were built up the center of all such entries, and that these brattices were kept within from 12 to 15 ft. of the face.

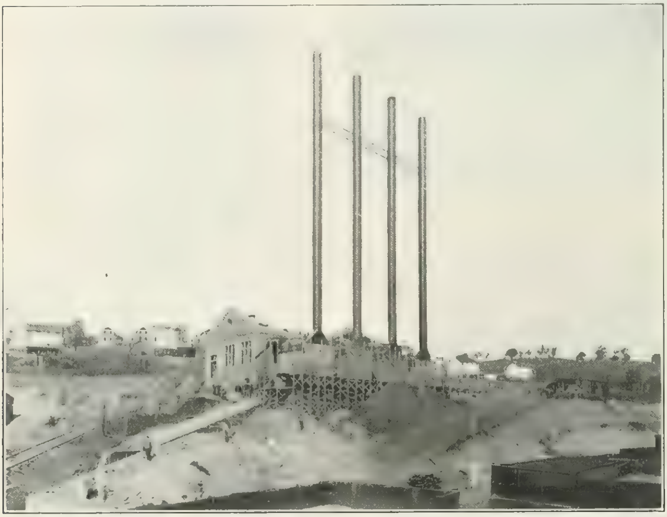


FIG. 5. POWER HOUSE AT MARIANNA DURING CONSTRUCTION

From Thursday morning until the explosion occurred Saturday, the barometer at Marianna rose steadily, registering an advance of ½ in. Conditions, therefore, were rather unfavorable to a gas explosion.

Colliery Notes

Expansion joints of steam pipes in a shaft should be brass lined on the sliding surfaces. Where the pressure is over 40 to 50 lb. per sq.in., such an expansion joint must be tied together by means of long bolts to limit the amount of movement in the joint.

At Arley colliery, North Warwickshire, England, workmen at a depth of 1020 ft., came across the bed of an old river more than 450 ft. wide; it is stated that at one point the stream runs into a lagoon or lake of considerable size. The river and lake have either dried up or have been diverted by some huge upheaval.

The life of mules and horses in our coal mines is anything but pleasant, and as a consequence, every effort made to benefit the lot of these animals is most commendable. A practice that might be successfully followed in this country has been inaugurated in England, where extraordinary enthusiasm was aroused by the parades of pit ponies, and thousands of pitmen with their wives and families, crowded around the ring where the little animals were judged. Each pony was attended by a pit boy, and all the animals wore the harness in which they work in the mines; they were also equipped with the skull-caps of stout leather which they need to prevent them from cutting their heads as they draw the cars of coal along the low entries. Various prizes were awarded to the different collieries whose animals were in the best order. Many of the ponies that were exhibited had been underground for five or six years and were a little dazed by the brilliant sunshine. In showing what good care will do for a pony that is used underground, mention was made of one pony which was taken down in June, 1887, 21 years ago, and has never since seen daylight. This animal continues to work eight hours a day and is still in fine condition. Exhibitions of this sort if started in our own country would do much to create a better feeling toward the animals now used underground.

Where rotary tipplers are used, the coal should not be dumped from the car onto a screen without some means of preventing the coal being thrown forward. This practice of dashing the coal on the screen is not only detrimental to the coal itself, but lessens the efficiency of the screening. Instead of having the rotary tippler revolve toward the screen, it should be arranged to turn backward, a circular plate being provided to receive the coal. The tippler should also be provided with a hood which accurately fits close to the circular extension of the screen, so that the coal is first received in the hood and gradually discharged upon the screen. It is also most important that the tippler should turn as slowly as possible. Many tipplers revolve too quickly, with the result that they stand several seconds, between each car; it is better to occupy more time in turning and thus insure less breakage. The best plan is to install an extra tippler rather than lower the selling price of the coal by having one tippler working at its maximum capacity and handling the coal roughly.

The committee appointed by the English Government to investigate the accident which occurred at the Roachburn colliery, Cumberland, England, early this year, has just submitted its report. In this accident three men lost their lives and 130 other miners barely succeeded in escaping to the surface. The bodies of the men entombed could not be recovered, and as a consequence, no inquest was possible. In the report of the inspectors, it is stated that the accident was caused by working the coal up to the outcrop at a point where the surface deposits were so saturated with water that they gave way and poured into the mine, the quantity being estimated by the manager to be about 90,000 cu.yd., forming a subsidence or cavity on the surface extending over nine acres and having a depth of 49 ft. The most interesting fact concerning this disaster is contained in the statement that the inflowing materials passed downward into the mine, and extended a distance of 2240 yd. by the shortest route to the bottom of the exploring dip. The sudden inflow of water into a mine has been known to overtake and destroy many miners, but this is one of the first instances where fluid moss has been known to flow with such rapidity. As a result of extending the workings so close to the outcrop under such surface deposits, the entire colliery is lost to the owners, besides the fatalities that resulted to the men.

THE ENGINEERING AND
MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. Robert McKean, Sec'y.
505 Pearl St., New York
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for November, 1908, was 42,500 *copies.*

Dec. 5	12,500
Dec. 12	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorial
Colliery Accidents 1167
Has the Value of Gold Depreciated? A Correction 1168
*The Hand Drill in Prospecting Placer Deposits *John Power Hutchins* 1141
The St. George Amalgamation Cyanide Mill 114[illegible]
*Tungsten Ore Deposits of the Coeur d'Alene *Herbert S. Auerbach* 1146
Diamond Production in South Africa *Special Correspondence* 1148
*The James Smelter *M. J. [illegible]* 1149
Copper Smelting Suits in California *Special Correspondence* 1149
*Stripping Canton Iron Ore in New York State *Edwin Higgins* 1150
The Necessity of Care in Laying a Compressed Air Pipe Line 1152
*Handling Crushed Rock on San Francisco Bay *F. K. Blue* 1153
*Improved Pinchcock for Burettes *George A. James* 11[illegible]
Permanganate Method for Determining Copper..............*Fred. G. Hawley* 1155
Mine Taxes in California *Special Correspondence* 1156
Steel Construction 1156
*A Scientific Search for a New Goldfield *Robert T. Hill* 1157
Gold Dredging in California. *Special Correspondence* 1160
Gold Production in Australasia 1160
California Quicksilver Mines. *Special Correspondence* 1161
Water Power Plants for California Mines. *Special Correspondence* 1161
Ore Treatment at Mount Morgan, Queensland 1161
Comagas Mines Ltd 1161
*Facts Concerning the Marianna Explosion *Floyd W. Parsons* 116[illegible]
Colliery Notes 1166
Correspondence:
A Gas Analysis Will Answer This Question *[illegible]* 1169
The Thickest Coal Seam *R. N. B.* 1169
Iron Reverberatory Furnaces. *G. J. H.* 1169
Elmore Vacuum Process at Broken Hill. *J. [illegible]* 1169
*Electric Signaling at Mines 1170
Traveling Cranes 1170
Sound Views of the Mine Inspectors 1171
American Mining Congress 1171
The Tariff Hearings. *Special Correspondence* 1171
The Conservation of National Resources *Special Correspondence* 1172
Mineral Production of the [illegible] *Special Correspondence* 1173
A Long Rest for a Blast Furnace 1173
Size of Lake Ore Carriers.... 1173
British Guiana Mines... 1173
Personals, Obituaries, Societies and Technical Schools 11[illegible]
Special Correspondence 11[illegible]
Mining News 11[illegible]
Markets, etc. 118[illegible]
*Illustrated.

Colliery Accidents

In an impassioned address at Pittsburg, last week, John Mitchell expounded the views of organized labor as to the great question of conservation of life and limb in coal mining. The reduction of the disgraceful loss of life that has occurred in American coal mining is a subject upon which everyone may meet upon the common ground of humanity, but opinions differ widely as to the paths to the meeting place. John Mitchell takes a path that leads through pitfalls, bogs and quagmires, and abruptly comes to an end—in short, a blind alley—yet among his there are glimmerings of sense.

He argues, in the first place, that the price for coal is too low. He does not want the domestic user to pay more. Indeed he considers that this class of consumer pays too much already. But on the other hand there are large consumers who do not pay enough. The addition of a few cents per ton to the general average would enable colliery operators to mine their coal more safely. Undoubtedly that would be so. Probably, moreover, many large consumers at present obtain their coal too cheaply. But how is this condition to be changed? How is the price for coal to be raised in an industry which enjoys such unfettered competition?

Mr. Mitchell does not accede to the views of some persons that [illegible] of this sad problem will gradually work out, and we must be patient in the meanwhile. He thinks that the evil ought to be corrected right away. In this we agree with him. Mr. Mitchell says that the danger of loss of life by explosions can be eliminated immediately by taking the men out of the mine, in other words, by employing shot-firers, at a cost of not to exceed 2c. per ton of coal. On its face this suggestion looks well. Certain States, Illinois for example, have already tried the expedient of making the employment of shot-firers compulsory. The defect of this procedure is that the shot-firer must not only explode the charge, but also must load all the holes if an extraordinary mortality among shot-firers is to be avoided. The miner who is not going to shoot his own charge is apt to be careless how he loads it. Nevertheless, there is a way around this difficulty, viz., the employment of electric shot firing, already introduced in a number of collieries with success and at an expense of only about 2c. per ton of coal, which Doctor Douglas reports as the experience at his colliery at Dawson, N. M. Electric shot firing eliminates the danger of loss of life by gas or dust explosions, and if properly supervised there need be no great danger of blowing up the whole mine, as happened in an early trial of this method in Utah. We advocate the further employment of electric shot firing, and insofar as taking the men out of the mine is concerned, when that method is employed we agree with Mr. Mitchell.

We do not agree with Mr. Mitchell in his specious reasoning that the operation of collieries is safest with organized labor. Although he supported his contention with statistics showing that the loss of life is greatest in West Virginia, where the union has least hold, we may point out that (1) conclusions should not be drawn from the experience of a single year in which some extraordinary disasters occurred in West Virginia; and (2) comparative statistics fail to show differences in mining conditions, the mines of West Virginia, for example, being notoriously more gaseous and more dusty than those of Missouri. Instead of unionized labor being a panacea for safety in coal mining, we believe that it is one of the factors contributing to danger. When the operator is able to dismiss an employee for breach of discipline without risking a strike, a great step toward safety will have been accomplished.

What then shall be done to counteract the dangerous ignorance of the foreign horde that we employ in our coal mines? Dictation by the union, which Mr. Mitchell suggests, is surely the last thing that will enter the mind of any intelligent operator. Not that, but rather the expedient which Dr. Douglas suggested, with his characteristic keenness of perception and clarity of thought, namely, the employment of more bosses, who will see that the unskilled miners do not break rules and endanger their fellows. This also would increase the cost of coal, which in the opinion of Dr. Douglas ought to be met by

Dr. Douglas came near to the real solution of the difficulty, which Mr Mitchell does not see at all. This is the enforcement of our laws by adequate inspection, and the unbiassed determination of blame for disobedience and carelessness of the laws, whether by operators or miners. Let Mr. Mitchell and his union make this their slogan. Not the employment of shot-firers, the unionization of labor, and State indemnity for accidents covered by a tax on the coal product (which would be unconstitutional as class legislation); but rather the appropriation by the respective States of such sums of money as will provide for severe mine inspection, the appointment of experienced and honest mining engineers as mine inspectors, free from political and all other kinds of influence, the *enforcement of the laws,* the abolition of the absurd coroner's jury, and competent means for fixing the blame for accidents. If this were done, everyone would be surprised at the speed with which our mortality rate would decline. The statistics show how much room there is for betterment in this respect. During the last 10 years upward of three American miners out of every 1000 employed have been killed annually. In Europe the rate is but little more than 1 : 1000.

The ignorant, and those who seek to pull wool over the eyes of the ignorant, talk about the mysterious conditions that exist in coal mining. A lot of this was heard at Pittsburg last week, which finally led the National Institute of Mine Inspectors to enter a protest, distinguished for its sanity amid the flood of wild talk. There is nothing mysterious about the conditions in a coal mine. The technologic branch of the U. S. Geological Survey, with its elaborate experimental station at Pittsburg, is going to arrive at a good deal of data that will be of value to engineers, but it is not going to unveil any mystery, or inaugurate a new era of safety in coal mining, although Mr. Mitchell and some politicians who spoke at the opening ceremonies may think so, or pretend to think so. Everybody who has had any experience in coal mining knows that a mixture of methane and air will explode; also that dust in suspension in the air will explode under certain conditions. Moreover we know well enough what those conditions are and how to obviate the danger. The trouble is simply that knowing this our operators become careless and take chances.

The great explosions—Monongah and Marianna—which more than anything else have aroused public sentiment in 1908 were in no way mysterious. They were not "acts of God." They were acts of carelessness by man. The coroner's jury decided that the Monongah explosion was due to a blown-out shot, making it consequently "an act of God," for which the company was not responsible, either legally or morally. The JOURNAL expressed the opinion, after an examination on the ground immediately following the explosion, that the cause was a runaway trip of cars. This was also the report of the mine inspector for the district. We have not had any reason to change our opinion, although in holding it we have stood alone in America, at least so far as public expression goes. However, we have had the endorsement of M. Taffanel, directing engineer of the French experimental station at Lièven, who came to America especially to study the cause of this explosion and arrived at the same conclusion that we did.

The more recent Marianna explosion was at first regarded as exceptionally mysterious. Here was a loss of life in one of the model mines of Pennsylvania, which moreover occurred within less than an hour after the mine had been examined by the inspector for the district and had been pronounced safe. Surely, it was said, this was an "act of God" if ever there was. However, we found upon investigation that there had been an accident to a steam pipe in the shaft; while repair was being made it is alleged that the fan was stopped and the explosion occurred while the fan was stopped. The mine was known to be gaseous and safety lamps were supposed to be employed exclusively in it; but—carelessness again—there were some naked lamps.

We do not yet say that the Marianna explosion occurred because the fan was stopped. The recording diagram shows that it did stop at about 10.27 a.m. The explosion happened at about 10.52 a.m. Officials of the company deny that the fan was stopped at the time of the explosion and claim that the clock of the recorder was slow, or that the record-paper slipped! All that we pronounce at present is that when the real investigation has been made—quite irrespective of the finding of the coroner's jury, which probably will be as farcical as usual—the Marianna explosion will be learned to have been due to carelessness by someone, somewhere.

Here, then, we have the solution of the problem: 1, Electric shot firing; 2, more bosses; 3, non-interference with discipline by the union; 4, adequate inspection; 5, enforcement of the laws; 6, intelligent adjudication of blame; 7, legal collection of damages. Let Mr. Mitchell and his union consider this and act accordingly. Let the operators meet him on this ground.

Has the Value of Gold Depreciated?—A Correction

In the article by Mr. Ingalls in the JOURNAL of Nov. 28, it was stated that "the fixity of the value of an ounce of gold at $20.67 is arbitrary, resulting from the dictum of Congress in 1792 that 270 grains of gold, 916⅔ fine (equal to 247.5 grains of pure gold), shall be stamped $10." Our attention has been called to the fact that according to these figures the value of an ounce of gold would be $19.39. Mr. Ingalls made an error through overlooking the change that was made in the weight of the American gold dollar.

The Act of April 2, 1792, provided for the coinage of eagles, each to be of the value of $10 or units, and to contain 247.5 grains of pure gold, or 270 grains of standard gold. By the Act of June 28, 1834, the weight of the eagle was reduced to 258 grains, of which 232 grains were to be pure gold. The Act of Jan. 18, 1837, did not change the gross weight of the coin, but caused the fineness to be 0.900.

The reference to the old English act stamping 113 grains of fine gold as £1, which was intended to be figurative, is, of course, incorrect if construed literally. The present gold standard was adopted in England in the 14th year of the reign of George III. Although accounts were kept in England in pounds, shillings and pence, the pound was not coined until after the Act of 1816. Previous to that date the English gold coin was the guinea of 21 shillings.

Of course, these figures were merely introductory, and the error as to how the value of an ounce of gold is established at $20.67 had no effect upon the argument of the article.

THE ESTIMATE of the iron ore resources of the United States made by the National Conservation Commission appears to be open to exceptions. The Commission does not say where the line between "high-grade" and "low-grade" ores is to be drawn. An important part of our iron industry has been built upon what some miners would call low-grade ores; such ores are yearly coming into increased use, and with improved methods and increased attention to economy in smelting, there is no reason to fear that we shall be depending upon imported ores by "the middle of the present century"—or at a much later date.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

A Gas Analysis Will Answer This Question

This mine, at Dorchester, Colo., has a tunnel something more than a mile long, running into a mountain of granite, porphyry, trachite, aplite, etc., much faulted and somewhat metamorphosed. After standing idle for eight months the tunnel was found to be so filled with gas that a light could not be taken into it. For several days air was pumped into it, but without improving its condition; so a suction pipe line had to be run to the breast before a light could be kept there. During the first few days after mining was commenced several men at different times were "knocked out by the gas." Some had to be carried out.

A raise was started soon after the mine was opened. After getting up 60 ft. trouble began to be experienced with the light. When the air got so bad that a candle would not burn, an inch pipe was run up, and compressed air blown in until the light became normal. This served the purpose until the raise got up another 40 ft. Then it was found that no matter how much air was blown into it, a few minutes after the air was shut off the light would go out; and a considerable amount of air constantly driven in hardly kept the light burning.

A branch from the suction pipe was carried up into the raise. The air was again good, but only when the suction pipe was kept within 20 ft. of the top of the raise. This raise has now been abandoned, and the pipes removed. A light cannot be kept in it, and a person cannot remain in it more than a minute without beginning to feel dizzy, the first sympton of becoming "knocked out" by the gas.

It has been suggested that this condition was due wholly or in part to the improper decomposition of the dynamite used, due perhaps to its being insufficiently thawed. Du Pont 40-per cent. powder was used. No such experience with gas has been experienced of late, but giant powder is now used, as it thaws more easily.

It is apparent that the gas in question is decidedly lighter than air; it does not readily mix with air; and it is generated in the mine.

What is this gas? Can it be a product of the explosion of the dynamite? Being so light this does not seem probable. Can it be helium coming up through the rock? If it were hydrogen or marsh gas, would it not intensify instead of deaden the light?

Arthur O. Christensen.

Dorchester, Colo., Nov. 21, 1908.

The Thickest Coal Seam

In the Journal of Nov. 21, 1908, an inquirer asks information regarding the thickest coal seam in the United States, and is answered by the description of a seam or bed of coal from 40 to 65 ft. in thickness at the little Grizzly mine in North Park, Colorado.

Wyoming can go one better for thickness. At the Prospect tunnel near Kemmerer, Uinta county, Wyoming, close to the Idaho line, the Oregon Shortline railway passes through a vein of pure lignite coal 84 ft. thick with one parting of clay 2 in. thick. On account of its poor shipping qualities, this coal has never been worked. It occurs in the upper Montana division of the Cretaceous formations, and is fully described with analyses in the report of the "Geography and Geology of a Portion of Southwestern Wyoming with Special Reference to Coal and Oil," by A. C. Veatch, of the U. S. Geological Survey, Professional Paper No. 56, p. 131. R. N. B.

Boise, Idaho, Dec. 1, 1908.

Ironing Reverberatory Furnaces

The mistaken idea of plating the sides of reverberatory furnaces with an aggregation of I-beams, limited only in number by the closeness with which it is possible to set them, cannot be too strongly condemned. Many constructors have been guilty of such work, some even have been known to use practically a continuous plating of 7-in. or 8-in. I-beams for this purpose; that too, in cases where there was no reason why the 15-in. size should not have been used, with its correspondingly greater economy. If a supporting covering is absolutely required, nothing will give greater satisfaction than a ribbed cast-iron or steel plate. The former is cheaper, and answers every purpose. If made of 3/4-in. metal, with properly spaced ribs, it will answer far better than any number of small I-beams, and cost vastly less. It must be understood that the side ironing, that takes the strain brought upon the walls by the molten contents of the furnace is here referred to. In this connection the point may be raised that the [illegible] deep I-beams near the doors may interfere with operations; but this can be easily obviated by framing horizontal beams above and below the doors, connecting them to the vertical buckstays. Indeed, horizontal beams, between vertical buckstays allow the use of the material to rather better advantage than using vertical buckstays entirely; this is especially true of large furnaces, in which the economy is susceptible of easy demonstration, even when the additional 0.25c. per lb. for framing is considered.

New York, Nov. 30, 1908. G. J. H.

Elmore Vacuum Process at Broken Hill

[illegible] 7, 1908, Gerard W. Williams, in his interesting article on "Metallurgy of Broken Hill" is made to say, "The Zinc Corporation, which purchased tailings from many companies, has so far proved a dismal failure."

This statement is in direct opposition to the actual facts, and as it is likely to reflect on the reputation of the Elmore process, the patents for which we control, we would ask you to be good enough to publish this letter.

As a matter of fact, the Zinc Corporation expended large sums of money and much time in successively trying on a large working scale, three different "flotation" processes, each of which in turn hopelessly failed. It is perhaps to these failures that Mr. Williams refers.

Following these failures the Elmore vacuum process was installed and yielded highly satisfactory results from the moment of its being put into operation.

The Elmore plant has now been running regularly night and day for about nine [illegible] tons per month resulting in a gratifying profit, notwithstanding the low prices prevailing for zinc, lead and silver at the present time. It may interest readers of the Journal to know that the standard 5-ft. Elmore machines of estimated capacity [illegible] Corporation plant have been proved to have an actual capacity of 70 tons per 24 hours.

[illegible]

Secretary, The Ore Concentration [illegible]

[illegible]

D. Anderson, secretary of the Zinc Cor[illegible]

"After exhaustive trials with a standard 5-ft. Elmore apparatus, this company determined to erect 16 such machines. The plant has been in regular operation for about nine months, giving a greater capacity than the trials with the one unit indicated as possible.

"The plant is now treating about 15,000 to 17,000 tons of tailings per month producing therefrom about 5500 to 6800 tons of concentrates per month. The Elmore machines give no trouble in operating by the usual labor available."

[The article in question remained in our hands several months before its publication and previous to that was several weeks in its transit from Australia. At the time of his writing Mr. Williams was probably justified in making the statement, which, however, was unjustified at the time of the publication. The reviser of the manuscript should have eliminated the statement. We tender our apology to the Zinc Corporation, to the Ore Concentration Company, Ltd., and to our readers.—EDITOR.]

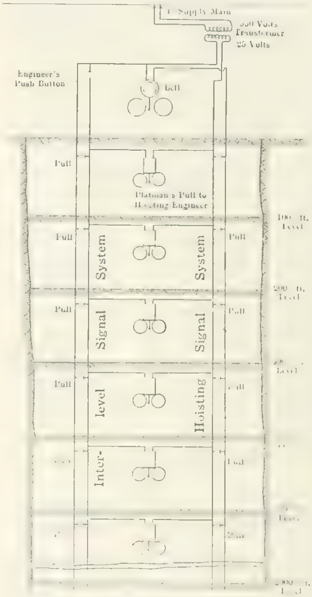
Electric Signaling at Mines

In the Mines Regulation act, 1906, of Western Australia, a system of return signaling is made compulsory. This provision has caused considerable objection on the part of mine operators in that State in spite of the fact that there are several successful installations of return-signal systems used in the mines of that State, especially that invented by Grayson and Glew, which is used at the Great Boulder Proprietary mine, Kalgoorlie. Before describing this installation, A. Montgomery, State mining engineer, in the report for 1907 of the Department of Mines, Western Australia, makes the following general comments on the question of mine signaling:

"Objection is taken to return signals being made compulsory. The history of Mines Regulation acts everywhere, however, bears out the contention that it is necessary to insist by legislative processes upon safeguards being introduced into mines before there is any very general disposition to supply them. Return signals are now insisted upon in many mining countries, and have proved a great additional safeguard to the workmen wherever they have been installed. The experience with them in this State has been highly satisfactory wherever a really good return-signal installation has been introduced. After much investigation and discussion of the subject I am fully convinced that the requirement of such signals is a proper one, and one which ought to be insisted upon in all large mines. In the smaller ones there is not so much liability to confusion of signals, and the same necessity does not, therefore, exist for repetition of them before the cage is moved, but in these also it is of much advantage. In the small mines it is a simple matter to arrange return signals by means of knocker lines, similar to those used for signaling from underground to the engine room. In the big mines various systems of electric signaling are being very generally introduced, which render signaling more easy and more rapid and permit good return signals to be readily made. Several of the large mines at Boulder are now equipped with electric signal systems, the latest installation being that at the Great Boulder Proprietary mine, where what is known as Grayson and McGlew's patent has been put in."

Return-signal System, Great Boulder Proprietary Mine

In the system installed at the Great Boulder Proprietary mine an alternating current transformed to 25 volts is used, and two separate signal wirings are installed, one for the return signals from the engineer and for signaling from the different levels to the cager or platman, as he is called in Australia, the other for signaling to the engineer. Thus the engineer receives signals only from the platman, his bell being silent when a person underground is signaling from one level to another, so that the engineer is less liable to become confused by the signals. In the shaft a steel-armored, lead-protected, jute-covered cable, in which are eight No. 16 wires, is used. The cast-iron junction boxes used are made at the mine. These are rendered water-tight by pouring melted paraffin into them. The doors are also protected by a rubber-cord luting. "Mix and Genest" pulls are used, and Siemens-Halske polarized bells. An accompanying illustration shows the wiring of the system. the Great Boulder Perseverance shaft is 2230 ft. deep, and this signal system connects with each of the 27 levels



ELECTRIC SIGNAL SYSTEM, GREAT BOULDER PROPRIETARY MINE

Traveling Cranes

In buildings supplied with traveling cranes the ordinary I-beam or channel is frequently used as a crane girder, and the crane wheels often run directly on the top flange. A point that is often lost sight of in designing work of this kind is the necessity of lateral support for the top flange of the beam that is used as a crane girder. If the width of flange is more than one twenty-fifth the span such stays may usually be omitted, but even then the fact that steel beams and channels are rarely straight enough to form a satisfactory track operates against the efficiency of the design. Beams used for this purpose should always be regarded solely as a support, and not used as a runway for the crane wheels. A separate rail should be provided for the latter, not necessarily of the T-section which sometimes takes up valuable head room, but it should be of such a type that it may be readily placed in position with a minimum amount of field work. An ordinary "flat" that is secured through holes in the top flange of the girder itself gives about as satisfactory a medium for this purpose, at minimum cost, as is desired. The holes should usually be punched in the top of the beam and drilled in the field through the plate after the latter has been lined up to the proper gage.

Another method of procedure, if bolts are used for fastening, is to punch holes in both top flange and plate. Those in the latter are slotted transversely of the plate itself, so that inaccuracies of gage may be corrected. This is one of the simplest points about crane girders for use in small work, but it is also one of the most frequently overlooked. The expense of adding these plates or rails after the structure is in position becomes very high, largely on account of the fact that it is practically all field work. The holes are usually placed on one side only, of the center line of the beam, namely, that away from the flange of the wheel. Unless the wheel tread is broad, these fastenings need not be countersunk, but if the connection is made on both sides, that side under the tread must not only be countersunk but is also apt to be loosened by the passage of the wheel end of the crane itself. I-beams used for this purpose are often found to be at least an inch and a half out of line, and the plates should therefore be figured to extend one inch beyond the edge of the flange. This allows a certain amount to be taken up in fastening the crane rails, the added stiffness, imparted by the use of a flat plate for this purpose, accomplishes the rest by drawing the flange into line and keeping it there.

Sound Views of the Mine Inspectors

The mine inspectors of the coal-producing States take issue with the statement, oft repeated during the recent session of the American Mining Congress, that the great cause of explosions is unknown. Fifty inspectors held nearly an all-day meeting at Pittsburg on Dec. 4 to discuss the addresses made during the meeting of the congress. The result was the presentation of an address to the mining congress by the inspectors protesting against the broad assertion that mine disasters are a mystery. In addition, the inspectors have in preparation a series of suggestions for recommendation as to new mining laws for all the States in the central competitive field. Most important among these recommendations will be the declaration that stricter rules are needed for the sprinkling of dust before shots. They will appeal to the legislatures to force the keeping of a record of the dust sprinkling, similar to the fire bosses' records in the mines.

The address from the entire body of inspectors was presented to the congress by J. T. Beard, secretary of the National Institute of Mine Inspectors. It contained the following:

"The State mine inspectors present at this meeting desire to assert their belief that the causes of mine disasters are for the most part known, and that it will be possible by united efforts of all persons interested to greatly reduce the liability of explosions. It would be a grave error to allow the statement made in this congress that the general causes of these disasters are unknown to go unrebuked. There is no hidden mystery in these happenings, as some of the addresses heard at this convention would lead the average listener to believe. At all the recent explosions, with the exception of the last, at Marianna, the causes have been speedily ascertained and remedial measures recommended."

The West Virginia resolutions, submitted by Chief Ross and his 11 deputies, read in part:

"Whereas, there are but two elements found in our mines which have caused recent explosions—namely, coal dust and gas, singly or in conjunction—we, as members of the Department of Mines of West Virginia, recommend that laws be advocated to the end that the roof, sides and bottom of all dry and dusty sections be kept thoroughly wet by systematic watering; that a record shall be kept by the mine foreman or someone appointed by him of the amount of water used, time expended, sections watered, and [illegible] watering.

"That the excessive use of brattice at a distance in excess of 80 feet between breakthroughs makes it impossible to maintain adequate ventilation; and that the State Department of Mines must be empowered to conduct common-sense examinations for mine foremen and other officials, with power to revoke their certificates with sufficient cause."

Secretary Beard said, in presenting the two papers, that the inspectors did not mean to say that they already knew the cause of the Marianna explosion. That, he said, would be premature. "But it has been so strongly stated that these explosions are a mystery, and that we cannot expect to be free from them," added Mr. Beard, "that the inspectors felt such declaration should not be allowed to stand without refutation."

American Mining Congress

The 11th annual session was held at Pittsburg, Penn., Dec. 2-5, the meeting being in the Carnegie music hall. The morning of the first day was devoted to addresses of welcome and responses thereto. In the afternoon reports of the committees on prevention of coal-mine accidents, prevention of accidents in metalliferous mines, smelter rates, and the relation of the national forest service to the mining industry were made. The reports of the last committee drew out an interesting discussion. It appears that the mining industry has some real grievances against the Forest Service. However, the opinion was expressed that the Forest Service is doing its best to preserve the timber, and is feeling its way as to how far it may go; if the existence of evils because of going too far is called to its attention, the Forest Service will undoubtedly quickly correct them.

At the evening session Dr. James Douglas delivered a paper on "The Mining Industry as Influenced by Transportation." He was followed by Dr. George Otis Smith, director of the U. S. Geological Survey, on "The Distribution of the Nation's Wealth." A. H. Brooks, chief of the Alaskan Division of the U. S. Geological Survey, delivered a paper on "The Mineral Resources of Alaska." Each of these papers was illustrated by stereopticon views. They were valuable contributions to knowledge and were warmly received.

In the session of Thursday morning J. B. Zerbe, of Cleveland, Ohio, presented some rational ideas respecting the subject of conservation in the coal-mining industry. He was followed by John Mitchell, w[illegible] theme of conservation of life and limb in coal mining. This is taken up editorially elsewhere in this issue. Mr. Mitchell's [illegible] sion, in which some illuminating ideas were offered.

In the afternoon the meeting adjourned to the arsenal grounds, where the U. S. Geological Survey has installed its station for the investigation of mine explosions, etc. Experiments have been going on at the station for several months, but this was made the occasion of the formal opening, addresses being made by Secretary Garfield, Dr. G. O. Smith, director of the Survey; Dr. Joseph A. Holmes, chief of the technologic branch, who is in direct charge of the station, John Mitchell, and others. Illustrations of the experiments that are being conducted were then made.

On Friday, Senator Charles Dick, of Ohio, delivered an address on the "Duties of the Federal and State Government in Relation to the Mining Industry." Dr. I. C. White, State geologist of West Vir- [illegible] waste of natural resources in Pennsylvania.

This meeting of the American Mining Congress was well attended and was marked both by an improvement in the character of the attendance and the discussions which took place.

The Tariff Hearings

[illegible]

At the tariff hearings on "Sundries" (Friday, Dec. 4), William B. Klee, president of the Damascus Bronze Company, Pittsburg, asked for the imposition of duties ranging from 3 to 7c. per lb on phosphor-copper and phosphor-tin, the rate varying according to the amount of the phosphorus content of these metals. In lieu of this, free phosphorus with a duty of 1c. on the manufactured metallic product would be considered satisfactory. At the same hearing M. T. Garlow, of Grand Island, Neb., asked for an increase in the rate of duty on pumice from $6 to $11 per ton.

The Central Dyestuff and Chemical [illegible] George J. Prochazka, president, has filed argument for the maintenance of a 30-per cent duty on coal-tar colors. Zinkersen & Co., of New York, in the course of a discussion of the duty on coal-tar colors ask that coal tar be free, intermediate products like phenols, kressols, naphthols, [illegible] like picric acid, carbolic acid, etc., 20 per cent., and aniline coal-tar colors 30 per cent. The New England Felt Roofing Works have filed protests against the im- [illegible] tar pitch.

[illegible]

March G. Bennett, manager for Samuel [illegible]

The International Creosoting and Construction Company, of Galveston, Tex., has filed protest against the imposition of any tariff on creosote.

[illegible]

has asked for duties of from 1c. to 7c. per lb. on magnesite at different stages of manufacture.

The Aluminum Company of America, Pittsburg, through Arthur V. Davis, its president, under date of Nov. 30, asks that the present tariff on alumina be retained. This request is supported by the Pennsylvania Salt Manufacturing Company, through Theodore Armstrong, its president.

The Henry Bower Company request the imposition of a duty of 5c. per pound on anhydrous ammonia in steel or iron cylinders; on sulphate of ammonia, 0.3c. per lb.; on prussiate of potash, 4c. per lb.; on prussiate of soda, 3.2c. per lb.; on sulphide of soda, 0.5c. per lb.; on tetrachloride of tin, 5.53. per pound.

Charles J. Staples, of Buffalo, has submitted argument in favor of a duty on crude barytes of $7 per ton. R. B. Dougherty, of Sweetwater, Tenn., asks for a duty of $5 per ton on the same product; while William A. Buddecke, for the Point Mining and Milling Company, St. Louis, has filed argument for a duty of $15 per ton on crude barytes. J. W. Coulston & Co., New York City, importers of paints, have recorded a protest against advancing the duty on crude barytes.

The Atlantic Terra Cotta Company, of New York City, protests against any duty on the imported carbonate of baryta, which is now paying 25 per cent. ad valorem.

The Conservation of National Resources

Special Correspondence

The National Conservation Commission began its meetings in Washington on Tuesday, Dec. 1, and remained in practically continuous session until Tuesday, Dec. 8, when the conservation conference was opened. The conference continued in session during the remainder of the week. At the meetings of the conservation commission reports on natural resources were prepared for submission to the conference and their discussion has occupied the bulk of the time of the latter body. Reports from all four sections of the commission have been presented.

Value of Mineral Production

On minerals the commission reports that the production of the United States now exceeds $2,000,000,000 per annum, furnishes light, heat and power, and supplies 65 per cent. of the freight traffic. Waste in mining and treating mineral substances is over $300,000,000 per annum.

Coal Resources

Approximately 1,463,800,000,000 tons represent the accessible supplies of coal in the United States. It is estimated that this supply will be so depleted as to approach exhaustion before the middle of the next century. The commission estimates that for every ton produced since coal mining was undertaken in this country half a ton has been lost or wasted. The first step recommended in extending the life of our fuel supply should be to lessen the waste in mining, handling and transporting coal, and to discover means of avoiding the losses involved in transforming heat into mechanical and electrical energy.

Iron-ore Supplies

Supplies of high-grade iron ores in the United States are estimated at 3,840,068,000 tons, which, it is believed, will not last beyond the middle of the present century. Before 1940, the commission thinks, production will have reached a maximum and begun to decline; resort must be had to low-grade ores, or there must be large importation of foreign ores. Petroleum, natural gas and high-grade phosphate rock cannot at the present rate last beyond the middle of the present century. Natural mineral resources used in building and engineering construction are being wasted in three ways: (1) by wasteful methods of mining and preparing for market, (2) by excessive use of structural materials due to ignorance of their qualities, (3) by fire loss due to inflammable construction and poor building laws. The greatest waste is attributed to fires and must be reduced by the use of fireproof construction. Total costs of fire of all classes for 1907 are estimated at $456,485,900 in 1907, or about 50 per cent. of the total value of the building construction of that year. The total per capita loss was $5.34. About 27 per cent. of the loss was due to fires extending beyond the building where they originated. Only $68,000,000 was lost on buildings of slow-burning construction while the loss on frame buildings was $148,000,000. About $234,193,000 per annum may be saved by making building construction in the United States as good as that found in foreign countries.

Public Lands

The Section of Lands finds that there are in the United States a trifle less than 3,000,000 sq.m., of which about one-fifth is under cultivation and one-fourth is covered with forests. The agricultural soils are not all losing their fertility, but nine out of 10 counties are holding their own or gaining. The parts of the country which are losing are proportionately largest in Mississippi, Louisiana, Texas, Arkansas and Oklahoma. The soils are not, however, producing 50 per cent. of what they can and must produce in the near future, with population growing at the present rate.

The public land laws, according to the Commission, do not furnish the necessary protection to the public interest. All those resources which still belong to the Nation should be used in such a way as to prevent waste, the land being turned into private ownership only when most valuable for agricultural use. Losses to live stock, grain, etc., due to injurious mammals are estimated at $100,000,000 annually. Losses due to the ravages of insects are estimated at $650,000,000. Most of these losses are said to be preventable. The public range, estimated at 300,000,000 acres, is in very bad condition and can be put into a proper state only by rigid control on the part of the United States. Some 75,000,000 or 80,000,000 acres of swamp and overflowed lands can be added to the cultivable area by drainage and protection, thus increasing the value of the present lands from 100 to 200 per cent.

Water Resources

The Section of Waters finds that the quantity of rainfall annually is 215,000,000,000,000 cu.ft., of which over half is evaporated, about one-third flows into the sea, and the remaining sixth is either consumed or absorbed. Less than 5 per cent. is utilized for power and less than 5 for navigation. From 85 to 95 per cent. is wasted. The Commission estimates that the theoretical power of our streams is over 230,000,000 h.p., the amount now in use being 5,250,000 h.p. It is believed that 37,000,000 h.p. would be available at a cost comparable with that of steam installation, while the amount available at reasonable cost is from 75,000,000 to 150,000,000 h.p. The 37,000,000 h.p. exceeds the entire mechanical power now in use. Damage by floods is estimated at $238,000,000 per annum, there being great loss through erosion and flooding. The Commission recommends the system of waterway improvement already recommended by the President, including irrigation, power development, purification of streams, etc. The work is estimated to last 10 years at a cost of $50,000,000 annually, while the savings are alleged to be, on transportation $250,000,000, on flood damage $150,000,000, on forest fires $25,000,000, through cheapened power $75,000,000, through saving in soil erosion $500,000,000; or in all 20 times the cost of improvements.

Forest Resources

The Section of Forests reports that our present forests cover 550,000,000 acres. Of this forests publicly owned are one-fourth and forests privately owned three-fourths. Forestry is now practiced on 70 per cent. of the public and on less than 1 per cent. of the private area. The yearly growth of wood averages about 12 cu.ft. per acre, or 7,000,000,000 cu.ft. anually. About 23,000,000,000 cu.ft. are used each year, including 100,000,000 cords of firewood, 40,000,000,000 ft. of lumber, more than a billion posts, poles, fence rails, etc.

Forest fires have caused an average annual loss since 1870 of $50,000,000. About one-fourth of the standing timber is lost in logging and about one-third to two-thirds of the timber sawed is lost in the mill. Only 320 ft. of lumber are used for each 1000 ft. which stood in the forest. On the whole three and one-half times their yearly growth is taken annually from the forests, the lumber cut having increased less than 15 per cent. in the last seven years, while the average price at the mill has risen 49 per cent. Thus far lands successfully planted to trees make a total area smaller than Rhode Island, while we are sending out of the country annually 1½ times as much timber as we bring in. The Commission asserts that under right management our forests will yield four times as much as now, while forest fires can be stopped and waste in the woods and at the mill can be cut by one-third. The important task, according to the Commission, is to induce private forest owners and users of wood not to waste the supply. In general the methods recommended by the Commission are the stopping of forest fires; more careful logging; the use of preservative treatment for timber; the avoidance of needless loss in the mill, the factory and in use; the planting of treeless lands mostly likely to be useful under forest; the adjustment of taxation so that cut-over lands can be held for a second crop, and the improvement of the national forests.

Mineral Production of the French Colonies

Special Correspondence

The French colonies—not including those in North Africa—are beginning to assume some importance as mineral producers. The total value of their mineral products increased from about $2,800,000 in 1900 to approximately $5,000,000 in 1906, doubling in value in five years. The colonies which report mineral production include French Guiana, the French Congo, West Africa, Madagascar, Indo-China and New Caledonia. The North African colonies—Algeria and Tunis—are under a different administrative régime, and their statistics are presented in a different form.

The total value of the mineral products of the six colonies above named in 1906 was as follows:

Guiana [illegible]	[illegible]
New [illegible]	
chrome [illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
coal	[illegible]
[illegible]	[illegible]
West [illegible]	[illegible]
Total	[illegible]

The total quantities and values of the different mineral products are given in the following table; the figures are metric tons, except gold, which is in kilograms:

	Quantity.	Value.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	1,500	86,850
[illegible]	24	12,159
[illegible]	[illegible]	[illegible]
Iron........ ..	13	12,086
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]

Gold is obtained from placer workings in West Africa, Madagascar and Guiana; also by dredging in Guiana. The production of Guiana was 3503 kg.; of Madagascar 2200 kg.; the balance coming from West Africa.

Nickel ore comes entirely from New Caledonia. The Société le Nickel, controlled by the Rothschild house in Paris, is the principal operator in that colony. Its relations with the International Nickel Company assure its control of the European market. Cobalt, which is also produced in New Caledonia, is suffering from over-production and accumulation of stocks; at present most of the mines are closed. This situation is due chiefly to the large recent production in Canada.

The chrome ore comes from New Caledonia, where there were six concessions worked in 1906. The most important of these is the Tiebaghi mine in the north of the island, which is owned by the Société le Chrome, but is worked on royalty by Birch & Co., Ltd., of London.

Coal and lignite are mined in Indo-China. The principal operator is the Société Française des Charbonnages du Tonkin, which works the mines of Hongay on the bay of Along.

Some important mineral deposits are as yet little worked. These include copper in the French Congo and in New Caledonia; zinc and tin in Indo-China, where important installations are projected. These justify the hope of an important increase of production in the French colonies.

A Long Rest for a Blast Furnace

Various causes, including strikes, revolutionary troubles and a short supply of coke, made it necessary last year to cease operating the blast furnaces of the Hantke Company, at Czenstochau, in Russian Poland. To avoid the inconvenience and possible danger of blowing out the stack, it was decided to bank the furnace. The stack had a capacity of 140 tons a day; at that time it had been in use over five years, and during that time it had been stopped once for repairs, and [illegible]

As soon as the blast had been stopped, the tuyeres were all hermetically sealed, and the furnace received charges of five tons of coke, five tons of ore, five tons of coke again; eight ordinary charges and finally several charges with an excess of coke. On top of the last charge there was placed a layer of granulated slag, then a layer of clayey iron ore, and finally one of clay, the latter reaching to the mouth of the stack. The outside was coated with coal tar, to prevent leakage of air through cracks in the masonry, and was left to itself. At the end of five months an examination showed that the tar coating had begun to crack in places; consequently some air had made its way through the joints of the brickwork, and the level of the contents of the furnace [illegible]

According to *Stahl und Eisen*, nothing further was done for nine months, when it was decided to put the stack in blast, just 14 months after it had been closed. The first step was to open the discharges for slag and iron; then to charge coke and ore at the top, the first charges having an excess of coke, which was gradually diminished to a normal proportion. The tuyeres were then reopened and the blast put on gradually, care being taken to allow the slag to run off freely. At the end of 36 hours the iron began to run, and in a few days the furnace was making its normal production, and working freely.

Size of Lake Ore Carriers

The increase in the size of vessels carrying iron ore on the Lakes is strikingly shown in the following table, compiled by the *Marine Review* from the records of the Lake Superior & Ishpeming dock at Marquette. The figures give the number of vessels loaded each season, with the average cargo, in tons:

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

This year to Nov. 1, only 112 vessels have been cleared and the average cargo was 6646 tons. This high average is due to the fact that only the larger boats, belonging to the steel companies, have been in commission this year. Very few of the small wildcat boats have done [illegible]

British Guiana Mines

Exports of gold from British Guiana [illegible] were 55,282 oz. bullion in 1907, and 55,- [illegible] bullion reported this year was equal to [illegible]

[illegible]

[illegible] drained

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Edmund B. Kirby, consulting mining engineer, St. Louis, Mo., has been visiting New York.

Arthur Thacher, mining engineer, St. Louis, Mo., has been visiting New York and Boston.

Cyrus Robinson, consulting engineer, New York, sailed for Europe Dec. 9, expecting to be abroad about two months.

Charles H. Fulton, president of the South Dakota School of Mines, Rapid City, S. D., has been visiting New York.

John E. Hardman recently returned to Montreal after a prolonged absence on business for the Canada Iron Corporation

William J. Cox, general manager of Camp Bird, Ltd., Ouray, Colo., has been called to London on business connected with the company.

John A. Church, mining engineer, of New York, has gone to the West on professional business, expecting to be absent about three weeks.

H. C. Eastman, a well known operator in Gilpin county, Colo., was seriously injured in a railroad accident near Pittsburg, Penn., on Nov. 30 last.

R. K. Hamilton, of McKeesport, Penn., has been appointed superintendent of the coal mines at Sutterville, Penn., owned by the Oak Grove Coal Company.

William S. Mann, manager of the Boston & Oaxaca Mining Company, has returned to Tlacolulu, Oaxaca, Mexico, from a trip to the United States.

Walter Fitch, who recently resigned his position with the Calumet & Hecla Company, is in Salt Lake City, Utah, where he proposes to stay for some time.

Marshall D. Draper has been appointed general manager of the Fifty Consolidated Gold Mines Corporation, operating at Black Hawk, Gilpin county, Colorado.

H. B. Clarkson, late of Eleno, W. Va., has been appointed manager of the Turkey Knob Coal Company, at Macdonald, W. Va., and has taken charge of the mine.

Robert G. Wells, general manager of the Tata Iron and Steel Company, of Bombay, who has been visiting this country, sailed from New York Dec. 2, on his return to India.

E. J. Franz, of New York, consulting engineer, who has been directing the development of mines in Plumas county, Cal., for Eastern owners, was in San Francisco last week.

A. P. Scott, for some time past chief chemist for the Dominion Iron and Steel Company, has been appointed chief metallurgist to the General Electric Company, with headquarters at Schenectady, New York.

J. Gordon Hardy, recently of El Paso, Texas, and formerly manager of the Dolores Mines Company, has been appointed consulting engineer in charge of La Republica Mining Company in Chihuahua, Mexico.

Frederick Keffer, of Greenwood, B. C., consulting engineer of the British Columbia Copper Company, recently made a thorough examination of the Brooklyn and Rawhide mines of the Dominion Copper Company.

John P. Cosgro, mechanical superintendent of the American Smelters Securities Company of New York, has tendered his resignation to take effect Jan. 1, 1909. Mr. Cosgro is at present at the Flat River plant of the Federal Lead Company.

E. C. Felton, president of the Pennsylvania Steel Company, has gone to Cuba to inspect the iron mines controlled by the company there. He is accompanied by John W. Dougherty, Quincy Bent and Charles F. Rand, officers of the company.

Samuel Treloar has been appointed manager of the mines of the Bingham-Butte Consolidated Mining Company at Bingham, Utah. He has been a resident of Butte, Mon., for 20 years past, and has held important positions with several mining companies there.

Thomas L. Lewis, president of the United Mine Workers of America, has been appointed by President Roosevelt a member of the National Advisory Board, which is directing the investigation into coal-mining conditions and means for the prevention of accidents.

E. C. Trask, general foreman of the Yampa Smelter, Utah, and Edward L. Kraemer, chemist at the same plant for the past 3½ years, resigned Dec. 1, to engage in the coal business at Salt Lake City, Utah. The name of the concern is the Wasatch Supply Company.

Obituary

General Sir Henry Wilkinson died at Kenora, Ont., on Nov. 23, aged 69 years, after a short illness. General Wilkinson had a distinguished military career, having entered the British army in 1856. For some years past he was prominent in the mining affairs of the Lake of the Woods district, Ontario, and was managing director and the principal shareholder of the Black Eagle gold mine, near Kenora.

Thatcher Tucker Bent, who died in Oglesby, Ill., Nov. 28, was born in Massachusetts in 1833, and went West in 1853. After working as a civil engineer for 12 years, chiefly on railroad work, he settled in Oglesby in 1867 and took charge of a coal mine there. Later he took part in the organization of the Oglesby Coal Company, subsequently becoming the chief owner. He was the oldest coal operator in Illinois.

Edwin H. Jones, who died at Wilkes-Barre, Penn., Dec. 2, aged 64 years, was well known throughout the anthracite country. As a young man he began work in the Vulcan Iron Works, at Wilkes-Barre, which were founded by his father in 1863. He became familiar with the construction of mining machinery, and when his father died he succeeded him as president, a position which he held up to the time of his death.

Addison J. Lysle, who died at Los Angeles, Cal., Nov. 29, was for many years one of the best known river coalmen in the Pittsburg district, and a prominent member of the Pittsburg Coal Exchange He was a member of his father's firm, George Lysle & Sons, and later treasurer of the Lysle Coal Company until the latter company sold out to the Monongahela River Consolidated Coal and Coke Company; besides having other important coal-mining and river interests. In 1900 he removed to California, and had since resided there the greater part of the time.

Enoch James, who died at Cardiff, Wales, Nov. 13, aged 60 years, had been manager of several important iron works, his most notable service having been with the great Dowlais works, near Cardiff, which were reconstructed under his charge. Since 1902 he had been employed as consulting engineer, his services being in much request. He was regarded as a high authority on iron and steel. In 1901 he was a member of the commission sent by the British Iron Trade Association to inquire into the iron and steel industries of the United States, and he contributed largely to the report made by that commission. He was a member of the Iron and Steel Institute and of several other technical societies.

Societies and Technical Schools

Mining and Metallurgical Society—The New York section will meet at the Engineers' Club, Thursday, Dec. 17. The Philadelphia and San Francisco sections will meet at about the same time.

Canadian Mining Institute, Toronto Branch—At a meeting held in Toronto, Nov. 19, resolutions were passed urging the retention of Hon. William Templeman as minister in charge of the Dominion Department of Mines. After the meeting a dinner was given to H. E. T. Haultain in honor of his appointment as professor of mining and metallurgy in the University of Toronto.

Pioneer City Mining Institute—This association was organized at Carbondale, Penn., Dec. 3, where the following officers were elected for one year: President, Mining Inspector P. J. Moore; secretary, D. R. Morgan; treasurer, J. C. Patten. The object of the association is to bring operators and employees together for the discussion of practical mining questions, in the same way as is now done by the Scranton and other local institutes.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte, Goldfield, Wallace and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 4—The Trinity River Mining Company has less than 300 ft. to run to complete its tunnel across the bend of the river above Lewiston. It will be [illegible] 10x12 ft., large enough to carry all the water of the river. The water will be run to low-pressure turbines to furnish power for mining purposes. About a mile of the river bed will be laid bare when the water is turned into the tunnel and the [illegible] then be mined.

In addition to the suction dredge being built at Hamburg Bar in Siskiyou county, other gold-dredging operations in that county are pending. A. W. Graham is prospecting the Wood Rat Bar and the Quigley ranch on the Klamath river, and Mr. Wade, of Callahan, has bonded the Lowden ranch at Seiad for dredging purposes. He is also prospecting the Collins ranch below Oak Bar and has bonded the Bailey place adjoining. The possibilities of the Klamath river as a dredging field are being well tested this year.

Hydraulic mining men in Nevada county have laid claim to the lands on which the noted Indian "campoodie," of Nevada City, is located, alleging them to be gold-bearing. The matter has been carried to the United States Land Office and testimony is being taken. Meantime local men are organizing a [illegible] opposition to the attempt to oust the Indians. Aid will be given them in protecting themselves from the mining claimants of the land. The campoodie is a picturesque Indian village, occupied as long as the white inhabitants have knowledge of the ground.

In this connection it may be stated that the superintendent of the Government Indian school at Carson, Nev., is about to establish an employment office for the purpose of supplying farming and mining labor [illegible] Nevada. No fees will be charged.

H. G. A. Brummer has [illegible] to pay off the debts of the Conlin mine, in Nevada county. Some of the old employees have already received checks, and the information comes that all debts will be paid and the mine will be suitably developed. The company has been in financial difficulty for over a year.

A new company has been organized in this city which is of interest to dredging men. This is the Natoma Consolidated Companies of California, with a capital stock of $25,000,000. In this consolidation are the Feather River Development Company, the Natoma Development Company, the Folsom Development Company and [illegible] the general manager. New dredges will be built and additions made to the machine shops and repair plants already owned by the companies. Considerable power will be developed, not only for the company's own use but also for cities and towns in the Sacramento valley. Among other things an electric railroad will be built from Folsom to Sacramento and a large tract of land will be reclaimed and sold in lots. The company will not only build and work dredges but will work stone quarries, construct reservoirs, handle gravel and cement and supply water, electricity and gas. Road metal will also be made extensively, the rock piles thrown up by the dredges being used for this purpose. It is also proposed to open new dredge fields. The Natoma and Folsom Development companies are the largest operating in the Folsom field, W. P. Hammon being the manager of one and R. G. Hanford of the other, and they have in operation between them nine dredges, all of large size. The Feather River Development Company at Oroville, another of the Hammon companies, owns four dredges. These companies have acquired large areas of dredging land which they are mining, and intend to obtain more.

The company which has started gold-dredging operations near Snelling, Merced county, has been so far apparently successful and this has drawn the attention of others to the valley of the Merced river as a mining or dredging field. The place is some seven miles below the foothills and it is now supposed that there must be an old gravel channel in these foothills from which the gold lower down came. Some prospecting operations are now going on in the attempt to find this supposed channel. Prospecting work is also being carried on by an Oroville dredging company on the Robinson farm, three miles above Snelling, on the south side of the river, and another ranch lying just below is also to be tested with drills. The field is a new one and thus far very [illegible]

Goldfield, Nevada

Dec. 5—Goldfield is trying hard to get the business of the new town of Helena, [illegible] Clifford district. The route to the mine via Tonopah is 76 miles long, while the road from Goldfield is 22 miles shorter. This road is at present in bad condition, but private citizens intend to improve it so as to divert trade to Goldfield. Goldfield has applied for a postal service from Gold-[illegible] miles from Bellehelen, 7 miles from Golden Arrow, and 12 miles from Silver Bow, all in a southeasterly direction. This district is a most promising one.

On the other side of the Montezuma [illegible] where the road to Silver Peak descends into Salt Marsh oil is being prospected for. It is thought that oil would be found before a depth of 1000 ft. is reached. Last week at a depth of 250 ft. a body of natural gas was tapped which blew the drilling rig into the air, demolishing it; several men narrowly escaped being killed by this accident.

It is said that material has been ordered by the Nevada California Power Company for extending its electric light and power service to the camps of Manhattan, Round Mountain, Rawhide and Fairview. Goldfield, Tonopah and Bullfrog are already supplied.

An interesting feature of the development of the Goldfield district is the work being done in the outskirts. The Ben Hur 3½ miles and the Nevada Eagles 3 miles [illegible] prospecting. This western portion has never been prospected heretofore. This area is capped by "malapai" and has been the scene of one or two of the worst wildcat promotions in the history of Goldfield. The Eagles company has opened up ore by sinking on a porphyry outcrop which is visible for only a short distance. The geology of the portion of the camp is not very well known but if the Eagles company's ore proves to be abundant as the management believes from present indications a great impetus will be given to prospect the western section now disdained on account of the "malapai" capping. Three miles east of town the Goldfield Fissure company has done some promising development work and farther [illegible] its ground. In the Red Mountain district, [illegible] being done, while in the Diamondfield district, 4 miles north and east of Gold-[illegible] ing to the fact that the policy of the Daisy [illegible] the Goldfield district.

Though plans have not yet freely ma-[illegible] Columbia Mountain, the Oro, the Booth and the Nighthawk companies in under way, but no details are available. George Wingfield is one of the heaviest owners in these companies.

The leasers of Goldfield have organized into a society for promoting the general welfare of leasers and the leasing industry, which has made Goldfield. Officers were elected and many grievances were discussed, but no definite action was taken at the first meeting.

There has been another sale of sulphur ground at Cuprite (which name is proving to be a misnomer) 17 miles south of Goldfield. The original property is shipping sulphur of various grades up to 98 per cent. sulphur for prices ranging up to $15 per ton f.o.b. mine. This second company, controlled by Ellsworth Oldt who negotiated the first sulphur deal, will hasten the opening-up of its property. Negotiations are under way for a sulphur smelting and refining plant. The sulphur at Cuprite is said to contain some gold and cinnabar.

Butte

Dec. 3—On Nov. 30 Samuel McConnell, trustee of the bankrupt Butte Central & Boston Copper Corporation, sold at public auction the Ophir claim, subject to the various attachment liens now on the property. The successful bid for the property was $7500, and was made by Walter S. Tallant, representing the local creditors of the company. Freeman I. Davidson, of Boston, a director of the bankrupt corporation, was in Butte for a week before the sale making arrangements for the satisfactory settlement of the company's affairs. As a result of his work there is now complete harmony among the creditors. Mr. Davidson states that a new corporation will be formed in Boston for the purpose of operating the mine, and he expects to put it on a producing basis within a short time.

The early part of this week a party of Montana smeltermen left for Salt Lake City to open offices preparatory to the construction of the new smelter in Tooele county, Utah, under the terms of the agreement between W. D. Thornton, of Butte, and the Utah Consolidated Copper Company. C. H. Repath, construction engineer of the Washoe smelter at Anaconda, will be in charge of the work. With him are J. B. McIntosh, of the engineering department of the Washoe smelter, who will direct the field work, and J. B. Whitehill, of the Anaconda Copper Mining Company's purchasing department, who will attend to the buying of the materials. The undertaking of this work by men so closely connected with Amalgamated interests in Butte is regarded as an indication that the Amalgamated is preparing to enter the field which has for some time been dominated by the American Smelting and Refining Company.

In the action of W. W. Wishon against Miles Finlen for alleged breach of a contract regarding the Minnie Healy mine, the district court has rendered a decision for the plaintiff for $1 damages. The suit was brought because of the alleged failure of Finlen to pay Wishon $7142 when Finlen purchased the Minnie Healy. Under the decision of the court it was found that Finlen had never in fact purchased the mine, and was, therefore, never bound to pay the money to Wishon.

The report of the United States assay office in Helena for last month shows that Madison county is the leading gold producer in the State with an output of $51,031.88 for the month. Fergus county is second and Lewis & Clark county third. The total receipts of Montana gold for the past month amounted to $102,518.

The affairs of the North Butte Extension Copper Mining Company are still before the Federal district court. Two days ago, the objections of the Ingersoll-Rand company and the United States Fidelity and Guaranty Company having been withdrawn, the bankruptcy proceedings against the mining company were dismissed. Immediately thereafter the National Mining and Investment Company, of Butte, filed a petition asking that the North Butte Extension Company be placed in the hands of a receiver. In the petition for the appointment of a receiver it is alleged that there has been an overissue of stock by the corporation, that there has been mismanagement of the company's affairs, and that the company is preparing to turn over all of its property to the North Butte Extension Copper Development Company, a corporation organized to get control of the property. While the matter is pending, word has been received from the committee on reorganization that they have granted another extension of time in which stockholders may make their assessment payments.

Denver

Dec. 5—The Western Metals Company, of Denver, has been incorporated with a capital stock of $1,000,000, its object and purpose being, it is said, to build a plant where the most refractory ores may be treated by what is termed an electro-chemical process, which eliminates both concentration and smelting, and is specially adapted to the recovery of zinc. This is a large order, and we shall look with anxiety for more detailed information.

In Leadville, Mrs. Tabor has been enjoined from operating the Matchless mine, which, it appears, she tried to superintend herself and to interfere with the lessee.

The advance of $1 per unit in the price of tungsten ore, resulting from the renewed activity in steel manufacturing centers, is having immediate effect in the Boulder county tungsten belt, where mines are being reopened, idle mills put in commission again, and general activity everywhere shown. A prosperous winter in these mines is confidently anticipated.

London

Nov. 28—The annual general meeting of the Consolidated Goldfields of South Africa Ltd., was held on Nov. 17, the chairman of the company, Lord Harris, presiding. In reviewing the events of the year the chairman was able to report a great improvement in the industrial position. The principal mines, which are under the management of the company and in which it has large holdings, namely the Simmer & Jack, the Robinson Deep and the Knights Deep, have made a large increase in profits, due to increased production, and to reductions in working costs. The obligations of the company to the managers and technical staff were not forgotten and the chairman made a graceful reference to the good work done by the officials in South Africa who, in consequence of the change over on many mines from Chinese to Kafir laborers, have had this year a particularly difficult task to perform.

As regards the future the chairman spoke in an optimistic vein, saying that he saw no threatening factor to obstruct progress. If there was any cloud on the horizon, it was in connection with unskilled labor, the supply of which might not meet the demands that would be made owing to the all-round expansion of business. This year will see the termination of the employment of Chinese on the mines. Their places have been filled by Kafirs, who have been recruited in larger numbers than formerly. Whether this supply will be maintained or not is the doubtful question, but Lord Harris anticipates that any difficulties that may arise in keeping the mines working, owing to insufficient unskilled labor, will be surmounted. In what way the deficiency of unskilled labor would be met was not explained, but it may be assumed that it will be brought about partly by increased economy in its employment and partly by a more extended use of mechanical appliances. The view taken by Lord Harris as regards labor is supported by Lionel Phillips, president of the Transvaal Chamber of Mines, who in an address to the Chamber on Nov. 19, is reported to have said that he conscientiously believed that with united action and with the benevolent assistance from the governments of South Africa, and with the probable assistance of mechanical appliances, they would meet the growing requirements of the industry. He further said that he would not be surprised if the output were to rise to £4,000,000 or more per annum. The Goldfields shareholders were also addressed by Drummond Chaplin, one of the joint managers in South Africa, who also spoke hopefully of the future prospects of the mining industry, saying, that during the eight years that he had held his position, he had never seen the sky so clear as it is at the present time.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Ketchikan District

It Mining Company—This company has shipped since Oct. 15 a total of 1200 tons of gold-copper ore to the Tyee smelter at Ladysmith, British Columbia.

Arizona

Cochise County

Copper Queen—The smelter is operating eight blast furnaces, one reverberatory and six converter stands. The output for November is expected to. be about 8,500,000 lb. copper.

Calumet & Arizona—Five furnaces are in operation, one of 500-ton capacity, and four of 300 tons. It is the intention to enlarge all the original furnaces, preparation for the work being under way.

Gila County

Arizona-Michigan Copper Company—This company has been found in Calumet, Mich. The property consists of 670 acres in the mineral belt of the Globe district, Arizona, and it is believed to carry the extension of the Old Dominion lodes and the Black Hawk vein of the Arizona Commercial Company. The company is capitalized at 150,000 shares of $10 each. James Chynoweth is president, Silas Chynoweth, secretary and W. E. Anderson, treasurer.

Old Dominion—Four furnaces of the smelter are in commission, and the total output for the year is expected to reach 3,500,000 lb. of copper. The November production was about the same as that of October.

Montgomery—The Warrior Copper Company is developing in this mine an orebody running high in copper. It has been opened on the 250-ft. level by a drift 450 ft. long and a crosscut of 65 feet.

Yavapai County

Alvarado Mining Company—This company, Congress Junction, is putting in a 25-stamp mill, and fitting up for direct cyaniding. Tube mill regrinding will be used, and only bullion will be shipped. The property is developed to the [illegible] level, and has enough ore blocked out to run the mill two years. The [illegible] mine which is being operated by leasers is said to be on a continuation of the same vein.

Golden Ridge Mining and Milling Company—This company has been organized. with Byron Smith, of Congress Junction, as the superintendent. It has taken over a group of claims west of the Congress mine, and adjoining the Ohio group. The ledge outcrops for a width of 9 ft. The shaft is about 75 ft. deep. This company has also purchased three claims adjoining the Alvarado mine, and will put a force of men at work there at once. Two separate camps will be maintained as the two properties are about eight miles apart.

United Mines Company—This company, of Congress, under the management of D. J. Sullivan, is installing a cyanide plant. The mine is down about 500 feet.

Ohio Group—It is understood that work will be again resumed on this group adjoining the Golden Ridge. A shaft has reached a depth of 200 ft. and has considerable water, which will soon necessitate the installation of other machinery.

Arizona Gold Company—O. L. Geer, of Congress Junction, manager of this property, about 25 miles west of Congress Junction, states that the company will install machinery during the first part of the year, and force sinking. The mine will need a hoisting plant.

Venus Mining Company—This company is planning to begin operations. E. H. Hagy, of Rapid City, S. D., president, will probably be on the ground by Dec. 1. The shaft on the property 10 miles west of Congress Junction is down 125 ft., and a hoist will be installed.

Octave—This company is changing its entire plant over to use electric power, which is to be furnished by the Central Arizona Power Company, of Wickenburg, Ariz. It is understood that this power company is a subsidiary organization of the Octave, though it purposes to sell power to any and all consumers who are within easy reach of its transmission lines.

California

Amador County

Volcano Ditch—A new inverted siphon has been installed, flumes repaired and ditch cleaned out, so that the ditch is now in as good condition as when built about 50 years ago.

Butte County

[illegible] This company recently bought the old Durgin claim near Paradise. An upper stratum of gravel was recently found by Superintendent E. D. Casterline. The Gunn, on the same channel, is also being opened.

Calaveras County

[illegible] river district, J. B. Sauve, superintendent, is showing a rich shoot of ore. A three-drill Burleigh compressor has been installed, and five stamps are being added to the mill.

Kenross—At this property, near Whisky Slide, S. W. Kerley, superintendent, a storage reservoir has been built, the ditch repaired, and a débris dam for tailings will be constructed.

El Dorado County

Capitola—At this mine, owned by Salt Lake men near El Dorado, J. P. Cowan, superintendent, a 10-stamp mill is being installed and also a new steam hoist.

Union—At this mine near El Dorado a new hoist has been installed and also new hydraulic pipe. Considerable timber has also been hauled in for timbering. M. L. Efflinger, of Nevada, is directing affairs, so it is supposed that the mine has changed hands or management..

Inyo County

Keane Wonder—A 200-ton cyanide mill is to be erected at this mine to treat the 14,000 tons of tailings on hand. There is a 20-stamp mill on the property.

Silver-lead Ores—The Christmas Gift mine at Darwin is shipping silver-lead ore to the smelter at Keeler, and the Lucky Jim operated by Charles Fitzhugh is doing the same. The Flier, north of Darwin, is preparing to make shipments to the smelter.

X-Ray—Williams Brothers are developing this group in Redding cañon, two miles south of the Dunlop. A tunnel has been put under the old workings, in the face of which is an 18-in. vein carrying good values in free gold.

Mariposa County

Mount Ophir—This old mine, near Mt. Bullion has been leased by Sane & Furey, who will work it this winter, shipping the ore to the mill at Bagby.

Nevada County

[illegible] been met on the 1400 level of this mine and some specimen ore is being taken out This mine was formerly a dividend payer [illegible] luck.

Plumas County

[illegible]

in American valley, testing the ground for a possible dredging proposition.

SIERRA COUNTY

No Better—At this mine, Forest district, a new gasolene hoist has been put in and a new gallows frame erected. A three-compartment shaft is being sunk.

SONOMA COUNTY

Great Eastern Quicksilver Mine This old mine near Guerneville ceased operations a few months ago, but there has been a large amount of quicksilver cleaned up from where it had accumulated about the furnaces in the past 20 years.

TRINITY COUNTY

Collins—This mine in Spring gulch has been equipped and its cannon-ball mill is to be set running as soon as there is a water supply.

TUOLUMNE COUNTY

Tuolumne River Water Power Company—This company has acquired the Golden Rock ditch and water rights of the Big Creek Ditch Company. The ditch runs from the middle fork of the Tuolumne river to a dam on the south fork and thence to Garotte, Big Oak Flat, to a dam on Pina Blanca creek.

YUBA COUNTY

Blue Point—The reservoir for holding the water for this mine has been completed and work will be resumed on the ditch when E. W. Tarr, the superintendent, returns from the East. The machinery for digging the ditch has all been shipped and the ditch line will be finished in two months.

Colorado

BOULDER COUNTY

Cashier Mill—It is reported that this mill at Camp Albion is to be increased from a 25-ton to a 75-ton daily capacity. Thomas Wood, Boulder, Colo., is manager.

Primos Mining and Milling Company—Two carloads of tungsten concentrates were shipped recently to the Primos Chemical Company, at Primos, Penn., the value of the shipment being $12,000 and representing a 40-days' run at the mill near Cardinal.

CLEAR CREEK COUNTY

Georgetown Mining, Power and Transportation Tunnel Company—This company, organized in the Georgetown district to build a 16,000-ft. tunnel into Columbia, Democrat and Sherman mountains, is contracting with the American Rotary Tunnel Machine Company, owning the Sigafoos drill, to install one of its machines. Part of the conditions were that two weeks are to be allowed for installation, and two weeks in which to prove the efficacy of the machine.

Terrible-Dunderberg—It is reported that this silver mine, in the Georgetown district, which has been idle for many years, is to resume operations. The Terrible is credited with an output of $10,000,000 in all.

GILPIN COUNTY

Fifty Consolidated Gold Mines Corporation—The Fisk vein has been opened up at a depth of 1400 ft., and is 5 ft. in width, all free milling ores. The company proposes to sink its 1450-ft. Cook shaft a further depth of 1000 ft. and develop on a heavy scale, and will arrange for the installation of a large pumping plant. M. D. Draper, Central City, Colo., is manager.

Golden Sun—Eastern and Colorado men are interested in property on South Boulder creek near Rollinsville, and they propose the installation of an air-compressor plant as well as electrical equipment of their property. E. T. Butler, Kittredge building, Denver, Colo., is manager.

Lucania Tunnel and Mines Company—Articles of incorporation showing capital stock of $2,500,000 have been filed, with E. A. Colburn, W. M. Kirby and J. A. Wright, of Colorado Springs, Colo., as incorporators. The company will operate in Gilpin and Clear Creek counties.

LAKE COUNTY

Lilian—John Withey is leasing on the lower portion of this property, Iowa gulch, and for some time has been working in ore. A few days ago a body of sand was opened in one of the drifts, and when it ceased to run the whole roof of the drift showed some native gold. Withey at once examined the pile of sand and found that it contained quantities of the yellow metal; he took samples from the pile and assays gave high returns. Since the opening of the sand work has shown that the pocket is of considerable length and hight. Being practically placer mine, Withey will run the whole of the sand through boxes.

North Mike—David Holden and associates have secured a lease on this property, Iron Hill, and are now engaged in opening the orebody in the upper workings; the ore is a good grade of iron containing considerable silver. The lower workings of the property have been cut by the Yak tunel, and when the upper workings are cleaned out of ore, the lower part will be worked from the tunnel level.

Tenderfoot—Several practical miners have secured a lease on this property, South Evans gulch, and will start at once to sink a new shaft. The property adjoins the Favorite, from which steady shipments of good ore are being made. It is expected that the new shaft on the Tenderfoot will require to be sunk over 150 ft. before the ore is reached.

OURAY COUNTY

Camp Bird, Ltd.—During October the mill ran 30 days, crushing 7054 tons, dry weight, and yielding 8329 oz. bullion and 441 tons concentrates. Sales of bullion and concentrates were $182,393; expenses at mine $49,082, and in London $1500, leaving a profit of $131,811. Expenditures for new construction were $178. There were 363 ft. of new development done.

Mono-Baltic—This company writes as follows of its mines at Ironton: "The company's claims now aggregate 180 acres, and development work has been so well pushed forward in the past 12 months, that there is fully 120,000 tons of ore in sight. The mines contain not only clean sulphide and silicious ores, but carry plenty of lime as well, making a healthy smelting proposition. The ores average 3.5 per cent. copper and 12 oz. silver per ton. The company has shipped 400 tons, mostly to the American Smelting and Refining Company, at Durango, averaging 7 per cent. copper and 14 oz. silver per ton. The grading for the smelter is now finished, and the company expects to have a 200-ton furnace installed in the spring."

PROWERS COUNTY

Lamar Oil and Gas Company—This company has struck what appears to be a body of oil in its new well at Lamar, at a depth of 1535 ft. The well is now being cased and the water drawn out.

TELLER COUNTY—CRIPPLE CREEK

The face of the Roosevelt deep-drainage tunnel was in 4171 ft. at the end of November. In the Cripple Creek district, the November production is stated to have been $1,318,000 gross bullion value.

The second annual banquet given by the Golden Cycle Mining Company to the ore shippers of the Cripple Creek district, took place Dec. 5 at the National hotel.

Jo. Dandy—Another Cripple Creek mining plant has been burned down, that of the Jo Dandy, on Raven Hill, the mill buildings and shaft house being destroyed, the cost of which was said to be about $100,000, with $40,000 insurance. This is the fourth big fire of a similar nature within a few months.

Tax Reduction—The various Cripple Creek mining companies some time ago brought action against the board of county commissioners, county treasurer and county assessor of Teller county, for a reduction of taxes, on the ground that non-producing property, though adjoining ground that was richly productive, could not be assessed as high as the latter, and they won their suits in the district court. An appeal was taken to the Supreme Court, and pending a decision, the companies will pay their taxes under protest, a stipulation having been filed to that effect.

Idaho

IDAHO COUNTY

[illegible]—A contract has been let for 100 ft. of development work. The claims were bonded by Fred Bradley while he was in central Idaho during the autumn.

Iron Crown—M. V. Garret, of [illegible], is at Newsome, preparing to start the stamp mill. Mr. Garret recently bonded the property upon which a small amount of development has been done.

Mount Marshall—Drifting is now being pushed on the 500-ft. level, where a crew of 25 men is employed. Supplies have been taken over from Stites sufficient to run through the winter.

SHOSHONE COUNTY

Full Moon—A compressor and drills are being installed at the mine, and as soon as completed, work will be started.

Blue Bell—William Carlson has taken a contract for 200 ft. of work. A contract for 400 ft.. has just been completed, making 1300 ft. of work on the property.

National Mining Company—A contract has been let for 100 ft. of shaft, which will give a total depth of 370 ft. The property lies north of Mullan.

Snow Cliff Mining Company—A contract for 100 ft. of work has been let. The property lies near the Liberty group upon which copper was struck a few weeks ago. Buildings are now under construction, and supplies are being laid in that work may be pushed all winter.

Cliff Creek Company—A vein of copper ore, 75 ft. wide and carrying 12 in. of solid chalcopyrite, has been opened up in the grading for the roadbed of the Chicago, Milwaukee & St. Paul railroad. A contract for 200 ft. of drifting has just been let.

Ruby Group—A strike of copper ore has been made on this group of claims, in the Lookout district. The group consists of four claims through which the ledge has been traced for 3000 feet.

Josephine Group—Two feet of ore carrying bornite and gold have just been opened up. The ledge is 12 ft. in width and in addition to the ore referred to carries a large quantity of good milling ore. A hoist and other machinery will be ordered and installed at once.

Paragon Company—A certificate of amendment to the articles of incorporation of this company has been placed on file with the county recorder by which the name of the company has been changed from the Paragon Mining and Manufacturing Company to the Paragon Consolidated Mining Company.

[illegible] Company—At a recent meeting of the directors it was decided to order a new hoist with a capacity of 1000 ft., and also to have the company's claims patented. The hoist in use at present has a capacity of only 600 ft. The property is operated by the Western Investment Company, of Wallace.

Indiana

DAVIESS COUNTY

Washington-Wheatland Coal Company—This company, which operates a mine at Wheatland, is sinking a shaft to the third vein, which will be the deepest mine in this section of the country. The shaft will be sunk to a depth of 270 ft., at which there is a vein of coal 6 ft. thick, with a good top. The company has for several years been operating the second vein, but the quality of this coal is not as good as in the third vein.

[illegible]

Winslow—This coal mine, near Oakland City, began operation Dec. 7. This mine, one of the largest in this field, has been closed for several years, and was allowed to fill with water. This has been pumped out and the mine thoroughly repaired. A new railroad switch has been completed. W. W. Wulfman, formerly operator of the Hartwell mines, is in charge of the work.

[illegible]

Peacock Coal and Mining Company—The stockyard at Massey caught fire from spontaneous combustion Dec. 1, and the fire has not yet been extinguished. The pile of coal has been cut in two, isolating the burning portion. About 500 tons will be lost.

VERMILLION COUNTY

Plans for sinking a new coal mine just west of Fair View, a recently incorporated town two miles north of Clinton, have been announced by T. A. Kibby. Chicago coal operators are back of the enterprise, having secured options on 1000 acres of coal land.

Louisiana

Oil production in Louisiana in November [illegible] Shipments reported by rail were 206,073 bbl.; by pipe line, 161,000; total, 367,073 bbl. This does not include oil delivered to local refineries or used in the field. There were 14 new wells completed in the Louisiana field during the month, of which eight were oil producers, one a gas producer and five dry holes. There were 43 wells in progress at the end of the month.

Michigan

[illegible]

Ahmeek—Work on the new stamp mill that this company is erecting is progressing favorably; the foundations for the wash are about completed and will soon be ready to receive the structural steel.

Franklin—The footwall of the Pewabic lode has been reached in the crosscut from the the 24th level. The lode opened at the 23rd level was well mineralized.

Centennial—At the stamp mill, which is owned jointly by this company and the Allouez company, the erection of the two additional heads is progressing nicely; the concrete foundations are ready and the large anchoring castings are in position. This will give the mill five heads, four steeple-compound and a single cylinder, which will be remodeled as soon as the two new heads are ready.

Lake—The additional machinery that this company is installing will soon go into commission and more drills will be started and a larger skip will be used.

Atlantic—This company has begun to sort its rock coming from section 16 shaft and is loading it into cars.

Victoria—This company has levied an assessment of $1 per share payable Jan. 11, 1909, in order to carry on extensive exploration in hopes of opening up a more consistent and better paying lode. The hydraulic plant is unable to operate continuously owing to the scarcity of water.

Quincy—This company is encountering some exceptionally good ground in its No. 9, or Pontiac shaft. This shaft is the most northerly of the openings and is down about 200 ft. on the Pewabic lode.

Lake—A shaft house is being erected. The enlarged equipment has gone into commission and greater progress will be made in opening the property. Conditions underground remain unchanged and the drifts in both directions from the second level are in the same highly mineralized formation.

Ojibway—At No. 1 shaft of this property the crosscut from the first, or 500-ft. [illegible] the Kearsarge series and has all the indications of carrying the same high mineralized ground as the one previously encountered. The formation cut by the crosscut from the same level of No 2 shaft is somewhat shattered, but not so much as in the level above, indicating that as depth is reached this condition will be eliminated.

Keweenaw—Sinking continues in the Medora shaft and the lateral openings from the lower levels are revealing a much better grade of stamp rock. The Phenix mill continues operating one shift [illegible] daily.

Wyandot—Drifting on the recently encountered amygdaloid formation continues and the copper-bearing portion has [illegible] mass and heavy copper and epidote.

Copper Range Consolidated — The Champion and Baltic properties are shipping about 3000 tons of rock to the mills daily and the underground conditions are [illegible] mountain is shipping about 1000 tons daily. Diamond drilling is now under way on sections 7 and 8, now held under option from the St. Mary's Mineral Land Company. It is expected that the Atlantic lode soon will be penetrated.

Franklin—This company is preparing to commence drifting from the 24th level of No. 1 shaft on the Pewabic lode. It is upon this formation that the life of the property now depends.

Missouri

Zinc-lead District

Dr. Boyd Land—A 300-ton mill is to be erected on the Cameron lease on this land at Sarcoxie.

Nortonia—This mine has resumed work after a long shutdown.

Montana

Butte District

North Butte Mountain—E. H. Wilson is in charge of operations at the company's mine just north of the city. The shaft has reached a depth of 240 ft., and is being sunk under a contract which calls for a depth of 500 ft. When the 250-ft. mark is reached a station will be cut and crosscuts run north and south.

Tuolumne—The shaft is down nearly 1100 ft., and sinking will be continued down to the 1600-ft. level, stations being cut every 200 ft. The crosscut on the 1000 has intersected three veins. One cross-compound condensing two-stage Nordberg air compressor and six 150-h.p. boilers, with 150 lb. pressure per sq.in. are being installed.

Butte & Balaklava The shaft, now down 1050 ft., is being sunk to the 120-ft. level. On the 1000 a station has been cut and a crosscut run which has intersected three veins. The veins range from 26 to 32 ft. in width, and all show copper, gold and silver. When the 1200-ft. mark is reached in the shaft a large station will be cut and an electric pump installed before any development work is done on that level.

Lewis & Clark County

Pittsburg & New York Copper Company—At the Umatilla group, seven miles west of Helena, the mill is being put in shape and the cyanide plant will soon be ready for operation.

Fergus County

Abbey Gold Mining and Milling Company—John R. Cook, general manager, states that a 100-ton mill is to be erected at once on the claims near Kendall. About 1000 ft. of development work has been done on the property.

Barnes-King—Manager McGee made his monthly report for October last week to President John Gillie. Owing to an unusually severe storm at Kendall in October the transmission line was blown down and operations suspended entirely for 10 days so that the showing made for the month was below the average. The mine produced bullion of the gross value of $24,056.79 and the net value of $23,982.40. The latter sum is about equal to the operating expenses of the mine.

Nevada

Esmeralda County—Goldfield

Combination Fraction—This week the shoot of ore that is being mined on the 300-ft. level has been found on the 450-ft. level. Work on the 612-ft. level will now be pushed to find the same oreshoot.

Grizzly Bear—A lease on this claim of the Consolidated has been granted to F. A. Lucy and associates.

Elk-Consolidated—This lease on the Yellow Tiger has been granted an extension of five years to its lease. It has the only steel gallows frame in the camp and has a fine plant of machinery. It was closed down several weeks ago, soon after the finding of pay ore at the 600-ft. level, when a large flow of water was cut. The shutdown, unexplainable at the time, now appears to have been for the purpose of extending the lease and preparing future plans for development.

Mushett Lease—This lease in the Laguna has now been acquired by the Hazel Goldfield, which owns the Hazel lease adjoining, and on which is the deepest shaft in the camp. Permission has been obtained from the Consolidated to work the Mushett ground from the Hazel shaft; work on both leases is now being pushed.

Little Florence—A 100-h.p. double-drum hoist is being installed, which is so arranged that it can use either electricity or gasolene for motive power. In addition to the present 6-drill compressor, a 15-drill compressor is being installed.

Consolidated—The old Mohawk dumps are being shipped to the new mill; about 1000 tons of ore have been put into the main ore bins at the mill ready for the stamps. The crushing plant, conveying machinery and sampling mill are in operation, but the whole mill will probably not be ready to run inside of 60 days.

Florence—A new lease has been granted to Pollard and associates on the block of ground formerly operated by the Florence Aurelia company on the Red King claim. This adjoins the old Pollard Florence on the east and the Engineers lease in the south. The shaft is 330 ft. deep, while the Pollard Florence shaft is 500 ft. deep; in it several reach veins were developed and followed up to the Aurelia line.

Atlanta—The Century lease has resumed work. The shaft now down 350 ft. will be sunk to a depth of 650 feet.

Nancy Donaldson—Work has been resumed at this group in the east slope of Red mountain in the extreme northeast part of the camp. Some small bunches of high-grade ore were found in the shallow workings.

Combination Extension—J. K. Walsh, of Los Angeles, has been granted a two-year extension of his lease. The two-compartment shaft, now 416 ft. deep, will be sunk several hundred feet deeper.

Florence Annex No. 2—A second shipment of ore has been made; this ore will average higher than the first shipment which, although not carefully sorted, assayed about $60 per ton.

Kewanas—The new vertical shaft is now 450 ft. deep; a crosscut will be run to the orebody found on the 500-ft. level in the old incline shaft. This will give about 100 ft. of backs.

Mohawk Ledge—An oreshoot 6 ft. wide has been opened up at the north end of the 300-ft. level, and a shipment from it has already been made. This is thought to be the extension of the Sheets-Ish-Kalfus shoot.

Crackerjack—This shaft on the western slope of Columbia mountain is now 400 ft. deep. Both crosscutting and sinking are in progress.

Black Butte—The company has had the old workings of the Huntzinger lease which was abandoned after an expenditure of several thousand dollars examined by an expert who found a vein cut by the former management which averages $200 per ton. Ore from this find is now being shipped.

Nevada Florence—Under this new name the old Chicago Florence is being worked. The shaft, now 400 ft. deep, will be sunk to a depth of 700 ft. Drifting has begun on the 400-ft. level.

Nye County—Bullfrog

Homestake King—The 25-stamp mill which is treating 75 tons of ore per day has sent two gold bricks to the mint. This bullion is worth about $8000, and was obtained from a partial clean-up of a two-weeks' run.

Springdale Mining and Milling Company—The last shipment of machinery has arrived, and the company's mill is expected to be running in about three weeks. The plant has a capacity of 40 tons per day.

Montgomery Mountain—Samuel Newhouse has given orders to resume operations. A shaft is to be sunk to a depth of 400 ft., and two veins that have been developed near surface will be prospected at that depth. This shaft when completed will be 550 ft. deeper than the collar of the neighboring Shoshone shaft, and 400 ft. below the Montgomery Mountain adit.

Montgomery Shoshone—The glory-hole talc deposit is still furnishing a large part of the 4000 tons of ore milled each month. This talc body has been proved for a length of 300 ft., and a width of from 40 ft. to 100 ft. Considerable of this talc ore is still held in reserve.

Nye County—Round Mountain

Round Mountain Hydraulic Mining Company—This company has purchased the Gordon-Garrecht lease on the Blue Jacket group and will replace the dry washers of the original leasers by a hydraulic giant which will wash 100 to 150 tons of gravel per day. A thorough prospecting of the ground is going on, but the location of the giant has already been fixed and the sluice boxes are now being put in place. The water main has been tapped near the incline on the Antelope lease so that a good head of water is available.

Sphinx—The mill is running at full capacity on ore coming solely from development work; no stoping is being done.

Nye County—Tonopah

The total output of the Tonopah mines for the week ending Nov. 21 amounted to 5325 tons valued at $133,125. The Tonopah Mining Company mined 3100 tons; Belmont, 800; Montana Tonopah, 625; Midway, 100; MacNamara, 350; West End, 100; Jim Butler, 250 tons.

Belmont—On the 1100-ft. level, the crosscut from the east drift, which passed through 38 ft. of quartz and struck what was then supposed to be the hanging wall, has been advanced 23 ft. and is still in vein material. Big bunches of milling ore and stringers of richer ore are frequently found; the ground is much broken up.

Montana Tonopah—Several finds of importance have been made this week; two of these are on the first or 390-ft. level in the west drift where a new shoot of ore has been found about 600 ft. west of the shaft. There is 2 ft. of good milling ore in the face. In the south crosscut, 400 ft. west of the shaft, the faulted portion of the oreshoot that was lost in the east drift has been found. The ore is oxidized and of good grade. A good streak of high-grade ore has been cut in the raise driven from the top of the 465-ft. level stope.

Tonopah Mining Company—Work in the Mizpah shaft has been stopped for a week in order to watch the progress of the water which appeared in the bottom. After the water rose to a depth of 12 in., no increase in the water was noted and a drill hole sunk down 14 ft. failed to show any further flow. A crosscut has been started on the 1200-ft. level and is now 65 ft. long, the face being still in dacite. The drill hole from the 740-ft. level of the Silver Top shaft is now 154 ft. deep

MacNamara—Six machine drills are now in use, four in ore and two in development work, the air being obtained from the Tonopah Extension power house.

Tonopah Extension—The station on the 35-ft. level has been completed, and work on the lower levels has been resumed. The crosscut in the new level has been driven north 40 ft., and has now been turned west.

Storey County—Virginia City

Butters Plant—A shipment consisting of 1000 lb. of precipitates from the Montana-Tonopah mill has been received at the Butters plant in Six Mile cañon. This is the first outside lot of precipitates sent to the Butters plant; quicker returns will be given than if the precipitate was sent to California or Utah.

White Pine County—[illegible]

[illegible] Mill and Mining Company—The old Newark mill, erected in 1866, has been started up and has made its first shipment of silver-lead-copper concentrates to Salt Lake smelters. A second shipment is ready.

New Jersey

Warren County

The closing down of the copper mine at Pahaquarry, near the Delaware river, which was recently reported, was for the purpose of installing new machinery. This machinery is now being delivered at the mine, and it is expected that it will be in place by January, when work at the mines will be resumed.

North Carolina

Buncombe County

Great Southern Mica Mining Company—This company has leased property at Asheville, and it is reported that it will concentrate all its manufacturing plants in that town. At present it has several small plants at different points.

New Mexico

Grant County

Gold Pass—This camp, about 30 miles southwest of Hachita, was discovered about three weeks ago. The ore, while low-grade, is said to occur in wide veins.

Santa Fe County

Cash Entry—This old mine has been bought by the Boston Cerrillos Mines Corporation. Houses for the men and for sheltering the machinery are being built; mining will be resumed this winter. In the past this mine produced much ore.

Oklahoma

There were 258 new oil wells completed in Oklahoma in November, of which 246 were oil producers, five gas producers and seven dry holes. There were 278 wells in progress at the end of the month.

The production of petroleum in November was 3,580,725 bbl. Deliveries by rail and pipe lines were 3,225,282 bbl., and 355,483 bbl. were stocked in tanks. The total stocks reported on hand Nov. 30 were 51,535,580 bbl., held in the State. Oklahoma oil stored in Texas tanks is not included.

Washington

[illegible]

New Republic—This company, recently formed to operate the abandoned Republic mine, has begun work by hand, while awaiting the arrival of hoist and compressor.

Walla Walla Copper—This company, formed by a company of Walla Walla men to work properties in the Keller district, has consolidated a number of claims and will begin development this month. The properties lie near the Keller smelter.

Manila—This mine has about 1200 tons of ore stored in bins, ready for the blowing in of the smelter. A new chute is being constructed to put ore from the mouth of the tunnel down at grade level.

Forest—The company recently took over the old Easter Sunday mine, 12 miles northeast of Orient, and expects to begin operations soon. A stamp mill has been ordered.

Stevens County

German Silver Gold Mining Company—The company has sold out its holdings to E. W. Shively and L. Bryant, of Spokane, who expect to begin development at once. The showings are in lead-silver.

Old Bullion—Work has been temporarily suspended, while a hoist and drills are installed. Ore carrying gold, copper and silver of an aggregate value of $20 per ton was opened up at a depth of 100 feet.

Okanogan County

Grant Consolidated—The company has completed a six-mile wagon road from the mine to the railway, and is ready to ship ore. Work done last spring opened up two veins of concentrating copper ore about 40 ft. wide.

Wisconsin

Zinc-lead District

Benton—The Beloit-Elmo has let a contract to the Galena Iron Works for a 50-ton mill

[illegible] sheets of high-grade jack were struck in the Drum lease at 72 ft. The main shaft at the Pittsburg-Benton is being sunk to the oil rock to take up the lower ore level; the upper run contains a sheet 2 to 4 ft. in thickness.

[illegible] close to the line of the Garden City. Preparations are being made to rebuild the 50-ton mill destroyed by fire last month

Garden City—This property, purchased recently by John Gubbins, of Chicago, made its first shipment of carbonate, assaying 45 per cent. zinc, to the American Zinc and Lead Smelting Company, at Deering, Kansas.

Philippine Islands

AMBOS CAMARINES

Paracale Miners' Association—The miners operating in the Paracale district have organized this association for the purpose of securing united action on matters of common interest. One of the objects is to obtain some improvements in the Malaguit river, which will furnish a harbor where coasting steamers can land, thus giving the district communication which is much needed. The officers are A. J. MacDonald, president; William Kane, vice-president; G. Armstrong, secretary and treasurer.

Paracale Gold Dredging Company—After many delays and difficulties, this company now has its dredge on the Paracale river working regularly. The production in September was 550 oz. gold. The gravel handled averaged 300 cu.yd. per day. In addition the company has saved a large quantity of black sand for future treatment.

Philippine Gold Dredging Company—This company, organized at Manila, has acquired a large area of placer ground on the Paracale river. It has brought the Risdon dredge formerly used on the Guinobatan river in Masbate, and removed it to the Paracale. It is also building a new dredge. The company is also testing by bore holes an area on the Malaguit river, which is believed to be good dredging ground.

Philippine Placers—A considerable amount of gold is saved from placers along the Malaguit and Paracale rivers by native workers, chiefly women, who pan out the gold with wooden washers, resembling the *batea* used in South America.

San Mauricio—This mine, at Mambulas, formerly worked by an English syndicate, has been taken up by a Manila company. Some 1500 ft. of the old slopes and drifts have been cleared out and retimbered, with such promising results that arrangements have been made to continue the work and put up a 20-stamp mill.

Tumbaga—This old gold mine, formerly owned by an English syndicate, is being unwatered and cleared out. The mine has not been worked since 1896. The main shaft is over 100 ft. deep. The old workings will be thoroughly prospected and extended if the results are favorable.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Nov. 28 were as follows: Coniagas, 64,000 lb.; Crown Reserve, 60,000; La Rose, 217,910; McKinley-Darragh, 240,000; Nipissing, 249,130; O'Brien, 191,920; Silver Queen, 156,000; Silver Cliff, 40,000; Temiskaming, 60,000; Temiskaming & Hudson Bay, 60,000; Trethewey, 63,000; total, 1,401,960 pounds.

Badger—In clearing ground for the installation of the compressor a small vein carrying smaltite and calcite with bloom was encountered at right angles to vein No. 9. Drifting is being done on the latter vein at 200 ft., at which level a station is being cut. A contract for diamond-drilling has been let.

City of Cobalt—This company has declared a quarterly dividend of 3 per cent., with an additional 7 per cent. bonus. It has been decided to raise the capitalization from $500,000 in one dollar shares to $1,500,000.

Cobalt Lake—Since the winze has been sunk 50 ft. from the 85-ft. level on the big niccolite vein high-grade silver ore has been found with the niccolite. Nearly two carloads have been mined, the native silver contents of which are said to run 5000 oz. to the ton.

Hargrave—The old shaft is being pumped out and sinking will be started as soon as possible. Machinery has been ordered.

Mount Royal—The reorganization of the Green-Meehan mine and its amalgamation with the Red Rock property have been effected and the new company will be known as the Mount Royal. W. B. Russell, Arthur Ferland and Wm. C. Chambers, as trustees for the controlling syndicate, purchased 694,000 shares of Green-Meehan placing in the treasury $60,000 for development purposes to be spent at the rate of at least $3500 per month. Green-Meehan shareholders are to receive shares in the new company equivalent to their holdings in the Green-Meehan.

ONTARIO—LONG LAKE DISTRICT

Richardson—A vein of good zinc ore, 800 ft. long and varying in width from 1 ft. to 4.5 ft. has been struck at this mine in Frontenac county, and is considered the best find so far made in the district.

ONTARIO—WELLAND COUNTY

British American Smelting Company—The smelter at Chippawa is working to full capacity on ore from the La Rose mine, Cobalt. Thirty men are employed. The capacity of the plant will be enlarged in the spring

ONTARIO—LARDER LAKE DISTRICT

Harris-Maxwell—A 10-stamp mill is running 24 hours per day treating 30 tons of ore daily. The workings comprise a tunnel driven 100 ft. into the bluff at the end of which a crosscut is run 50 ft. to the west through paying ore. Forty more stamps with compressor, boiler, etc., will be installed during the winter.

Reddick—New machinery is being installed, which will raise the capacity of the plant to 150 tons per day. The ore now being treated is running more than $9 per ton. A strike of rich ore was recently made in No. 3 shaft which is said to run in places more than $500 to the ton.

Mexico

CHIHUAHUA

Santander—This mine, in the Santa Eulalia district, the property of C. O'Çalahan, is producing 10 tons per day of 200-oz. silver ore. It is one of the new mines.

Chicago—Work is about to begin on this copper mine near Coyame in the eastern part of the State. The mine is on the same vein as the Las Vigas.

Rio Plata — November production amounted to 63,120 oz. exclusive of tailings. Net returns on shipments were $36,803, and applied on account of operating expenses $11,041. The cyanide plant is expected to be in operation in February when the output will be doubled.

Palmarejo—Important improvements are under consideration, among them moving the mill to the mines to do away with the railroad haul.

JALISCO

Cinco Minas—A payment has been made on the purchase price of this property in the Hostotipaquillo district by a representative of the Marcus Daly estate. An option was granted a short time ago by Martinez and Cardona, the owners. The purchase price is said to be in excess of $500,000. New work will begin at once under the direction of H. E. Crawford. The plans include a big reduction plant.

Magistral Ameca Mining Company—This company is in process of organization at Spokane, Wash., to work properties at Ameca. The officers contemplate the erection of a 100-ton concentrator to treat the bornite and chalcopyrite ore.

MICHOACAN

Dos Estrellas—During October the mills worked without interruption and treated 24,633 tons of ore, the total production having a value of $661,242. Expenses of the mines, including exploration, development and taxes, were $325,913, and $15,455 worth of new machinery was installed.

New Caledonia

Shipments of ores from the colony in September and the nine months ended Sept. 30 are reported by the *Bulletin du Commerce* of Noumea as follows, in metric tons:

	September.	Nine Months.
Nickel ore...............	9,557	96,619
Cobalt ore...............	560	3,023
Copper ore...............	7	10
Iron ore..................	11	33
Chrome ore...............	3,070	37,175

In addition to the above there were shipments during the year of 5 tons of lead and 5020 kg. silver.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 9—The coal trade in the West generally is quiet, showing little or no advance in the demand for steam coal. Mines are not generally running full time, but there are complaints at consuming centers of over-supply, and consequent low prices. Continued mild weather has kept down the domestic demand. The Lake trade is now over for the season, and if more coal should be needed in the Northwest it will have to be shipped by rail.

The Seaboard bituminous market remains dull and quiet. Mines are not working to capacity, but the supply seems to meet all demands. The requirements for steam coal do not increase as rapidly as was expected. Manufacturers generally do not seem inclined to put in more coal than they need for the time being.

Anthracite coal is also dull, partly on account of the weather, which keeps down the domestic demand. The shipments from the mines hold up well, but a considerable quantity must be going into the storage yards which all the large companies have.

Coastwise trade is falling off, though perhaps not more than is usual at this time of the year.

Coal Traffic Notes

Tonnage originating on Pennsylvania lines east of Pittsburg and Erie, year to Nov. 28, in short tons:

	1907.	1908	Changes
Anthracite	5,192,424	4,714,361	D. 47[illegible]
Bituminous	36,373,165	30,797,256	D. 5,57[illegible]
Coke.............	12,[illegible],292	6,165,059	D. 6,068,[illegible]
Total.........	54,099,0[illegible]	41,976,690	D. 12,1[illegible]

Total decrease this year to date was 22.4 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad for the 11 months ended Nov. 30 were [illegible] tons in 1907, and 560,556 tons in 1908; a decrease of 341,735 tons, or 37.9 per cent.

Coal receipts at Boston 11 months ended Nov. 30, reported by Chamber of Commerce, in long tons:

	1907	1908	Changes
Anthracite ...	1,874,654	1,619,800	D. [illegible]
Bituminous ..	[illegible]	[illegible]	I. [illegible]
Total domestic..	[illegible]	[illegible]	D. 180,44[illegible]
Foreign........	491,139	338,808	D. 152,[illegible]
Total ...	[illegible]	[illegible]	D. [illegible]

The foreign coal reported comes chiefly from Nova Scotia.

Anthracite coal shipments reported in November were 5,830,481 long tons; being 158,016 tons less than in October, but 93,959 tons more than in November, 1907. For the 11 months ended Nov. 30 the shipments were as follows, in long tons:

	1907	1908	Changes
Reading	[illegible]	[illegible]	D. [illegible]
Lehigh Valley	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
Del. & Hudson	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	I. [illegible]
N. Y., Ont. & West.	[illegible]	[illegible]	I. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

The total decrease this year is 4.7 per cent. Only two companies—the Erie and the New York, Ontario & Western—show increases. The larger proportional losses were on the Reading and the Lehigh Valley.

New York

Anthracite

Dec. 9—The demand for both prepared and small steam sizes has abated and hard coal is in good supply.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

The soft-coal market is dull in all consuming territories, especially so in New York harbor, where good grades of steam coal fetch $2.45@2.65 with poorer grades as low as $2.30. Transportation is fair and cars are in good supply. In the Coastwise vessel trade boats do not seem to be scarce. Freight rates remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, $1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Dec. 7—[illegible] in several of the larger collieries is approaching normal again and before the holiday season sets in it is believed there will be a general return to the usual output. The railroads are handling the product promptly. A little car shortage is reported in some sections, but this will not be extensive. The Car Service Association reports a larger number of cars being handled in the coalfields than for the past 14 months. There is considerable coal being shipped out of the district, much of it going to Louisiana and Mississippi markets.

Coke is in strong demand and good prices are obtaining for it. The production continues to show an increase.

Chicago

Dec. 7—[illegible] steady and comparatively free from accumulations of demurrage coal, shipments being generally restricted. There is some depression of prices on screenings and on lump from Western mines, but the consumption of both steam and domestic coals, speaking generally, is increasing, and the tone is firmer than for many weeks. The coming of cold weather throughout Chicago territory has appreciably increased sales of anthracite and domestic bituminous. Advertising has aided the sales of the best brands of smokeless, though run-of-mine smokeless continues in large supply.

[illegible] mines bring $1.75@2.65; run-of-mine sells for $1.65@1.75, and screenings are sluggish at 95c.@$1.55. Hocking is in good demand and fairly restricted supply at $3@3.15. Youghiogheny moves on contracts at $3.15 for ¾-in. gas and Pittsburg No. 8 is steady at $2.65@2.85. Smokeless brings $2.85@3.30 for run-of-mine. Anthracite moves steadily to both retailers and consumers, with nut coal much in de[illegible] to be steadily increasing, and there is a feeling in the trade that weather conditions are bound to continue the good demand for domestic sizes and grades that is satisfactorily shown in both city and country with the beginning of this week.

Indianapolis

[illegible] operators are interested in the plan of an outlet for Indiana coal for the South, announced by the River & Rail Coal Company. This company proposes to build at [illegible] across the Ohio river at Evansville. The Evansville & Terre Haute railroad runs direct from the Indiana coalfields to Evansville. The River & Rail company has notified Indiana operators that it will be glad to handle Indiana coal for ship[illegible]

There has been a slight improvement in [illegible] district during the past week, but the improvement has not been sufficient to bring the relief that is needed. Work in this coalfield is considerably below the average for this season of the year. These conditions prevail to some extent, all over the State. The operators give as their opinion that the slack work is due to the mild winter and the unsettled condition of the country. They further say the only relief that could come is through severe cold weather, for at least a month or two.

Pittsburg

Dec. 8—The general coal market continues dull and prices are much softer, with but little new business. Large operators continue to hold to quotations based on mine-run at $1.15 at mine and slack around 75c. A number of small sales have been made during the week at considerably less and for prompt shipment there would be no difficulty in buying mine-run coal at $1. Several important coal interests in the Pittsburg district met informally Dec. 7, and decided to arrange for a general meeting to discuss conditions and devise a plan for improving the situation. The large steel companies have provided by long term contracts with different companies for their requirements and there is but little business outside. This week not more than 50 per cent. of the railroad mines are in operation and the river mines are all idle.

Connellsville Coke—Conditions in the coke trade show no improvement and prices for prompt shipment are weaker. Producers still adhere firmly to the quotation of $2 a ton for furnace coke for first-half delivery and for foundry coke $2.25@2.40 at ovens. Production is about 53 per cent. of capacity and this percentage will not likely be increased until after the opening of the new year when a number of idle furnaces are expected to go in blast. For prompt shipment regular prices of both foundry and furnace coke have been shaded 10@25c. a ton. A number of inquiries for coke for delivery through the year have been received, but producers hesitate about taking this business. One or two large sales of foundry coke have been made for the year at $2.60 a ton. The *Courier* gives the production in both of the Connellsville regions at 229,199 tons. The shipments were 8364 cars as follows: To Pittsburg district, 3238; to points west of Pittsburg, 4623; to points east of Connellsville, 503 cars.

Foreign Coal Trade

United States Coal Imports—Imports of coal and coke into the United States, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Anthracite............	3,101	15,029	I. 11,928
Bituminous..........	1,719,327	1,279,470	D. 439,857
Total coal..........	1,722,428	1,294,499	D. 427,929
Coke..........	108,508	95,779	D. 12,729

Canada furnished this year 924,593 tons of coal and nearly all the coke; Australia, 306,924 tons of coal. Imports are chiefly on the Pacific Coast.

United States Coal Exports—Exports of coal from the United States, with coal sold to steamers in foreign trade, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Anthracite........	2,336,304	2,334,931	D. 1,373
Bituminous	8,675,258	7,558,962	D. 1,116,296
Total exports..	11,011,562	9,893,893	D. 1,117,669
Steamer coal ...	4,735,620	5,014,168	I. 278,548
Total coal.	15,747,182	14,908,061	D. 839,121
Coke......... ...	761,568	498,907	D. 262,661

Canada took this year 7,766,932 tons of coal, or 78.5 per cent. of the total exports.

Coal in Russia—The production of coal in Russia is officially reported at 19,624,700 metric tons in 1904; 18,683,800 in 1905; 20,664,411 in 1906; and 26,023,344 in 1907. The increase last year over 1906 was 5,358,933 tons, or 26 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 28: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.92; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Dec. 9—The iron and steel markets have been generally quiet during the week, and it looks as if buying beyond present requirements had subsided for the present, probably until the close of the year. Part of this is probably due to the expectation that there will be some reduction in the tariff, and consequent lower prices. At any rate the markets seem to be in rather a waiting condition. Some action on prices is looked for also, as the possible result of the gathering of steelmen set for Dec. 10, in New York.

Pig-iron sales have been light, though orders on contracts are reported to be coming in quite freely. Foundry iron is most in demand for new sales, the inquiry for basic having fallen off. In finished material orders for structural steel are evidently held back. Actual sales are much lighter than they were a week or two ago; and will probably continue lighter until the price question is settled. The railroads are making no sign, and the rail orders for next year are still a very uncertain quantity.

A special feature is the growing demand for heavy steel scrap from the open-hearth steel makers. At present it seems uncertain whether this demand can be met without an advance in prices.

Lake Iron Ore Shipments—A Duluth estimate of the total iron ore shipments from the Lake Superior region for the season is 25,421,000 tons, of which 17,232,000 tons, or 67.8 per cent., were from the Mesabi range. Shipments by lake are now closed. The last ore to leave was two cargoes from Escanaba, which started this week, and are not included in the total above given.

Baltimore

Dec. 8—Exports from this port for the week included 631 tons steel rails and 531,934 lb. structural steel to Colon; 1,628,588 lb. tin scrap to Rotterdam.

Birmingham

Dec. 7—Southern pig iron manufacturers have announced an advance in quotations, though the new price has not yet become general. No. 2 foundry iron has been quoted at $13.50 per ton, 50c. above the price that has been in vogue for some time; but as yet there have been but few sales made, if any. Some sales were made during the past week for delivery during the second quarter of 1909 at $13 per ton. Two furnaces at Bessemer have been dried out and it was believed they would be making iron by now but there has been some delay. There has been no difficulty experienced in selling iron, and several companies have been out of the market for more than a week for iron to be delivered during the first quarter.

Raw material supplies are being given some attention, especially in ore. The coke production is healthy, as well as the limestone. The ore situation promises to be easy even when several other furnaces are blown in.

There is no change at the Ensley steel works of the Tennessee company. There are many orders being received and when the new year starts in there will be a double force put on in every department.

There is but little accumulation, if any, in this district in the way of pig iron. The shipments are in all directions. A little iron is being sold for immediate delivery. Some of the larger consumers are asking for quick shipments of iron.

Cast-iron pipe makers are doing a steady business. The United States Cast Iron Pipe and Foundry Company has landed the Cuban order for 15,000 tons of pipe and the greater portion of the business will be supplied from the Alabama plants.

Chicago

Dec. 7—Sales of pig iron are not large, but are fairly steady for the needs of the first and second quarters and well distributed. Melters have apparently no intention of contracting heavily for their needs and much tonnage, it is figured, remains to be placed for the first half. The feeling is strong toward conservatism on the part of both sellers and buyers, with no weakening of prices and no expectation of more than the customary dullness due to the coming of the new year. Lots for second-half delivery are occasionally placed.

Southern iron remains the favorite of buyers at $13 Birmingham ($17.35 Chicago) for No. 2, and Northern No. 2 is quoted at $17 minimum for the first quarter. Above these quotations there is 25@50c. range for second-quarter sales and special lots. Northern charcoal iron is quiet with no special features, at $19.50 @20.

Iron and steel products remain steady and in general firm, with good sales and prospects of steadiness until after the opening of the new year. Coke is strong at $5 for first-class Connellsville.

Philadelphia

Dec. 9—Very little business is reported today by the pig-iron makers. The bulk of buyers have all the iron they want just now, and furnace owners say they have enough business to satisfy them for the present. Offers were submitted this week for considerable lots, which are held under advisement until after the turn of the year. Foundry iron is more inquired for, and nothing has been done in basic. Forge is dull and weak. More iron is being melted, and makers assert the situation is in their favor, but this depends upon the capacity that may be blown in in the next few weeks. A few large consumers have just closed for delivery of Southern iron.

Steel Billets—The outlook for steel billets has materially improved and large orders are almost in sight. Prices are firm.

Bars—Bar mills are actively seeking business, but are not making concessions. Quotations remain the same. Car builders are not buying as much as their reported contracts would seem to require.

Structural Material—Active figuring is going on for a large amount of work which may or may not be wanted in the next 60 days. The present situation is not altogether encouraging.

Scrap—Scrap dealers are acting on the theory that there will be a general expansion of demand during the coming quarter. Actual sales are light, and prices are firm. Stocks are being held firmly, and dealers are quietly scrambling for supplies, with the effect that scrap is creeping up fractionally.

Pittsburg

Dec. 8—One of the few bright spots in the iron and steel trade this week is the report, evidently based on substantial authority, that the rail-makers and railroads have reached an agreement on specifications and that some large contracts for steel rails will be placed shortly. A representative of one large rail producing interests said today that every indication points to rail buying before the end of the month. The railroads, however, will not contract for their full 1909 requirements at one time as formerly. While it is assumed that the various roads will take at least 3,000,000 tons for next year it is not likely that more than 500,000 tons will be placed this and next month. The possibility of tariff changes is one reason assigned for the delay of the railroads and another is a lack of funds to carry on extensions that are under consideration.

In finished lines there is a gradual improvement and large concerns report that business in November was greater than in October, which was the best month of the year. December opened with many good orders in different lines and heavy specifications against old contracts. As a result the Carnegie Steel Company is operating its Duquesne and Clairton works to full capacity and the Homestead plant at around 90 per cent. Arrangements have been completed for starting the steel plant at Mingo Junction, which has been idle since the depression began late last year.

Pig Iron—The market is dull as to actual transactions, but strong as to prices. With the exception of one or two furnaces, the prices named are being firmly adhered to, quotations for December and first-quarter delivery being: Standard bessemer, $16.50@17; basic, malleable bessemer and No. 2 foundry, $15.50@16; gray forge $14.50@15; all f.o.b. Valley furnaces. Sales so far this week are light and include small lots of malleable bessemer, at $15.75, standard bessemer at $17 and No. 2 foundry at $16. Buyers are hesitating because the Westinghouse Electric and Manufacturing Company recently bought 5000 tons for second-quarter delivery at a trifle less than $15.50 for No. 2 foundry.

Steel—There is no change, the only transactions in billets being on sliding-scale contracts. Both bessemer and open-hearth billets are still quoted at $25, merchant-steel bars at 1.40c. and plates at 1.60c., Pittsburg.

Sheets—An improvement is noted and prices are firm. Production has been materially increased owing to increase in demand. Black sheets are firm at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The market continues strong with quotations for prompt shipment $46.50@47. Indications point to a higher price after the opening of the first quarter.

Foreign Trade in Iron and Steel

[illegible] iron and steel, including machinery, into the United States for the 10 months ended Oct. 31 were valued at $34,116,740 in 1907, and $16,38[illegible],031 in 1908; a decrease of $17,727,709, or 52 per cent. Leading items of imports, in long tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

All items show decreases. Tin plates increased up to October, but imports in that month were light.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the 10 months ended Oct. 31, are valued by the Bureau of Statistics of the Department of Commerce and Labor at $165,017,157 in 1907, and $127,985,824 in 1908; a decrease of $37,031,333, or 22.4 per cent. Leading items of export, in long tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Considerable decreases are shown.

Iron Ore Movement—Exports and imports of iron ore in the United States for the 10 months ended Oct. 31 are reported as follows, in long tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Imports of manganese ore for the 10 months, 173,045 tons in 1907, and 154,698 in 1908; decrease, 18,347 tons.

Metal Markets

New York, Dec. 9—The metal markets generally have shown only moderate activity during the week, with no special changes. Silver has reacted a little from the lowest price, but is still below 50 cents.

Gold, Silver and Platinum

UNITED STATES [illegible]

Metal.	[illegible]	[illegible]	[illegible]
[illegible]:			
Oct. 1908..	$[illegible]	[illegible]	[illegible]
" 1907..	3,716,258	4,512,466	[illegible]
Year 1908..	70,889,354	42,210,678	[illegible]
" 1907..	53,596,071	35,374,686	[illegible]
Silver:			
Oct. 1908..	4,378,015	3,744,163	[illegible]
[illegible]	5,053,997	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	53,024,790	[illegible]8,087,919	[illegible]

[illegible]

The Bank of France now has what is probably the greatest accumulation of specie ever held by one banking institution. The reserve reported this week is $670,576,760 gold and $178,813,615 silver; [illegible] adding to its gold reserve.

Gold—Bar gold is quoted in London at 77s. 11⅛d. per ounce; American eagles, 76s. 6⅛d. Nearly all the gold arriving in London for the week was again taken for Paris account. No more gold has been taken in New York for shipment to Europe, and sterling exchange has fallen to a [illegible] out at present.

Platinum—Dealers report a good business at unchanged prices: $24 per oz. for refined platinum, $26.50 for hard, and $20@21 for scrap. The market is firm.

Silver—Under the influence of some speculative covering silver has shown a slight disposition to react. It is thought the Indian bazars may ship silver back to London, perhaps next week. That would have a tendency to check the advance.

Silver

SILVER AND STERLING EXCHANGE.

Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Dec.	Sterling Exchange.	Silver. New York Cents.	Silver. London, Pence.
3	4.8675	48¼	22¼	7	4.8645	48½	22⅜
4	4.8665	48	22	8	4.8655	48⅜	22 5/16
5	4.8650	48	22 3/16	9	4.8685	49	22[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

In the table in the JOURNAL of Dec. 5, the price of silver in London on Nov. 28 was given at 23 3/16d., through a typographical error. It should have been 22 3/16d., as was evident from the context.

Copper, Tin, Lead and Zinc

Dec.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
3	14¼ @14½	14⅛ @14¼	63	29⅝	4.25 @4.30	5.12½ @5.15	4.97½ @5.00
4	14¼ @14½	14⅛ @14¼	62 13/16	29½	4.25 @4.30	5.12½ @5.15	4.97½ @5.00
5	14¼ @14½	14⅛ @14¼	....	29¼	4.25 @4.30	5.12½ @5.15	4.97½ @5.00
7	14¼ @14⅜	14 @14¼	62	29	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00
8	14¼ @14⅜	14 @14⅛	62¼	28¾	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00
9	14¼ @14⅜	14 @14⅛	62⅝	29	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—During the week ending Dec. 9 the market has continued dull, although the volume of business has shown a small increase over the previous week, some transactions having been made in electrolytic copper both with foreign and domestic manufacturers. The market for Lake copper has been particularly dull. All of the leading producers of Lake are well sold up and manifest no inclination to come into the market at the present level. The market for electrolytic has been influenced by the decline in standard abroad. The sentiment among producers as to the immediate future has become more mixed. Several producers continue to hold aloof pending the time when manufacturers will be compelled to buy, but other first hands have shown more disposition to meet the present market. An encouraging feature has been considerable inquiry for December copper, showing that all manufacturers have not covered their requirements for this month, but many appear to have covered their needs for some time ahead and to be waiting for a decided tendency one way or the other before extending their commitments. The copper in the weaker speculative hands appears to have been cleaned up; at least it has not been an important factor in the market this week; however, the larger speculative interests undoubtedly still exist. The market closes lifeless at 14¼@14⅜c. for Lake copper; 14@14⅛c. for electrolytic in ingots, cakes and wirebars. The average for casting copper has been 13¾@14c.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

The standard market in London has been depressed throughout the week, not so much on account of the quantities offered for sale, as the entire absence of buying power. The decline has established a wider margin between g.m.b.'s and refined sorts than has existed for some time past. It is reported that the bulk of the holdings is in strong hands, so that a material decline is not anticipated so long as refined copper is held at the present level of prices. The market after touching £62 5s. for spot, £63 5s. for three months, closes better at £62 12s. 6d. for spot, £63 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Tin—The decline in the London market has made further progress, but a firmer tone is reported at the close. Quotations are cabled as £132 for spot, £134 for three months.

There were no new features to the domestic market, where buyers remained rather reticent and covered only immediate or near requirements. Spot tin is rather plentiful and at the close can be bought at about 29 cents.

Lead—There has been a great deal of pressure to effect sales, particularly from Missouri, where producers have accumulated fair-sized stocks. Buyers, however, have not changed their attitude. The tariff agitation is, perhaps, an influence in the market, since consumers are reluctant to anticipate their wants even at the present low level of prices. The market closes weak at 4.22@4.27½c. New York, and 4.12½c. St. Louis.

Little interest is shown in the metal in London, and as a result transactions have been small. The close is steady at £13 5s. for Spanish lead, £13 7s. 6d. for English.

Spelter—In spite of the excitement in Joplin, where the scarcity of ore has caused an advance in its price away above the relative level of the price of spelter, the latter has not reflected this situation, due to the fact that the demand from consumers has been of small volume throughout the week. Any increase in the inquiry would bring about a quick advance in the price of spelter, as first hands necessarily are reluctant to sell their product for less than it costs them to make it. The close is firm at 4.97½@5c. St. Louis, 5⅛@5.15 New York. Metal for delivery several months ahead has fetched higher figures.

The London market has eased off somewhat and the close is cabled at £20 for good ordinaries, £20 5s. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Aluminum—The Aluminum Company of America reports prices unchanged, and quotes 24c. per lb. base for No. 1 ingots; 33@34c. base for sheets. Foreign metal is still offered at 22c. for ingots in New York. There is some report of attempts to regulate prices abroad, but they are reported still at 14c. and even lower.

Antimony—The market is quiet and the volume of business is small. The foreign market is steady. Quotations are 8.15@8.25c. for Cookson's, 8@8⅛c. for Hallett's and 7⅝@7⅞c. for ordinary brands.

Quicksilver—The New York price is unchanged, and quotations are $46@47 per flask of 75 lb. San Francisco prices are higher, at $45@46 per flask for domestic orders and $43@44 for export. London quotation is steady at £8 10s. per flask, with 1s. 6d. less named by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Imports and Exports of Metals

Exports and imports of metals in the United States for the 10 months ended Oct. 31 are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.	
Copper, long tons	258,969	75,065	Exp.	183,904
Copper, 1907....	158,911	99,341	Exp.	59,570
Tin, long tons....	192	29,246	Imp.	29,054
Tin, 1907........	522	34,115	Imp.	33,593
Lead, short tons.	60,848	91,250	Imp.	30,402
Lead, 1907......	41,497	62,490	Imp.	20,993
Spelter, sh. tons.	2,410	824	Exp.	1,586
Spelter, 1907....	414	1,763	Imp.	1,349
Nickel, lb........	8,580,540	15,115,275	Imp.	6,534,735
Nickel, 1907....	7,490,062	15,720,017	Imp.	8,229,955
Antimony, lb.....	....	6,901,591	Imp.	6,901,591
Antimony, 1907.	....	6,913,074	Imp.	6,913,074
Platinum, oz.....	... .	31,802	Imp.	31,802
Platinum, 1907.	....	62,364	Imp.	62,364
Quicksilver, lb...	214,100	....	Exp.	214,100
Quicksilver, '07	346,118	....	Imp.	346,118
Aluminum, value	$291,364	....	Exp.	$291,364
Aluminum, 1907	285,278	....	Exp.	285,278

Ores, etc.	Imports	Exports	Excess
Zinc dross, lb.	14,580,283	....	[illegible]
Zinc dross, '07	17,215,893	...	[illegible]
Zinc ores, lg tons	23,311	41,052	Imp. 17,741
Zinc ores, 1907	13,991	....	.
Antimony ores, lb.	.	[illegible]	[illegible]
Ant. ores, 1907	....	[illegible]	[illegible]

Copper, lead and nickel [illegible] the metal contents of ores, matte, bullion, etc. The exports given include re-exports of foreign material. Zinc ores imported this year included 19,275 tons calamine and [illegible] tons other ores; not reported last year.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 5—This week $42.50 was the highest price paid for zinc [illegible] per cent. zinc. For 80-per cent. lead ore $52 per ton was paid.

SHIPMENTS, WEEK ENDED DEC. 5

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	844,445	......	244,900
Benton	187,410	.	..
Hazel Green	326,000	[illegible]	.
Cuba City	152,190	88,240	. .
Galena	140,000	....	..
Livingston	140,000	.	....
Strawbridge	70,070	....	
Elmo		41,150	
Linden	156,980		.. .
Highland	125,500	..	....
Harker	123,330	......	..
Mineral Point	40,000	.....	. ..
Total	2,606,325	197,090	244,900
Year to Dec. 5	104,007,062	10,101,815	4,649,504

In addition to the above there was shipped to the Platteville Separating Company 308,060 lb.; to the Joplin [illegible] Works, 140,060 lb. zinc ore.

Joplin, Mo., Dec. 5—As high as [illegible] per ton was paid for sulphide zinc concentrate, and the base price ranged from $42 to $46 per ton of 60 per cent. zinc, the higher base price for concentrate carrying 60 per cent. or more zinc was [illegible]. Silicate of zinc sold on a base price of $19 per ton of 40 per cent. zinc, the high price being $23. The average price, all grades, was $40.48 per ton. Lead concentrate weakened again, the closing price of the week being $50 per ton, [illegible] was settled for from the previous week's purchases as high as $54. The average price, all grades, was $50.80 per ton.

No more strenuous conditions of the purchasing market were ever recorded than those of the past four weeks. This week a large proportion of the purchases were made by offerings of the highest base price that could be made. Buyers would tell their customers they would give a certain base price, or as high a base price as [illegible] offered by any other buyer, [illegible] secure an allotment of ore. This was done because the price was so changeable that a set bid would be [illegible] by some other.

The district value, for the year to date, just passes $10,000,000, or two-thirds of the value for last year. The zinc tonnage is [illegible] tons and the lead tonnage [illegible] tons less than the same period of last year.

The same week last year [illegible] per ton of 60 per cent. [illegible] and lead [illegible] per ton.

SHIPMENTS, WEEK ENDED DEC. 5

	Zinc, lb.	Lead, lb.	Value.
[illegible]	[illegible]	649,240	$103,290
[illegible]	[illegible]	233,520	[illegible]
[illegible]	[illegible]	51,590	15,794
[illegible]	[illegible]	95,000	14,975
[illegible]	[illegible]	[illegible]	12,580
[illegible]	448,180	[illegible]	11,639
[illegible]	[illegible]	47,780	10,335
[illegible]	[illegible]		[illegible]
[illegible]	189,510		[illegible]
[illegible]	126,240		3,877
[illegible]	[illegible]	......	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	145,490		3,150
[illegible]	145,220		3,121
[illegible]	[illegible]		1,415
[illegible]	55,490		1,220
[illegible]	57,500		1,150
[illegible]	[illegible]		975
[illegible]	[illegible]		392
[illegible]	11,218,570	1,310,710	$260,146

[illegible]

MONTHLY AVERAGE PRICES

Month.	[illegible]		[illegible]		[illegible]	
	1907	[illegible]	[illegible]	1908	[illegible]	1908
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	48.30	[illegible]	47.11	[illegible]	[illegible]	[illegible]
March	49.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	49.25	[illegible]	48.24	[illegible]	[illegible]	[illegible]
May	46.90	[illegible]	45.98	[illegible]	[illegible]	[illegible]
June	47.00	[illegible]	44.82	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	45.73	[illegible]	[illegible]	[illegible]
August	44.56	[illegible]	43.22	[illegible]	[illegible]	[illegible]
September	41.00	[illegible]	40.11	[illegible]	[illegible]	[illegible]
October	41.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		[illegible]		[illegible]	
Year	[illegible]		$43.68		$68.90	

[illegible] 60 per cent. [illegible] ores sold.

Chemicals

[illegible] general chemicals seems to be healthy and in good volume. Forward business is improving.

Copper Sulphate—The market is strong and no goods are available at less than standard quotations except, perhaps, a few small lots. Quotations are $4.75 per 100 lb. for carloads and up to $5 for smaller [illegible]

[illegible] low; figures are in long tons:

	[illegible]	[illegible]	[illegible]
Stocks, Jan. 1	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Quantities afloat include all cargoes due to arrive at United States ports by March [illegible]

[illegible] exports of chemicals and raw materials in the United States 10 months ended Oct. 31 were as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Soda salts, lb.	[illegible]	[illegible]	[illegible]
Acetate lime, lb.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Estimating sulphur contents [illegible] the total sulphur imported [illegible] mately 240,718 long tons.

Mining Stocks

[illegible] stock markets and some sharp advances [illegible] however, and later there was a much slower market, with comparatively small trading and also with small fluctuations in [illegible] a professional market and with no decided tendencies. Money is plentiful, but the business revival is slower than had been expected. Many people evidently think that the advance in stocks has been greater than was warranted by actual conditions, and are, therefore, keeping out of the market.

On the Curb copper stocks were less in evidence, and the trading in them was only moderate. Price changes were small, most of the stocks closing at about the same level as a week ago. The Cobalt stocks were more active and there were heavy sales, especially of Cobalt Central and Kerr Lake. The Nevada gold stocks were more active than for some time past.

Subscriptions for the $30,000,000 Panama Canal bonds offered by the Treasury reached a total of over $102,000,000. The bids showed 102.4 average price.

[illegible] have declined as a rule during the week, but no serious breaks are to be recorded. In a few instances prices are [illegible] to $83.25, recovering but fractionally [illegible] change is expected in the dividend to be [illegible] dend expectations. Arcadian is off to $4 on a proposed plan to reorganize [illegible] vide for exploration. A short lived sell- [illegible] the price is back to below $10.

[illegible] mining flotations are coming out in the [illegible] cess. Eventually they will find a market in the East. Already one is quoted on the local curb, that of the Arizona-Michigan. It started at $2, but is now off to $1.50. Old Dominion touched $60.50 and Arizona Commercial $40, both reacting from these prices. Franklin is off $1 for the week to $18; Atlantic $1.37½ to $18.12½; Butte Coalition $1.25 to $27; Copper Range $1.25 to $81.25; North Butte $2.50 to $87.25. An item of interest is the fact that the three so-called Amster companies are loaning about $500,000 on the Street.

The Curb is now housed and has 125 members, its limited number, who have paid an initiation fee of $500 each. Several stocks traded in there will soon be taken over on to the Exchange, notably Batopilas, East Butte, Keweenaw Copper, North Lake and Superior & Boston. Ultimately Ahmeek, Chemung, Helvetia, Ojibway and others will graduate to the Exchange. Features on the Curb have been an advance of $1.87½ in East Butte to $9.25 and $3 in Superior & Boston to $18.50. Nipissing dropped $1.75 to $9, but it subsequently recovered most of the decline.

Denver, Colo, Dec. 5—A new stock exchange is spoken of for Denver. The intention is to devote attention chiefly to mining stocks. The latest accounts are that it is likely to be opened by Jan. 1, and it is stated that 50 seats have been signed for already. Mining, railroad and industrial securities will be traded in.

STOCK QUOTATIONS

NEW YORK Dec. 8 Name of Comp.	Clg.	BOSTON Dec. 8 Name of Comp.	Clg.
Alaska Mine	⅜	Adventure	9⅞
Amalgamated	83⅞	Allouez	39¼
Anaconda	49⅜	Am. Zinc	‡26¼
Balaklala	‡2 1/16	Arcadian	4
British Col. Cop.	8	Arizona Com.	39
Buffalo Mines	‡3⅝	Atlantic	18⅛
Butte Coalition	27¼	Bingham	‡30
Colonial Silver	½	Boston Con.	16¼
Cum. Ely Mining	8¼	Calumet & Ariz*	119
Davis Daly	3⅛	Calumet & Hecla	680
Dominion Cop.	3/16	Centennial	‡34½
Douglas Copper	3⅜	Con. Mercur	.38
El Rayo	4	Copper Range*	81⅝
Florence	4 11/16	Daly-West	11
Foster Cobalt	.35	Franklin	18
Furnace Creek	.13	Greene—Can.	11¼
Giroux	6½	Isle Royal	24
Gold Hill	½	La Salle	15
Goldfield Con.	8½	Mass	7¼
Granby	104	Michigan	‡14¼
Greene Gold	¼	Mohawk	70¼
Greene G. & S	7	Nevada	19⅞
Greenw'r & D.Val.	‡.75	North Butte*	85¼
Guanajuato	2	Old Colony	‡.65
Guggen. Exp.	‡186	Old Dominion	58
Hanapah	.15	Osceola	134
McKinley Dar.	1.05	Parrot	30
Micmac	2½	Quincy	96½
Mines Co. of Am.	1¼	Rhode Island	[illegible]
Mitchell Mining	[illegible]	Santa Fe	‡2⅞
Mont. Sho. C.	1	Shannon	18
Nev. Utah M. & S	3	Superior	‡53
Newhouse M. & S	6¼	Superior & Pitts.	18¼
Nipissing Mines	10½	Tamarack	‡83
Old Hundred	¾	Trinity	17
Silver Queen	1.02	United Cop., com.	14
Stewart	[illegible]	U. S. Oil	29¾
Tennessee Cop'r	44	U. S. Smg. & Ref.	45
Tri Bullion	1	U.S.Sm. & Re.,pd.	46½
Union Copper	⅞	Utah Con.	46
Utah Apex	6	Victoria	3¾
Utah Copper	48	Winona	6½
Yukon Gold	4¼	Wolverine	149
		Wyandotte	2¾

*Ex. Div. †Ex. Rights ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	32¾
Am. Smelt. & Ref	90¾
Am. Sm. & Ref. pf.	‡106
Colo. Fuel & Iron	40⅞
Federal M. & S., pf.	‡83
National Lead	82¼
National Lead, pf.	‡106
Pittsburg Coal	13
Republic I. & S	[illegible]
Republic I.& S., pf.	86¼
Sloss-Sheffield	78¾
Standard Oil	673
U. S. Steel	55⅛
U. S. Steel, pf	112⅝
Va. Car. Chem	43½

BOSTON CURB	
Ahmeek	120
Black Mt.	3½
Chemung	20
East Butte	9
Globe Con	7⅛
Hancock	11¾
Helvetia	3¾
Keweenaw	5½
North Lake	8
Ojibway	11
Superior & Bost	17¾

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 28

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.05	.03
Center Cr'k	2.00	1.75
Cent. C. & C	72.00	70.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	20.00
Doe Run	130.00	115.00
Gra. Bimet.	.30	.25
St. Joe	15.00	12.50

LONDON Dec. 9

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 2 6
Camp Bird	0 15 6
Esperanza	3 1 0
Tomboy	1 0 7
El Oro	1 6 10
Oroville	0 8 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 9

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.32
Best & Belcher	.43
Caledonia	.17
Chollar	.07
Comstock	.33
Con. Cal. & Va.	.77
Crown Point	.37
Exchequer	.35
Gould & Curry	.10
Hale & Norcross	.33
Mexican	.82
Ophir	1.67
Overman	.16
Potosi	.13
Savage	.22
Sierra Nevada	.22
Union	.18
Utah	.04
Yellow Jacket	.48
TONOPAH STOCKS	
Belmont	.82
Extension	.37
Golden Anchor	.01
Jim Butler	.16
MacNamara	.33
Midway	.18
Montana	.83
North Star	.04
Tono'h Mine of N.	5.50
West End Con.	.33
GOLDFI'D STOCKS	
Adams	.03
Atlanta	.16
Booth	.20
Columbia Mt	.17
Comb. Frac	1.39
Con. Red Top.	.16
Cracker Jack	.04
Diamdfield B. B. C.	.11
Goldfield Belmont	.05
Goldfield Daisy	.73
Great Bend	.24
Jumbo Extension	.18
Kendall	.09
Lone Star	.05
May Queen	.04
N. Y. C. O. D.	‡.10
Oro	.12
Red Hill	.18
Roanoke	.
Sandstorm	.20

Name of Comp.	Clg.
Silver Pick	.08
St. Ives	.20
Triangle	.03
BULLFROG STOCKS	
Bullfrog Mining	‡.03
Bullfrog Nat. B	‡.04
Gibraltar	.03
Gold Bar	‡.03
Homestake King	.13
Montgomery Mt.	‡.05
Mont. Shoshone C.	.93
Original Bullfrog	‡.01
Tramp Cons.	.10
MISCELLANEOUS	
Bonnie Clare	.06
Lee Gold Grotto	...
Nevada Hills	1.75
Nevada Smelting	1.00
Nevada Wonder	.35
Nevada-Utah	2.93
Penn-Wyoming	.17
Pittsburgh S. Pk.	.80
Rawhide Coal	1.40
Round Mt. Sphinx	.15

COLO. SPRINGS Nov. 28

Name of Comp.	Clg.
Acacia	7¾
Black Bell	....
C. C. Con.	4
Dante	6
Doctor Jack Pot.	8½
Elkton	68¾
El Paso	49⅜
Findlay	‡17
Gold Dollar	9⅛
Gold Sovereign	3¼
Isabella	26⅝
Index	....
Jennie Sample	7
Jerry Johnson	‡3⅞
Mary McKinney	32½
Pharmacist	4
Portland	1.04
Un. Gold Mines	3⅞
Vindicator	80
Work	7½

Assessments

Company.	Delinq.	Sale.	Amt.
Blackjack Con., Utah	Dec. 15	Jan 6	$0.01
Challenge, Nev	Dec. 11	Jan. 5	0.05
Con. Cal. & Va., Nev	Nov. 24	Dec. 15	0.20
Confidence, Nev	Dec. 9	Dec. 30	0.20
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Exchequer, Nev	Dec. 30	Jan. 20	0.05
Julia Con., Nev.	Dec. 21	Jan. 15	0.03
Little Chief, Utah	Dec. 15	Jan. 5	0.01
Lower Mammoth, Utah	Dec. 18	Jan. 8	0.05
Lucky Dutchman, Nev	Nov. 21	Dec. 12	0.01
Mountain Dell	Dec. 24	Jan. 12	0.02
New York Con., Nev	Dec. 18	Jan. 8	0.03
Oro Cobre, Cal	Dec. 31	Jan. 16	0.02
Overman, Nev	Dec. 2	Dec. 23	0.05
Prudential, Cal	Dec. 3	Dec. 21	0.05
Roosevelt Oil, Cal.	Nov. 30	Dec. 19	0.03
Union Con., Nev	Dec. 23	Jan. 14	0.10
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Yellow Jacket, Nev	Dec. 28	Feb. 3	0.15
Zeibright, Cal.	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	49.647	27.154	22.933
December	54.565	......	25.362	.....
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	14.130	13.870	14.386	61.226	63.417
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	......
			Av. year	38.160	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	4.330	17.281	13.538
December	3.658	......	14.500	....
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	......	4.104	.....	20.075	......
Year	5.962	......	5.812	.....	23.771	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, DECEMBER 19, 1908. NO. 25.

The Cactus Club at the Newhouse Mines, Utah

A Cooperative Organization, Controlled by the Mine Employees, Which Has Proved to be a Success Both Socially and Financially

BY LAFAYETTE HANCHETT

The Newhouse Mines and Smelters, owning the Cactus mine and concentrating mill at Newhouse, Utah, in equipping the property, planned to control absolutely the townsite, which was upon the company's land. No lots were sold, and every house erected in the town is owned by the company. This resulted in shutting out from the town saloons and low dives, so usual to mining-camp life. With the realization that intoxicating liquors would find an entrance through devious channels, the experiment of handling this problem by means of an incorporated club, controlled by employees, was made. There was also a desire on the part of the company to provide pleasant surroundings in which men could spend their idle hours.

On May 27, 1905, the Cactus Club was incorporated, naming as directors nine employees of the company. An attractive and commodious club building of one story and basement was erected. The main floor was divided into general reception room, reading room, billiard room and bar room. This was furnished with one billiard table, one pool table, card tables, reading tables, book cases, lounge, and a plentiful assortment of easy and comfortable chairs. A small bar with usual fixtures was included.

A few days later the club was opened to its members, having obtained its first supplies upon credit, payment being guaranteed by the mining company.

Organizing the [illegible]

The organization followed lines similar to those adopted by city clubs. An initiation fee of 50c. and monthly dues of 25c. were charged. The directors instituted a policy of selling best grades of liquors and cigars at about two-thirds the price usually charged in saloons. The club employees were instructed to discourage and prevent excessive drinking. The club was open from 10 a.m. to 10 p.m. to members only. The first requisite for membership was that the applicant be an employee of the mining company, his election or rejection resting solely with the directors.

From its inception the club has been a success. An average membership of 250 has prevailed, out of 400 employees. Investment was made in a pianola piano, an Edison talking machine and a supply of books. A barber shop was fitted up. The magazine and newspaper list was increased extensively. A ladies' day was established each Wednesday, with dancing as a feature of the evening.

The excessive use of intoxicants, formerly apparent in many individual cases on pay days, almost disappeared, because of the restrictions imposed by the club directors.

As the club prospered it accumulated a considerable fund, which resulted in the [illegible] better handling of public entertainments and dances. At this time the miners' boarding-houses afforded the sole and somewhat unsuitable means of accommodating the theatrical companies; therefore, the club directors decided to erect a small hotel, which was to be conducted in a superior style and to be completed at the same time as the theater building. Both buildings were put in use early in 1908, and served to improve materially the social life of the town.

Financial Success

[illegible] for use of the club building, the mining company refrains from any connection or interference with the affairs of the club. All powers are vested solely in its nine directors. In the three and one-half years of its existence, from a start with no funds and with a stock of goods bought entirely upon credit, it has reached a point where its property, fully paid for, including theater and hotel building, furniture, fixtures and stock of merchandise, shows an inventory value of $16,131.75. In addition, it has cash in treasury amounting to $2500. Its directors are now considering carrying their cooperative plans into broader channels by instituting a club general store, for the purpose of furnishing members and their families all commodities directly at cost.

HOME OF THE CACTUS CLUB, NEWHOUSE, UTAH

---

*General manager of Newhouse interests, Salt Lake City, Utah

The financial result obtained by the club tells more clearly than any other argument can of its success, to which must be added the fact that the company has been greatly benefited by the excellent regulation of the liquor traffic and the consequent freedom from petty disturbances usual to pay days in mining camps as a result of excessive drinking by a portion of the employees.

The volume of business is reflected by the secretary's report for the year 1907, showing: Gross receipts, $24,205.30; expenses, $15,351.51; gain, $8,853.79. The profit on money spent in mining camps for liquor usually accrues to a few. In this instance all profit arising therefrom is used for the benefit of the entire community. The club's financial success is eloquent of its material welfare, but the great purpose of its creation is the insurance that the mining camp may be clean, and it is an instrument in the hands of the employees, whereby they preserve a moral and social excellence in the community.

Consolidated Goldfields of South Africa, Ltd.

Special Correspondence

The report of this company for the year ended June 30, 1908, contains, as in former years, interesting information on the general position of the mining industry of the Witwatersrand, and its publication is, for this reason, looked forward to by a wider circle than the actual shareholders. Both of the joint managers, R. G. Fricker and F. D. P. Chaplin, have a knowledge of the Rand extending over many years, and their views on the industrial and political situation deserve attention. Drummond Chaplin, in particular, on account of his being a member of the Transvaal legislative assembly, is able to speak with special authority on the influence of recent legislation on the progress of the mining industry. It is satisfactory to find that these gentlemen raise no complaint against the Transvaal government. The new gold law, it is true, is not entirely to their liking, but they report that it is a measure which "is undoubtedly capable of being administered in a manner in no way prejudicial to the rights of property holders and investors." It is also satisfactory to find that, on account of the flourishing condition of the finances of the colony, there appears to be no danger of any increase in the profits tax. All parties are alive to the fact that the prosperity of the colony is at present wholly dependent on the prosperity of the mining industry, and while this is so, the miner can count on sympathetic treatment from the government.

The managers refer to the extraordinary reduction in working costs and the consequent increase in profits that have taken place during the year under review, and the three following months, their report being dated Sept. 28. The causes of the reduction in costs are not expressly explained, but it is evident from the report that the increased scale of operations has a good deal to do with it. Attention is called to the necessity of watching the profits as well as the working costs, and the managers state that they are satisfied that the returns made by the mines under the control of the company are fair and legitimate. During the last six months the Goldfields mines show costs of 52c. per ton less than the average of the Rand, due, no doubt, largely to the fact that the group controls some of the larger mines, such as the Simmer & Jack, the Knights Deep and the Robinson Deep. The improvement made since last year is the more remarkable when one remembers that in some of the mines there has been a transition from Chinese to Kafir labor, owing to the expatriation of the Chinese.

Not less interesting than the report of the managers is that of the superintending engineer, Leslie Simson. In his report the reduction in costs is more fully explained. It is chiefly due, in his opinion, to the marked improvement in the efficiency of both white and colored laborer in underground work. In support of this statement he says that in the three principal producing mines under his direction the average tonnage mined per skilled white man underground during August, 1908 was 356.7 tons and per colored laborer 27.3 tons; while for the corresponding month in 1907 the figures were 245.2 tons and 22.7 tons respectively.

Economy is also obtained in the consumption of stores, as the efficiency of the underground labor increases. The greatest savings have been made in the mine, but there has also been a reduction of costs on the surface. While there is not so much room for improvement in the reduction works, it is pointed out that small economies, when the scale of operations is large, run into big figures in the aggregate, and that a penny a ton saved on the ore at present being milled by the producing mines of the Goldfields Company amounts to about £13,000 per annum. The total cost of ore treatment—including surface transport, breaking, sorting, stamp-milling, tube-milling and cyaniding—in most of the Goldfields companies is under the value of 1 dwt. of gold.

The reduction in costs is further largely explained by the statement that a new standard for the daily task has been set up. Instead of a 3-ft. hole a 4-ft. hole has been fixed as the standard task for hammer boys, both in stoping and development; and in the case of machine drills an 8-ft. instead of a 6-ft. hole.

As regards mechanical and metallurgical improvements, Mr. Simson reports that a compressed-air system of hoisting underground has been installed by H. C. Behr, the consulting mechanical engineer of the company at the Simmer Deep. The system consists in the operation of a hoisting engine by means of air delivered from a specially designed compressor at a very high pressure; the exhaust from this engine being delivered into the air-drill main for the operation of the rock drills. The employment of heavier stamps has effected a large initial economy in battery construction and likewise a reduction in operating cost, owing to the smaller number of units requiring attention and maintenance. The electrical driving of stamp batteries also meets with Mr. Simson's approval, this being the system adopted at the new Simmer Deep—Jupiter joint plant. In metallurgical work a new plan designed by W. A. Caldecott for increasing the capacity of sand plants has been experimented on with promising results. This method is to be adopted for regular operations.

The Rhodesian properties in which the Goldfields company is interested are reported on by H. A. Piper, consulting engineer. The Giant is now the most promising mine belonging to this group. During the year ended June, 1908, the profits earned with a 15-stamp mill and one tube mill amounted to £70,650. The orebody has recently widened out considerably, and the future of the mine looks promising. Operations have been put back owing to the caving of the main shaft, which has had to be abandoned.

The directors' report refers to investments in other countries besides South Africa, but no detailed information is given. The net profit for the year amounted to £662,799, largely derived from dividends, the company holding 1,600,176 shares in the Simmer & Jack mine, capital, £3,000,000, dividend and bonus for the year, 20 per cent.; 293,361 shares in the Knights Deep, capital, £643,526, dividend, 25 per cent., and 431,985 shares in the Robinson Deep, capital, £980,000, dividend, 35 per cent. After paying the dividend on the preference shares and French Government taxes, and writing off £200,526 for depreciation of securities, there is a balance of £468,260, out of which it is proposed to pay a dividend of 20 per cent. on Goldfields ordinary shares involving £400,000, and to carry forward £68,260 to this year's accounts.

West African Gold Mines

The West African Chamber of Mines reports the gold output of Ashanti and the Gold Coast in October at 23,781 oz. bullion, being 1342 oz. less than in September. For the 10 months ended Oct. 31 the total production was 243,693 oz. bullion in 1907, and 248,305 oz. in 1908; an increase of 4612 oz. The bullion reported this year was equal to $4,817,349, or 233,060 oz. fine gold.

Ore Occurrence at Fortuna Mine, Bingham

The Shattered Quartzite in Close Proximity to the Veins Often Shows Sufficient Mineralization to be Classed as a Low-grade Copper Ore

BY EDWARD R. ZALINSKI*

Bingham is attracting attention on account of its large deposits of copper-bearing porphyry. Within the last year it has been shown that quartzite in various parts of the camp is also impregnated with copper sulphides and can be worked at a profit. The quartzite footwall of a vein in the Ohio Copper Company's property is impregnated and yields good milling ore. A similar occurrence is found in the Fortuna mine. It is intended to describe this latter occurrence and also to give a brief description of the other orebodies in the mine.

The Fortuna mine is situated in Keystone gulch on the eastern slope of the Oquirrh range at an altitude of 6500 ft. The mine buildings lie half way down the gulch at a point where the steep drop from the main ridge changes into a gradual slope to Salt Lake valley. The sides of the gulch are still steep here as it is about three-quarters of a mile farther down to where the gulch merges among the rolling foothills of the range. An accompanying photograph shows the Fortuna mill and buildings, as well as the dump from the main working levels.

The ground covered by the property takes in the summit of two ridges and includes the area between Keystone and Dalton and Lark gulches. On the west it extends to the summit of the main ridge above Bingham cañon. An accompanying illustration looking north across Dalton and Lark gulch shows the topography on the Fortuna claims. Six veins outcrop on the hillslope and dip into the hill. The Dalton and Lark mine and Salt Lake valley are shown on the right.

Geology

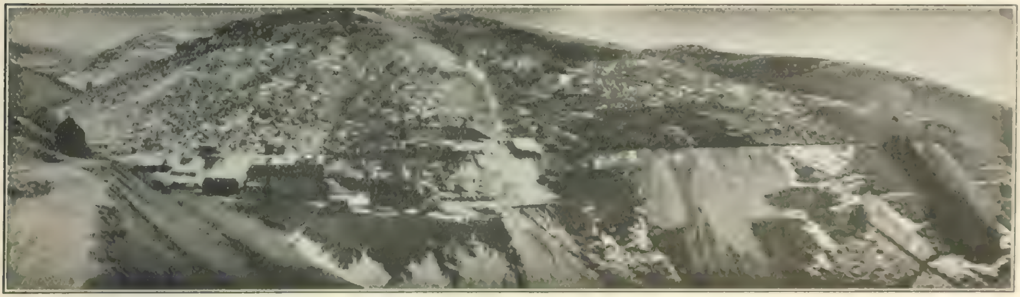
The surface of the Fortuna property is rounded. Keystone gulch exposes a series of sedimentary rocks. Quartzite is the principal country rock and contains interbedded limestone. The extent of the latter is not great, and so far has proved of little economic interest. Porphyry sills and dikes are intruded into the sediments, being probably contemporaneous with the main monzonite stock of Bingham. These intrusive bodies vary from a few feet up to 70 or 80 ft. in thickness, and are mostly in the form of sills. They are genetically connected with the ores, and in some cases the mineral-bearing solutions have risen along their contacts.

The most prominent of these intrusives is the Fortuna sill, about 70 ft. thick, which forms the hanging wall of a number of important orebodies. It can be traced westerly across Fortuna ground to the Bingham cañon divide and across Ohio Copper Company's ground into the property of the Utah Copper Company where it joins the main Bingham eruptive. An accompanying illustration taken from the Fortuna claims shows the topography of Bingham with the great mineralized porphyry stock in the center. Across the cañon in the foreground is shown part of the Boston Consolidated and Utah Copper steam-shovel workings.

Another porphyry sill occurs in the quartzite to the north and west of the Fortuna sill. It can be followed from the bottom of Keystone gulch southwesterly, and is in a general way parallel to the Fortuna sill. This intrusive is the one on which the Congor, Illinois and Blaine tunnels have been driven. Northwest of the Congor sill is a third porphyry sill which outcrops about 20 ft. wide near the northwest corner of the Youcan claim. It can be traced southerly across Keystone gulch and is exposed in w[illegible] on the south slope. Two other bodies of porphyry occur on or near the Fortuna property. An irregular intrusive stock connecting with the main porphyry at upper Bingham covers the southwest portion of the claims. The pass to Bingham looking west toward the porphyry stock is shown in one of the illustrations.

The Vein System

The ore occurs in a system of nearly parallel veins. These are well defined, and follow the strike and dip of the quartzite bedding, though in some places they cut across it. The vein formation appears to have been accompanied by more or less fracturing and crushing. This is especially noticeable in the footwall of the Mayflower vein. Movement has occurred at successive periods and is known to have taken place during and after ore deposition.



THE FORTUNA MINE, BINGHAM, UTAH, [illegible]

Six veins apex on Fortuna ground. The Abe Lincoln vein is the farthest north. About 600 ft. south of this is the Winnebago vein which outcrops below the Congor porphyry. This quartzite is fractured and iron-stained, and on the Congor Mining Company's ground bordering the Fortuna on the north the outcrop is prominently exposed. South of the Winnebago is the Sierra Grande vein, which outcrops along the hanging wall of the Fortuna sill. On the lower or [illegible] quartzite is the Fortuna vein. The Mayflower vein outcrops about 200 ft. south of the Fortuna and runs nearly parallel with it. The Weasel vein outcrops from [illegible] the Mayflower; in the eastern part of the property it is known as the Superior vein.

The general strike of the veins varies between north 30 and north 70 deg. east, and the dip is from 25 to 40 deg. to the northwest. The veins strike a few degrees east of north on the eastern portion of the property and gradually curve so that they approach an east-west strike on the western end of the claims.

---

*Mining engineer, University Club, Salt Lake City, Utah.

Numerous tunnels and inclines develop the upper part of the veins. On the Fortuna vein, above the Freedom and Fortuna tunnels, old stopes, from which considerable lead ore was mined, extend to the surface. The Portland incline, 360 ft. long, connects with the Freedom tunnel; it follows the contact of the porphyry. The Mayflower incline is driven on the Mayflower vein to the Keystone tunnel level, which is also called the Mayflower 800-ft. level. The inclination varies from 30 to 40 deg. The ore is silicious; being oxidized, it carries more gold and silver than copper. Along the incline, the hanging is the soft, altered quartzite, characteristic of the Mayflower vein. The footwall is relatively fresh and hard. In the Winnebago and Weasel veins sulphide ore, 2 to 3 ft. wide and containing mainly pyrite, was developed.

The sulphide ore in all the upper workings is low in copper. The surface showing was not particularly promising and gave little valuable orebodies since developed at a depth of 300 to 900 ft. Up to the present time the Fortuna and Mayflower veins have been the most productive.

THE FORTUNA CLAIMS; DALTON AND LARK MINE ON RIGHT

Fortuna Vein

The orebodies on the Fortuna vein occur along the lower contact of the Fortuna sill. Movement occurred between the quartzite and the sill, and a tough, clay-like gouge from a few inches up to several feet in thickness has resulted. Along this contact the mineral-bearing solutions have risen, and the ore was deposited in lenticular bodies having their greatest length apparently in the direction from which the solutions came.

In the Fortuna vein there are two main shoots, each composed of several separate lenses of ore. The lenses vary from a few inches to several feet in thickness. The shoot exposed along the Keystone incline and adjoining workings was about 150 ft. wide on the Freedom level, and was followed on its dip a distance of 400 to 500 ft. Another shoot opened by the big raise is 12 ft. thick on the Keystone level. The oreshoots pitch from 25 to 35 deg. to the southwest toward the main Bingham porphyry, which is the center of the mineralized area of the camp.

In the upper workings lead ore occurs. As in some other mines of this district the lead ore has changed with depth to copper ore. The boundary between the lead and copper is, as a rule, well defined. Near the surface in the northeast portion of the mine, there are separate lead shoots. Farther to the west, these are intermingled with shoots of copper ore, but at greater depth the lead disappears and the ore consists almost entirely of copper. The lead orebodies form the highest portion of the shoots previously mentioned. Galena occurs up to 7 ft. in thickness.

The Ore

Pyrite is the chief vein mineral, and it often impregnates the walls for some distance. The pyrite occurs both fine grained and massive; also as pentagonal dodecahedral crystals in vugs and along the veins. Movement has taken place after the formation of the ore so that sometimes the massive pyrite is seamed and fractured; in a few places the angular fragments have been recemented by secondary pyrite. The fractured zones contain much chalcocite. The ore, as a rule, is solid and compact, consisting almost entirely of sulphides. Quartz is the principal gangue mineral.

The ore assays from 2 to 4 per cent. copper; the copper is mainly in the small grains of chalcopyrite that are disseminated through the pyrite. The latter also carries 3 to 5 oz. silver and about 0.06 oz. gold per ton. The lead ores generally carry 30 to 35 per cent. lead, and varying amounts of silver. The lead occurs mainly as galena, but there is some cerussite and anglesite.

The oxidized zone follows the surface contour. In the copper ore all stages from completely oxidized ore to fresh, unaltered sulphide are exposed. The process of alteration resulting in the oxidation of the sulphides to sulphates of iron and of copper can be seen constantly occurring on faces of sulphides exposed to the air. Many faces of ore on standing become covered with efflorescent sulphates.

Secondary Enrichment

Secondary enrichment is constantly taking place. This is especially noticeable along both the foot and the hanging walls of the veins, and also in the vein wherever vugs and cavities have permitted the circulation of surface water. Some quartz is occasionally deposited along with the reprecipitated copper sulphides.

The depth at which the zone of secondary enrichment is found varies; in the large orebody opened by the Mayflower drift it reached a maximum on the 800-ft. level. Below this, the percentage of copper in the ore decreases. This orebody is 700 to 900 ft. from the surface measured along the vein, but it is probable that enrichment extends to a greater depth in other parts of the mine.

On the Contention level about 1050 ft. from the entrance, the Fortuna vein strikes north 30 deg. east and dips 25 deg. to the northwest. Several thin lenses of pyritic ore were found on that level, and some stoping done. Lenses of dark rock resembling a limestone or a banded, calcareous shale are found between the porphyry and the quartzite and often overlying the ore.

A sub-level between the Freedom and the Fortuna tunnels recently opened a body of galena which at present is exposed for more than 100 ft. along the strike and about 40 ft. on the dip. This orebody pitches toward the southwest. The ore is a fine-grained galena; its average thickness is 4 ft. and its maximum thickness about 7 ft. Some oxidized portions were found carrying anglesite and cerrusite associated with limonite and iron-stained chert. Small quantities of pyrite are mixed with the galena, and the ore carries 0.08 to 0.10 oz. gold per ton. The ore assays 30 to 50 per cent. lead and about 12 oz. silver per ton. The rock in the hanging wall between the ore and the porphyry intrusion is calcareous. Several occurrences of this character suggest that the quartzite is calcareous in places and that these points proved especially favorable to ore deposition.

At points on the Freedom, the highest level being worked, high-grade copper ore, largely chalcocite, was cut. In most cases lead ore has been developed above these high-grade streaks. Whether this is simply a coincidence or a genetic relation between the galena and chalcocite, I am not prepared to say.

MAYFLOWER VEIN

The Mayflower vein is formed by a bedding fissure in the quartzite; it strikes north 40 to 70 deg. east, and dips 30 to 48 deg. northwest. This vein, which is in the footwall of the Fortuna, is roughly parallel to the Fortuna sill, though the dip is steeper. Some of the orebodies in this vein are of special interest owing to the fact that the footwall is impregnated with copper sulphide.

The vein is opened by the Mayflower crosscut which is driven northeast from the Keystone tunnel, and reaches the Mayflower vein 83 ft. from the Fortuna. A short distance from the Keystone tunnel a small dike or stringer of porphyry is cut. At this point the bedding dips 30 deg. west, but gradually becomes steeper, and at the Mayflower vein reaches 40 deg. The last part of the crosscut is driven through soft black rock which forms the hanging wall of a large portion of the Mayflower vein.

A dike-like tongue of porphyry, starting from the Fortuna sill near the Winnebago drift, forms the footwall of the Fortuna vein at this point. This tongue dips [illegible] deg. west and appears below in the Mayflower inclined shaft near the 850-ft. level. This porphyry is connected with one of the richest orebodies. The Mayflower drift, or 800-ft. level, extends southwest from the crosscut over 1000 ft. on the vein. The shaft is sunk on the vein to the 1025-ft. level.

THE MAYFLOWER LENS-SHAPED [illegible]

The Mayflower drift cut an irregular lens shaped body of ore, which [illegible] about 175 ft. along this level and has been followed approximately 200 ft. on the dip. The ore is principally pyrite, and is fractured and porous; it contains considerable black sulphides of copper. These are evidently the result of secondary enrichment, which is well illustrated in this orebody. The copper content varies from 3 to 12 per cent., ore carrying 5, 6 and 7 per cent. copper being common. The amount of gold in the ore is nearly uniform, being about 0.07 oz. per ton. This ore also carries a few ounces of silver; the iron content is high and the silica low.

The direction of the Mayflower footwall, and its relation to this orebody is worth noting. Near the shaft on the 800-ft. level the strike of the footwall is north 60 deg. east, and a little to the southwest it changes to north 70 deg. east. Still farther southwest it varies from north 70 deg. east to due east, and then swings back to north 70 deg. east. The ore occurs between the two normal directions of north 70 deg. east. The difference in direction of the footwall appears to have formed an opening or widening, as it were, between the strata, in which the mineral was deposited and which determined the size of the orebody. It seems probable that this local variation of the walls was caused by the porphyry intrusion. The variations as compared with the strike on the 1025-ft. and main level to the east and west are clearly marked on the 850-ft. and 925-ft. levels. The general direction of the vein near here is north 60 to north 70 deg. east and at raise seven, 425 ft. southwest of the shaft, it has the same strike.

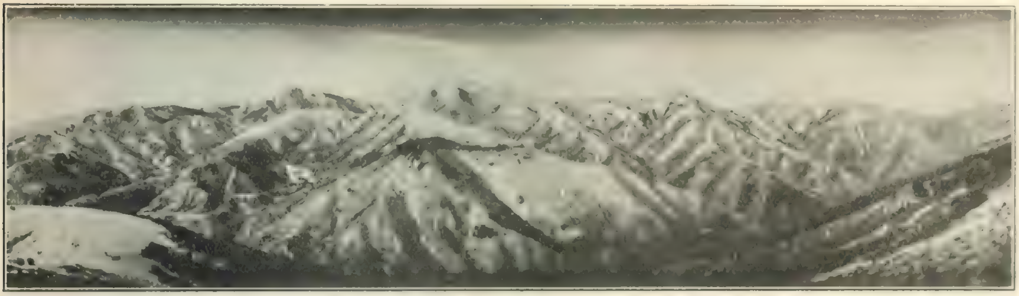
The width of the ore varies; where the footwall strikes east and west the width [illegible] between the walls. The width of the ore gradually decreases as the direction of the footwall changes, and on the southwest where the ore ends the strike is again the [illegible] deg. east. [illegible] the 800- and 850-ft. levels, 3 ft. of solid sulphides is exposed in the stopes; over this is 2 to 3 ft. of ground-up quartzite impregnated with pyrite and containing numerous slips with black gouge and [illegible] faces. On the 925-ft. level where the orebody ends the footwall swings in the same manner as noted on the 850-ft. level, and strikes north 75 deg. east, dipping 45 deg. northwest.

The porphyry is intimately associated with the ore, and in part forms the hanging wall. As shown in the shaft near the 850-ft. level the porphyry tongue is of irregular outline and here spreads along the footwall of the Mayflower vein. It crosses the shaft diagonally and passes up into the stopes on the southwest side. The dike above in the Mayflower crosscut connects with this body of porphyry though not in the plane of the shaft, the connection being somewhat to the north. An accompanying section through the Mayflower incline shows this porphyry, the Fortuna sill, and the relative position of the Mayflower, Fortuna, and Sierra Grande veins.

Near the 850-ft. level the porphyry incloses angular fragments of soft grayish quartzite, showing from the sharpness of the fragments that the alteration of the Mayflower hanging wall took place after [illegible]

Above the 850-ft. level in the stopes the ore extends several feet below the porphyry and widens and spreads along the hanging. The same porphyry swings southwest, and appears on the Mayflower 800-ft. level continuing into the raises above this level. Where the porphyry crosses the main drift it forms the footwall to about 4 ft. of solid pyritic ore, the hanging wall being soft black quartzite. This is the only place so far as noted on the Mayflower vein where porphyry forms the footwall. In the [illegible] porphyry forms the limit of the orebody in that direction, although vein matter extends beyond. The ore in this part of the mine was 2 to 6 ft. wide; it carried secondary [illegible]

Several winzes were sunk from the main drift. A sample from winze No. 2 taken at a depth of 30 ft., and representing 3 [illegible]



[illegible]

41 per cent. iron and 3 per cent. silica. This is perhaps a typical assay for this orebody, though at many points the ore runs higher in copper.

A short crosscut in the hanging wall passes through granular quartzite impregnated with pyrite, but no trace of porphyry was to be seen. From this it appears that the porphyry tongue turns before it reaches the crosscut and does not extend along the entire length of the orebody.

Mayflower 800-ft. Level

The Mayflower vein is exposed along the Mayflower drift from the orebody above described southwest for a distance of about 1300 ft. In places the vein is tight, and shows little sulphides. The footwall is hard quartzite and contains slips parallel to the vein; it is much fractured and carries copper. The hanging wall is the soft black Mayflower quartzite, but southwest of raise 7, it changes to a white granular quartzite, carrying small disseminated pyrite crystals; southwest of raise 8, for some distance the hanging wall is almost unaltered, being but slightly inferior in hardness to the footwall.

Raise 6A developed pyritic ore, a foot thick, carrying black copper sulphides along the walls. Raise 7 started on a minerailzed streak a few inches wide; this ore widened to three feet a short distance above the drift. From this point up to the breast, a distance of about 250 ft., solid sulphides, 3 to 4 ft. wide, were developed, with secondary chalcocite specially noticeable along the hanging and footwall and where much fracturing occurred. Part of the ore here runs 6 and 7 per cent. copper. Near the breast traces of oxidation occur, and the amount of copper is smaller than in the ore deeper in the vein. The average dip of the vein in this raise is 40 degrees.

Recently the footwall of the Mayflower vein was found to carry iron and copper sulphides. The copper varies from 0.5 to 4 per cent.; a large tonnage of milling ore is being blocked out.

Impregnated Quartzite

Southwest from raise 7 the footwall of the Mayflower vein carries copper. The quartzite is crushed and fractured. Along the fractures, sulphides of iron and copper have been deposited; this is spoken of as impregnated quartzite. This quartzite has been exposed for a distance of more than 1000 ft. in the direction of the strike. How far it extends into the footwall is not fully determined. It appears from developments that the country between the Mayflower and Weasel veins is shattered, and carries copper over a wide area. It is possible that some of this impregnation, though in the footwall of the Mayflower, owes its origin to parallel fissures between the Mayflower and Weasel veins.

Near raise 6A, southwest of the Mayflower orebody above described, the footwall begins to be mineralized, and shows black sulphides. It assays a few tenths of a per cent. in copper, and carries small amounts of gold and silver. Southwesterly more black-copper coatings appear and the copper content gradually increases. The Mayflower drift near raise 7 is in the footwall of the vein, and samples from across a 6-ft. face assay from 0.3 to 3.3 per cent. copper. The amount of gold is small and nearly constant. From assays in the crosscuts, silver appears to be present close to the vein, and to diminish on going farther into the footwall; the amount is small.

Southwest of raise 7 the footwall is heavily mineralized, and in places runs 3 to 4 per cent. copper. For every 2 per cent. of copper, the quartzite carries approximately 0.015 oz. of gold and 1.5 oz. of silver. The Mayflower vein is north of the drift, but parallel slips in the footwall are mineralized with coatings and veinlets of chalcocite. The quartzite is shattered by cross fractures; it is mineralized chiefly along the cracks and parting planes, but some sulphide occurs in the quartzite itself. Close examination shows it to be porous and to contain grains of both pyrite and chalcocite.

Between raises 7 and 8 the copper content increases, and at 516 ft. from the Mayflower crosscut, the ore assayed 4.5 per cent. across the 6-ft. face of the drift. Southwest for 139 ft. to raise 8 the footwall averaged better than 1.7 per cent. copper. Two crosscuts were driven into the hanging wall. Assays showed that the disseminated pyrite crystals carry small amounts of gold and silver with but little or no copper.

Around raise 8 is a zone of strong fracturing and shearing. This raise opened 3 ft. of pyrite with secondary chalcocite, and in a sublevel driven southwest from the raise the ore, 4 ft. thick, assayed from 3 to 5 per cent. copper. In the face of this sublevel the quartzite footwall is heavily impregnated with sulphides; streaks of chalcocite ¼ to ½-in. thick occur, and assays of 4 to 5 per cent. copper are common across the face. There is no predominating set of fissures to give the idea of one definite movement, but instead shearing and crushing appear to have taken place.

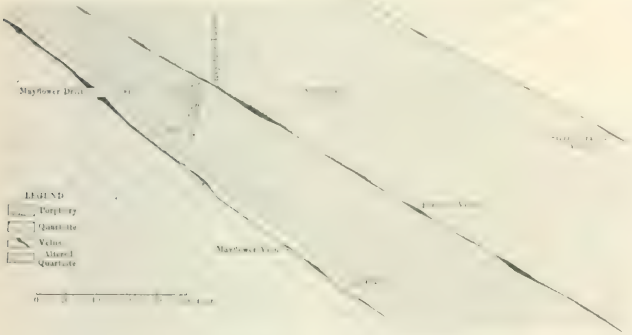
Southwest of raises 8 and 9, the footwall is developed by crosscuts from the Mayflower vein, and through it copper is widely disseminated. Crosscut No. 3 south is driven into the footwall at right angles to the bedding. Beginning at the vein the footwall is mineralized for some distance, but the amount of mineralization gradually decreases; finally the footwall changes into a hard, relatively unfractured quartzite containing little copper. Farther in, other fractured and altered zones occur. Where the quartzite is relatively little fractured the copper content is low, and pyrite when present is fresh and yellow; in the more fractured zones the pyrite is often covered with a black coating of copper sulphide. Along this crosscut the copper content gradually decreases and increases, showing that mineralization took place also from fissures in the footwall of the Mayflower vein.

Near raise 9 the vein is 4 to 6 ft. wide, and carries appreciable quantities of chalcocite; the black walls are polished. Rough fragments of quartzite with soft gouge comprise the vein filling. The sulphides are not as massive here as in

LOOKING EAST ACROSS BINGHAM CANYON AT PROPERTY OF OHIO COPPER COMPANY raises 7 and 8, though they carry a larger percentage of copper. The ore is especially rich along the footwall. It is worth noting that while the vein at this point contains very little masive sulphides, the footwall is much fractured and highly mineralized. It seems probable that the sulphides, instead of filling the vein as in other places, were deposited in the more open and fractured footwall.

Native Copper

Along the drift in this part of the mine native copper occurs. This is found in films and veinlets in the fractured quartzite near the vein, both in the foot and in the hanging wall. Where recently exposed it is bright and fresh, but gradually on exposure to the air and mine water it becomes covered with a coating of oxide, possibly also of sulphide. The copper frequently forms a network around quartzite fragments, holding them together. Some crystals of native copper were observed. Stringers of chalcocite also occur at this point, and the quartzite is thoroughly impregnated with sulphides coating the cracks and fractures. The native copper is found for a distance of about 200 ft. along the vein and occurs particularly at points where water flows into the drift from fractured zones in the quartzite. The native copper probably resulted from chemical reactions.



SECTION THROUGH MAYFLOWER INCLINE

Southwest of raise 9 the footwall contains veinlets of black sulphides, and carries much copper at various points. Ground-up quartzite and gouge form part of the vein filling. Bunches of sulphides occur, and in places translucent vein quartz; the footwall quartzite is sometimes entirely replaced by this translucent quartz.

The hanging wall is soft and does not ring when struck with a hammer. It contains slips with curved faces coated with shiny black gouge. Occasional nodules or silicious concretions are found in the hanging wall; these are lens-shaped having a maximum dimension of 1 in. and consist of quartz with concentric layers of sulphide. An assay of one of these concretions gave 0.5 per cent. copper. The hanging is leached and porous in this part of the mine, and contains vugs partially filled with sulphide. The copper, however, in the hanging wall is negligible as compared with that in the footwall.

Northeast of raise 9 for 100 ft. the footwall gave assays of 3 and 4 per cent. copper across the face of the drift; in some places it assayed between 5 and 6 per cent. copper. The ore contains open cavities lined with pyrite crystals coated with chalcocite. The quartzite is porous, and in a measure is refilled with white, translucent, vein quartz. This often carries disseminated chalcocite grains, loosely imbedded in it.

Genesis of the Ore

It appears that the mineralized quartzite is due largely to an original impregnation of a crushed and fractured zone, from the Mayflower vein; but the present orebodies may also be due in part to reprecipitation as chalcocite of copper leached from the upper part of the vein. To support the former view the impregnated quartzite occurs where the footwall is crushed and fractured, and the Mayflower vein at points where the best ore occurs in the footwall generally contains little solid sulphides, indicating that the sulphides were in part deposited in the fractured footwall instead of in the vein. If this is the case the ore will probably extend to some depth. In the mine of the Ohio Copper Company the mineralized quartzite is worked 400 to 600 ft. deeper than at present in the Fortuna mine; in both cases the impregnation is very similar. An accompanying illustration, looking east across Bingham cañon, shows the property of the Ohio Copper Company, which adjoins the Fortuna on the west.

The Fortuna mineralized quartzite is well adapted to milling. Most of the ore will concentrate better than 12:1. Average assays show it to contain from 8 to 24 per cent. total sulphides. A large tonnage of milling ore has been exposed, but the extent of the impregnated quartzite is not fully determined, and no milling has been attempted.

Ontario Mining Flotations

The attention of the provincial government of Ontario having been drawn to the large number of Cobalt and Montreal river flotations now being made, in which the provisions of the Ontario Companies act, designed for the protection of investors, are entirely disregarded, a statement was issued on November 20 by the Provincial Secretary's Department warning offenders that the law would be strictly enforced. The document, after calling attention to the flagrant disregard of the law in regard to information required to be set forth in prospectuses, stated that steps are being taken to bring before the courts a number of cases unless those interested proceed at once to comply with the law. The requirements of the "prospectus clauses" of the act are recapitulated as follows: Advertisements must set out the names, addresses and descriptions of directors, their qualification and remuneration; the minimum subscription on which directors may proceed to allotment; the amount payable on subscription and allotment; the times when further calls may be made, amount of shares or debentures agreed to be issued otherwise than in cash, that is for property or services; names and addresses of vendors of property to be paid for out of the shares offered for sale and the amounts to be paid; amount paid in commissions and to promoters; dates and parties to all material contracts and places where such contracts may be inspected; and the interest of every director in the promotion. These clauses apply not only to advertisements published by companies, but also to those of brokers interested in the promotion and to Dominion and foreign companies, as well as to those incorporated under the Ontario act.

A New Oilfield in California

[illegible]

It is expected that a new productive oilfield will be developed in the southern portion of San Joaquin county, California. Several rigs are now sinking wells. A third stratum of sand is being bored through by the pioneer company at work there, and this is below 1500 ft. depth. Some oil was met at 1200 ft. and the new wells will be sunk to the depth of those in Kern and Coalinga districts. The new field is within easy reach of tidewater, so that oil can be shipped cheaply. One company has bonded a strip of land two miles wide and 15 [illegible]

Manganese Deposits of Morro da Mina, Brazil

The Deposits Are Nearly Vertical and Are Easily and Cheaply Mined by Open Cuts; 260,000 Tons of Ore Mined in Five Years

BY JOQUIM LUSTOSA* AND J. C. BRANNER†

By Joquim Lustosa

The name Morro da Mina (mine hill) comes from the fact that in colonial times a tunnel was driven into the hill where the deposits occur, probably in the hope of finding gold. The Morro da Mina is 1110 m. above sea level; it is 5 km. east of the city of Queluz and 6 km. east of the Central railway. A branch line, built by the mining company, but operated by the railway, joins the mining property with Lafayette, the nearest railway station. The route selected for this branch line is a difficult one; one of the cuts alone required the moving of 108,000 cu.m. of earth, and in the total length of the branch (6840 m.) the movement of materials amounted to nearly 500,000 cu.m. This branch lines reaches an altitude of 1056 m., and has a difference of level of 127 m. between the two ends.

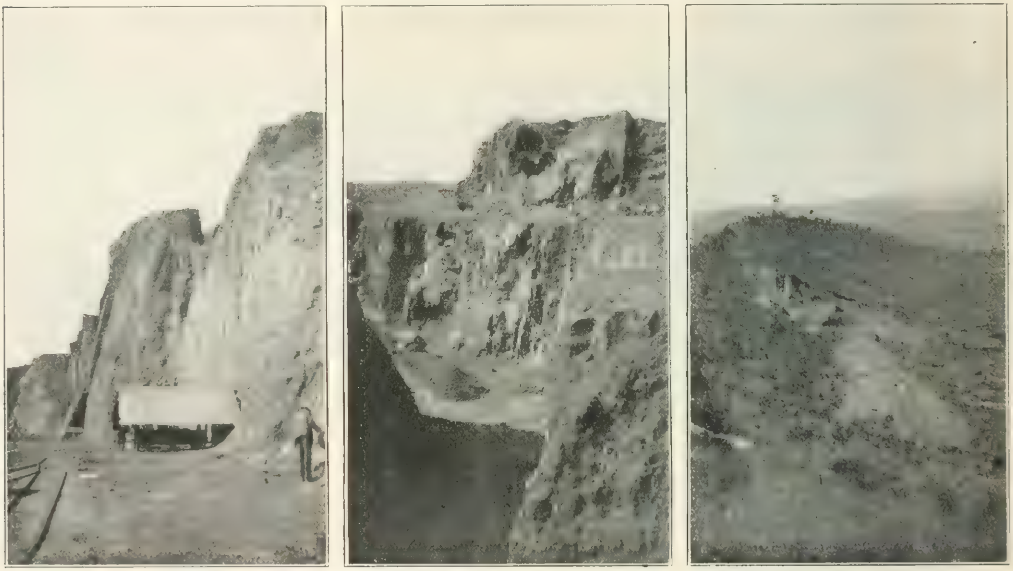
The area of the property, formerly known as the Fazenda da Olaria contains 159 hectares, and of these more than five hectares are mineral bearing. For many years this great deposit attracted no attention and its first explorers reporte the ore to be of inferior quality, so that it was only about five years ago that it began to be seriously studied. Mining operations began Nov. 12, 1902, when the branch railway was completed.

The deposit belongs to the Morro da Mina Company which is organized as a limited liability company with a paid-up capital of 1,600,000 milreis,[1] in shares of 200 milreis. The equipment in service is worth about 120,000 milreis, of which 80,000 milreis is invested in the railway and the remainder in the mines. The rolling stock in service on the branch line belongs to the Central railway with which the company has a contract for the shipment of ore.

General Character of the Deposit

The general strike of the country rock and of the ore deposits is north 30 deg. west. The dip is nearly vertical, inclining sometimes east and sometimes west at an angle of 10 deg. from the vertical. The outcrop of the ore can be traced for a distance of nearly 1000 m. The country rock is a schistose eruptive deeply altered, but not readily classified. In immediate contact with this rock forming genuine injections is another type of eruptive rock, perhaps a gabbro or other similar type.[2] The deposit has a lenticular form.

All the workings are open cuts in three terraces. The attack was directed lengthwise along the east side of the hill. For this reason and on account of the topography, it is possible to carry on the work simultaneously along a face 750 m. in length. Owing to length of the face mining operations can be carried on rapidly, and 600 tons of ore have been taken out in 10 hours; it is possible still farther to increase the output by simply increasing the number of laborers. The workings have a total length of more than 3000 m. The waste is mostly thrown down the west slope of the hill either from the open cuts, or through tunnels. On account of the topographic prominence and the isolation of the deposits this part of the work is easily done, and the open cuts can be driven into the hill for 130 m. below its summit. All the blasting is done with dynamite. Owing to the jointing of the rocks and to the numerous cleavage planes the breaking up is easily done and the consumption of explosives per ton of



OPEN CUTS ON THE MORRO DA MINA AND ADJOINING PROPERTY SHOWING METHOD OF MINING available ore costs approximately 100 reis (about 3c.).

---

*Mining engineer, Lafayette, Estado de Minas Geraes, Brazil.

†Professor of geology, Leland Stanford University, California.

[1] A milreis is worth about $0.33. (J. C. B.)

[2] Opinion of Dr. O. A. Derby.

As soon as the ore is sorted it is hauled in mine cars to the ore bins from which it is loaded automatically on the freight cars of the Central railway. The time occupied in loading a car of 30,000 kg. is 5 min., and only two workmen are required to operate the loading chutes.

The annual output averaged nearly 60,000 tons during 1903, 1904 and 1905. Up to this time the company has exported nearly 200,000 tons. The output depends entirely upon the number of cars the Central railway can furnish.

Future of the Enterprise

Careful prospecting of the beds by means of bore holes and tunnels has proved the deposits to a depth of more than 120 m. below the outcrop. In 1904 the company considered that it had an available orebody of 5,000,000 tons. I believe, however, that there should be included the reserves that lie below the

OPEN CUT OF THE USINA MINE. THE BEDDED ROCKS AT RIGHT ARE SCHISTOSE SPECULAR IRON

[illegible]

lowest plane reached by the prospect holes, and which are still 60 m. above the floor of the valley of the Corrego do Gigante that runs along the base of the hill.

The analyses made in Europe and in the United States of carload lots of the ore have shown an average of 50 per cent. of metallic manganese, from 1 to 2 per cent. of silica and 0.06 to 0.08 per cent. of phosphorus.

Supplementary Statement

The foregoing was written nearly two years ago; since then mining operations have gone on regularly and up to the end of 1907 there have been mined 260,198,800 kg. of ore. It is expected that there will be an increased output during the present year, not only on account of the promise of a larger number of cars, but also because the mining company has ordered cars of its own. The change of the gage of the branch line from one meter to 1.6 m., the gage of the Central railway, will also facilitate this increased output for it will do away with the transhipment heretofore required at the Lafayette station.

Probability of the Downward Continuation of the Ore

On this point, so important for the future of the company, the mining work of the two companies, "Mineraçao do Brazil" and "Queluz de Minas" has thrown valuable light. These companies have carried their mining operations to a level of about 200 m. below the culminating point of the Morro da Mina, and in the same general direction of the outcrop, though from one to two kilometers away. It is to be expected, therefore, that in the Morro da Mina there is the same depth of workable ore.

By J. C. Branner

One of the largest mines near Queluz is known as the Morro da Mina. Dr. J. Lustosa, the engineer in charge of that property, has kindly sent me the above short paper which I have translated into English.

The statistics of the production of manganese ore as given in the last volume of "The Mineral Industry" show that in 1906 Brazil was one of the first four largest manganese producers in the world. The total output for the year 1906 was 201,500 metric tons, which was considerably less than that for the years immediately preceding. This falling off seems to have been due to a temporary lack of railway facilities, and is not likely to occur again. Indeed it seems probable that there will be a marked increase in the Brazilian output for 1908.

During 1907, in company with Dr. R. A. F. Penrose, Jr., of Philadelphia, Dr. Derby, director of the Geological Survey of Brazil and J. H. Means, of London, I visited the most important of the Brazilian manganese mines, which are those at and near Miguel Burnier and several in the vicinity of Queluz in the State of Minas Geraes. The accompanying photographs were made at the time of that visit.

[illegible] were given me by Dr. Lustosa at the time of our visit. Laborers receive from \$2.50@3 a day (Brazilian currency); that is 80c.@\$1 a day (United States cur- [illegible] Seventy per cent. of their workmen are Brazilians, 20 per cent. are Italians, and 10 per cent. Portuguese.

The geology of the deposits is extremely interesting. There are three main beds of manganese ore standing nearly on end; these are respectively 28, 14 and 50 m. thick. The accompanying rocks are profoundly decomposed, and are easily removed.

At the Sao Gonçalo mines west of Queluz the ores are also nearly on end and are close to granites. Here also the lenticular bedded deposits follow the strike of the deeply decomposed country rocks. At Miguel Burnier a few miles further on the Central railway are the older Usina mines. Here too the manganese is interbedded with other rocks, some of which are the *itabirites* or schistose specular iron ores. The manganese beds are here visi- [illegible] rocks.

It is to be hoped that Dr. Penrose, who is our leading authority on manganese, and who saw all of these and several other Brazilian manganese deposits, will soon give the geologists and mining engineers of this country the benefit of his observations on these remarkable deposits.

The *Wall Street Journal* says: In the United States alone the water power is estimated at 21,000,000 h.p., of which only [illegible] ness that power and develop collateral resources might easily absorb all of that fearsome gold production we can well lay hands on for the next 20 years. By that time other uses will be found for the precious product. There would appear to be no immediate occasion for alarm over the prospect of being obliged to pay [illegible]

The Hennig Testing Plant and Metallurgical Laboratory

Near East Thirty-fifth street and the Long Island Railroad tracks in Flatbush, Brooklyn, N. Y., is a large, well equipped testing plant which, although little known, is of more than passing interest. Here Charles T. Hennig, Ph. D., with his corps of assistants, carries on experimental work in ore concentration and investigates metallurgical and chemical processes. The clientele includes both American and European individuals and corporations. The equipment of the plant, much of which is interchangeable to allow for variations in processes, provides for work in the following lines: Crushing and sizing, including crushers, stamp mills, rolls, etc.; concentration, wet and dry; amalgamation; cyaniding; magnetic separation; roasting; blast-furnace smelting; electric smelting; electrolysis; leaching; and chlorination.

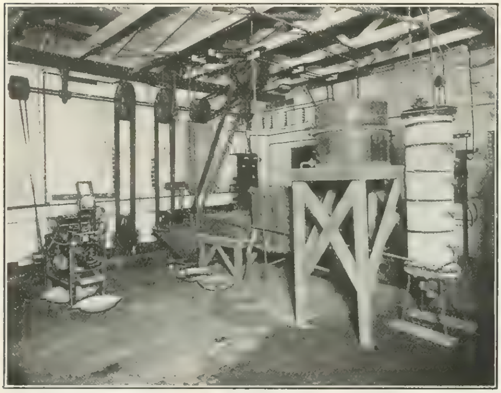


FIG. 1. EXPERIMENTAL PLANT FOR LEACHING AND PRECIPITATING COMPLEX ZINC-LEAD ORE

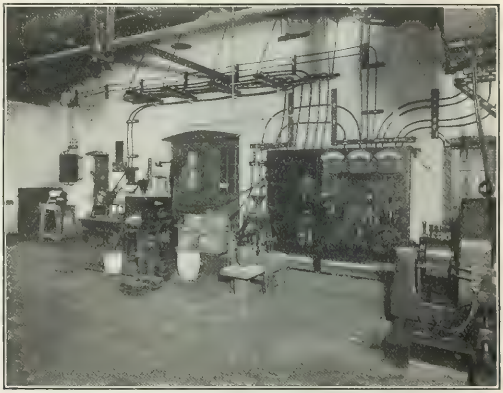


FIG. 2. SMALL ELECTRIC FURNACES, SWITCHBOARD AND PART OF DYNAMO

EQUIPMENT

The following description of the plant will furnish an idea of the work carried on: The building is divided into three rooms, the front room containing a 4-stamp mill, concentrating, cyaniding and leaching plants, apparatus for magnetic separation and electrolytic work, a steam plant for drying purposes, and an air compressor. The middle room contains rolls, sample mills, crushers, screen, reverberatory furnace, blast furnace (24 in. diameter by 12 ft. high), and a large power hammer for testing steel bars. The back room contains one 75-h.p. Springfield gas engine (another of 100-h.p. to be added), one 60-kw. Eddy dynamo, six electric furnaces for smelting refractory metals, making carbides and the different alloys of nickel, chromium, molybdenum, tungsten, vanadium, titanium, thorium, etc.

On one side is a room containing one 25-h.p. White & Littleton gas engine, and one small dynamo for the small electric furnaces; on the other side is the laboratory. Power is furnished to the plant by six gas engines of different makes, ranging from 3 to 75 h.p., and having a total capacity of 130 h.p.

Doctor Hennig has in his collection 53 elements, many of which were isolated in this plant. Among other interesting objects of the collection is a piece of praseodymium which was prepared in this plant.

THE HENNIG ORE CONCENTRATOR

The Hennig concentrating table was described in part in the JOURNAL of July 18, 1908. Since that time, however, several improvements have been made in the foundation, driving gear and feed trough.

The foundation consists of three 5-ft. cross-pieces made of 8x8-in. timbers. Resting on these cross-pieces are two 8-in. channel bars as shown in Fig. 3. The table proper rests upon two cross-pieces (see Fig. 3), the four corners of which are fitted with short steel pins with ball ends. These pins work freely in sockets fitted to the ends of the cross-pieces and on the bottom side of the table, as shown in Figs. 3 and 4. The cross-pieces are fixed rigidly to the channel bars. Projections from the cross-pieces work freely between guides attached to the bottom of the table (see Fig. 4). The guides may be set at any angle with the line of the driving rod (shown in Fig. 3), thus giving to the table the required amount of side motion. In addition to the longitudinal motion, and the side motion just described, the table is also capable of a rocking motion, which is imparted by the ball-and-socket arrangement. The motion of the table in operation is very similar to the motion imparted by the prospector to the ordinary pan.

The driving gear is all in one piece and embodies fast and loose 12-in. pulleys, balance wheel and double eccentric drive. The longitudinal oscillations may be varied from 0 to 1 5/16 in., at a speed of from 150 to 180 per minute. To drive the table requires ¾ horsepower.

The table, which is 16 ft. long by 7 ft. wide, is covered with canvas coated with asphalt. The riffles are made of lead strips of semi-circular section, there being required a total length of 1256 ft. of these strips to supply each table. They are 5/16 in. wide and 3/16 in. high, except when flattened, as will be explained later. The distance between riffles at the feed end of the table is 3 in.; at the discharge end ¾ in. These figures, however, may vary according to the quality of the ore under treatment. As the discharge end of the table is approached the riffles are flattened; this is accomplished by passing the lead strips through a hand-power rolling machine. The arrangement of the riffles in sinuous curves is one of the special features of this machine. The lead strips are shaped in a wooden mold.

The feed trough, shown in Fig. 5, is 15 ft. 7 in. long, 3 in. high, 8 in. wide at the feed end, and 3 in. wide at the discharge end of the table. Partitions or gates divide the trough into five compartments, the gates consisting of a strip of wood which may be raised or lowered and fixed in position. Extending along the bottom of the entire trough is a groove. The gates are capable of adjustment so as to leave a space anywhere from 1/16 to 5/16 in. The pulp is charged onto the table through holes placed 2¼ in. apart in the outer side of the feed trough; at the feed end of the table these holes are ¾ in. in diameter, those at the discharge end being ⅜ in. in diameter. In the improved table this feed trough is capable of adjustment to within 0.001 in. The table assembled is shown in Fig. 5.

OPERATION OF THE TABLE

The ore is fed into the wide end of the trough at the head end of the table.

Through the agency of the table motion, the gates and the grooved bottom of the trough, a concentrating effect is obtained, the mineral portion of the feed collecting in the groove and passing on toward the discharge end of the table. The overflow from each of the compartments passes by means of the holes referred to onto the table proper. The fineness of the concentration in the feed trough and the quality of the pulp fed through the holes is controlled by the inclination of the trough and the space left under the gates. By this arrangement the bulk of the concentrates are made in the trough, only the remaining pulp passing over the table.

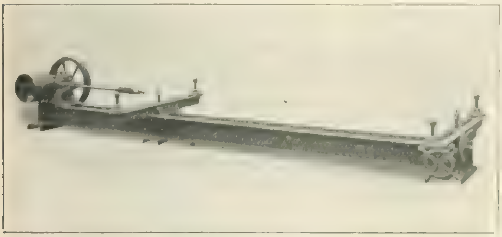
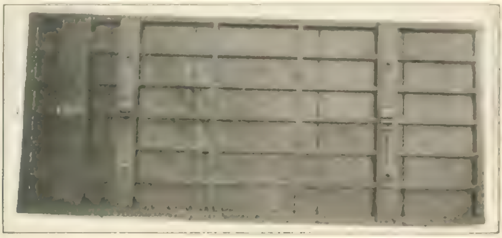


FIG. 3. CHANNEL BARS, CROSS PIECES AND DRIVE, HENNIG ORE CONCENTRATOR


[illegible]

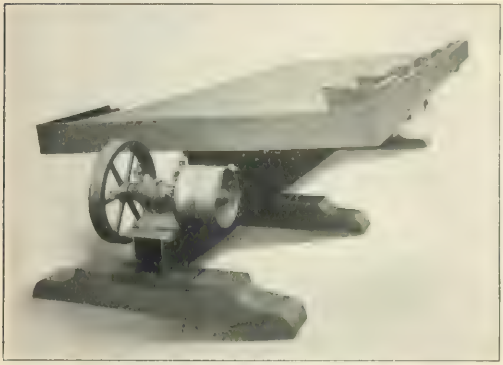


FIG. 5. HENNIG ORE CONCENTRATOR ASSEMBLED, NOTE DRIVE, FEED TROUGH AND FOUNDATION

[illegible]

Through the agency of the curved riffle and the gyratory motion of the table the pulp is washed at every curve and within the arc of each curve, thus making the concentrating process continuous over the entire length of every riffle. The average capacity of the table is 50 tons per 24 hours.

During the six months ending May 31, 1908, the Broken Hill Proprietary Company sunk its Delprat shaft 5 ft., making the total depth 1302 ft.; the Stewart shaft was sunk 112 ft., making the total depth 1324 ft.; the Half Way shaft was sunk 113 ft., making the total depth 1313 feet.

Diamonds in German Southwest Africa

Some interesting particulars come from Berlin with regard to the discovery of diamonds in alluvial deposits near Lüderitzhuaht in German Southwest Africa. At the first discovery point a white man and six natives, working with spades and a sieve are said to have taken out 70 carats in a day. At another point near 150 carats were taken out in a day with a washing machine run by hand.

The diamonds so far produced have been very small, rarely exceeding ⅞ carat, the average being half a carat. The quality, however, is said to be first-class, the stones being flawless and of a clear white color, except, sometimes, for a slight yellow shade. During October 2687 carats were sold for 65,427 marks.

Attempts to find water by boring have been fairly successful, a supply suitable for working but not for drinking having been tapped at a depth of [illegible] ft. Land in the vicinity of the discovery, which is near the railway, has increased enormously in value, but the owners are unwilling to sell. A large area has been staked out, on which great activity prevails, but the most promising ground has already been taken up and there is no room for new comers.

Fast Tunnel Driving

The American record for speed in tunnel driving has been broken at the Elizabeth tunnel, which is being driven to furnish water to the city of Los Angeles, Cal. This tunnel, according to J. B. Lippincott, [illegible] ft. in section and was advanced in granite during the 31 days of October 466 ft., or at a rate of 15 ft. per day. The best previous record was the driving of the advance heading, 8x12 ft., of the Gunnison tunnel, 449 ft. in granite during one month. The best record in driving a large mine adit was the run of 354 ft. in the Kellogg tunnel, Bunker Hill & Sullivan mine, Idaho.

In driving the Elizabeth tunnel a bonus [illegible] Gunnison tunnel. Both were in charge of public-service engineers. The Elizabeth tunnel was driven full size by the lower-[illegible] ner drills were used; the mucking was [illegible] R[illegible] blower. At the end of the month the face was 2508 ft. from the portal. Each man was paid a bonus of 40c. for each [illegible] per day. The cost of driving the Elizabeth tunnel, inclusive of the bonus, was [illegible]

Gayley's Invention of the Dry Blast

Mere Condensation, as Proposed by Others, Was Not Sufficient for the Removal of Moisture; Solidification Made the Method Practicable

BY ROSSITER W. RAYMOND

The immense commercial value of the Gayley dry-blast process has been established beyond controversy. The testimony of practical blast-furnace managers, on both sides of the Atlantic, agrees that it reduces the cost of pig-iron about $1 per ton; but from the same testimony it appears that this direct economy does not by any means cover its commercial advantages—in fact, that under conditions frequently encountered in practice, it presents other benefits of even greater immediate financial importance. To this point I shall recur in a later part of the present paper.

The history of the reception given to this invention, especially on the other side of the Atlantic, has repeated an experience familiar to American engineers. First, the reports of our practice were rejected as theoretically impossible, according to generally accepted notions and formulas; then the figures were reluctantly accepted; and finally the attempt has been made to explain how they could have been obtained. As to the Gayley dry-blast, we Americans have been for several years in the last stage of the discussion, and the rest of the professional world is rapidly coming to it.

What Did Mr. Gayley Invent

Meanwhile, the remark has been repeatedly made that, whatever Mr. Gayley's process may turn out to be worth, it was not an invention on his part, but simply the energetic and persevering execution of a procedure already proposed by others. This question I wish to discuss first in the present paper. What did Mr. Gayley invent?

Realizing that this is not the place for detailed argument on an issue of patent law, I shall not undertake to quote and criticize the publications prior to Mr. Gayley's first patents. It may be admitted, without such critical analysis, that the possible advantages of removing moisture from the air forced into an iron blast furnace were recognized and talked about a hundred years ago, and again fifty years ago; that methods and apparatus for cooling air (and incidentally precipitating moisture from it) were known before Mr. Gayley's invention, and that, in one case at least, a system of cooling the blast for a converter had been actually patented. All these prior prophecies and proposals might be shown in detail to be impracticable, defective or visionary; but it is not my present purpose to discuss them. The fact remains, that after they had all died out, to the last echo, and after the object they sought had been pronounced by high scientific authority, with the general consent of technical experts, economically unattainable, Mr. Gayley went ahead, and did the thing!

This alone might not be conclusive as to his claims, since mere energy and perseverance, however meritorious, do not constitute invention. But this is not all. The significant fact must be added that, after beginning, with all the light that previous investigation and invention could give him, his attempt to carry out the "well-known" operation, Mr. Gayley spent six years in costly experiments before he found out how to do it. This certainly raises a strong presumption that during those six years, Mr. Gayley discovered something not previously known; and it is that discovery which I wish to define.

Features of Previous Proposals

All previous plans or suggestions for removing moisture from the blast by reducing its temperature have two features in common.

(1) Following the analogy furnished by the natural precipitation of dew, they assume that moisture can be effectively removed from the blast in proportion to the reduction of its temperature to successively lower dew-points.

(2) They assume that this operation would be metallurgically advantageous in proportion to the extent to which moisture was thus removed. Considering the objectionable effect of such moisture to be a direct function of its amount, they all infer that removing part of the moisture would to that extent remove part of the evil, and that the benefit thus realized would be positive, even if it were but partial.

The first of these assumptions is based upon an incomplete conception of the analogy of nature. Closer observation should have shown these theoretical inventors that the lowering of the temperature of the atmosphere below its dew-point does not produce the deposition of dew, except in a quiet atmosphere, because wind prevents the fall of dew, and drives it away as fog. Moreover, all the inventions for taking moisture out of air by cooling it deal with bodies of air practically at rest. Nobody before Mr. Gayley had attacked the problem of taking the moisture out of a hurricane in that way; and everybody who had talked, however vaguely, of doing something of the kind with the blast for a furnace had overlooked the circumstance that simply segregating the moisture by such means, as a mist, and then letting the mist be blown into the furnace, would secure no metallurgical benefit whatever.

Solidifying the Moisture

By years of patient experiment, Mr. Gayley discovered, and was the first to declare, that if the reduction of temperature were carried to or below the freezing point of water, the ice or snow thus formed could be precipitated as well as segregated; that (with proper proportions of apparatus) it could be practically caught and held, so as to permit a blast free from suspended mist or fog to go forward into the furnace. The amount of aqueous vapor still held in the air would depend, of course, upon its temperature. There would be less of it at 10 deg. below freezing point than at that point. But this small difference has little practical significance. The main point is, that unless the moisture be not only segregated by cooling, but actually solidified, its approximately complete deposition from a rapidly moving current cannot be effected. Practically, therefore, the effect of going below the freezing point is to make sure that that point has been effectively reached in all parts of the current.

With regard to the second assumption above stated, it follows from what has been said already that no reliable metallurgical advantage can be secured by cooling the blast to any temperature short of the freezing point. For, under such circumstances, not only might moisture thus segregated be carried onward as mist, but the possible precipitation of a part of it as rain, *en route*, would introduce a new and serious evil—the evil of uncertainty. This point deserves special discussion.

Significance of Certainty

The significance of certainty as a necessary element of any real industrial art has been often overlooked. To such loose logic we owe much fascinating but misleading rhetorical celebration of the "lost arts" of the ancients. In spite of the eloquence with which these "lost arts" have been extolled by orators and amateurs, I have been brought by much patient study to the conviction that (as a general rule, at least) no real arts have been lost. For an art is a process which arrives with reasonable certainty by the intelligent use of definite means at a desired and foreseen result. This proposition may be made clearer by illustration. For instance:

NOTE.—A paper read at the meeting of the American Institute of Mining Engineers in Chattanooga, Tenn., Oct. 2, 1908

Certain ancient tribes are said to have heated iron ore and wood or charcoal together in rude hearths, with the aid of the wind blowing across a mountain-top, or of a primitive bellows, supplying an artificial wind, producing thus a half-fused conglomerate, out of which could be selected pieces of true steel—indeed, of tool steel or razor steel, of exceptionally high quality. But the assertion that these ancient experimenters had the art of making steel is not justified by any such stories, however authentic. To combine blindly the materials and forces furnished by nature, and then to overhaul the result, seeking for fortunately valuable products, is not to practice an art. Such vague experimenting may be the beginning, out of which, with greater knowledge and the growth of conscious skill, an art may come; but an art it is not. For an art demands the intelligent use of definite means for a definite end.

On the other hand, it is not easy to say at what point a primitive and empirical procedure attains the rank of an art; and it is not necessary for my present purpose to fix that point. The much more important proposition which I wish to emphasize is this: that every industrial process involves the two elements of ignorant dependence upon natural conditions and intelligent control of such conditions; and that the degree of perfection attained by a given art is the degree in which the former element has been superseded by the latter. In practice we try to make a specified product by a given process; yet often, in spite of all our scientific or traditional precautions, a part of our output fails to meet the specifications imposed upon us, and must be rejected; so that, in a general way, it is fair to say that the perfection of an art is measured in inverse ratio to the proportion of such "rejections."

Importance of Exact Knowledge

The progress of our metallurgical arts toward perfection in this respect has been largely due to the exact determination of the composition of our raw materials. We can all remember when American iron and steel works began to employ chemists of their own, and to determine by chemical analysis not only the character of their products, but also the nature of their ores and fluxes. The result has been a revolutionary transformation of our blast-furnace practice. The old "founder," who diagnosed his slag, and dosed his furnace accordingly, has disappeared. The superstitious reliance upon this or that brand of ore as a material for this or that brand of iron has gone with him. The chemist dictates the charges, and tests the product.

Yet, with all this increase of analytical control the blast furnace has continued to be, as a great authority once described it, at once the crudest and the most delicate of metallurgical apparatus, subject to inexplicable irregularities, and seemingly obeying whims of its own, beyond the prevision or regulation of the most scientific manager.

One reason (and, in my judgment, the chief reason) is, that while we have [illegible] the second or third place of decimals, we have practically ignored the composition of the blast which goes into the furnace, although this material constitutes more than half the total weight of the materials charged. This defect in our control of the furnace process has not escaped notice. The effect of varying moisture in the blast has been recognized for a hundred years past, especially as between summer and winter; and furnace managers have adjusted burden and blast, in a rude way, to meet the conditions they created. But I do not think that the significance of diurnal and even hourly variations of the moisture in the blast was ever fully recognized until Mr. Gayley called attention to it. At all events, he was the first to propose a practical remedy for the evils resulting from such frequent changes.

Effect of Changes in Blast Composition

The nature of these evils deserves here a preliminary word, especially because it affects profoundly the validity of all our theoretical calculations of heat economy, etc.

The influence of moisture in the blast may be summarized with sufficient accuracy for my present purpose, as consisting of two elements: (1) the effect of a useless constituent, diluting the effective oxygen of the air, and absorbing the heat in requiring the temperature of other materials; and (2) the effect of a constituent which, by its dissociation, absorbs heat in the hearth (where heat is most needed), and either, by the recombination of its elements, restores that heat in another part of the furnace (where it is neither needed nor desired) or else, through incomplete recombination (evidenced by the presence of free hydrogen in the furnace gas), fails to restore a part of the heat it has absorbed.

We are accustomed to determine the economy of the blast-furnace process by means of thermo-chemical equations and heat-balances, in which we take account of the composition, temperature, specific heat, heat of combination or separation, etc., of the materials entering the furnace, and the composition and temperature of the materials escaping from it. With due allowance for the incidental loss of heat by conduction and radiation, this method should be accurate, if the data upon which it rests are accurately determined. That it fails to give us a perfect criterion of our practice, is due, in my judgment, to the circumstance that it is necessarily based on averages, and assumes these averages to represent uniform conditions [illegible] such a quantity, pressure and temperature of blast, composition of ore and flux, and quantity and grade of pig-iron produced. These data are usually averaged from considerable periods; in fact, the longer the period taken, the stronger the assumption of the trustworthy character of the calculation—an excellent rule for most purposes, since averages eliminate incidental variations. But when incidental variations are directly influential upon technical and commercial economy, it is not to be hastily assumed that they can counteract one another, so that the average result is equivalent to that of uniform conditions. Suppose, for instance, that a certain temporary change in one factor of the process would have an injurious technical or economical effect; and that a subsequent equal change in the contrary direction, would likewise have an injurious effect. Evidently, the net result would not be fairly represented by calculations based upon the average conditions of the period embracing both changes, and upon the assumption that they cancelled and neutralized each other.

[illegible]

That this supposed case is not imaginary, I shall try to show. But first I would point out another defect in our usual method of stating the "heat-balance" of the blast-furnace. Our estimates of the utilization and the waste of heat may be practically fair enough, so far as the heat-requirements of reduction and fusion, and the loss of heat in slag and gases are concerned; but they are seldom based on accurate data as to the grade of the pig-iron actually produced. At least, so far as I now recall, the highest degree of accuracy in that respect does not go beyond a recognition of the general distinction between different grades, from foundry to white iron, or of the special heat-requirements of pig-iron of peculiar chemical composition (as to silica, sulphur, manganese, etc.). The statement that a given furnace is "running on" this or that grade of iron, and the use in calculation of the figures appropriate to that grade, seems to be the best that has been achieved in this regard. But a furnace "running on" a particular kind or grade of iron not only may, but in present practice invariably does, produce more or less iron of other grades (sometimes colloquially called "off-iron") the amount of which, sometimes even exceeding 50 per cent. of the total product, may seriously affect the value of our technical calculations of heat-economy, if these do not include it as a factor. I offer this [illegible] fact that such theoretical calculations do not always furnish a safe criterion of alleged or possible technical economies. The method is scientifically sound; but it is ap- [illegible] such precise mathematical discussion. [illegible] that in "duty-trials" of engines, he "would carry out to the third decimal place the determination of the weight of the ashes, while he guessed at the amount of coal shoveled into the fire-place." Possibly some such inconsistency may explain the hasty conclusion of some foreign experts that the reported technical economy of Mr. Gayley's process was "simply impossible."

Commercial Economy

As regards commercial economy, on the other hand, there is no room for doubt or contradiction. If a blast-furnace is "running on" (i.e., managed with the purpose of producing) a particular kind of pig iron, and if Mr. Gayley's process will deliver it altogether, or to an unprecedented degree, from the risk of producing incidentally another kind, not called for, and probably not desired or readily salable at a profit, the commercial value of this insurance is beyond measurement by any technical formula that has been, or could be constructed. The case presented in Mr. Cook's paper on "Experience with the Gayley Dry Blast at the Warwick Furnaces," furnishes a striking illustration of this proposition. As already observed, the testimony from iron works both in the United States and abroad agrees in declaring that the Gayley process reduces the cost of pig iron about $1 per ton; but this saving, though important, is trivial compared with the commercial advantage of a more effective control of the operation and product of the furnace. To state the case roughly, the Warwick company was caught, with innumerable others, in the financial revulsion of 1907, which stopped for a time the market-demand for pig iron. It had a profitable contract with solvent customers for iron of a special grade; but the old and almost dilapidated furnace, which it had kept in blast for the purposes of that contract was running so irregularly that only half—or less—of its product could be delivered under the contract, and the rest would have to be stored as not immediately salable, and, indeed, as never likely to be salable at a price covering the special expenses incurred for the purpose of producing the special and more costly grade of product for which the furnace had been burdened and operated. Under these circumstances, the interest on the capital represented by the "off-iron" would have exceeded the profits on the proportion of special iron deliverable under the specifications of the contract; and a prudent manager would have been obliged to accept the unwelcome alternative (adopted, in fact, by most of our American merchant furnaces) of sacrificing his pending contract, blowing out his furnace, and submitting to the losses in general expenses, interest, etc., and the even greater damage caused by the scattering of skilled and trusted workman, and the inability to take immediate advantage of a general revival of business, or of a sudden special opportunity for a local resumption of work. These disastrous effects of a suspension of operations are, as I need scarcely say, those most dreaded by technical managers, since, besides their direct financial results, they involve the immeasurable anxiety and responsibility of subsequent reorganization.

Actual Results in Operation

Fortunately for the Warwick company, it had just completed the installation of an expensive plant for the Gayley process; and by the operation of this plant, under all the disadvantages of new and untried apparatus, inexperience of both manager and workmen, and dilapidated condition of the furnace then in blast, enabled the company to raise the proportion of its immediately and profitably marketable product from below 50 to above 80 per cent.; to fill its pending contract; and to realize, instead of industrial demoralization and financial loss, a substantial profit from continued operations. Indeed, it is no secret that, through the total gains of this campaign, the entire cost of the installation of the Gayley system, including the sum paid for the patent right, was repaid in a few months, though the certified saving of $1 per ton in the average cost of pig iron would not by any means have accomplished that result in so short a time.

The situation above described is one which any manager of a "merchant" blast furnace (i.e., a furnace selling its product to outside customers) may at any time encounter. But it carries a meaning also for establishments, like the works connected with the U. S. Steel Corporation and other great concerns, which have a use for the "off-iron" produced by their blast furnaces. For such "off-iron" could be manufactured at smaller expense than when it is turned out as an unwelcome by-product from a furnace charged and operated, at extra cost, to yield a more valuable product. In short, every blast-furnace manager knows that both technical and commercial economy, as well as relief from personal anxiety, would be secured if he could only be sure of making what he is trying to make.

Bearing upon the Element of Certainty

This brings us back to the inquiry, what is the bearing of Mr. Gayley's invention upon this desirable element of certainty, through complete and intelligent control, in the operation of the blast furnace?

As I have already observed, we have sought to secure such certainty through the minute analyses of all the raw materials, etc., except the air of the blast, which weighs more than all the rest put together. But when we come to consider this element, we perceive at once that it cannot be usefully analyzed like ore, flux or fuel. We cannot determine its composition and then store it, until we wish to use it; and if we could analyze it as it enters our blowing engines, our knowledge would come too late to permit any effective action on our part, based upon such information. If we would attain that certainty of control which constitutes the perfection of an art, we cannot treat the air of the blast as we do all the other elements of the charge, which we regard as variables, to the character of which we adjust our practice. The air, most variable of all, cannot be thus dealt with. We must make it practically a constant. Mr. Gayley has shown us that the only way to do this is to freeze the moisture out of it. No attempts at vague amelioration by partial measures will meet the case. What we want is, first, to know just what we are putting into the furnace through the blast, and, secondly, how we can continue to do that particular thing practically without variation.

Mr. Gayley, after years of costly experiment, has shown us, for the first time, how to attain this object; and I am not surprised that leading ironmasters, in this country and abroad, have recognized this invention as the greatest advance in blast-furnace practice since the introduction of the hot blast by Neilson. It is scarcely too much to say that this invention, completing our mastery of conditions previously uncontrollable, has elevated the manufacture of pig iron from the category of processes which are partly art and partly accident to that of the true arts, which may be practiced with approximate scientific certainty.

Ontario Mineral and Metal Production

According to the Ontario Bureau of Mines the output of metals and minerals from mines and smelteries in the Province for nine months ending Sept. 30 was as follows:

MINERAL PRODUCTION OF ONTARIO, JAN.-SEPT., 1908.

Substance.	Quantity.	Value.
Gold, oz.	1,738	$ 40,796
Silver, oz.	12,223,834	6,141,090
Copper, tons	5,892	837,559
Nickel, tons	7,760	1,494,693
Pig iron, tons	189,287	3,098,661
Arsenic, tons	464	19,892
Cobalt, tons	408	80,623
Iron ore, tons	166,088	448,532
Iron pyrites, tons	13,417	43,948
Total		$12,205,795

In 1907 the production of white arsenic in Canada was 317 tons; hence it will be seen that the arsenic in the Cobalt ores is being utilized to a greater extent this year.

After the first of the year the use of metric weights and measures will be compulsory in the Philippine Islands.

The largest crushing equipment on the Rand under one roof is the Knights Deep-Simmer East mill; it consists of 400 stamps and seven tube mills.

Camp Alunite, a New Nevada Gold District

A New Camp in Lincoln County Situated and Mineralized Like the Goldfield District and Having Similarly Altered Rocks

BY ROBERT T. HILL*

Camp Alunite is the name which we have given to a new alunite locality which we found as a result of our prospecting in Lincoln county, Nev., 22 miles southeast of Las Vegas. The camp and its accompanying topography and geology do not appear upon any current map, although possibly indicated at the northwest corner of the old Mojave quadrangle of the U. S. Geological Survey. The mountains surrounding this camp, so far as known, have no names other than those here given them. The general geology and topography of the locality is entirely erroneous and misleading upon Wheeler's and other maps of the region.

The locality is situated in a low volcanic cross-range, running in a northeast-southwest direction, or contrary to the normal trend of the larger north-south ranges of stratified sedimentary rocks (mostly Paleozoic) known as Charleston (Spring mountain) and El Dorado ranges. There is a low gap or pass in this cross-range of mountains, known as Railroad pass, which is clearly visible to the southeast from Las Vegas. This pass is the site of the mining prospects here described.

TOPOGRAPHY

The range is a comparatively low, narrow ridge, probably less than 1000 ft. above the pass, rising to altitudes of 4000 to 5000 ft. above the sea. It is composed, so far as studied, exclusively of igneous rocks, which apparently differ in kind from one another in the mountains to the east and west of the pass and apparently within the pass itself.

The two portions of the range to the west and east of the pass differ somewhat in details of configuration and geologic material. The portion to the west is called Monzonite mountain, and consists of a long-crested and peaked ridge with salients leading toward the pass. This mountain is an eroded remnant of a once deep-seated lacolite or volcanic neck, which has been uncovered by erosion.

The mountain on the east may be termed Andesite mountain. It is a mass of eroded peaks, which terminate on the sides of the pass in sharply defined lines suggestive of fault scarps.

Railroad pass, the pass between the mountain in which Camp Alunite is located and which alone for our present purposes is considered as mineral ground, is a somewhat low, flat area connecting the desert areas which lie to the north and to the south of the range. Its surface drainage, mostly southwest, is largely desert "wash," through which here and there a few low ridges and hills of bedrock project.

ROCKS OF CAMP ALUNITE

Our studies at Camp Alunite have not progressed to the point where we can fully discuss or describe all of the rock species, but according to microscopic determination the chief rocks are biotite monzonite, latites and andesites. The monzonite occurs in the mass of Monzonite mountain to the west of the pass, in Big Butte, and in one or two isolated localities. For the present we are considering the area of the main Monzonite mountain as nonmineralized ground, although gold occurs in it, and it has been extensively located and prospected in times past. The unaltered andesites and latite are found in Andesite mountain to the east of the pass, which, like Monzonite mountain, for the present, is not included in the area of expected value.

The area of the pass between Monzonite and Andesite mountains (Alunite and Homestake ground) is underlaid by peculiar-looking white and gray, or red colored rocks, which at first glance would appear to be entirely distinct species from the monzonites and andesites of adjacent mountains. To the eye these whitish and grayish rocks of the pass at the localities mentioned might be easily mistaken for rhyolite and some other light-colored volcanic rock, and are usually called rhyolite on first observation. When thinly sliced and studied under the microscope, however, it is seen that these rocks are mostly the same species as the dark-colored andesites and monzonites of Andesite and Monzonite mountains and that their entirely different color is due to the intense and peculiar alteration which their original feldspar minerals have undergone, being converted into kaolinite and alunite minerals. The nature of this alteration, produced by hot, ascending, acidic, volcanic, mineralized vapors, especially the occurrence of alunite, is the key and guide to the mineral occurrence, as will be described later on.

CAMP ALUNITE. UNAL[illegible] MOUNTAIN [illegible] IN BACKGROUND [illegible] IN FOREGROUND AND DISTANT HILLS ON RIGHT, ALUNITIZED

These altered rocks, in the area of the pass, are those wherein valuable mineral is expected to be found and which are the present objects of interest. These rocks are exposed here and there in gullies, ridges and low conical hills in the pass and on the edge of the plain to the southward. They also outcrop in many places along the base of Andesite mountain, in direct contact and contrast with the black andesite of the mountain.

Near the northern end of the pass is a low, white, three-pointed hill (Alunite hill). The two southern cusps or points are of intensely silicified rock, which is a fine-grained quartz, resembling very much the honestone of commerce. It is surrounded by and passes into a white, intensely altered and decomposed material, resembling the talc and kaolin of the miners. Occasionally there is a little iron stain, but this is comparatively feeble.

---

*Mining geologist, 25 Broad street, New York.

At the foot of the south end of Andesite mountain, extending in an east-west direction for 2500 ft., and in line with and allied to Alunite hill, there is a row of five peculiar tepe-shaped white hills composed of the whitish material above described. Between these hills and the main mass of Alunite mountain is a great "footwall," an east-west fault zone, running along the east side of the pass. These hills are alined with Alunite hill and probably collectively constitute a belt or zone of similar conditions.

There are also many little areas of bedrock exposed in the pass where the wash has eroded down to bedrock, showing that a broad belt extending through the whole pass is underlain by these altered rocks.

In the southern half of the pass and the plain southward there are several elongated ridges of the grayish-white rock which appear as low erosion divides between arroyos. These are from 20 to 50 ft. high, and have a north-south axial direction. When closely examined the ridges are seen to be intensely indurated, and the apexes or combs are found to be north-south fracture lines which have been hardened by silicification along the fractures, removed the softer altered material alongside these ridges, leaving them a little higher than the adjacent ground.

These little ridges, the Silverspoon, Long Ridge, Homestake and others, have a north-south strike directly toward the belt of white hills, above described.

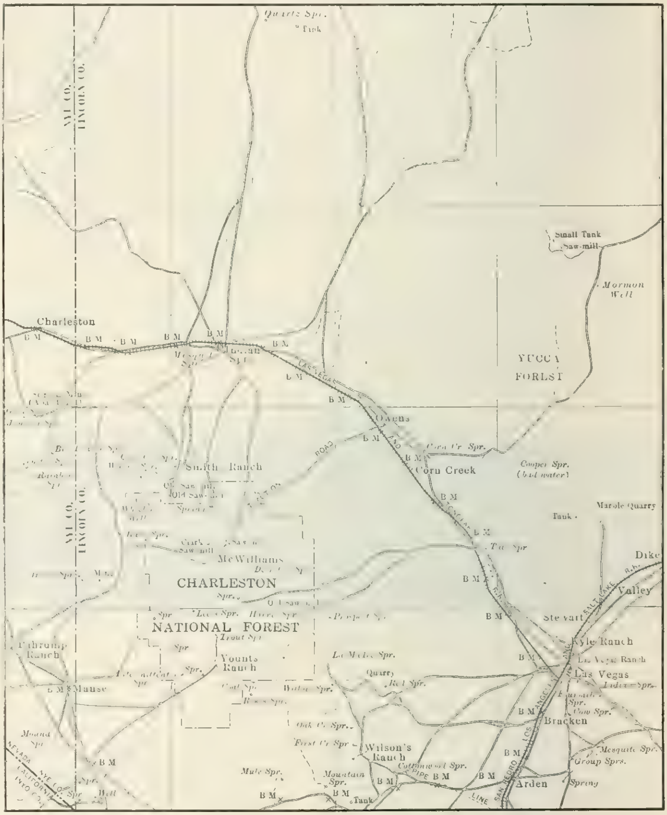
STRUCTURE

The configuration of Alunite pass, the rock alternation and mineralization and the former extrusion of volcanic vapors at this site, is largely due to the intense fracturing, faulting and cross-faulting, of which this locality seems to have been a focus of intersections and which permitted the ascent of the mineralizing volcanic vapors.

The main west of north—east of south direction of the pass conforms in general to a great fault zone along which the andesite mountain has suffered great downthrow against the monzonite area to the west. Still another strong set of fracturing in a north-south direction is seen in the fractures along the combs of the silicified ridges and in the adjacent Andesite and Monzonite mountains. This is a zone of intense fracturing, and its effects are seen in many details. A strong east-west fault zone is also present, as seen at the south end of Andesite mountain, and cuts directly through the pass. There are also complimental northeast-southwest fracture lines.

This intense faulting and fracturing is actually seen and mapped in many places within the pass, even though in some areas the fractures are lost in the soft altered ground, or veneered by wash. An accompaniment of this faulting is the occurrence of many strong minor intersection points, which, as mining men know, are most favorable localities for the finding of ore-bodies.

In general, the pass is an area of intersection of the three major Nevada fault systems accompanied by many minor intersections; and it was this condition of structure which permitted the ascension of the volcanic vapors (fumarolic or solfataric) which altered the dark andesite into the white rocks described, and introduced the mineralization, as will be further explained.



MAP OF LAS VEGAS, NEVADA, AND VICINITY

MINERALIZATION

The surface at Camp Alunite shows gold values upon many of the claims located. In fact, no portion of the surface seems void of traces of gold. The assays ran from 40c. to $26 per ton. These assays are very similar in value to those originally found at the surface at Goldfield, where rich ore did not occur at the surface, but in the unleached zone below; the preliminary assays are as high as anticipated or desired in the type of mineralization here described.

The accompanying or accessory minerals thus far noted at the surface at Alunite are: a small proportion of silver (detected in the assays), small patches of copper resembling bornite, pyrite (oxidized) and magnetite. Bismuthinite and sylvanite have also been reported, but not yet confirmed. These accessory minerals in kind, association and mode of occurrence are similar to those at Goldfield.

The studies and deductions by Dr. F. L. Ransome, of the United States Geological Survey at Goldfield,[1] have shown the close relationship in genesis and occurrences of the mineral alunite to the gold ores of that camp. Concerning the occurrence of this mineral he says: "The recognition of alunite as a characteristic constituent of the Goldfield ores, and the demonstration of its genetic relation to them establishes a new type, that of alunitic and kaolinitic gold quartz veins. It is not believed that the Goldfield district is unique in the possession of this type. Other examples are likely to be found among the great number of ore deposits associated with Tertiary volcanism."

---

[1] "The Association of Alunite with Gold in the Goldfield District, Nevada," by Frederick Leslie Ransome, U. S. Geological Survey, Economic Geology, Vol. II, No. 7, October-November, 1907.

Significance of Alunite

In view of the general resemblance of the altered rocks of Camp Alunite, we collected and had studied microscopically and chemically specimens of all the altered and gold assaying rocks of the camp. These studies were made by the firm of Washington & Lewis. They discovered that in all of the altered rocks from the mineralized zone of the pass at Camp Alunite, alunite was either present, abundant, or apparent. Concerning the rocks of Homestake hill "much alunite" was reported; others in the center of the field "mostly alunite" (57 per cent.). These determinations were from the two ends and center of the altered ground of the pass and indicate that the whole belt, which is of similar rock, is alunitized. The proportions of alunite varied from 1 to 57 per cent. of the mass of the material studied. In the monzonite areas the percentage was small, but large in the areas of the altered andesites.

These microscopic determinations in connection with the actual occurrence of gold in these rocks demonstrated beyond all doubt that we had found a new alunite gold locality in Nevada, and the only one thus far discovered except Goldfield. It is apparent, from Ransome's careful studies of Goldfield and the significant association of gold with alunite in that camp, that the discovery of a second alunite gold locality in Nevada is of great scientific interest and possibly much economic significance.

From this resemblance and the actual occurrence of gold we have strong reason for believing that Camp Alunite, when developed, will show in depth ores similar in origin to those of Goldfield. Whether they will be similar in value development alone can tell, and Camp Alunite may now be defined as a Nevada mineralized locality of the Goldfield-Alunite type.

The igneous rocks at Alunite do not present the same succession as at Goldfield, nor can the andesites be correlated with the earlier or later andesites elsewhere separated, nor is the matter material, inasmuch as the andesite is alunitized and mineralized and that is the chief point of economic interest.

RAILROAD PASS, NEVADA, SHOWING [illegible]

It is the feldspar in both the andesite and dacite rocks which alters into alunite and affords the matrix for the gold introduction, inasmuch as these feldspars are the same in both plain andesite and dacite-andesite the absence of dacite at Camp Alunite is *not* necessarily of significance. The andesite of the pass is altered, mineralized and alunitized exactly like the dacite and andesite at Goldfield, and that fact is the all-important point.

[illegible]

[illegible] mineralization in Nevada differ very much [illegible] field, Rhyolite and Searchlight, but the [illegible] strongly resemble those of Goldfield than any other locality; in fact, it is the only known spot in Nevada approximating it, although others may be found. The two localities in essential conditions present many strong points of resemblance.

In order to more fully appreciate the significance of the prospects at Camp Alunite, one should be thoroughly acquainted with the conditions and occurrences at Goldfield, as published in scattered and somewhat inaccessible literature, especially the researches of Dr. Ransome, which I have summarized in earlier articles.

In general, Camp Alunite presents the following points of resemblance to Goldfield, which justify our expenditures in development of the camp in the expectation of finding similar returns of gold:

[illegible]

Similar Geologic Causes—The Goldfield [illegible] ground is located in a low pass or [illegible] in between two adjacent mountains, as [illegible] Camp Alunite. These passes are at [illegible] th places developed in areas of shattered [illegible] altered rock due to extensive faulting [illegible] rock softening by solfataric metamorphism. At Goldfield the ore was [illegible] nd at the surface as an enriched por- [illegible] k in the valley plain. Some of the [illegible] lges of the southern part of the Alunite field resemble those of Goldfield, as seen in the accompanying figures.

[illegible]

Both areas consist of andesite lava flows, which have been intensely changed and altered by ascending solfataric volcanic vapors. Both areas are fractured and faulted by intersecting faults.

[illegible]—The rocks of both areas are altered into similar rocks by similar action of the ascending hot volcanic vapors, resulting in the production of similar alteration products, kaolinized, gypsumized and alunitized rocks, especially alunite, which is known in Nevada in only these two localities; also the similar alteration of quartz into the same kind of semi-flinty stone [illegible]

Mineralization—Under this classification may be included the same character and occurrence of gold at the surface; the similar feeble ferrugination of the outcrops; the similar accessory minerals in similar proportions, silver and copper, and probably bismuthnite, and tellurium.

[illegible]

The foregoing account of Camp Alunite describes the conditions which we have [illegible] Sept. 1 the sites for five shafts have been determined by the structure, pannings and [illegible] at the present writing has progressed to a depth of 50 ft., and all the conditions encountered so far justify our faith in the experiment. The work of organizing, equipping and mining in camp in Nevada, should be the subject of a separate story.

It is hardly necessary to say that no stock of the Alunite Mining Company is for sale, or will be placed upon the market, and that the money for the experiment was raised entirely from private resources. If the experiment succeeds, its backers will be abundantly rewarded; if it fails, there will be no complaints from a dissatisfied public.

SILICIFIED RIDGES AND ALUNITIZED GROUND, CAMP ALUNITE

DuPont Blasting Gelatin

In driving adits, drifts and tunnels, great trouble is often experienced in bringing the cut even when the cut holes are loaded with 60-per cent. dynamite. In overcoming this trouble, the new explosive, DuPont blasting gelatin, has been found satisfactory at the Cripple Creek drainage adit.

When A. E. Carlton began to drive this adit in February, 1908, he found it difficult to blast two rounds in a face in 24 hours owing to the fact that the cut holes had to be blasted several times. These were drilled 10 ft. deep in the granite country rock, being started 2½ ft. to either side of the center line of the adit and made to almost meet at their bottoms. Heavy charges of 60-per cent. gelatin dynamite were used in the cut holes for some months, but without very satisfactory results for up to September the best monthly advance was 301 ft. At that time Mr. Carlton decided to try Du Pont blasting gelatin; so the holes were loaded with approximately the same amount of blasting gelatin as formerly had been used of gelatin dynamite, and fired. The effect of this explosive was so much greater than that of the gelatin dynamite that great havoc resulted. Finally by experiment it was found that by loading 4 to 7 cartridges of 1¼x8-in. blasting gelatin in the bottom and 6 or 7 cartridges of 1½x8-in. 60-per cent. gelatin dynamite on top, placing a quintuple detonator in the top of the blasting-gelatin charge and tamping the hole to the collar, the cut holes could be broken to the bottom by blasting twice. The first charge broke out about half the depth of the hole and chambered the bottom so that 15 to 20 cartridges of 60-per cent. gelatin dynamite could be got into the bottom chamber where the two holes met. As this second charge is directly behind the center of the cut and one-half the ground is already broken, little trouble has been experienced in bringing the remainder of the cut. Occasionally one stick of blasting gelatin was used in the "relief-cut" holes but usually a charge of 60-per cent. gelatin dynamite was all that these holes required. The rest of the round was charged with 50-per cent. gelatin dynamite.

By this method of loading the holes 353 ft. was driven in September or an increase of 17 per cent. over the best previous work. While the blasting gelatin costs somewhat more than gelatin dynamite, the smaller amount of explosive required offset this, and the cost for explosives was approximately the same. In October the work showed considerably better results than those for September. This new explosive, the DuPont blasting gelatin, has a strength of practically 100 per cent. Apparently it will have considerable usefulness where a quick shattering explosive is required.

Although in Mexico electrically driven stamp mills (20 stamps in a unit and each 10 stamps driven by a separate belt from the unit-line shaft) are common, especially at Guanajuato, Pachuca and El Oro, in South Africa the use of individual electric motors for driving separately the line shafts of each unit is causing much discussion.

Iron and Steel in Russia

We are indebted to the American Iron and Steel Association for figures of the iron industry in Russia for a series of years, compiled chiefly from official sources.

IRON ORE

The production of iron in 1904 was 5,160,990 metric tons, the largest ever reported. In 1905 it was 4,942,182 tons; in 1906 it was 3,873,356; and in 1907 it was 4,227,419 tons. The production last year showed an increase of 354,063 tons over 1906, but was 933,571 tons less than that of 1904. The exports of iron ore from South Russia to Germany increased from 373,000 tons in 1905 to 535,000 in 1906, and 1,613,000 tons in 1907.

The exports of manganese ore from Poti, in the Caucasus were 464,016 tons in 1906, and 881,322 in 1907; an increase of 417,306 tons.

PIG IRON

The output of pig iron has been almost stationary for several years, decreasing slightly from the maximum reached in 1904. In that year the total was 2,950,651 metric tons. In 1905 it was 2,713,674 tons; in 1906 it was 2,691,606 tons; and in 1907 it was 2,820,604 tons. The make last year exceeded that of 1906 by 128,998 tons, but it was less than that of 1904 by 130,047 tons. Pig iron reported includes castings made direct from the blast furnace.

STEEL

The production of steel for two years past compares as follows:

	1907.	1908.	Changes.	
Converter..........	402,268	524,786	I.	122,518
Open-hearth........	2,046,935	2,129,503	I.	82,568
Crucible, etc........	193,824	168,739	D.	25,085
Total..............	2,643,027	2,823,028	I.	180,001

The total steel made by all processes was 3,034,911 tons in 1904, and 2,751,930 in 1905. The total for 1907 was 180,001 tons more than in 1906, but 211,883 tons less than in 1904. The steel rails made in 1904 were 401,668 tons; 358,499 tons in 1905; 271,739 tons in 1906; and 311,806 tons last year.

The H. W. Johns-Manville Company, of New York, is introducing a chemical compound, called Leak-No, which resembles powdered iron, and when mixed with water and applied like putty to cracks, or other defects, in iron or steel articles, metallizes and becomes a permanent part of the article to which it is applied. When hard it much resembles iron in color. The manufacturers offer to refund the purchase price in case it fails to stop any ordinary leak in anything made of iron or steel against any pressure of oil, steam, gas, air, ammonia, or water; and to stand any heat or chemicals that iron will stand, when applied according to directions.

Fatal Accidents in Coal Mines of America

Over 3000 Persons Were Killed in Coal Mining Operations in 1907 and 20,000 Lives Have Been Lost During the Last Decade

BY FREDERICK L. HOFFMAN*

TABLE I. NUMBER OF PERSONS KILLED BY ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1898-1907.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1898-1907
Ala.	[illegible]	40	37	41	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	789
Colo.	21	41	29	[illegible]	[illegible]	10	89	[illegible]	[illegible]	[illegible]	[illegible]
Ill. *f*	75	84	94	99	99	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,283
Ind.	22	16	18	24	21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	324
Ind. Ter.	17	25	10	11	[illegible]	33	30	[illegible]	[illegible]	[illegible]	364
Ia. *f*	26	20	29	26	[illegible]	[illegible]	31	[illegible]	[illegible]	[illegible]	[illegible]
Kan.	17	16	22	26	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ky.	6	7	17	21	19	[illegible]	19	[illegible]	[illegible]	[illegible]	216
Md.	4	5	7	[illegible]	11	[illegible]	12	[illegible]	7	[illegible]	84
Mich.		4*a*	10	6	6	8	7	8	6	[illegible]	62
Mo.	9	14	10	[illegible]	10	[illegible]	11	11	[illegible]	8	[illegible]
N. Mex. *f*	7	15	15	9	17	[illegible]	[illegible]	[illegible]	9	31	140
Ohio	[illegible]	57	68	72	81	114	118	131	127	153	973
Pa. *a*	411	161	411	513	300	518	[illegible]	[illegible]	557	708	[illegible]
Pa. *b*	199	258	265	301	[illegible]	402	536	[illegible]	477	806	4,179
Tenn.	19	20	10	53	226	[illegible]	28	[illegible]	[illegible]	[illegible]	475
Utah	3		209	10	8	[illegible]	9	[illegible]	[illegible]	8	268
Wash.	9	45	33	27	34	[illegible]	31	[illegible]	[illegible]	[illegible]	266
W. Va. *f*	90	89	141	134	120	[illegible]	110	[illegible]	[illegible]	[illegible]	1,691
Br. Col.	7	11	17	102	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	413
Nova Scot.	7	19	21	14	[illegible]	31	19	[illegible]	[illegible]	[illegible]	[illegible]
Total deaths	1,049	1,247	1,503	[illegible]	[illegible]	[illegible]	2,018	2,191	[illegible]	[illegible]	[illegible]

a Six months only.
b Six months only.
c Underground accidents only.
d Nine months only.
e Returns not available.
f Statistics are for the year ended June 30 [illegible].

During 1907 more miners were killed in the coal mines of North America, in proportion to the number employed, than during any single year of the last quarter century since the facts have been made a matter of accurate and official record. Among an average number of 673,657 coal miners in North America, there occurred 2812 deaths from accident, or 4.17 per 1000 employed. This rate contrasts with 3.16 per 1000 for 1906, and 3.33 for the ten-year period ending with December 31, 1907. The statistical tabulation for 1907 is, unfortunately, incomplete and does not include a number of states for which the returns could not be secured. Although the publication of this article was delayed for several months to secure the information, the effort proved fruitless.

Since the tabulation of statistical facts of coal-mining accidents is very simple, there appears to be no good reason why the publication of such statistics should be unduly delayed for more than a year after their occurrence. If the State laws are defective with respect to the early publication of this information, they should be amended to make it mandatory upon the inspectors to give publicity at the earliest possible date to a summary statement of the facts as they have been made a matter of official record. The practical value of such information is materially increased by the earliest possible publication, and diminished in proportion to the period of time intervening between the occurrence of the accidents and the final presentation of the totals in the usual form. The subject is certainly one in which the public at large has a vital interest which demands that the statistics should be made public within not more than three months after the close of the calendar year. In fact, it would be a decided improvement if quarterly reports of coal-mining accidents were published, in conformity to the methods adopted by the Interstate Commerce Commission, and considering the vast extent of the coal-mining industry, the interest is certainly of equal importance to that of railway transportation.

TABLE II. FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, [illegible] RATIO OF PERSONS KILLED PER 1000 EMPLOYED.

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ala.	[illegible]	3.10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Colo.	[illegible]	5.60	[illegible]	[illegible]	8.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ill. *f*	2.14	2.27	[illegible]	[illegible]	2.15	[illegible]	[illegible]	3.36	[illegible]	[illegible]	[illegible]
Ind.	2.63	2.07	[illegible]	[illegible]	1.83	3.64	[illegible]	[illegible]	1.61	[illegible]	[illegible]
Ind. Ter.	4.82	6.24	[illegible]	[illegible]	9.62	5.42	[illegible]	[illegible]	4.81	[illegible]	[illegible]
Ia.	3.38	2.49	[illegible]	[illegible]	4.23	1.59	[illegible]	[illegible]	[illegible]	2.05	[illegible]
Kan.	1.95	1.57	[illegible]	[illegible]	2.70	3.61	[illegible]	[illegible]	[illegible]	2.67	[illegible]
Ky.	0.67	0.83	[illegible]	[illegible]	1.58	1.85	[illegible]	[illegible]	[illegible]	1.82	[illegible]
Md.	0.89	1.08	[illegible]	[illegible]	1.99	2.29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mich.		4.88*a*	6.11	[illegible]	4.24	2.54	[illegible]	[illegible]	[illegible]	[illegible]	3.06
Mo.	1.22	1.80	[illegible]	[illegible]	1.09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
N. Mex. *f*	3.71	7.98	[illegible]	[illegible]	10.11	7.26	7.61	[illegible]	[illegible]	[illegible]	[illegible]
Ohio	1.77	2.03	[illegible]	[illegible]	2.16	2.75	[illegible]	2.96	2.73	3.20	2.52
Pa. *a*	2.89	3.28	[illegible]	3.47	2.03	3.41	[illegible]	3.83	[illegible]	[illegible]	3.33
Pa. *b*	2.27	2.82	[illegible]	[illegible]	3.37	2.65	3.44	2.90	[illegible]	[illegible]	3.05
Tenn.	2.43	2.60	[illegible]	6.10	25.80	2.69	2.81	2.38	3.07	[illegible]	4.98
Utah	4.38		[illegible]	5.81	3.24	3.21	4.06	[illegible]	3.69	3.07	15.04
Wash.	2.70	[illegible]	[illegible]	5.59	7.83	5.13	6.69	[illegible]	[illegible]	[illegible]	[illegible]
W. Va.	3.86	[illegible]	[illegible]	4.14	3.78	4.03	3.08	[illegible]	[illegible]	6.92	4.49
Br. Col.	[illegible]	[illegible]	[illegible]	25.67	34.65	9.85	8.31	[illegible]	[illegible]	[illegible]	[illegible]
Nova Scot.	[illegible]	[illegible]	[illegible]	1.83	2.36	[illegible]	1.63	[illegible]	[illegible]	[illegible]	2.36
Average	2.59	2.98	[illegible]	[illegible]	3.49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.33

[illegible]

Table I exhibits in detail, for twenty-one States, Territories and Provinces, the number of persons killed by accident in the coal mines of North America during the ten-year period ending with 1907, except as otherwise stated on account of the impossibility of securing the necessary information. Coal is mined in certain States for which as yet the information is not available for a period of some length, and which it has not been thought advisable, for that reason, to include in the present tabulation, but in the course of years it is to be hoped that all the coal-mining States can be included in the annual summary and that the returns will be furnished at a sufficiently early date to make it possible to publish comparative statistics during the middle of the year. If allowance is made for the States for which information is not at present available, it is practically certain that during 1907 over 3000 persons were killed in coal-mining operations in North America, and that during the ten-year period ending with 1907 more than 20,000 lives have been lost on this account.

Table II shows the fatality rate in coal mines in the United States and Canada, [illegible] number employed. The fatal accident rate for 1907 for the entire coalfield of North America was 4.17 per 1000 against an average of 3.33 for the entire decade. The excess in the fatality rate is in remarkable contrast to former experience and foreshadows the possibility of even more serious and disastrous experiences in the future than have become a matter of record in the past. During 1907 the fatality rate was above the average for the ten-year period as a whole in the States of Alabama, Colorado, Indiana, Kansas, New Mexico, Pennsylvania (anthracite), Pennsylvania (bituminous), Washington, West Virginia, and Nova Scotia. The rates were below the average in Illinois, Indian Territory, Iowa, Michigan, Missouri, Utah and British Columbia. The highest rate during the year prevailed in New Mexico, where it attained to 10.13 per 1000 against an average of 6.61 during the decade, followed by Colorado with 7.67, Alabama with 7.61. West Virginia with 6.92, and Washington with 6.04 per 1000.

---

*Statistician, Prudential Insurance Company of America, Newark, N. J.

TABLE III FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA COMPARISON OF 1907 WITH THE FIVE PREVIOUS YEARS.

	Number Persons Killed, Yearly Average		Rate per 1000 Employed.		Rate of Increase or Decrease per 1000 Employed.
	1902-06.	1907.	1902-06.	1907.	
Ala	94	154	5.21	7.61	+2.50
Colo	70	99	6.46	7.67	+1.21
Ill	153	165	2.82	2.47	—0.35
Ind	38	53	2.43	2.79	+0.36
Ind Ter	41	32	5.67	4.15	—1.52
Ia	31	35	2.18	2.05	—0.13
Kan	29*a*	32	2 99	2.67	—0.32
Ky.	27	32	1.87	1.82	—0 05
Md	11	*	1.91	*	
Mich	7	7	2.67	2.43	—0.24
Mo...	13*b*	8	1.34*b*	0.73	—0.61
N Mex *c*	13	31	6.01	10.13	+4.12
Ohio	114	153	2.65	3.20	+0.55
Pa.*a*	523	708	3.29	4.19	+0.90
Pa.*b*.	470	806	3.01	4.40	+1.39
Tenn	68	31	6.66	2.79	—3.87
Utah.	8	8	3.75	3.07	—0.68
Wash	23	36	4.88	6.04	+1.16
W. Va. *c*.	176	356	4.07	6.92	+2.85
Br. Col.	49	31	11.17	5.12	—6.05
Nova Scot.	23	35	2.18	2.89	+0.71
	1985	2812	3 31	4.17	+0.86

* Returns not available.
a Four and one-half years only.
b Four years and nine months only.
c Statistics are for the year ended June 30, 1907

Table III exhibits the fatal accidents in coal mines during 1907, compared with the average for the preceding five years, both upon the basis of actual numbers and the rate per 1000 employed. The States showing an increase in the rate during 1907, compared with the preceding five years, were Alabama, Colorado, Indiana, New Mexico, Ohio, Pennsylvania (anthracite), Pennsylvania (bituminous), Washington, West Virginia and Nova Scotia. The net increase in the rate was 0.86 per 1000. Of all the States and Territories under review, only two (Missouri and Kentucky), during 1907 returned a fatality rate of less than 2 per 1000. In the case of all the other States and Territories the rates exceeded 2 per 1000, and in the case of eleven States and Territories the rates were above 3 per 1000. While this experience would appear to disprove the rule laid down in former years, that the coal-mining accident rate, under normal conditions, should not exceed 2 per 1000, it is nevertheless a safe assumption, based upon world-wide experience, that such a rate is not incompatible with the conditions under which coal-mining operations, combining a high degree of productive activity with comparative safety, can be carried on.

Table IV affords a means of convenient comparison of the fatality rate in coal mining during 1907 with that of previous years, showing the number of employees, the number of miners killed, and the rate per 1000 employed, for each of the years 1893-1907. The table shows that while the rate during the first five years of the period was 2.56, it increased to 3.14 during the next five years, and to 3.47 per 1000 during the last quinquennial period. The table discloses a distinct tendency toward a greater average accident liability, and as previously stated, never during our coal-mining history, as far as the records enable us to judge, has the rate attained to the high proportion of 4.17 recorded for the year 1907.

TABLE IV FIFTEEN-YEAR RECORD OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1893-1907.

	Employees.	Number Killed.	Ratio per 1000 Employed.
1893	382,133	965	2.53
94	385,579	957	2.48
95	395,549	1,057	2.67
96	401,874	1,120	2 79
97	405,433	947	2.34
98	405,600	1,049	2.59
99	417,415	1,247	2.98
00	462,308	1,503	3.25
01	494,367	1,604	3.24
02	525,443	1,834	3.49
03.	574,210	1,802	3.14
04	598,856	2,018	3.37
05	637,522	2,191	3.44
06.	658,189	2,078	3.16
07.	673,657	2,812	4.17
1893-97	1,970,568	5,046	2.56
1898-02	2,305,133	7,237	3 14
1903-07	3,142,434	10,901	3.47
1893-07	7,418,135	23,184	3.13

The foregoing statistical data suggest a comparison with the corresponding fatality rates of other coal-mining countries throughout the world. While all international comparisons are subject to the risk of serious error in the interpretation of statistical tabulation based upon possibly widely varying methods in accident notation and registration, the risk of error is reduced to a minimum in the case of fatal accidents, to which the present comparison is limited on account of the more serious difficulty in eliminating the risk of error in comparative tabulations of non-fatal accidents. The wide attention which the subject of coal-mining accidents has attracted during the past few years, leading to a special government investigation into coal-mine accidents, their causes and prevention, and the publication of a considerable amount of useful and suggestive data, warrants the inclusion in this article of a series of tables derived from official sources, exhibiting the degree of fatal accident frequency in the principal coal-mining countries of the world.

Table V exhibits in detail the number of persons killed by accident in the bituminous coal mines of Austria during the decade ending with 1906.

TABLE V. FATAL ACCIDENTS IN BITUMINOUS COAL MINES OF AUSTRIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897.	58,067	55	0.95
1898	60,809	55	0.90
1899	62,943	68	1.08
1900	67,461	61	0.90
1901	70,344	84	1 19
1902	66,582	72	1.08
1903	66,663	49	0.74
1904	66,507	61	0.92
1905	66,072	96	1.45
1906	68,115	70	1 03
1897-01	319,624	323	1 01
1902-06	333,939	348	1 04
1897-06	653,563	671	1 03

During the period under observation the rate has been as high as 1.45 per 1000 and as low as 0.74, but comparing the latter five-year period with the former the rates have remained practically the same, or 1.04 and 1.01, respectively. The average rate for the decade was 1.03 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907, there would have been 694 deaths from accident instead of 2812 actually recorded.

Table VI exhibits in detail the number of persons killed by accident in the brown-coal mines of Austria during the decade ending with 1906.

TABLE VI. FATAL ACCIDENTS IN BROWN COAL MINES OF AUSTRIA.

Years	Average Number Employees	Persons Killed	Rate per 1000 Employed
1897	48,084	94	1 95
1898	49,690	87	1 75
1899	50,790	88	1 73
1900	54,473	163	2 99
1901	59,591	97	1 63
1902	56,269	124	2 20
1903	55,065	54	0 98
1904	52,732	49	0 93
1905	53,189	87	1 64
1906	53,064	85	1 60
1897 01	262,628	529	2 01
1902 06	270,319	399	1 48
1897 06	532,947	928	1 74

During the period under observation the rate has been as high as 2.99 per 1000 and as low as 0.93, but comparing the latter five-year period with the former, there has been an increase in the rate from 1.48 to 2.01 per 1000. The average rate for the decade was 1.74 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1172 deaths from accident instead of 2812 actually recorded.

Table VII exhibits in detail the number of persons killed by accident in the coal mines of Belgium during the decade ending with 1906.

TABLE VII. FATAL ACCIDENTS IN COAL MINES OF BELGIUM.

Years.	Average Number Employees	Persons Killed.	Rate per 1000 Employed.
1897	120,382	124	1 03
1898	122,846	172	1 40
1899	125,258	121	0 97
1900	132,749	140	[illegible]
1901	134,092	157	1 17
1902	134,889	144	[illegible]
1903	139,492	159	1 14
1904	138,567	129	0 93
1905	[illegible]	[illegible]	0 91
1906	139,394	132	[illegible]
1897 01	635,327	714	1 12
1902 06	687,189	687	1 00
1897 06	[illegible]	1,401	1 06

During the period under observation the rate has been as high as 1.40 per 1000 and as low as 0.91, but comparing the latter five-year period with the former, there has been a decrease in the rate from 1.12 to 1 per 1000 during the latter quinquennial period. The average rate for the decade was 1.06 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 714 deaths from accident instead of 2812 actually recorded.

Table VIII exhibits in detail the number of persons killed by accident in the coal mines of France during the decade ending with 1906.

TABLE VIII. FATAL ACCIDENTS IN COAL MINES OF FRANCE.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	143,401	153	1 07
1898	148,626	159	1 07
1899	153,925	208	[illegible]
1900	162,079	[illegible]	[illegible]
1901	163,796	198	[illegible]
1902	164,810	180	[illegible]
1903	167,213	170	1 02
1904	171,792	[illegible]	1 07
1905	175,104	182	1 04
1906	178,431	1,280	7 17
1897 01	[illegible]	948	1 23
1902 06	857,350	[illegible]	2 33
1897 06	1,629,177	[illegible]	1 81

During the period under observation the rate has been as high as 7.17 per 1000 and as low as 1.02. The high rate during 1906 was due to the exceptional accident at the Courrieres mine, which caused a loss of approximately 1000 lives and which is without parallel in the mining history of the world. As the result of this accident there has been a material increase in the average death rate during the last five years as compared with the first five, or from 1.23 to 2.33 per 1000. Even when this remarkable accident is included, however, the average fatality rate during the 10-year period was only 1.81, and had this rate prevailed in the coal mines of North America during 1907 there would have been 1219 deaths from accident instead of 2812 actually recorded.

Table IX exhibits in detail the number of persons killed by accident in the coal mines of India during the nine years ending with 1906.

TABLE IX. FATAL ACCIDENTS IN COAL MINES OF INDIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898	62,905	43	0 68
[illegible]	74,285	98	1 32
1900	[illegible]	64	[illegible]
1901	95,309	70	[illegible]
[illegible]	98,902	77	[illegible]
[illegible]	[illegible]	97	[illegible]
[illegible]	92,993	67	0 72
1905	89,991	60	[illegible]
1906	99,138	100	[illegible]
[illegible]	322,908	[illegible]	0 85
[illegible]	467,162	[illegible]	[illegible]
1898 1906	[illegible]	[illegible]	0 86

During the period under observation the rate has been as high as 1.32 per 1000 and as low as 0.67. There has been a very slight increase in the rate, from 0.85 per 1000 during the first four years to 0.86 during the last five years. The average rate for the nine years was 0.86 per 1000, and had this rate prevailed in the coal-[illegible] of North America [illegible]

from accident instead of 2812 actually recorded.

Table X exhibits in detail the number of persons killed by accident in the coal mines of Natal during the decade ending with 1906.

TABLE X. FATAL ACCIDENTS IN COAL MINES OF NATAL.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	1,560	[illegible]	4 49
[illegible]	2,723	[illegible]	3 31
[illegible]	2,044	11	[illegible]
[illegible]	[illegible]	[illegible]	0 62
1901	3,397	[illegible]	[illegible]
[illegible]	3,850	16	4 16
[illegible]	[illegible]	13	[illegible]
1904	4,792	16	[illegible]
1905	5,650	22	[illegible]
1906	6,059	[illegible]	6 44
[illegible]	[illegible]	71	[illegible]
1902 06	24,756	106	4 28
1897 06	36,082	177	[illegible]

During the period under observation the rate has been as high as 12.06 per 1000 in 1901 and as low as 0.62 in 1900, showing remarkable fluctuations. The rates were very high during most of the years, but comparing the latter five years with the former, there has been a decrease from 6.27 to 4.28 per 1000. The average rate during the period was 4.91, which is still higher than the corresponding rate of 4.17 for the coal-mining area of North America during 1907. Natal, according to the information at present available, exhibits the highest fatality rate of any mining country in the world, but if the comparison were made with the individual States of North America the difference would be in favor of Natal, since quite a number of our States have experienced an average rate higher than that of Natal during the 10-year period under review.

Table XI exhibits in detail the number of persons killed by accident in the coal and shale mines of New South Wales during the decade ending with 1906.

TABLE XI. FATAL ACCIDENTS IN COAL AND SHALE MINES OF NEW SOUTH WALES.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
[illegible]	9,979	16	[illegible]
[illegible]	10,519	[illegible]	[illegible]
[illegible]	10,523	10	[illegible]
[illegible]	11,491	21	[illegible]
[illegible]	[illegible]	17	1 37
[illegible]	[illegible]	105	8 01
1903	13,917	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
1906	[illegible]	21	[illegible]
[illegible] 01	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	175	[illegible]
1897 [illegible]	[illegible]	[illegible]	2 14

[illegible]

to 2.50 per 1000. The average rate for the decade was 2.14 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1442 deaths from accidents instead of 2812 actually recorded.

Table XII exhibits in detail the number of persons killed by accident in the coal mines of New Zealand during the decade ending with 1906.

TABLE XII. FATAL ACCIDENTS IN COAL MINES OF NEW ZEALAND.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	1,912	4	2.09
1898	2,003	1	0.50
1899	2,153	3	1.39
1900	2,460	4	1.63
1901	2,754	3	1.09
1902	2,885	2	0.69
1903	2,852	4	1.40
1904	3,288	4	1.22
1905	3,269	6	1.84
1906	3,692	6	1.63
1897–01	11,282	15	1.33
1902–06	15,986	22	1.38
1897–06	27,268	37	1.36

During the period under observation the rate has been as high as 2.09 and as low as 0.50. The average during the former five years was 1.33, and during the latter, 1.38. The average rate for the decade was 1.36 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907, there would have been 916 deaths from accident instead of 2812 actually recorded.

Table XIII exhibits in detail the number of persons killed by accident in the bituminous coal mines of Prussia during the decade ending with 1906.

TABLE XIII. FATAL ACCIDENTS IN BITUMINOUS COAL MINES OF PRUSSIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	303,370	714	2.35
1898	324,351	929	2.86
1899	344,368	797	2.31
1900	377,385	848	2.25
1901	408,375	956	2.34
1902	411,323	818	1.99
1903	429,837	826	1.90
1904	449,160	808	1.80
1905	452,151	840	1.86
1906	469,700	924	1.97
1897–01	1,757,849	4,244	2.41
1902–06	2,212,171	4,216	1.91
1897–06	3,970,020	8,460	2.13

During the period under observation the fatal accident rate of the bituminous coalfields of Prussia has been as high as 2.86 per 1000 and as low as 1.80, there being apparently a definite tendency toward a decrease in the rate, which is measured by the difference in the averages of 2.41 per 1000 for the former half of the decade, and 1.91 for the latter half. The average rate for the decade was 2.13 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1435 deaths from accident instead of 2812 actually recorded.

Table XIV exhibits in detail the number of persons killed by accident in the brown-coal mines of Prussia during the decade ending with 1906.

TABLE XIV. FATAL ACCIDENTS IN BROWN COAL MINES OF PRUSSIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	33,020	78	2.36
1898	35,135	70	1.99
1899	37,017	72	1.95
1900	42,350	100	2.36
1901	48,801	122	2.50
1902	44,342	96	2.16
1903	43,211	83	1.92
1904	43,297	86	1.99
1905	44,607	79	1.77
1906	47,374	81	1.71
1897–01	196,323	442	2.25
1902–06	222,831	425	1.91
1897–06	419,154	867	2.07

During the period under observation the rate has been as high as 2.50 per 1000 and as low as 1.71, with apparently a definite tendency toward a decrease in the rate as measured by the difference between the average for the first half of the decade, 2.25 per 1000, and that for the second half or 1.91 per 1000. The average for the decade was 2.07, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1394 deaths from accident instead of 2812 actually recorded.

Table XV exhibits in detail the number of persons killed by accident in the coal mines of Queensland during the nine years ending with 1906.

TABLE XV. FATAL ACCIDENTS IN COAL MINES OF QUEENSLAND.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898	1,278		
1899	1,142	1	0.88
1900	1,246	9	7.22
1901	1,266	1	0.79
1902	1,336	1	0.75
1903	1,329		
1904	1,336	1	0.75
1905	1,432	1	0.70
1906	1,349		
1898–01	4,932	11	2.23
1902–06	6,782	3	0.44
1898–06	11,714	14	1.20

During the period under observation the rate has been as high as 7.22 and as low as 0.70 per 1000, but the returns cover only the nine-year period commencing with 1898. Apparently there were no accidents during three of the years, but during the remainder the rate fluctuated between 7.22 per 1000 in 1900 and 0.70 in 1905. During the first four years the average rate was 2.23, and during the last five years it was 0.44. The average rate for the nine years was 1.20 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 808 deaths from accident instead of 2812 actually recorded.

Table XVI exhibits in detail the number of persons killed by accident in the coal mines of the United Kingdom during the decade ending with 1906.

TABLE XVI. FATAL ACCIDENTS IN COAL MINES OF THE UNITED KINGDOM.*

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	695,213	930	1.34
1898	706,894	908	1.28
1899	729,009	916	1.26
1900	780,052	1,012	1.30
1901	806,735	1,101	1.36
1902	824,791	1,024	1.24
1903	842,066	1,072	1.27
1904	847,553	1,055	1.24
1905	858,373	1,159	1.35
1906	882,345	1,142	1.29
1897–01	3,717,903	4,867	1.31
1902–06	8,255,128	5,452	1.28
1897–06	7,973,031	10,319	1.29

*Reported under Coal Mines Regulation Acts.

During the period under observation the rate has been as high as 1.36 per 1000 and as low as 1.24, with a slight tendency toward a decrease as measured by the difference in the rates for the two quinquennial periods, indicating a reduction from 1.31 during the former period to 1.28 during the latter. The average rate for the decade was 1.29 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 869 deaths from accident instead of 2812 actually recorded.

Table XVII exhibits in detail the number of persons killed by accident in the coal mines of Victoria during the decade ending with 1906.

TABLE XVII. FATAL ACCIDENTS IN COAL MINES OF VICTORIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	908	3	3.30
1898	893		
1899	880	4	4.55
1900	807	1	1.24
1901	827	4	4.84
1902	1,303	1	0.77
1903	377	1	2.65
1904	589	2	3.40
1905	640	2	3.13
1906	678		
1897–01	4,315	12	2.78
1902–06	3,587	6	1.67
1897–06	7,902	18	2.28

During the period under observation the rates for the different years have fluctuated considerably, having been as high as 4.84 per 1000 in 1901 and as low as 0.77 in 1902. The average rate for the former half of the decade was 2.78, and 1.67 per 1000 for the latter half. The average rate for the decade was 2.28 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1536 deaths from accident instead of 2812 actually recorded.

Table XVIII exhibits in detail the number of persons killed by accident in the coal mines of Western Australia during the nine years ending with 1906.

TABLE XVIII. FATAL ACCIDENTS IN COAL MINES OF WESTERN AUSTRALIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898	70		
1899	192	1	5.21
1900	400		
1901	383		
1902	368		
1903	402	1	2.49
1904	358		
1905	351		
1906	307		
1898-01	1,045	1	0.96
1902-06	1,786	1	0.56
1898-06	2,831	2	0.71

The returns are only for the nine-year period beginning with 1898, and during only two of these years did fatal accidents occur in the coal-mining operations of this colony. The operations were on a very limited scale, and the number employed being very small the rates are merely included to make this international comparison as complete as the present state of coal-mining statistics will permit. During the period under observation, the rate has been as high as 5.21 per 1000 and as low as 2.49, the average rate for the first four years having been 0.96, and for the last five years 0.56 per 1000. The average rate for the decade was 0.71, and had this rate prevailed in the coal-mining area of North America there would have been 478 deaths from accident instead of 2812 actually recorded.

The foregoing summary of coal-mining accidents in North America and the most important coal-producing countries of the world, emphasizes the serious importance of the subject from a commercial, social and economic point of view. In the preparation of this summary I have received much valuable aid from all of the mine inspectors of the different States, to whom I am under material obligation for their courteous coöperation. The foreign statistics are all derived from Part IV, Colonial and Foreign Statistics; Mines and Quarries; General Report and Statistics, which is the most convenient source of information on the subject.

Water as a Motive Power Underground

According to the *Coal and Iron Trades Review* there are many coal mines with wet shafts in which a considerable amount of water has to be collected and pumped, but there are probably few cases in which the water falling down the shaft has been utilized for driving machinery underground. Under the circumstances, the experience of the Bowhill Coal Company may prove interesting to those who have a similar set of conditions to contend with.

The circumstances leading up to the introduction of water as a source of power in the mine in question are as follows: Some time ago R. A. Muir, the general manager of the company, found that the surface fan was not capable of providing sufficient ventilation in the lowest of the three working levels, and on measuring the resistance at each level he discovered that the highest resistance existed in the bottom seam; he therefore concluded that if this could be reduced it would ease the drag on the surface fan. To meet the case he decided to install an auxiliary fan to deal with the entire ventilation of the bottom seam, and to allow for development, a 60-in. diameter double-inlet "Sirocco" fan was installed, capable of dealing with from 60,000 to 90,000 cu.ft. of air per minute at from 1-in. to 3-in. water gage.

As electric power is also available in the [illegible] ring fitted around the shaft; this ring caught and conveyed the water to a tank placed in a lodgment specially made for the purpose. A pipe shaft was then taken from the tank to the bottom of the shaft, giving a head of 295 ft., which was utilized to drive a "Pelton" wheel 4 ft. 6 in. diameter; various sizes of nozzles were supplied to give the speeds required for the different duties.

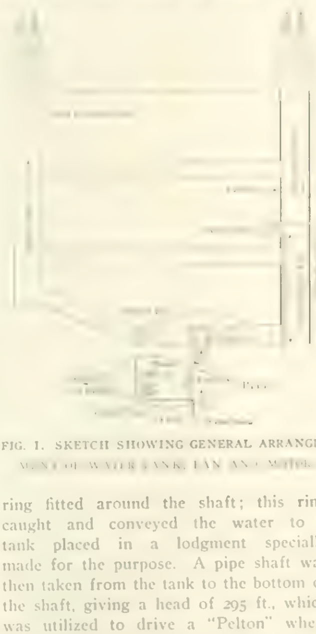


FIG. 1. SKETCH SHOWING GENERAL ARRANGEMENT OF WATER TANK, FAN AND MOTOR.

Provision was made for driving the fan by belt from an electric motor in the event of the water supply failing temporarily, but although the plant has been running for some little time, it has not yet been found necessary to use the electric motor, as the water supply has been quite sufficient.

Should it be necessary to stop the fan at any time, a bypass valve is arranged, which allows the water to be discharged into the sump, from which the main [illegible] supply.

Colliery Notes

In deciding upon the style of mining machine to use, it should be remembered that the nature of the coal to be mined is a consideration of the greatest importance. One mining company recently purchased disk machines to mine a seam where the coal was of a tender nature. In cutting the coal at this mine, the disk was often jammed and had to be loosened [illegible]

It should be the rule at every coal mine in case a misfire in blasting occurs, when a safety fuse is used, to require that the place be fenced off and a danger signal put up, which latter should not be removed for at least three or four hours after the misfire occurs. When a system of electric firing is used, the shot-firer should return at once when a hole has missed fire. He should then examine the cable and the connections with the shot-hole, and if defects are here found, this may be remedied by providing a new cable. It is also advisable for him to see that the relieving hole shall not be bored within 12 in. of the hole which has missed fire. If the missed shot has a detonator, the shot-firer should tie a string to it, and attach it to the cable, or prop, which may be close by, before firing the relieving hole. After firing, the shot-firer should return to the face and examine whether the detonator of the missed shot has exploded. Should the missed shot not be dislodged, further holes must be drilled until that is effected. Severe accidents have been known to occur from the detonator becoming mixed with the coal.

One of the most successful devices so far used as a substitute for explosives in coal mines is the hydraulic mining cartridge. This cartridge is worked by means of a specially constructed hydraulic pump, which is connected to the cartridge by a pipe. A cartridge of the standard size gives a pressure of three tons per square inch, which amounts to a total pressure of over 60 tons on the coal. This machine has entirely superseded explosives in a large number of mines in England, Scotland and Wales; also in Germany and Canada. As many as 300 holes per day have been forced off in one mine by this method. The advantages claimed over explosives are: 1. There is no danger of explosions from ignition of gas or coal dust. 2. A much larger quantity of round coal is produced. 3. The roof is not injured after the operation. 4. Large spaces of unprotected roof are avoided, as sprags can be left in after the operation until coal is wanted. 5. Its cost is low, as water is used in place of explosives. 6. There is no obstruction to the workmen, as the operation can be performed while they are in the place. 7. Less accidents from flying particles of coal or stone, owing to timber being blown out. 8. No dust is caused.

The Mines of South Carolina

By H. L. Scaife*

South Carolina has been more noted for the diversity of its mineral occurrence than for its mineral production, although mining of the non-metallic minerals has recently become important. In 1906 the production of phosphate rock and clay, together with their products, amounted to $10,070,162. In a few instances gold, monazite and tin have been mined profitably, but at the present time the tonnage is generally small. Little prospecting has been done for other substances such as graphite, asbestos, soapstone, manganese, mica, corundum, magnetite, hematite, specular iron, siderite, beryl, copper, lead, nickel and cobalt, although their occurrence is known. Emerald, sapphire and topaz, of gem quality, are occasionally found, while the finding of one diamond, supposed to have been derived from the itacolumite, is recorded. A few of the rarer metals have been, and probably others will be found if they are sought for.

The existence of tin in pegmatite dikes, which have lately been traced through Kings Mountain, N. C., into Cherokee county, S. C., has been known for more than a quarter of a century, the discovery of cassiterite on the South Carolina side being made by S. S. Ross, of Gaffney, S. C. in 1902. Since 1885 when the first development company was organized several spasmodic efforts have been made to mine the cassiterite of the Carolina tin belt. The Ross mine in Cherokee county has been in operation since 1903, but, as yet, no deposits of considerable commercial importance have been developed, the production in 1906 being $34,719. In several of the counties attention has been directed to monazite; its production amounted to $43,000 in 1906, but in 1907 there was a decrease in the production of both tin and monazite. In 1906 the production of gold amounted to $78,959, most of this coming from the Haile mine in Lancaster county which is the only gold mine in the State where operations have continued for a number of years with any degree of success. The total production of this mine is estimated to be $3,250,000. It can also be said that the Haile mine is the only one in the State where systematic mining on a large scale has been attempted, and here, by able management, the total cost of production has been reduced to about $1.60 per ton. At the present time work is being started on several gold properties in Cherokee county, among them the old Nuckolls and Norris mine which was worked to some extent about 50 years ago.

The gold mining operations of this State, as well as in other portions of the Southern Appalachians, date back to the Colonial period, and, as late as 1848, Dr. M. Tuomey, the State geologist, in his report on the geology of South Carolina, stated: "I believe that it is now satisfactorily settled that the gold formation of the United States is confined to a band of schistose rocks, extending from the Rappahannock, in Virginia, to the Coosa river, in Alabama." The mining industry of this region had reached considerable importance before the discovery of gold in California, but since that time, especially subsequent to the War, mining operations have been of a more or less desultory nature. In the ante-bellum period a large part of the mining was done by the slaves after the harvesting of the crops, and it was during this period of cheap labor that the most substantial results were obtained.

Several important bonanzas were discovered during the active period prior to the Civil War. The Dorn mine, in Abbeville county, is accredited with the production of $1,100,000 and upward; the Brewer mine, in Chesterfield county, is said to have yielded $1,000,000; while the Nott mine, in Union county, is known to have produced a large sum, but there are no authentic records as to the amount. Tuomey mentions that a few bushels of ore taken from a bonanza orebody at that mine yielded $3000. The West and Thomson mines, then known as the Fairforest mines, in Union county, were considered important producers, the yield of the latter being estimated at $100,000. According to Tuomey, a neighboring mine, known as the Harmon or Mud mine, was abandoned not on account of the absence of ore, but because the presence of copper made it impossible to recover the gold by amalgamation. Near the Harmon mine a number of gold nuggets have been found, the largest of which weighed about 85 dwt. Lieber states that at the Martin mine, in York county, a piece of quartz containing 4000 dwt. was found in a placer, and that the Austin placer, in Cherokee county, yielded $50,000 to $75,000. The Blackmon mine, of Lancaster county, and the Schlegelmilch, Ferguson, Wilson and Brown mines, of York county, were well known mines in their day, and, in addition to these, there are a large number of abandoned and forgotten shafts in the mineralized area in the counties lying to the northwest of a line running from Chesterfield to Edgefield county. Dr. Waldemar Lindgren, of the United States Geological Survey, estimates the total production of the Appalachian States between 1800 and 1900 at $47,000,000, of which amount not less than $10,000,000 should be accredited to South Carolina, as three of its mines alone are known to have yielded $5,350,000.

ORE OCCURRENCE

The veins are found in granite, syenite, gneiss, hornblendic and talcy micaceous schists; according to L. C. Graton, of the United States Geological Survey, the veins occur principally in dense metamorphic rocks and seem to be most common in amphibolite. Many of the veins are considered to be fissures, but the orebodies usually occur as lenses, chimneys and shoots, with the principal axis parallel with the inclosing formation. The geologists of the ante-bellum period have classed the veins of this section into the following groups: 1. The "Carolina group" of crystallized quartz veins, which contract with depth, the gold decreasing in quantity, while copper, associated with the ores of manganese, lead and silver, appears and increases with depth. 2. The "saccharoid veins" of granular quartz, resembling powdered sugar, which become less productive as they pass from the slates into the underlying rocks. 3. The "hornstone lenticular veins," irregular wedge-shaped, detached quartz veins, sometimes containing very rich pockets, which disappear at depth in the talc-slates. Earle Sloan, the present State geologist, asserts that the gold formations of South Carolina pertain to the following three main types (with intergrading phases): The Tyger, the York and the Lancaster, which he has named from localities where each class of deposit occurs. When Tuomey and Lieber wrote, the deepest shaft in the State was down only 115 ft., and at this time there are probably no workings at a greater depth than 200 ft., except at the Haile mine, which still has large orebodies at a depth of 600 ft. In my opinion, until systematic mining and deeper workings are more general, there is not sufficient data to form a basis for the foregoing classifications and deductions.

From the amount of erosion which has taken place since the formation of the veins, as well as from the character of the deposits themselves, Becker, Graton and Lindgren, of the United States Geological Survey, consider the present croppings to be the stumps of quartz veins which originally extended much higher, possibly 20,000 ft. higher, and that no great change in the character of the veins and the occurrence of the orebodies may be expected with depth. With such an estimated hight to the veins, the scattered and desultory explorations, which in South Carolina seldom reach a depth of 200 ft., seem insignificant. The present knowledge as to what may be expected with greater depth is meager, but there is no reason for the presumption that orebodies of commercial extent, possibly with secondary enrichment, will not be found in this section at depth. The Haile mine in South Carolina, which is one of the few, if not the only steady dividend-paying gold mine east of the Mississippi river, and the copper mines at Ducktown, Tenn., where a large orebody is developed to 700 ft., are sufficient to prove that all of the veins of the Southern Appalachians do not pinch out with depth. The results of a century of gophering are not inviting to capital, but until core drillings and deep workings are undertaken, the mineral possibilities of the oldest mining section of the United States will remain practically virgin and unproved.

---

*Clinton, South Carolina.

Aside from lack of depth, there are several factors which have contributed to the failure of mining enterprises in this region when in some cases the results might have been different. Most of the operations have been attempted with a great lack of mining and metallurgical knowledge. The difference in the character of the veins here and those of the Western States are frequently overlooked, and the orebodies when found are often lost. In the reduction of the ores there has been a general failure to recover a large percentage of the metals, and the lack of facilities for the treatment of the sulphide ores, together with a lack of capital, has no doubt caused the abandonment of properties which otherwise would have been considered bright prospects. The exaggerated stories of rich ore left in the bottom levels by the old miners on account of water, unfortunately, has led to the cleaning out of old workings and sometimes to the sinking of numerous shafts to undercut the orebodies which proved not worth the expense, while the discovery of rich ore of unproved tonnage has in many cases led to a hasty erection of large stamp-mills instead of spending the money on development work.

If the present system of shallow mining is to be continued in spite of past experiences, no doubt better results would be obtained by persistently following the oreshoots along the dip and the pitch after the method of the Mexican miner, as the rich pay streaks are often lost when an attempt is made to pick them up with crosscuts and drifts from a perpendicular shaft. This system was employed largely during the ante-bellum days, and the chimneys of ore which the old miners followed from the surface are now sometimes found at the bottom of their inclines, but the money thus expended could be more profitably used [illegible] the placers and the surface for gold, at which operations it is rarely the case that money is lost.

Bibliography

The following is a brief bibliography of the mines of South Carolina: [illegible] Survey of [illegible], Geology of South Carolina, M. Tuomey, 1848; Report on the Geology of South Carolina, Oscar M. Lieber, 1858; [illegible] No. [illegible] N. C. Geol. Surv., Nitze and Wilkens, [illegible]; Gold Fields of the Southern Appalachians, G. F. Becker, Sixteenth Annual Report U. S. Geol. Surv., Part III, 1895; Precious Stones in South Carolina, Ibid., Part IV; History of Gold Mining in South Carolina, [illegible]; Reconnaissance of Some Gold and Tin Deposits of the Southern Appalachians, L. C. Graton, *Bull.* No. 293, U. S. Geol. Surv., 1906; The Occurrence and Distribution of Tin, F. L. Hess and L. C. Graton, *Bull.* No. 260, U. S. Geol. Surv., 1905; The Occurrence, Production and Commercial Value of Monazite, C. D. Test, *Bulletin* of Colorado School of Mines, January, 1908; Monazite in the Carolinas, Joseph Hyde Pratt and Douglas B. Sterrett, *Trans.* Am. Inst. Min. Eng., ninety-fifth meeting; Notes on the Carolina Gold Deposits, Walter Harvey Weed, ENG. AND MIN. JOURNAL, Vol. 72, page 494; Mineral Resources of the United States, U. S. Geol. Surv., for 1907 and *ante;* Geology and Mineral Resources of South Carolina, Earle Sloan, 1908.

Judge Gary on Steel Cooperation

Elbert H. Gary, chairman of the United States Steel Corporation, entertained nearly 100 steel men at a dinner at New York, Dec. 10. He reviewed the course of events in the trade in the last year, which brought the sharpest reaction the industry had ever seen without demoralization, and dwelt upon the good which had come of the open discussion of trade affairs between the principal interest and the independents. He continued:

"It seems now to be the common belief that the action and disposition of the manufacturers of iron and steel in the last year have been of material benefit to the manufacturers themselves, to their customers, to their employees, and to the general public. Possibly the influence of your action has extended in some measure to other countries.

"What is this movement, and up to date what have been its results? The movement has been simply an effort on the part of those interested in the iron and steel industry to establish a basis of friendly association and intercourse which is calculated to enable each to obtain full knowledge concerning the affairs of all the others, and the beneficial results which naturally follow such knowledge.

"That some have misunderstood our action is probable. Some at least have questioned the propriety, if not the legality, of our efforts; and apparently others have believed these efforts would be of no substantial benefit. I think I represent the views of all present in saying we have never doubted the propriety or legality of our action because we knew [illegible] interests of anyone. As I understand, it is not improper for competitors to meet and without reserve furnish full information and express opinions concerning the business affairs of all, provided they are not acting under an agreement, expressed or implied. It is not wrong, even though [illegible] particular business, nor even though the result may be to prevent radical and unreasonable changes in prices.

"It is common practice the world over for men engaged in all the different lines to meet their associates and competitors frequently and to discuss conditions and interchange views respecting the proper and reasonable conduct of all concerned.

"In connection with the movement under consideration we have had no agreement in restraint of trade, expressed or implied. We have never intended nor resorted to any evasion, and the public has been accurately informed concerning our action. Therefore, we may dismiss this subject with the statement that if we shall be convinced we are wrong in our conclusions, or that we have antagonized public interests, or if complaint is made by anyone authorized to make it, we will discontinue our efforts to cooperate, whatever injury may ensue.

"We have been successful in securing stability as opposed to demoralization. This has tended to promote the best interests of ourselves and all others. Whether or not this movement for conciliation and coöperation, as opposed to the unreasonable and destructive competition of the past, shall continue to be successful, I cannot say. As a very learned and eminent gentleman said to me within the last few days, 'It is well worth trying.'"

Tariff Revision

William H. Taft, after [illegible] with Chairman Payne and other Republican members of the Ways and Means Committee, following a talk with Speaker Cannon, on Dec. 11, made public the following statement:

"I had an interview with Mr. Cannon yesterday, and, with his concurrence and at the suggestion of a member of the Ways and Means Committee, with the Republican members of that committee this afternoon, and from my conversation with them and the discussion which followed as to the examination which they are now conducting and expect to conduct, I have [illegible] keenly alive to the obligation which is on them as representatives elected to repre- [illegible] honest and thorough revision of the present tariff, that they have taken three times as much evidence as has ever been taken in the preparation of other tariffs, and [illegible] effort and independent effort to get at the evidence themselves by the use of sub- [illegible] reaching the difference in the cost of pro- [illegible] within the tariff here and abroad.

"I found them quite anxious for as much harmony as possible, in which I sympathize with them, and prepared for consulta- [illegible] at any time in the future. The plan is to prepare a bill on such evidence as they have and will have in the course of the hearings, and then to call for additional evidence as to the items whenever it should seem necessary. Not only from conversation with the members together, but with the members individually, I am quite convinced that they are in good faith going to prepare a bill which shall be a thorough revision on the platform of the Republican party."

Withdrawal of Western Phosphate Lands

Acting under instructions from President Roosevelt, the Secretary of the Interior, on Dec. 10, withdrew from entry, selection and location all public lands in Wyoming, Idaho and Utah believed to contain phosphate rock, pending appropriate action by Congress. The list of lands withdrawn was furnished by the Geological Survey as a result of preliminary examination of the field. A careful classification of the lands in question will be made by the Survey as soon as practicable so that the portions that are found to contain no phosphate can be again thrown open to agricultural entry.

This action of the President has been taken largely as the result of facts brought out at the recent meeting of the National Conservation Commission in Washington. At this meeting it was shown that, at the present rate of production, the known available supply of high-grade phosphate rock in the United States will last only about 50 years. Although this Western field embraces the largest area of known phosphate beds in the world, the absolute necessity of utilizing these deposits for the benefit of the farms of the United States was strongly emphasized.

Phosphoric acid is one of the three substances which must exist in the soil if it is to be productive. It has been shown by work at the agricultural experiment stations in Wisconsin, Ohio and Illinois that lands that have been under cultivation in these States for 54 years have been depleted of one-third of their original content of phosphoric acid. This is equivalent to 20 lb. per acre annually. Assuming it to be only half this amount, for the 400,000,000 acres of land in the United States bearing crops it would require 6,000,000 tons of phosphate rock annually to offset this loss, without considering the question of increasing the agricultural yield above the present production.

In 1907 there were 2,265,000 tons of phosphate rock produced in the United States, and of this amount 900,000 tons, or about 40 per cent. was exported. The phosphate rock of South Carolina is practically exhausted; the Florida deposits have reached their maximum production; the output of the Tennessee deposits is on the increase, but this field alone would last only 11 years at the present rate of increase in production. There is some phosphate in Arkansas, but it is low grade; therefore, the large deposits of the public-land States must be depended upon for the greater part of our phosphate in the future. To insure the utilization of our own deposits in our own country some means must be devised to prevent its shipment to foreign lands. It would appear that this can be done only by retaining Government title to all public lands underlaid by phosphate rock, and leasing these lands under terms which will prohibit exportation.

The Secretary of the Interior is charged by law with the care, preservation and disposition of the public domain for the benefit of all the people of the United States; and the rulings of the Supreme Court are to the effect that he has full power to meet such unexpected contingencies or emergencies as are created by changed conditions, new discoveries or unforseen happenings. In such cases he fortunately has the power to make temporary reservations or withdrawals of the public domain, with a view to protecting and preserving the same pending the submission of information to Congress in order that it may enact appropriate legislation to meet the conditions disclosed. This power has been frequently exercised during the last 40 years in the public interest. In this particular instance, the question is so vital to every citizen of the United States interested in the present and future agricultural production of the country that immediate action is necessary.

An executive order of withdrawal, general in its nature, like this, is under the rulings effective from the first moment of the day upon which it is made, and thereafter during the existence of the reservation, no valid location can be made or claim initiated. Valid claims initiated prior to a withdrawal and maintained by compliance in all respects with the law are not defeated or impaired by such a reservation.

Ferrosilicon

High-grade ferrosilicon is an alloy of silicon and iron, made in an electric furnace, of which the use by steel makers is now large and increasing. Up to a comparatively recent date, nearly all of the ferrosilicon consumed in this country has been imported from abroad, chiefly from the Austrian Tyrol. Within the last two years, several manufacturers have turned their attention to the establishing of a domestic industry with a view to supplying the demand for ferrosilicon in this country, and, in addition to this, some works have been erected on the Canadian side, using Niagara power.

Mineral Production of Austria

The production of ores and minerals in Austria—other than coal, iron ore and manganese ore—is given by the official report just published as follows, in metric tons:

Ores:	1906.	1907.	Changes.	
Gold ore	33,033	30,711	D.	2,322
Silver ore	21,944	13,380	D.	8,564
Quicksilver ore	91,494	89,370	D.	2,124
Copper ore	20,255	10,400	D.	9,855
Lead ore	19,683	22,792	I.	3,109
Zinc ore	32,037	31,970	D.	67
Antimony ore	1,071	910	D.	161
Tungsten ore	57	44	D.	13
Uranium ore	16	11	D.	5
Minerals:				
Graphite	38,117	49,425	I.	11,308
Asphalt	2,840	3,858	I.	1,018
Sulphur ore	15,125	24,099	I.	8,974

The production of salt was 376,212 tons in 1906, and 395,053 tons in 1907. The salt reported in 1907 included 38,608 tons rock salt, and 43,878 tons sea salt, the latter made in the provinces bordering on the Adriatic.

The production of metals—other than iron—was as follows, in metric tons, except gold and silver, which are in kilograms:

	1906.	1907.	Changes.	
Gold, kg	126	142	I.	16
Silver, kg	38,948	39,000	I.	52
Quicksilver	526	527	I.	1
Tin	42	47	I.	5
Copper	877	592	D.	285
Lead	15,905	14,461	D.	1,444
Zinc	10,804	11,208	I.	404
Antimony	......	207	I.	207
Bismuth	......	2	I.	2
Uranium salts	10	11	I.	1

Lead includes a small quantity of litharge—1059 tons in 1906 and 863 tons in 1907. Minor products from metallurgical works for the year are reported as follows:

	1906.	1907.	Changes.	
Copper sulphate	578	579	I.	1
Sulphuric acid	745	....	D.	745
Copperas	154	....	D.	154
Mineral pigments	943	1,091	I.	148

The total value of the mineral products showed a gain in 1907, but this was due entirely to the increase in coal and iron. Many of the other minerals and metals show decreases, but they are generally small in quantity.

Australian Gold Production

Gold production in New South Wales in October is reported at 24,788 oz. fine; an increase of 713 oz. over October, 1907. For the 10 months ended Oct. 31, this year, the total production was 220,380 oz., or $4,555,255 in value.

Gold production from the mines of Western Australia is reported at 136,380 oz. fine in October, which is 1861 oz. less than in September and 13,437 oz. less than in October, 1907. For the 10 months ended Oct. 31 the production was 1,397,272 oz. fine in 1907, and 1,371,752 oz. in 1908; a decrease of 25,520 oz. By values, the output was $28,881,612 in 1907, and $28,354,114 in 1908; the decrease this year being $527,498, or 1.8 per cent.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. and Treas. [illegible]
505 Pearl St., New York
London Office: 6 Bouverie Street, London, E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription payable in advance, [illegible] of 52 numbers, including postage, in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, [illegible] its equivalent, 33 shillings; [illegible]

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date [illegible]

For sale by all newsdealers generally.

Entered at New York Post Office [illegible] the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for November, 1908 was 42,500 copies.

Dec. 5	12,500
Dec. 12	10,000
Dec. 19	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials
- The Discovery of Ore Deposits 1215
- The Social Life of Miners 1216
- Statistics of Colliery Accidents 1216

*The Cactus Club at the Newhouse Mines, Utah. *Lafayette Hanchett* 1189
Consolidated Goldfields of South Africa, Ltd. *Special Correspondence* 1190
West African Gold Mines 1190
*Ore Occurrences at Fortuna Mine, Bingham. *Edward R. Zalinski* 1191
Ontario Mining Flotation 1195
A New Oilfield in California. *Special Correspondence* 1195
*Manganese Deposits of Morro da Mina, Brazil. *Joquim Lustosa and J. C. Branner* 1196
*The Henning Testing Plant and Metallurgical Laboratory 1198
Diamonds in German Southwest Africa 1199
Fast Tunnel Driving 1199
Gayley's Invention of the Dry Blast. *Rossiter W. Raymond* 1200
Ontario Mineral and Metal Production 1202
*Camp Alunite, a New Nevada Gold District. *Robert L. [illegible]* [illegible]
Du Pont Blasting Gelatin [illegible]
Iron and Steel in Russia 1206
Fatal Accidents in Coal Mines of America. *Frederick L. Hoffman* [illegible]
Water as a Motive Power Underground 1211
Colliery Note 1211
The Mines of South Carolina. *H. S. Scaife* [illegible]
Judge Gary on Steel Coöperation 1213
Tariff Revision 1231
Withdrawal of Western Phosphate Lands 1214
Ferrosilicon 1214
Mineral Production of Austria 1214
Australian Gold Production [illegible]
The National Conservation Conference. *Special Correspondence* 1217
Mining Costs and Profits in the Transvaal. *Special Correspondence* [illegible]
Mineral Production of Greece [illegible]
Questions and Answers 1218
New Publications 1219
The Tariff Hearings. *Special Correspondence* 1220
Anti-Debris Activity in California. *Special Correspondence* [illegible]
Indian Gold Mines [illegible]
Personals, Obituaries, Societies and Technical Schools [illegible]
Special Correspondence 1223
Mining News 1226
Markets, etc. 1231
*Illustrated.

The Discovery of Ore Deposits

We often hear it said, "The world has now been well explored; we shall not discover any more great ore deposits." With this statement we flatly take issue, and we believe that attention to some facts will prove our contention that the era of discoveries has not been closed, but on the contrary, is, perhaps, only in its infancy. If the pessimists should express more precisely what is probably their idea, namely, that we shall not in North America, outside of Alaska and the north of Canada, discover another Comstock, or Leadville, or any new mineral bonanza exposed at the surface, we should agree. However, there are many parts of the world still unexplored, in which important outcropping mineral deposits may be discovered. It is not yet 15 years since the placers of the Klondike acquired fame, since when there have been the discoveries of gold at Nome and in the Fairbanks region, and copper in the Copper River region of Alaska, and in Katanga, Africa, to mention only a few important instances.

Nevertheless, we conceive that the future of ore discovery now depends chiefly upon finding deposits that are not exposed on the surface. It is in this search that the science of economic geology is likely to win its spurs. Already it has established the knowledge of some of those fundamental principles, which have from time to time filtrated into all minds as the essence of practical geological knowledge.

Thus, the early prospectors for gold and silver in Nevada looked especially for quartz lodes. They found occurrences of silver-lead ore, but the then low grade, rebellious, "cooking" ore, existing in limestone formations, was useless to them, and was passed by with contempt. In the districts where rich ore had been found near the surface in limestone country rock the results had been unfortunate, the ore "petering" out early. For this reason, the rich deposits of White Pine, which bore a striking and ominous resemblance to other discoveries of fair prospect and rapid failure were at first regarded with distrust; it was several months before much confidence was felt in their permanence. When, however, their value was demonstrated and knowledge was gained as to their character and directed to several of the old districts, which had been abandoned or disregarded on account of the limestone country rock, and in the new light that White Pine had thrown upon this formation many discoveries were made, among them the great ore deposits of Eureka. White Pine may be considered, therefore, to have led directly to Eureka, and ever afterward prospectors looked especially for great deposits of lead ore in limestone formations; not that limestone had not previously been known as a kindly rock for the deposition of lead, but that it remained for the discovery of the Eureka bonanzas to impress the fact on all minds.

Similarly, the discovery of gold in the andesite and phonolite of Cripple Creek, Colo., in 1891, was followed by the rich discoveries at Tonopah, Goldfield and Bull Frog about 10 years later. Previous to 1891 American prospectors did not know that gold occurred in the andesite class of rocks, and were ignorant of the kind of ore indistinguishable by the eye from the mother rock, which could be determined as ore only by the pan or the crucible, but the prospectors of today have learned this lesson.

Only five years ago, Ely, Nev., which had been known since the '60s, was still regarded as a low-grade gold-mining district, and efforts were being made to operate by improved methods the mines which, as gold mines, had been failures for more than 30 years. The original exploitation for gold of districts that subsequently became famous for great deposits of base metals is no new thing. Mining began in that way at Leadville, Colo., at Bingham, Utah, and elsewhere. However, no one dreamed five years ago of the immense deposits of copper ore that underlaid the lean copper-free gold ore of Ely. That discovery was analogous to the nearly contemporaneous discovery that the great bodies of gold ore at the Mount Morgan mine, in Queensland, Australia, were also underlaid by immense deposits of copper ore. These discoveries, to our mind, are of more importance than the development of the particular supplies of copper, inasmuch as they led to a knowledge of new facts in the science of ore deposits which probably will be of immense value. Already we have witnessed the discovery of the great Miami orebody in Arizona under similar conditions, this immense mineralization having shown no copper on the be discovered as the result of this fundamental principle that Ely and Mount Morgan have forced into all minds, namely, that certain conditions of rock, worthless upon any surface showing, may be underlaid by immense deposits of copper ore enriched to the profitable point?

The search for these blind deposits is the coming duty of the mining geologist. Up to the present time the deductions of this scientist have been to a large extent negative, i.e., pointing out that because of certain observed conditions the prospect for finding ore is hopeless. His constructive work, i.e., the indication of directions in which ore should be sought, has been almost entirely in connection with mines or districts that have already been found by the rambling prospector. The mining geologist himself has not yet gone into the field as a prospector to any great extent. The novelty of the experiment in this direction lends particular interest to the work that Robert T. Hill is now doing in Nevada, which he has described in a series of highly interesting articles in the JOURNAL, concluded in this issue. He has been systematically searching for another Goldfield and has found a place where he considers the general geological conditions of Goldfield to be reproduced. One of the factors, the alunitization of certain rocks, is in itself a mark of the progress in geological knowledge. Five years ago no one knew that this phenomenon had anything to do with the formation of an ore deposit; indeed, the word had not been coined. Ransome pointed out the connection, and now geologists feel that they ought to go back and restudy Cripple Creek, where alunitization also occurs, in the new light. Whether Mr. Hill will find pay ore at Alunite or not remains to be seen. If he does, it will be the greatest triumph for economic geology; if he does not, his experiment will at least be the forerunner of what will without doubt be one of the greatest activities of the mining geologist of the future.

The Social Life of Miners

The article by Mr. Hanchett in this issue is particularly noteworthy as the chronicle of a successful attempt to relieve the monotony of the Western mining camp and better the social conditions of the employees. Perhaps the means which have been introduced at the Cactus mine by the initiative of Mr. Newhouse and of Mr. Hanchett are capable of successful application only in a one-company camp, but nevertheless there are many camps of that character, and other companies may undoubtedly profitably follow the example of the Newhouse Mines and Smelters. A little attention toward improving the welfare and social conditions of the men is a good investment, inasmuch as improvement in those respects tends toward increased efficiency in work. There are not many companies which have done so much as the Newhouse Mines and Smelters, but there are a good many which have paid attention to the erection of suitable bunkhouses and the conduction of well managed boarding houses. The Richmond-Eureka Mining Company may be cited as a noteworthy example in this particular.

On the other hand, there are many companies which ignore the private life of their men, and thereby compel them to live under such careless and unsatisfactory conditions as tend to cause the men not only to lose their self respect, but also to lose more or less of their efficiency. Living conditions have been one of the grievances in the Cœur d'Alene, but companies in that district are far from being the only sinners. What shall be said of the conditions at Bingham, Utah, which has been described as a "sewer four miles long?" Some mining districts, Butte for example, have had such a duration that the men have acquired homes of their own, and they have thus become family camps, but these are the exceptions, and the general lot of the Western miner is discouraging. Such amelioration as has been conferred by some enlightened companies like the Colorado Fuel and Iron Company and the Newhouse Mines and Smelters is consequently deserving of particularly favorable commendation.

Statistics of Colliery Accidents

The annual article by Frederick L. Hoffman summarizing the statistics of the accidents occurring in the coal mines of the United States, published elsewhere in this issue, discloses that 1907 was one of the saddest years on record. It is, indeed, disgraceful that the fatalities in coal mining in this country last year amounted to more than four men out of every 1000 employed. In our editorial last week we pointed out some of the reasons for this shocking loss of life and the remedy.

Referring now to the purely statistical aspect, this publication is the earliest that has been possible for 1907. It is a pity that the data cannot be brought to the attention of the public while the subject is still fresh in mind, and has not become more or less out of date as is at present the case. Mr. Hoffman's statistics are based upon the reports of the mine inspectors of the several States. His summary is held back by the delay in the reports for several States. In some cases this delay is probably due to obstacles (arising through inexperience, insufficient appropriation, etc.), in putting the official report through the press.

Everyone has been talking a good deal lately about the necessity for new legislation by the States with respect to coal mining. If this talk is seriously meant, let each State make a beginning by enacting a law that the report as to accidents in the calendar year must be published before July 1 of the ensuing year. There is really no reason why the report should not be published previous to March 1. If the State officials cannot get the matter through the press so early, let it be provided by law that they shall give their main data in manuscript to the newspapers, which will attend to the matter of publication for them.

Mr. Hoffman's series of statistical reviews upon this subject is the only one in existence for the United States that covers a long series of years. When the U. S. Geological Survey directed its attention to this subject, it was compelled to have recourse to Mr. Hoffman's figures, in adopting which it neglected to give him the full credit that was due him.

THE RECENT consolidation of gold-dredging companies in California brings all the dredges in the most productive field in that State under one control. The Natomas Consolidated will be far the largest company of its kind in this country, and probably the largest in the world. Moreover the combination is not yet complete, for negotiations are in progress for the absorption of other companies, now independent, which will doubtless be added to its possessions in time. New ground is also being prospected, with a view to a further extension of operations, and a general improvement in the dredging plant is also included in the plans. The strength of the consolidated company will also put it in a position to fight the opposition of the Anti-Débris Association effectively.

The National Conservation Conference

Special Correspondence

The National Conservation Conference in session in Washington on Dec. 8, and the succeeding day [illegible] sessions in discussion of the reports of the four sections of the Conservation Commission already sketched in this correspondence, with additional papers and short speeches tending to develop the same subjects. The outcome of the conference has taken form in a series of resolutions relating to the general question of conservation and the manner in which it is to be attained. After commending the work of the commission in suitable resolutions the conference specifically approves the principle of coöperation among the States and between these and the Federal Government, and urges both State and Federal legislatures to enact laws to extend and apply such coöperation in all matters pertaining to the use and conservation of natural resources.

The conference further urges the adoption of the policy of separate disposal of the surface rights, timber rights and mineral rights on the remaining public lands of the United States, the disposal of mineral rights by lease only, and the disposal of timber rights only under conditions insuring proper cutting and logging with a view to the protection of growing timber and the watersheds and headwaters of streams used for navigation and other interstate purposes.

As to waters the conference urges legislation providing for the immediate development of the waterways of the country for navigation, water supply and other interstate uses, preferably by direct Federal appropriations; otherwise by the issue of bonds.

After approving those portions of the commission's report pointing out the need for continued investigation the conference supports the maintenance of conservation commissions in every State, and the desirability of maintaining a National Commission on the Conservation of the Resources of the Country, empowered to coöperate with the State commissions.

The most direct result of the work of the conference is found in the following resolution:

"*Resolved*, That a joint committee be appointed by the chairman to consist of six members of State Conservation Commissions and three members of the National Conservation Commission, whose duty it shall be to prepare and present to the State and National Commissions, and through them to the Governors and the President, a plan for united action by all organizations concerned with the conservation [illegible]

At the special instance of Senator Newlands a resolution was adopted urging adoption of the plan recommended by the Inland Waterways Commission for waterway development under an executive board or commission appointed by the President.

On the suggestion of Mr. Cuttle, of California, it was recommended that the several States enact laws regulating the cutting and removal of timber and slash on private lands, that the continuity of the forests may be assured, that damage from floods may be prevented; and that a more uniform flow in rivers may be maintained.

Powell Evans, of Pennsylvania, and Calvin Rice, secretary of the American Society of Mechanical Engineers, concurred in the following suggestion which was unanimously adopted:

"That the national organizations invited to attend this conference be asked to give their advice and suggestions to the committee of nine which is to be appointed as to how they may best join in this movement, and that the committee of nine thereupon communicate with them in turn transmitting to these various organizations the suggestions and advice thus received and tabulated by the committee."

Mining Costs and Profits in the Transvaal

[illegible]

In the elaborate statistics issued each month by the Transvaal Chamber of Mines interesting indications are provided of the results of recent progress. At the beginning of this year, the Chamber enlarged its records to include figures relating to working costs, so that the value of its analysis has been greatly enhanced. The points illustrated by this general compilation, which cannot be learned of elsewhere, and which are especially significant, are the great increase of tonnage due to higher metallurgical efficiency, and the reduction of costs and yields per ton, with a practically constant margin of profit per ton, but greater total profit owing to the bigger tonnage. It is to be regretted that these statistics were not compiled earlier, for they are only available for the current year. An estimate may be given for January, 1907, for comparison with exact results for the last nine months, as follows:

	[illegible]	[illegible]	[illegible]
	Ton.	Ton.	Ton
[illegible] 1907	[illegible]	[illegible]	[illegible]
[illegible] 1908	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	7.72	4.52	3.20
April	7.76	4.48	3.28
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	7.66	4.36	3.30
July	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Notwithstanding the decrease in yield, the profit per ton shows little change. Some critics protest against the reduction of costs at the expense of the grade; but these arguments are weak in view of the constant profit accompanied by greatly increased tonnage. The two elements of progress must be reviewed in association for the position to be equitably judged. Bearing on this latter aspect, the following statistics are illuminative:

	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]
July	[illegible]	[illegible]
August	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

The number of companies remained practically the same.

The increase in tonnage was not accompanied by a corresponding increase in stamp mills, though there was an increase in the tube mills. The following table shows the average duty per stamp for the same months:

	[illegible] Work	[illegible]	No. [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	8,775	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	76
March	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	74
[illegible]	[illegible]	[illegible]	76
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	6.17	86
[illegible]	[illegible]	[illegible]	97
September	9,069	[illegible]	[illegible]

Two mines, the Luipaardsvlei Estate and New Modderfontein, record stamp duties of over 9 tons per 24 hours; while the scheme of coarse crushing with stamps is to be carried to far at one mine that a duty of 12 tons is anticipated.

Since the work thrown upon the tube mills can be increased almost indefinitely by the adoption of coarser screening, the stamp duty figures cease to constitute a criterion of milling efficiency. At the same time the greater tonnage passed through the mortar boxes indicates to a considerable extent the influence of heavy stamp practice.

Mineral Production of Greece

An abstract of official returns for the full year shows that the fuel production of [illegible] mainly exported—was, in metric tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Manganiferous iron...	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The production of chrome ore in 1907 [illegible]

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Centrifugal Pumps

Are centrifugal pumps suitable for mining work? What is their efficiency?

T. T. N.

For certain work they offer advantages. The Sulzer high-pressure centrifugal pump is extensively employed. An efficiency of 80 per cent. is often obtained, and that high figure is exceeded in favorable cases where the relation of quantity of water to hight of lift is particularly advantageous.

Equivalency of Coal and Petroleum

How much petroleum is equivalent to a ton of coal as fuel? H. S. K.

The amount is variable, of course. One of the most convenient tables is given by Prof. G. F. Gebhardt in "Steam Power Plant Engineering," as follows:

B.t.u. Per Lb. of Coal.	Lb. Coal 1 Bbl. Oil.	Barrels of Oil Equal to 2000 Lb. Coal.
10,000	620	3.23
11,000	564	3.55
12,000	517	3.87
13,000	477	4.19
14,000	443	4.52
15,000	413	4.82

A barrel of petroleum contains 42 gal. and weighs 310 to 332 lb., according to the specific gravity.

Treatment of Mixed Sulphide Ores

What is the maximum grade of zinc ore that can be separated from a mixture of pyrites, galena and blende? Would not a discussion of this subject be of interest to the readers of the Journal?

A. R. K.

The subject has been treated repeatedly in the Journal. Under certain conditions it is conceivable that a zinc ore containing as much as 60 per cent. zinc might be obtained. However, in ordinary practice, it is difficult to exceed 45 per cent. zinc. The subject is treated exhaustively in the report of the Canadian Zinc Commission, published by the Department of Mines, Ottawa, Canada.

Silver Shipments to the East

In the Journal I find weekly a report of silver shipments to the East from London; but I find no statement of shipments from United States ports to the East, which ought to be large.

A. G.

Silver shipments from London to the East are given periodically because they constitute the great bulk of this trade. From United States ports there are no shipments direct to India. Some are made to China, with which this country has a large trade. The total direct shipments, however, are insignificant compared with those from London. In 1908 they have been much larger than for several years past; but for nine months of this year the total was only $3,619,680, against about $45,000,000 from London. The reasons for this are that the trade of India is largely controlled by Great Britain; and that the East is extremely conservative and prefers to buy in London, where it has bought for many years. Some years ago an attempt was made to arrange for large shipments of silver from San Francisco to India direct; but it was not a success, and the trade kept on its old course. The only country which has any considerable share in the Eastern silver trade, outside of Great Britain, is Australia. Recent reports indicate that over 60 per cent. of the silver produced at the Broken Hill mines is sold in the East.

Concrete Chimneys *vs.* Brick Chimneys

How do concrete chimneys compare with brick chimneys in first cost?

W. T. S.

Of course, much depends upon the relative cost of material under local conditions. However, concrete chimneys are apt to be the cheaper inasmuch as the quantity of material required is less, while the cost of concrete and brick per cubic foot in place is apt to be about the same. Landmann, in *Zeit. f. Architektur u. Ingenicurwesen*, 1905, iii, 278, gives computations for a chimney 164 ft. high, upper diameter 4.6 ft., lower diameter 7.9 ft., the thickness at top and bottom being 7.9 and 17.7 in., respectively. The concrete required was 3770 cu.ft., and the iron reinforcement 4530 lb., whereas a similar chimney in brick, of the best material, having a thickness at the top of 7.9 in. and at the bottom of 25.6 in., would require 5225 cu.ft. of material at a stress of 360 lb. to the square inch. Since, however, experience indicates that 9.85 in. is about the least thickness allowable at the top of the stack, this necessitates that the thickness at the base shall be increased to 27.6 in., in order to keep the stress within the allowable limit of 375 lb. per sq.in., thereby adding at least 350 cu.ft. of material, whereas with reinforced concrete the same result could be obtained by increasing the radius by ½ or 1 in. only, or by adding slightly to the reinforcement. Allowing for greater difficulties of construction, Landmann considers that the reinforced concrete has a decided advantage in point of economy as compared with brickwork for this type of structure.

The Laszczynski Copper Process

What is the Laszczynski copper process?

E. D. C.

The Laszczynski process is based upon lixiviation of the roasted ore with a dilute sulphuric acid, and electrolysis of the resultant solution in special vats, using lead anodes and copper cathodes. The principle of the process is not new, but Laszczynski has introduced some novel features. The ore is carefully sorted to free it from gangue, etc., ground to pass a 1 mm. sieve, and is then mixed with clay and formed into briquets, which are roasted. By this treatment the iron is converted into an oxide that does not dissolve in the leaching liquor. The copper is present in the roasted ore partly as sulphate and partly as oxide. The roasted ore is leached with a 5-per cent. solution of sulphuric acid in lead-lined vats, the saturated copper solution meeting the fresh ore, and the exhausted ore being leached with fresh acid solution. The liquor obtained by this leaching operation contains 5 per cent. of copper and 1 per cent. of free acid, and is filtered before passing into the electrolytic vats.

The electrolytic vats are square wooden boxes lined with sheet lead and measuring 1 m. in each direction. Each vat when fully charged contains nine anodes and eight cathodes, the former of sheet lead, 3 mm. thick, and the latter of thin copper sheet. The anodes are incased in cotton cloth. The electrolyte is constantly agitated during the passage of the current, by aid of wooden frames placed between each anode and cathode, and operated mechanically. The current strength is 900 amperes per vat, and the electromotive force required varies from 2 to 5 volts, while the yield is 25 kg. per 24 hours. In the course of one month the cathode sheets attain a thickness of 20 to 30 mm. and increase in weight to 55 lb. The exhausted electrolyte contains 1 to 1½ per cent. of copper and 5 per cent. of sulphuric acid and is used again, with the addition of fresh acid, for leaching purposes. The presence of carbonate of lime in the ore leads to some loss of acid, due to the formation of calcium sulphate, which is removed during filtration; but this loss is partly compensated by the presence of sulphur in the raw ore and by the formation of copper sulphate during the roasting operation.

The re-solution of copper at the cathodes which usually occurs when a mixed solution of iron and copper sulphate is electrolyzed is avoided in this process by the use of the covered lead anodes. The use of linen covers for these, in some unexplained manner, prevents the formation of ferric sulphate by oxidation of the ferrous sulphate present in small amounts in the solution, and the full theoretical yield of 1.15 gram of copper per ampere-hour is therefore obtained at the cathode. The cotton covering of the anodes is stated to last about four months without renewal.

The success of this extraction process at Boleslav, Poland, has led to the erection of a larger works for operating it on the river Nid, not far from the original experimental installation of plant. The cost of a plant capable of producing 1000 kg. of copper per day is about $20,000, and the process is stated to be equally efficient when worked on a small or large scale.

New Publications

Industrie des Metaux Secondaries et des Terres Rares. By Paul Nicolardot. Pp. 435; illustrated. 4¾x7 in.; cloth, 5 francs. Paris, 1908: Octave Doin.

The Clays of Arkansas. By John C. Branner. U. S. Geological Survey Bull. No. 351. Pp. 247, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

This report was originally prepared by Doctor Branner when he was State geologist of Arkansas. It has been revised and brought uptodate, including all the results of recent field work. The chapters are occupied by the general topography and geology; the character, origin and occurrence of the clays; their geologic age and graphical distribution. The rest of the book includes descriptions by counties of the clay deposits, and of their utilization. Tables of analyses of clays are appended; also statistics and a list of the clay-working industries.

The Mechanical Engineering of Collieries. Vol. II. By T. Campbell Futers. Pp. 296, illustrated. 7½x9¾ in.; paper. London, 1908: The Colliery Guardian Company, Ltd.

Mr. Futers completes his treatise in this second volume. Together with Vol. I it forms the most elaborate discussion of the mechanical engineering of coal mines that has yet been issued. The drawings have taken years to complete, and are of such size and detail as to make them of great practical benefit to the mechanical draftsman. The index at the end of the book makes it easy for the reader to turn to any section or discussion desired. The various phases of coal mining are now being covered with greater thoroughness than ever before; however, the mechanical side of the subject has been somewhat neglected, and the present treatise is certain to be of great advantage to the engineers who are engaged in coal mining.

The Mechanical Engineering of Collieries. Vol. I, Part III. By T. Campbell Futers. Pp. 177, illustrated. 7½x9¾ in.; paper. London, 1908: The Colliery Guardian Company, Ltd.

This book completes the first volume of Mr. Futers' treatise. It has been prepared with the same care and completeness that characterized Part I and Part II. The subjects here treated are the screening and washing of coal. The author has succeeded in presenting a concise investigation of all the accepted practices. The discussions are not only of much importance to mechanical engineers, but will prove of benefit and interest to coal-mine managers and superintendents who have to do with the construction of coal plants. One of the most interesting parts of this book is the discussion dealing with the various tipplers now in use at the different coal operations. The rotary tippler is examined in detail and the descriptions are further improved by many excellent mechanical drawings.

Principles and Practice of Agricultural Analysis. Vol. II. By Harvey W. Wiley. Pp. 680, illustrated. 6x9 in.; cloth, $4.50. Easton, Penn., 1908: The Chemical Publishing Company.

The second volume of this work treats of fertilizers and fertilizing materials and contains a short treatise on insecticides. Part I is devoted to sampling and to analytical methods for phosphoric acid and other constituents of natural fertilizers; Part II, the determination of nitrogen and nitric acid; Part III, the analysis of potash fertilizers; Part IV, miscellaneous fertilizers and insecticides and fungicides. The general principles of fertilizer manufacture are presented insofar as they tend to throw light on the rational method of examination and analysis. Dr. Wiley's book will be welcomed by chemists who are interested in this important branch of the chemical industry.

The Mechanical Engineering of Steam Power Plants. Third Edition, Revised. By Frederick Remsen Hutton. Pp. 825, illustrated. 6x9¼ in.; cloth; $5. New York, 1908: John Wiley & Sons. London; Chapman & Hall, Ltd.

The more we study Professor Hutton's well known work, the more does it excite our admiration as one of the great classics of steam engineering. The manner in which this new edition differs from its predecessor is best told by the author himself, who says in his preface:

A former edition of this book, issued in 1897, embodied the study and experience of the author gathered during the previous 20 years and brought together for teaching purposes. The years since then have been a period of great and rapid progress in the power plant and in all engineering departments contributory thereto; and while the old edition was modernized here and there and year by year, the time had come with the opening decade of the 20th century that it be rewritten entirely. The present edition is the result of such rewriting.

It is a new book so much enlarged that the old plates could not be used, but the size of page has been increased, new illustrations chosen, and many new topics and treatments have been introduced. While the former approved analytical viewpoint is retained and amplified, there has also been introduced a discussion in many chapters of the principles and data of applied mechanics attaching to the subject in hand. This has been done to enable teachers who desire to enliven the drill in the mathematical classes to find practical problems and applications of interest and future meaning, and to encourage teachers of the applications of theory to find easily the links and bases for such sound applications. The distinction between the applied thermal principles and those derivable from other departments of theory should tend also to clearness and benefit.

The new treatments which are specially noteworthy are those of the analysis of the power plant and its diagram, and the separation between the simple and the complex phases of this problem; the treatment of the steam pipe as an element of coördinate importance in the plant with the boiler and the engine; the chapters on the auxiliaries as distinguished from the essentials; the steam-turbine chapter, the engine-mechanism chapter, and the establishment of the philosophy of the expansion of the elastic medium as the basis for the valve gear, the governor, the condensing and the compound engine. This is new, and it is believed that it will be helpful and illuminating. Some data and tables have been introduced, but only sparingly. The author prefers that students should acquire the habit of going to the "Engineers' Pocket Books" for statistical or quantitative information, using this book to give a perspective or setting to make clear the meaning and interpretation of such data and constants as these excellent books are prepared to furnish.

Modern Practice in Mining. Vol. I. Coal. By R. A. S. Redmayne. Pp. 199, illustrated. 5½x9 in.; cloth, $2. New York, Bombay and Calcutta, 1908: Longmans, Green & Company.

Contents: Coal: Varieties, composition and occurrence. Determination of the value of fuels. Geology applied to coal mining. Prospecting and boring for coal. Later developments in boring. Some boring problems.

This volume is the first of a series of technical works which the author intends to bring out in successive order, the completed set to constitute a comprehensive library on modern practice in coal mining. Mr. Redmayne has remembered one point which the average writer fails to consider: coal mining is an industry requiring specialists in the various branches, and as a consequence, the subject is here carefully subdivided rather than treated in a general manner. There is a happy blending of the practical and theoretical, and an effort has been made to present only such ideas as are supported by facts. The book is not a resumé of antiquated methods, but contains only the latest information concerning the best modern practice. The chapter on "Geology as Applied to Coal Mining" is opportune, as mining men now recognize that a correct understanding of the geology of a field is essential to the economical development of the dif- [illegible] the chapter on boring, for this subject is one, concerning which but little useful information has been available. The various drills are examined in detail, and excellent tables showing costs and records of boring are given.

The Tariff Hearings

Special Correspondence

At a hearing before the Ways and Means Committee on Dec. 10, E. H. McCullough, Philadelphia, for the Westmoreland Coal Company and for delegates representing nearly the entire bituminous coal output of Pennsylvania and West Virginia, requested the maintenance of the present duty on coal as a maximum, with possibly free trade under a reciprocity provision with Canada as a minimum.

H. E. Miles, of Racine, Wis., a member of the National Manufacturers' Association and other organizations, at several hearings before the Ways and Means Committee Dec. 5, 8 and 10, discussed the tariff question generally but paid special attention to iron and steel. Mr. Miles asked for large reductions in iron and steel duties, discussed the question of "trust" organization, gave figures for costs of production, and speaking as a farm implement and wagon producer estimated the duties needed by that industry as probably not more than 15 or 20 per cent. or with free trade in, or materially reduced duties on, iron and steel, perhaps no tariff whatever.

A large number of briefs relating to tariff revision have been filed with the House Ways and Means Committee by interests representing minerals and mining industries. With reference to schedule C (metals and manufactures of), the members of the Western Bar Iron Association ask that in the adjustment of tariff rates comparative labor costs be considered, a differential between steel and iron bars corresponding to that in the present tariff being maintained. The brief is signed by James H. Nutt, secretary.

James M. Swank, for the American Iron and Steel Association, has filed a long brief protesting against the maximum and minimum tariff plan. Frank Samuel, of Philadelphia, has presented argument to show that producers of iron and steel products need no protection. Andrew J. Ennis, of Ennis & Co., Philadelphia, recommends the repeal of the duty on iron ore.

The American Iron and Steel Manufacturing Company, Lebanon, Penn., on behalf of 25 producers, suggests reduction of duties on bar iron from 0.6 to 0.5c. per lb. The Pittsburg Forge and Iron Company, Pittsburg, argues that no considerable portion of the trade will assent to reductions of duty on bar iron. Joseph L. Hills for the Association of Agricultural Colleges and Experiment Stations requests the transfer of basic slag meal from the metal schedule to the fertilizer schedule under the free list. H. G. Hester for the New Orleans Cotton Exchange has filed resolutions asking that cotton ties be put on the free list. Searle & Pillsbury, Boston, representing certain New England importers of strip, plate, and sheet steel that has been cold-rolled only, protest against any additional duty levied upon such steel in accord with polish or brightness. Searle & Pillsbury for New England importers of high-speed steel, request that no ad valorem rate be substituted in paragraph 135 for the present specific rate on steel valued above 16c. per lb. but that the rate be made specific at 3.5c. per lb. instead of 4.7c. Godfrey L. Cabot, Boston, in a brief urges the removal of duties on iron pipe, rods, bars and pig iron and argues that they are sold cheaper abroad than at home. The Taylor Iron and Steel Company, of High Bridge, N. J., has submitted additional argument in behalf of specific duties on manganese steel (not less than 7 per cent. manganese) of from 2c. per lb. to 4c. per lb. A new classification of steel bands or plates for making saws is recommended by the Simonds Manufacturing Company, Fitchburg, Mass., whereby the duties on steel bands or strips untempered suitable for making band-saws will be the same as on saw-plates wholly or partially manufactured. They desire that there be 30 per cent. extra duty on the tempered strips over and above the duty on the untempered strips for making saws. Wallace H. Rowe, Pittsburg, protests against reductions of duty on steel hoops, bands, and cotton ties. Searle & Pillsbury, for Edward Ward & Sons, request that strip steel be dutiable as low as or lower than at present. Jas. A. Coe & Co., Newark, N. J., request a marked reduction on Swedish bars and billets with corresponding cuts of 0.5c. per lb. on English tool steels.

Henry K. McHarg, of the Virginia Iron, Coal and Coke Company, has filed a long brief in behalf of the retention of the present duty on pig iron. The Grasselli Chemical Company, Cleveland, O., urges that pyrites ore be left on the free list. Joseph B. Carper, West Milan, N. H., asks for a duty of 25 per cent. on pyrites ore. The Collins Company, Collinsville, Conn., and the Aetna Nut Company, Southington, Conn., demand the removal or reduction of duty on scrap iron and steel.

Specific enumeration of steel wool is requested by the American Steel Wool Manufacturing Company, New York, giving a duty at the rate of 11c. per lb. on steel wool and steel shavings.

The Electro-Metallurgical Company, Niagara Falls, N. Y., submits a supplemental brief as to ferro-alloys, asking that the duties on ferrosilicon, ferrotungsten, etc., be made clear, be equalized on all these alloys, be ad valorem and be reasonable. About 20 per cent. would be satisfactory. The American Vanadium Company, Pittsburg, requests the retention of crude vanadium on the free list with a duty of 20 per cent. on the manufactured article. The Titanium Alloy Manufacturing Company, Niagara Falls, asks that titanium be made dutiable at 35 per cent. Dana & Co., New York, have filed argument to show that the ferro-alloys need no duty. The Globe Steel Company, Mansfield, O., asks increase of duties on iron shot, steel shot, iron grit and other iron abrasives from 45 to 75 per cent. The Standard Roller Bearing Company, Philadelphia, urges the retention of present duties on steel balls, ball bearings, roller bearings. The Excelsior Steel Ball Company, Buffalo, N. Y., asks for increase of duty on anti-friction ball forgings to a protective point. The Tungsten Roller Bearing Axle Company, Canton, O., asks an increase of 20 per cent. on anti-friction ball forgings. The Standard Roller Bearing Company, Philadelphia, Penn., has filed a list of concerns importing foreign ball bearings and steel balls. The Diamond Machine Company, of Providence, R. I., through Z. Chafee, treasurer, argues that free trade in iron and steel and free lumber would greatly advance the manufacture of grinding machinery. They also complain of the retaliatory tariffs of several foreign countries and ask for a policy of reciprocity rendering it possible to buy cheap materials in bulk. A considerable number of representatives of the machine-tool industry have united in argument filed with the committee for a maintenance of the present tariff of 45 per cent. on machine tools, with a minimum tariff of 30 per cent. to be used in bargaining with foreign countries. The King Bridge Company, Cleveland, O., asks for reduction of duty on structural shapes such as I-beams, channels, angles, plates, etc.

Hon. James Kennedy, for the Carnation Tin Plate and Sheet Company, Canton, O., asks the retention of the present duties on tinplate and the reduction of the drawback allowance to 40 or 50 per cent. A committee representing the Amalgamated Association of Iron, Steel and Tin Workers has filed argument against the present drawback on tinplate. John Williams, secretary-treasurer of the association, has submitted elaborate comparative wage tables in support of the request for maintenance of the tinplate duties and abolition of the drawback. The John A. Roebling's Sons Company suggests a reduction of 0.25c. per pound from the specific rates on wire of 1.25c., 1.50c. and 2c. under paragraph 137 of the present tariff. On wire coated with other metals they suggest an advance from 0.2c. per lb. to 5c. per lb. H. F. Lyman, Cleveland, O., has filed an account of a conversation with John A. Roebling about 1900 in which the latter stated that he could profitably sell wire-rope abroad in competition with English producers. John W. Walton, Cleveland, O., suggests a duty of 25 per cent. on wire, wire-rope or cordage whose chief element is drawn wire.

The New Jersey Zinc Company, through H. L. Wardner, asks for the same duty on zinc dust as there now is on the spelter—1.5c. per lb.—the change to be made by inserting in paragraph 192 the words, "or zinc dust." L. Vogelstein &

Co., New York City, dealers, importers and miners, ask duties as follows: "Zinc ores crude of any kind, carbonate of; silicate of or sulphides of, free of duty. Spelter (zinc in pig), duty 1.5c. per pound;" with lead or copper mixed with zinc ore free. This concern further asks that whatever be done as to a tariff on lead, the present relation between lead in ores and lead in bullion be maintained. A new paragraph making ores containing more than one metalliferous substance dutiable according to their chief element of value is also recommended.

J. M. M. Shimer, of L. & R. Wister Company, Philadelphia, advocates the removal of duty from lead. The Cockerill Zinc Company, Nevada, Mo., protests against duties on zinc ore. M. L. Cohn, of the Federated Mines and Milling Company, Chicago, Ill., asks for a protective duty on zinc ore. R. A. & Jas. Balph, Pittsburg, request a specific duty of 1.5c. per pound on the metallic contents of zinc ore. The Lanyon Starr Smelting Company, Bartlesville, Okla., protests against any duty on zinc ore.

Hon. Amos Allen, for John [illegible] and others, of Portland, Me., asks that calamine be made dutiable at 20 per cent. The Commercial Club, of Joplin, Mo., urges a duty of 1½c. per pound on zinc ore. The Chanute Zinc Company, St. Louis, protests against all zinc ore duties. The National Zinc Company, New York, asks that zinc ore be free.

The Tacoma Chamber of Commerce and Board of Trade protest against any reduction in the tariff on lead and are supported by telegrams and letters from a large number of western and northwestern concerns. A large number of individuals and firms in Leadville, Colo., protest against the tariff on lead and ask for duties on zinc in ores and spelter.

The Asheville Mica Company, Asheville, N. C., opposes any reduction in duty on mica. The Ohio & Western Lime Company, Huntington, Ind., protests against any reduction of duty on lime. The California Board of Trade asks a duty on asphalt containing over 60 per cent. bitumen of $3 per ton, with $5 per ton on all containing over 60 per cent. The Republic Mining and Manufacturing Company, Philadelphia, asks a duty of $2 per ton on bauxite. The Aluminum Company of America asks the retention of the present duty of $1 per ton. The National Carbon Company, Cleveland, O., files a supplemental brief in favor of retaining present rates on carbons applied [illegible] pieces of commercial length only, thus taxing proportionately the greater lengths. E. E. Cory, New York, asks readjustment of the classification of carbons so as to permit importation of standard lengths at present rates. Several paper companies have filed argument for the large reduction or abolition of the duty of $2.50 per ton on kaolin. The Laclede-Christy Clay Products Company, asks a duty of [illegible] 33 per cent. on clay and gas retorts. This is supported by the Parker Russell Mining and Manufacturing Company, St. Louis. Several other American manufacturers unite to suggest 35 per cent. ad valorem or not less than $5 per ton on firebrick used for gas retorts, etc.

The Anselma Graphite Company, New York, asks a duty of 2 or 3c. per lb. on graphite, filed denial of statements made by graphite producers, and is supported by the Imperial Graphite Company and the Chester Graphite Company.

The Monarch Plaster Company, Rochester, N. Y., asks protection from Canadian gypsum. J. B. King & Co., New York City, in supplemental argument denies the statements of domestic gypsum interests in favor of protection. The Keystone Plaster Company, Chester, Penn., objects to the duty on gypsum and asks that the article be placed on the free list. The Atlantic Terra Cotta Company, New York, Staten Island Shipbuilding Company, Port Richmond, N. Y., Keystone Fireproofing Company, Philadelphia, and a large number of others, request the removal of duties on gypsum rock.

George M. Whitwell for the Rosiclaire Lead and Fluorspar Works, Rosiclare, Ill., asks for a duty of $3 per ton on fluorspar, now free. C. S. Munn, for the Kentucky Fluorspar Company, Marion, Ky., asks a duty of $5 per net ton on fluorspar.

The Beckton Chemical Company, Philadelphia, manufacturer of lithopone, asks that the duty on crude barytes be not advanced. This is supported by H. M. Earle, New York City, in behalf of certain users of barytes.

The Semet-Solvay Company, Syracuse, N. Y., has filed a statement admitting its former demands to be in part unwarranted, and submits a revised schedule of requested duties omitting entirely from its proposed dutiable list tar, pitch, and all primary coal-tar products, and all but a few items of the class of intermediate coal-tar products.

Frank G. Carpenter, for the Vermont Marble Company, has filed a supplemental statement on costs of producing marble abroad. C. D. Jackson, New York, requests reduction of duties on carrara marble, breccia and marble mosaic. The Puffer Manufacturing Company, Boston, asks that marble be placed on the free list. W. R. Guy, San Diego, Cal., suggests a new classification of Mexican onyx marble, giving it a duty of 65c. instead of $1.50 per cu.ft. The Italian Chamber of Commerce, New York, asks the removal or reduction of the present duties on marble.

James H. Rhodes & Co. submit supplemental argument for the abolition of the 15 per cent. duty on pumice stone and an increase on the manufactured product from $6 to $9 per ton with retaliation on foreign export duties. L. L. Boone, San Diego, Cal., asks that sandstone be admitted free under certain conditions.

Anti-Debris Activity in California

The California Anti-Débris Association, with headquarters in Sacramento, is sending out men to see if any hydraulic mining operations are in contemplation in the drainage basins of the Sacramento and San Joaquin rivers. This means that the association intends not only to worry the hydraulic miners who have procured licenses to mine from the California Débris Commission, as in the past, but also, if possible, to prevent any new hydraulic enterprises from commencing operations. For these reasons few persons are contemplating hydraulicking in the regions referred to, since they will not [illegible] but are apt also to be brought into expensive litigation. This is all wrong, of course, but can hardly be helped since the California Miners' Association is no longer in a financial position to combat its old enemy.

At the last meeting of the Anti-Débris Association much attention was given to the subject of gold dredging. Reports were received from agents who have made examinations of the various dredging operations and some of them described the so-called "damage" done near Oroville. Finally a committee was appointed with full power to instruct the attorneys for the association to bring suits against all dredging companies which declined to comply with the suggestions of the association as to their operations. The association which intends these rather high-handed actions is in no sense a State institution, though it carries the State's name. It is a private association with no authority whatever to compel incorporated bodies to adopt its suggestions or obey its orders. It is evident that the dredge people will eventually have trouble with this association and they will suffer as the hydraulic miners did unless they band together for mutual protection and aid the California Miners' Association to defend the mining interests against this long-lived and active foe to the mining industry of California.

Indian Gold Mines

Gold production in Kolar goldfield, Mysore, India, in November was 45,000 oz. bullion, being 315 oz. more than in October [illegible] the total was 481,416 oz. bullion in 1907 and 483,741 oz. in 1908. The bullion re[illegible] or 435,307 oz. fine gold. The output statements of the larger mines in November [illegible] 10,007 oz. from the Champion Reef; 7087 [illegible] the Ooregum

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

There will shortly be a vacancy on the editorial staff of the JOURNAL, open to a young engineer, who must be a graduate of a technical school and must have had several years of practical experience.

J. R. Finlay has returned from the West.

F. F. Sharpless has returned from Europe.

E. G. Reinert, of Denver, Colo., visited Cobalt, Ont., recently.

W. H. Shockley has removed from Tonopah, Nev., to Palo Alto, California.

Henry F. Lefevre has spent four weeks examining gold mines near Sumpter, Oregon.

J. Nelson Nevius, of Pasadena, Cal., has been investigating dredging methods at Oroville.

R. B. Brinsmade sailed from New York Dec. 12, on his way to Germany on mining business.

William M. Brewer has returned to Victoria, B. C., from a stay in southeastern Alaska.

P. R. Whitman is with the Virginia & Mexico Mine and Smelter Corporation at Hostotipaquillo, Jalisco, Mexico.

George A. Guess is now superintendent of the smelting works of the Tennessee Copper Company at Copperhill, Tennessee.

D. C. Jackling, general manager of the Utah Copper Company, has returned to Salt Lake City from a visit to New York.

George Leyson, formerly of the Silver Queen mine, has been placed in charge of the Green-Mechan and Red Rock mines, Cobalt, Ontario.

George Gordon Crawford, of Birmingham, Ala., president of the Tennessee Coal, Iron and Railroad Company, is ill with typhoid fever.

D. P. Shuler, of the Dominion Nickel-Copper Company, Sudbury, Ont., recently visited New York in connection with the business of his company.

A. S. Dwight, consulting metallurgical engineer, of New York, has returned from the West, where he has been engaged for several months on professional business.

Herman C. Bellinger, well known in Montana and British Columbia as a metallurgical engineer, has gone to New South Wales to take charge of the Great Cobar Copper smelting and refining works.

A. Von Hammerstein, who for several years has been engaged in exploring for oil in the region north of Athabasca Landing, Alberta, has been in Winnipeg and reports that he has a large force of men engaged.

G. C. Lloyd has been appointed secretary of the Iron and Steel Institute of Great Britain, in place of Bennett H. Brough, deceased. Mr. Lloyd was formerly assistant to Mr. Brough, but for some time past has been secretary of the Institution of Electrical Engineers. L. P. Sidney has been appointed assistant secretary, a new office.

Bennett Brown, of Kansas City, Mo., has resigned his position as commissioner of the Southwestern Interstate Coal Operators' Association, to date from Jan. 1, on account of ill health. William D. Ryan, of Indianapolis. Ind., has been chosen commissioner to succeed him. Mr. Ryan is at present national secretary-treasurer of the United Mine Workers of America.

The Council of the Iron and Steel Institute has awarded the Bessemer gold medal to Alexander Pourcel, an eminent French metallurgist. The Bessemer medal is awarded annually for services to metallurgy and it is for his investigations in the manufacture of ferromanganese and for his work on the thermal reactions involved in the manufacture of iron and steel that Mr. Pourcel becomes the recipient for this year.

Obituary

A. B. Boecker, for many years connected with the Argentine smelter at Kansas City, and latterly with different smelters in Mexico, died at his home at Parsons, Kansas, Nov. 12, 1908.

E. W. Chapman, manager of the Channel Mining Company, was killed Nov. 22, in the Chapman mine near San Andreas, Cal., by a fall of gravel from the roof of a drift. He was well known in California as a miner and superintendent of long experience.

George McCully Laughlin, who died in Pittsburg, Dec. 11, aged 66 years, was born and brought up in that city. After serving with some distinction in the Civil War, he entered the employ of Jones & Laughlin, the iron and steel firm established by his father, James Laughlin, and B. F. Jones. He served in this concern actively for over 35 years, in various capacities. He was secretary and treasurer for about 20 years, and later vice-chairman of the board. In 1900 he retired from active work, remaining a director of the company. Three brothers survive him, all interested in the management of the company.

Societies and Technical Schools

Colorado State School of Mines—Dr. Victor C. Alderson, president of this school, has asked the Colorado legislature to establish an experimental ore-dressing and metallurgical plant at Golden. This is a most worthy object, and must redound to the best interests of the mining industry of this State. The plant as advised by Dr. Alderson would consist of four units: first, a sampling mill; second, an ore-dressing plant; third, a mill for amalgamation, cyanidation and chlorination; fourth, a section for roasting and smelting, each unit to be capable of treating a carload a day.

Scranton Miners' Institute—At the regular meeting in Scranton, Penn., Dec. 14, Mine Inspector Hubert Johnson occupied the chair, and in a brief opening address said that the subjects to be discussed would be divided into three parts: First, "The advantages and disadvantages of safety and black powder;" second, "What determines the amount of cost;" and third, "The dangers of mixed powder." Mr. Johnson said that they must take exception to the use of the word "safety" in connection with the use of powder. No powder was safe. The general discussion that followed seemed to favor the ideas advanced by Mr. Johnson in his opening address.

University of Washington—The special three months' course for mining men begins its eleventh annual session at the School of Mines of this university at Seattle on Jan. 5. Admission to the classes is without examination. Instruction is given by lectures, laboratory exercises and visits to mines and plants in operation. The past experience and future aims of each student are taken into consideration, and the character of his work arranged accordingly. During the first week of the course the instruction is of a general nature. Thereafter the students select those courses which best fit their needs. These include geology, mineralogy, assaying and analysis, mining, mining law, the care of machinery, making and sharpening drills and general forge work. The laboratory equipment of the school includes a stamp-mill, concentrating plant, sampler, compressed air and drill plant, machinery for framing timbers and a complete assaying plant.

Coal Mining Institute of America—The fifty-second meeting was held at Pittsburg, Penn., Dec. 1. In the absence of President B. F. Jones, of Irwin, the vice-president, H. H. Stoek, presided. Several papers were read touching on the practical and technical work of mine operation. The old officers were re-elected except that Peter Y. Cox, of Carnegie, was elected auditor, in place of John Britt, deceased. There was a day and night session, the chief feature of the latter being a paper on "The Organization of First Aid Corps," written by Dr. W. J. Shields, of Scranton, and read by W. M. Judd. Dr. Shields was the originator of the first-aid movement in coal mines. A plan of organizing a working corps in mines and training men in elemental surgery to be available for use, was discussed in the paper. It was decided to hold the next meeting at Uniontown, in conjunction with the West Virginia Coal Mining Institute.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte, Goldfield, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 9—For the past week there has been more or less stormy weather in the mountain and foothill region of the State, bringing welcome rains to fill the streams, reservoirs, ditches, etc. In the higher altitudes from 6 to 24 in. of snow has fallen, thus starting the storage snow of the season.

The old mining camp of Darwin, Inyo county, is showing greatly increased activity after a long period during which little or nothing has been done. Several of the old mines are being reopened or developed with additional men, and prospectors are showing renewed interest in the possibilities of the district. The proximity of the new smelter at Keeler which has already taken considerable ore from Darwin has encouraged property owners to hold and develop and newcomers to invest. J. B. Haggin is developing the old Modoc mine, where high-grade silver ore is found. The Giroux Copper Company will shortly start up. On the Mineatta mine operations will shortly be resumed, and the Jackass mine of Porter & Beeman will soon be opened again. The Inyo Consolidated Mining Company, 20 miles south of Darwin, will complete its new mill next month and has finished its three-mile pipe line. Several mines of the McKenzie estate have shipping ore and some of them have sent more or less to the Keeler smelter.

The Monster mine in Lead cañon, near Big Pine, Inyo county, has been sold to S. A. Stanton, of Manhattan, Nevada, representing New York men. Miners have been set at work and a contract let for hauling ore to the railroad. The mine is a silver-lead property and is already well developed, having been a shipper for some time.

One of the first advantages that the people of Angels district, Calaveras county, have received from the work of the Union Construction Company, is the furnishing of a supply of water to the Eho hydraulic, a Lake mine, near the Stanislaus river. This mine is now being put in condition for winter work. The water for the mine comes from the Union Company's new ditch and will be siphoned across the Stanislaus river.

Probably the largest placer mining plant in the Mother Lode section of Calaveras county is the new one being installed by the Reiner Gravel Mining Company, of Angels. Work was started on this mine in May of this year, and a three-[illegible] A hoist has been installed and a compressor building put up ready for the new compressor which is nearly complete. The building for the new 20-stamp mill is finished ready for the machinery. Three electric motors are being installed, and the power line is nearly finished. The new rock breaker has a capacity of 400 tons daily. The gravel to be mined is cemented, and hence the necessity of the crushing plant. By the first of the new year the mine and plant will be in full operation.

The Natoma Consolidated of California, which has taken over the properties of the larger dredging companies at Folsom, has also acquired the dredge and ground of El Dorado Dredging Company at the same place. There is one more independent company at that point and negotiations for the purchase of its property by the Consolidated are nearly completed.

The North Star Mines Company, of Grass Valley, has offered a reward of $500 for information leading to the recovery of gold precipitates stolen from its cyanide plant recently. A large amount of gold was taken, but thus far the company has been unable to get any track of the robbers.

At Grass Valley the 1000-ft. level of the Idaho-Maryland mine has at last been reached, the shaft having been unwatered and entirely retimbered. Drifting will now be carried on to the west where there is known to be a large amount of virgin ground; this same ground has been worked in the upper levels by the present management. The entire plant of the company has been put in first-class order. Four years ago the present company began to reopen the property and has now reached a depth where it is confident of being able to take out paying ore.

The old ocean beach black sand gold mine at the mouth of Harris creek opposite Dow's Prairie, Humboldt county, formerly owned and operated by F. M. Schideler, C. W. Hill and others, has been adjudged by the court to belong to A. I. Duprey, of Eureka. He brought suit against the Pacific Beach Consolidated Mining Company, claiming the 88 acres of land in the mining ground.

There is quite a little mining boom in Siskiyou county at present and numbers of investments are being made in both quartz and gravel property. This county shares with Trinity the credit of having the most extensive beds of auriferous gravel in the State. In comparatively few places are these gravels being worked, though there are numbers of hydraulic mines in operation. Preparations are now being made to work these properties on an extensive scale and many investments are being made in new ones. The anti-débris law does not apply in either Trinity or Siskiyou counties, there being no navigable streams there.

Goldfield, Nevada

Dec. 8—A. D. Parker, vice-president of the Florence Goldfield Mining Company, before leaving stated that the company has decided not to let any more leases. None of the present leases extend beyond the end of March, 1909. The leases have produced approximately $5,000,000, of which the parent company has received 25 per cent. as royalties. C. A. Gehrman has been appointed mine superintendent and M. T. Morris superintendent of the mill, while Tom Lockhart, the president and general manager, will take a long and much needed rest. One of the romances of the desert attaches to the Florence. Parker is said to have grubstaked Lockhart for many years; from 10 to 35 years, according to various authorities. Lockhart finally found the Florence.

Joe Hutchinson is in Pittsburg making strenuous efforts to get the next American Mining Congress to come to Goldfield. The local Chamber of Commerce is supporting this effort. Goldfield has been maligned and wildcatted until it is almost impossible for an earnest inquirer to obtain authentic information regarding this camp which contains the mine that in 1907 produced more gold than any other mine in the world. It did not produce the largest tonnage nor pay the most dividends, but it did produce the most gold.

A recent decision by Judge O'Brien, of Tonopah, has been handed down which has a wide bearing on business interests in Goldfield, and as a result of which plans for further building are now being drawn. Owing to a question of original title, leasers of buildings and ground after obtaining possession have in many cases claimed squatters' rights, refusing further remuneration to the landlords and fighting dispossession. The opinion says: "To permit a person, who has been let into possession of one of these town lots under a lease from the original possessor, and after recognizing his title by the payment of rent or by accepting possession thereunder to repudiate his lease and the title under which he entered simply because the officials of the land office might cancel the mining claim upon which the title rests and afterward issue a townsite patent, would be to place a premium upon fraud, violation of personal covenants and other acts of more or less moral turpitude."

Two long tunnels on the Western Pacific railroad have been completed. The Flower lake tunnel is 5657 ft. long, and cuts under the Pequop mountains in the middle of Elko county. This tunnel was completed in 21 months. The Spring Garden tunnel at Beckworth pass is 7306 ft. long and was completed in 27 months. A regular train service has been inaugurated on the Western Pacific railroad from Salt Lake City to Shafter, where connection is made with the Nevada Northern road running to Ely.

It is still impossible to get production figures from the local ore-purchasing concerns, but it is certain that the production of Goldfield is pretty near the lowest in the history of the camp. This is due mainly to the fact that the main companies in the district no longer are letting leases. A large number of leases are still working, but the frantic production from bonanza leases, which yielded over half a million dollars per week, is a thing of the past.

Water has been found in one of the mines at Tonopah. Almost without exception the Goldfield mines are wet and show no unusual temperatures. But the Tonopah mines have been dry and have shown a high rate of temperature increase. In the Montana-Tonopah shaft temperature measurements showed an average increase of 1 deg. F. for every 43.5 ft. in depth, one reading going as high as 1 deg. for 36 ft. The water encountered between the 1250- and 1300-ft. level in the Belmont probably marks the water level of the camp. The determination of the nature of the ore deposits below water level will be eagerly awaited.

Butte

Dec. 10—On Friday of last week considerable excitement was caused in Butte and throughout the State by news received from Washington that President Roosevelt was considering the advisability of Government action in the courts for the purpose of enjoining the operation of the Washoe smelter at Anaconda, because of the injury the fumes from the smelter were causing to the forest reserves in the vicinity. Two years ago the farmers in Deer Lodge valley adjoining the smelter instituted an action in the Montana Federal Court for the same purpose, claiming that their farm products were ruined by the sulphur fumes. Many months were consumed in the hearing of the case before a special master in chancery appointed for the purpose, and volumes of testimony were taken. The findings of the Master in Chancery were submitted to Judge Hunt some months ago and are now held under advisement by him preparatory to rendering his decision.

When the news was heard in Butte it was received with indignation and disapproval on all sides. The closing of the smelter by temporary injunction or otherwise would also mean the closing of practically all the larger mines in the Butte district and would directly affect more than 100,000 persons who depend upon the mining industry for their livelihood. Mass meetings in Butte, Anaconda and other mining centers were held and resolutions telegraphed to the President and the Montana representatives at Washington urging that no action be taken until an opportunity be presented for hearing both sides of the controversy. As a result of the telegrams and a conference held at the White House between President Roosevelt and the representatives of the Amalgamated it is probable that no action will be taken by the Government until the feasibility of installing fume consumers at the smelter is determined.

Production of the Butte mines for November was about 28,400,000 lb. of copper. Of this amount the North Butte Company produced 3,900,000; Coalition, 2,300,000; Anaconda Company, 7,200,000; and Boston & Montana, 7,600,000 pounds.

The report of the United States Geological Survey for the year 1907 places Montana eighth in the list of mineral producers, with products of the value of $60,663,511.

Sylvanite, New Mexico

Dec. 7—During the week the Sylvanite Consolidated Mining Company was organized; Sol Camp is president, Marvin E. Ish, vice-president, C. H. Morse, secretary and S. M. Aguirre, treasurer. The company owns the Holcomb property, composed of eight claims, and is preparing to ship ore.

The most important deal last week was the sale of the Nederland and Oversight claims to C. C. Hamlin, G. F. Fry and E. C. Newcomb, of Colorado. C. H. Lawrence, of Chicago, bought three claims north of Sylvanite, while the Clark brothers, who were the original locators at Sylvanite, sold a claim to Goldfield men during the week.

The Clemmie, Wake-up Charlie and Broken Jug mines will begin to ship this week. The tunnel at the Wood mine, which was sold last week to Pierson Brothers, of Ouray, Colo., for $65,000, is now 300 ft. long; for half this distance the tunnel is in ore that averages over $30 a ton, select samples assaying as high as $967. The Sylvanite Queen Mining Company, composed of Bisbee business men, is sinking a shaft on the Cowboy claim south of Sylvanite.

El Paso men have organized the Gold Pass Mining Company to develop claims across the Playas valley about 15 miles from Sylvanite.

Calumet, Michigan

Dec. 12—At the annual meeting of the Arcadian Copper Company, to be held at Jersey City on Dec. 31, 1908, proposal to sell the company's portion of lands in section 16-55-33 will be taken up and steps taken toward the reorganization of the company. The plans are not fully decided upon but, in all probability, a new company will be organized under the laws of Michigan and will take over the lands and effects of the old company and an assessment may be called to furnish funds to resume operations.

A development company has been formed to fully explore the lands lying in section 16-55-33. A formation, believed to be the northern extension of the Baltic lode was recently disclosed and it is upon this formation that operations will be centered. James P. Edwards will be in direct charge of the work.

Denver

Dec. 12—The ore production of San Juan county for November is given at 20,000 tons, of which 1825 tons were shipped direct from Silverton to the smelters, the balance having to be beneficiated by concentration prior to shipment.

The Camp Bird dividend of 24 per cent. paid on Nov. 7, amounted to $196,800. The monthly dividends for the year are given at $787,200, and the total to date $4,608,504. This on a capitalization of five millions of dollars ought to give the British owners who get most of this money, a fairly good opinion of Colorado mining properties.

In the Cripple Creek district, the committee of assessors appointed for the purpose, are drafting a bill to appoint a Revenue Commission, whose duty it shall be to prepare a new revenue code for the State of Colorado. It is hoped that this bill will be adopted by the next legislature, as it will result in a more equitable enactment than that which now obtains, assessing non-producing property adjoining ground that is richly productive, as high as the latter.

In the same district, the dividends payable this month are stated to be as follows: Elkton Consolidated, $50,000; Requa Savage, Dec. 10, $4035; Acacia, Dec. 19, $14,389; Mary McKinney, Dec. 21, $28,000; El Paso, Dec. 25, $24,500; or very nearly $121,000 in all.

The Golden Cycle mill is credited with a November output of 9000 tons, which could be largely exceeded but for the reason that the company's mill has to take care of the treatment of custom ores under contract. The Portland output was upward of 9000 tons.

It is reported that the Westinghouse Electric Company has secured a site for a reservoir and power plant on the South Platte river, near Denver, which will supply electric current, for which there is a largely increasing demand, in Denver and the surrounding country. It is stated that the head secured by the dam [illegible] 20,000 h.p. in use.

The Central Colorado Power Company, which project entails the expenditure of about $20,000,000, is moving its headquarters from Colorado Springs to Denver, and it is stated has contracted to supply the Denver Gas and Electric Company with all the power it needs. The former company will obtain its energy from Shoshone, near Glenwood Springs, where a dam has been built which will furnish 20,000 h.p. Another dam and reservoir will be built at Gore Cañon, on the Moffat road, and another on Middle Boulder creek. It is stated that the total capacity of these three power plants when completed will be 81,000 kw. of electric energy.

Toronto

Dec. 12—A number of mining companies are being prosecuted by the Ontario Provincial government for violations of the Ontario Companies Act. For failure to comply with the provisions of the Act each director is liable to a fine of from $50 to $400. Several cases were tried recently before Police Magistrate Kingsford, Toronto. James H. Dixon, president of the Crown Jewel Mining Company was fined $200, and J. C. Ritchie, secretary-treasurer of the Gifford Extension, and secretary of the Gifford Cobalt companies were fined $200 for each company. Informations had been laid against the other directors of these companies, but Thomas Mulvey, who prosecuted the cases intimated that one fine for each company would be sufficient. Several other cases were adjourned.

Since these prosecutions were instituted companies offering stock for sale are complying with the law, and many have modified their announcements accordingly.

Dr. Eugene Haanel, Canadian Director of Mines, has left Ottawa for Sweden to investigate further the electric smelting process. As a result of the experiments in electric smelting undertaken by the Canadian government, at Sault Ste. Marie, Ont., under Doctor Haanel's supervision about two years ago, a leading Swedish firm of ironmasters undertook a series of experiments with a view of perfecting the system and has erected a plant at Dumnarfret, which is claimed to be superior to any yet designed. It employs 800 h.p. in place of the 250 h.p. used at Sault Ste. Marie, and on the same plan a 3000-h.p. furnace could be built, at a cost of $20,400 with a capacity of 10,000 tons of pig iron per year. The cost of producing pig iron is placed at $12.03 per ton, which is about three-quarters of the cost of production by existing electrical methods. Doctor Haanel has been specially invited to investigate the operation of the furnace, which will be started up on or about December 1. The Mines Department is keenly alive to the industrial importance of the question, as there are extensive deposits of iron ore in Ontario and Quebec, which cannot profitably be exploited by the ordinary methods on account of their distance from the fuel supply. The process of electric smelting would also render available large deposits which, owing to their high sulphur content, cannot be treated in ordinary blast furnaces; the electric furnace can successfully handle ores containing as high as 2.5 per cent. of sulphur. While in Europe Doctor Haanel will also devote some attention to the latest results of experiments in the use of producer-gas engines for industrial purposes and the employment of bituminous coal for generating producer gas.

The Ottawa mint has received about 70 oz. of gold in bars from the Doctor Reddick mine at Larder lake. It will be coined into British sovereigns, and they will be the first gold coins made in Canada. The mint has at present no dies for stamping Canadian gold coins and has the privilege during this year of minting English sovereigns.

The Ottawa customs department has issued a circular to the collectors at Winnipeg, Brandon and other western points, calling attention to the number of fatal accidents from coal-oil explosions, and enjoining vigilance to prevent the importation of oil unless it complies absolutely with the terms of the petroleum inspection act.

London

Dec. 5—An interesting experiment in co-partnership between employers and employees has recently been started at the ship-building yard at Hartlepool. The head of the works, Sir Christopher Furness, in order to avoid strikes or lockouts, which he complained were far too frequent in England, and which were destroying the ship-building trade of the country, made two offers to his workmen through the trade unions. One was to sell the works outright to the trade unions at a price to be fixed by arbitration, and the other was to take the employees into partnership, a condition of the bargain being that there should be no strike and no lockout, all differences to be settled by a board on which masters and men would be properly represented. If this board failed to agree, the controversy was to be settled by an impartial tribunal. The second proposal has now been accepted by the workmen and the scheme is to be tried for 12 months.

The principle of co-partnership is one which will be generally accepted as sound. When men have a direct personal stake in the work that they are doing, they will naturally take a greater interest in it than when they work merely as wage earners. The experiment at Hartlepool will be watched with much interest, for if successful other industries, including mines, which suffer quite as much from strikes as shipbuilding or engineering works will probably not be slow to follow the example.

Quicksilver Mines—The Karabounan Mercury Syndicate, with mines in Asia Minor, reports that for the year ended Sept. 30, 1908, the value of quicksilver sold amounted to £23,076. The quantity is not stated. The profits for the year amounted [illegible]

Poderosa Mines, Chile—The Poderosa Mining Company, Ltd., is the name of a new company formed to acquire from the Compañia Minera Poderosa de Collahuasi, of Valparaiso, Chile, certain copper mines situated in the province of Tarapaca. The purchase price is £480,000. The capital of the company is £500,000 and £20,000 in £5 shares is now being offered for subscription at 10s. premium. Regular shipments of ore commenced in January last. In October a shipment was made of 1523 tons of ore, containing 25 per cent. copper and 12 oz. of silver to the ton. The general manager of the Chilean company, Robert Hawxhurst, estimated the ore reserves on June 30, 1908, at 100,000 tons of an average value of 25 per cent. copper and 12 oz. silver per ton.

New Zealand Crown Mines—The report of the New Zealand Crown Mines Company, Ltd., for the year ended Aug. 31, 1908, states that the operations have resulted in a loss of £920. Difficulty has been experienced in keeping the water out of the lower levels owing to insufficient pumping plant, and it has now been decided to install new electrically driven pumps. During the erection of this plant mining operations have been discontinued. During the year under review 20,190 tons of ore were crushed and treated from which bullion valued at £43,320 was recovered. The extraction obtained was 88.02 per cent. The cost of mining is given at 15s. per ton, including mining, maintenance and repairs, miscellaneous charges, [illegible] exclusive of development. Milling cost was 10.09s. per ton. The amount charged to development account was £11,342, which was written off in the profit and loss account.

The new power station is to contain one Belliss-Morcom three-crank triple-expansion engine, one 550-kw. three-phase generator, one 25-kw. exciter, two Babcock & Wilson boilers, each having 1827 ft. heating surface, one surface condenser and one feed-water heater and filter. One 750-h.p. turbine with governor will be erected to drive the generator by water power, which is available for a considerable period of the year. The transmission line will consist of three bare 37/14 stranded conductors, which will carry the power to the mine, and of three core cables which will carry the power down the shaft to the motors. The plant will [illegible] gal. water per minute from a depth of 1000 ft. The motors are each 250 h.p., of the three-phase type.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Jefferson County

Tennessee Coal, Iron and Railroad Company—This company is erecting a large and well equipped chemical laboratory at Ensley, in connection with the steel works and blast furnaces there. J. R. Harris, chief chemist of the Ensley division, will have charge. The company is also building a laboratory at Pratt City, to be used in connection with the Pratt coal mines and washers. It will be in charge of H. R. de Holl, chief chemist of the coal mines division, whose office is in Birmingham.

California

Amador County

Lavazzo—Where the tunnel tapped the vein in this mine at Pine Grove there is 6 in. of $60 rock. The five-stamp mill will shortly start up.

Butte County

Bills—In this gravel mine near Wyandotte, James Wheeler, superintendent, good pay gravel has been struck, but with it considerable water so that a pump has been installed.

Calaveras County

Etna King—At this property, Angels, F. F. Ames superintendent, a new 20-stamp mill is being put in place, with concentrators.

Gobbi Ranch—Lagormasino & Quierolo, who are working this mine on the Gobbi ranch, have again made a strike of the "black metal."

Heckendorn—This mine is about to be started up again after an idleness of over 40 years. The quartz mill from the Black Wonder mine is being placed on the ground. The mine is near West Point.

Utica Mining Company—This company at Angels is keeping the Madison mill busy on rock from the Gold Cliff, but the Cross and Stickles mines are not running at present.

El Dorado County

Big Cañon—This mine, also known as the Oro Fino, has been unwatered and a ditch to supply water for power, etc., has been finished.

Inyo County

Copper—Officials of the Standard Oil Company have bought from Owen Jones a copper mine near Ballarat, where there is a 30-ft. vein. Extensive development work will be commenced at once.

Mariposa County

Pocket—R. B. Stockton has struck a rich pocket in the Santa Rosa mine a few miles from Mariposa. Mr. Stockton has been prospecting the mine for several years.

Merced County

Dredging Ground—A dredge-ground prospecting outfit has been set at work on the Ruddle, Dale and Buckley properties along the Merced river below the holdings, being operated by the Yosemite Gold Dredging Company, near Snelling.

Mono County

Placers—John Conway has transferred his ranch near Mono lake to Mr. Siebel, representing Chicago men, who will begin placer-mining operations on a large scale.

Nevada County

Black Bear—The tunnel on this mine has been driven far enough to prove the permanency of the ledge and development will now go ahead on a larger scale. A compressor has been ordered and a new hoist will be built.

Nevada County

Bear River Tunnel Company—This company has been organized at Grass Valley, with Ben Penhall as superintendent, to develop further the Bear river mines which have for the past two years been worked by a prospector's company of local men. The tunnel is now in 500 feet.

Grover & Murphy—These claims near Grass Valley have been bonded to Honolulu capitalists and a hoisting and pumping plant are being put up. A double-compartment incline shaft is to be sunk.

Placer County

Fighting Bob—This new quartz mine on the American river hill about a mile from Auburn, is showing up ore of good milling value. The owner is Charles Gaus, of Auburn.

Bellevue—At this mine, Ophir, P. Lozano, superintendent, the last crushing of 110 tons yielded $2460. Tribute workers are making about $5 per day.

Plumas County

Crown Point—At this mine, Squirrel creek, 12 miles east of Quincy, H. Gobert, owner, the last crushing yielded $60 per ton. The leases have run out and Mr. Gobert is now mining the property himself. The 3-ft. ledge carries a very rich streak.

Shasta County

Shasta King—Work is being resumed on this mine and the Balaklala, the starting of two furnaces in the Coram smelter giving employment to all the idle miners in that vicinity.

Sierra County

Omega—This company near Forest City, J. L. Green, manager, has completed its new mill and is now crushing high-grade gravel.

Sierra County

Crittenden—Frye, Winrod & Blivens have taken a bond on this mine in Sailor ravine and have put two shifts at work in the lower tunnel. The mine is an old one, but has not been worked for some time.

Siskiyou County

Happy Camp—This hydraulic claim has been sold by the sheriff for $10,500 to Reeves Davis, of San Francisco. The Eastern company, which owned it, spent about $200,000 and quit some years ago.

Solano County

St. Johns Quicksilver Mining Company—This company, of which A. Tredgidgo is manager, has decided to erect a 60-ton fine-ore furnace. A new shaft will be sunk this winter.

Trinity County

Mountain Boomer—This mine at New River is being operated by R. A. Skinner & Co. as lessees. The last clean-up showed values of $28 per ton.

Yosemite Improvement Company—This company is prospecting the bed of the Trinity river with a view to putting in a dredge. The company already has a dredge at Hamburg Bar, Siskiyou county.

Tuolumne County

Jupiter—At this mine near Jacksonville, owned by Bolton, Foster & Vance, they have been pocket mining, but the finds are such that it has been determined to develop for a milling proposition.

McCormick & McPherson—A new mill is being installed at this mine near Jacksonville, and the mine is idle pending its completion.

Joy Mining Company—This company is working the Mother Lode and Kelly mines near Jacksonville and has sunk a 400-ft.

three-compartment shaft and finished 900 ft. of underground workings.

Colorado

Larimer County

A new placer district is being opened in the southwest corner of North Park, 30 miles from Steamboat Springs. A number of claims have been taken up, and it is proposed to organize a dredging company to operate on a large scale.

Teller County—Cripple Creek

Free Coinage—Reid & Young, lessees this company's Wilson claim on Bull hill, are making heavy shipments to clean up work on their lease, which will expire Jan. 1 next.

Gould—Laburge & Co., leasing in this company's mine on Raven hill, are obtaining good ore from a drift on the Doctor vein.

Rubie—A promising orebody has been opened at a depth of 1265 ft. in this mine on Bull hill. It is operated by the Rubie Leasing Company.

Indiana

Blackford County

The week in oil shows a decided increase in activity. The number of wells completed in this county during the week was 11, all producers.

Cass County

The additional steel mills in this country and their recent renewed activity are greatly stimulating quarrying in this territory. The Casparis Stone Company, of Logansport, has received a contract which will keep the Kenneth quarries, near that place, and other quarries operated by the company busy. The contract is with the Lackawanna Steel Company, of Buffalo, N. Y., for the delivery of 3000 tons of limestone daily for a period of 25 years. It has also a contract with the Indiana Steel Company, of Gary, and two shifts are being worked at the quarries to supply the demand. New quarries are to be opened.

Greene County

Fourteen tons of iron ore mined from a ledge of the Gobin farm, a few miles from Bloomfield, were shipped to Linton a week ago to be given a critical test of value. That part of the country is underlaid with ore which is of easy access on Richland creek. Years ago, before the advent of railroads, there were iron furnaces a mile east of Bloomfield; the ore was smelted and pig iron sent on flat boats down White river and the Wabash, finally reaching Louisville and other river towns. On account of the opening of iron ore in other parts of the country with better shipping facilities the Indiana field was abandoned. But since the recent completion of the Indianapolis Southern railroad, which pierces the heart of the ironfields, the business is being revived. The railroad company has leased hundreds of acres in this field, and it is reported that this movement is in the interest of the Steel Corporation. If the ore now being tested proves to be of sufficient richness to pay for working there will be further developments.

Clover Leaf—An explosion of gas in this mine, of the Shirley Hill Coal Company on Dec. 9, resulted in a fire which threw 250 miners out of work for several days. The night pumper went into the shaft and the gas ignited from his lamp. By dropping the moment the explosion took place he was not seriously injured. Owing to the dense smoke no one ventured into the mine. The loss cannot be estimated until the fire is extinguished.

Michigan

Copper

Franklin—The crosscut from the 24th level of No. 1 shaft is entering the Pewabic lode and as soon as provisions can be made drifting will be started. The lode opened in the level above was exceptionally rich. The new shaft that is being sunk to operate this lode is down about 450 ft. No. 1 shaft is put down on the conglomerate lode.

Ojibway—Sinking is continuing in both shafts of this company; No. 1 is down about 575 ft. and No. 2 is 550 ft. deep. At No. 2 shaft crosscutting has been discontinued after cutting the lode, which was somewhat shattered, but of a better character than the ground opened in the level above, indicating improvement with depth. In No. 1 shaft the crosscut from the first or 500-ft. level has cut the second, or west lode of the series but it is not as well charged with copper as the lode cut in proximity to the shaft.

Atlantic—The first rock shipment from section 16 shaft has been put through the mill and ran about 28 lb. of copper to the ton. The rock coming from the openings is being stored in cars and when sufficient quantity has been obtained the second run will be made. The shaft is sinking below the 18th level and from this level a crosscut is being driven to open the lode. Openings south from the 12th, 13th and 15th levels are encountering a good grade of rock.

Superior—This company has made its first shipment of rock to the Atlantic mill, but will not be in position to maintain regular shipment until its hoisting and compressor plants go into regular service which, barring some unforeseen delay, will be early next year. The rock was not put through the mill, but stored in the bins.

Victoria—This company has encountered a favorable-looking formation in the breast of the tunnel it is driving and also in the crosscut from the 22d level of its shaft. Attention will be centered upon these two points and their merits fully established. The assessment recently levied will provide ample funds to carry on this exploration.

Montana

Butte District

[illegible] the new gold dredge which has been in the course of construction for the past few months will be completed and ready for operation by the first of the year. The pooling agreement of the company's stock will expire Jan. 1.

[illegible] were put to work yesterday sinking a new two-compartment shaft on the Right Bower claim, north of Meaderville. By means of this shaft the adjoining Mattie and Adelaide claims will also be developed.

Fergus County

[illegible] this week the coal miners who have been out since Nov. 18 returned to work. While the exact terms of the settlement are not known it is understood that both the miners and the operators have made concessions. Vice-president White, of the United Mine Workers of America, came from Indianapolis to conduct the negotiations.

Cascade County

Great Falls Water Power and Townsite [illegible] a high-power line from Butte to Great Falls has recently been completed. When the power dam at Rainbow Falls is completed a large amount of the power used in the Butte mines will be furnished by the company.

Carbon County

[illegible] The work of repairing the damage caused by the fire of Nov. 20 in the coal mine at Red Lodge is progressing steadily. For a while the Finnish miners refused to work in the part of the mine where their fellow workmen were incinerated, but later were persuaded to do so.

Jefferson County

Boston & Corbin—The time within which stockholders could subscribe to the new issue of stock at $25 per share expired about two weeks ago. Since the issued stock was quoted at $23 in the market, but few of the stockholders took advantage of the offer and practically the entire 1000 shares were taken by President Amster.

Madison County

[illegible] formerly superintendent of the Pittsmont mine in Butte, has secured a lease and bond on the McKee gold mine, 20 miles from Norris. The property is being worked through four adits having an aggregate length of [illegible] n the property last summer.

POWELL COUNTY

True Blue Mine—C. H. & E. H. Powers have recently purchased machinery in Butte which they will place on the True Blue mine, four miles southeast of Iron mountain. The shaft on the property is down about 150 ft. It is the intention to sink to the 450-ft. level, with crosscuts every 50 feet.

Nevada

ESMERALDA COUNTY—BLAIR

McNamara—At this old lead mine 18 miles south of Blair and on the north side of the Palmetto range, leasers have opened up new orebodies in a winze sunk from the tunnel at a distance of 600 ft. from the portal. A wagon road is being built to the mine. The ore averages 50 per cent. lead, 24 oz. silver, and $1.50 gold per ton.

ESMERALDA COUNTY—GOLDFIELD

Blue Bull—F. B. Knickerbocker has secured an 18-month lease on a block of ground, 400x600 ft. in size, at the north end of the Blue Bull claim. From the Simmerone, Lone Star and Commonwealth adjoining, considerable ore has been extracted from shallow workings. On the Blue Bull there is a vein, 18x24 in. wide, containing shipping ore.

Eureka Group—This group near Diamondfield has resumed work. Trenching is being done. John O. Knight, of Los Angeles, is secretary of the new company, which has taken over these eight claims.

Velvet—At the Ricker lease rich ore has been found at a depth of only 20 ft. The paystreak is only a few inches wide, but assays very high. Both the lessees and the management are pushing work to develop this new vein.

Florence Consolidated—This lease on the Cornishman claim of the Florence has closed down, for, owing to the short time remaining before the expiration of the lease and the refusal of the parent company to grant an extension, it has been deemed advisable not to do any more exploration. The machinery will be moved to a lease which the principal stockholders have secured on the Red Top Extension ground.

Combination Fraction—Ore shipments have been resumed, four carloads having been sent to the smelters last week.

Hazel Goldfield—The recent strike in the Hazel lease on the Last Chance claim of the Laguna has been shown to be the extension of the Red Top vein. The ore is holding out both in width and in value. A station has been cut at the 740-ft. level; drifts are being driven both ways on the ore. The shaft will be sunk another 100 ft. as soon as possible.

Consolidated—The Clermont shaft is now nearly 800 ft. deep, being now the deepest shaft in the camp. An increased flow of water has necessitated the installation of another pump.

Mohawk Ledge—This lease on the Gold Wedge claim has struck ore on the 300-ft. level, and has resumed shipments. Work is being pushed to find this vein on the 450-ft. level.

Vantage Extraction Company—This company is to erect a small testing plant later to be replaced by a custom mill employing the Porter-Clark cyanide process patents for which it controls. The process is claimed to effect very high extraction of gold and silver ores of all sorts with an inexpensive plant, no amalgamation nor concentration being necessary.

ESMERALDA COUNTY—GOLD MOUNTAIN

Royal Flush—Eight sets of leasers are now at work on the Royal Flush; 40 miners are employed. Considerable excitement is shown here due to the probable finding in this property of the famous lost Breyfogle mine.

ESMERALDA COUNTY—HORNSILVER

Great Western—A traction wagon driven by a 50-h.p. gasolene engine has been sent to haul ore from the mine to Cuprite.

Redemption Gold Mining and Milling Company—On the 200-ft. level a vein of lead-zinc ore about 7 ft. wide and averaging about $40 per ton has been found. This oreshoot has been developed for a length of 75 ft. Ore is being sacked for shipment.

ESMERALDA COUNTY—RAWHIDE

Rawhide Queen—The Bradshaw lease on the southeast side of Balloon hill is opening up what promises to be one of the biggest bodies of high-grade ore in the Rawhide district. The entire bottom of the shaft is in rich milling ore where the high-grade streak has widened to 18 in.; 10 sacks of specimen ore, worth between $200 and $300 per sack, have been sorted out of the ore from this vein.

ESMERALDA COUNTY—WAGNER

Wagner Copper Mining Company—Work has been resumed on this property on the railroad about 25 miles south of Goldfield. The shaft, now 400 ft. deep, will be sunk to water level.

HUMBOLDT COUNTY—LOVELOCKS

Tungsten—A shipment of 30 tons of scheelite has been made from Brown's station. If the results of this trial shipment are satisfactory the property will be developed by De Gorlia & Atkins, the owners.

HUMBOLDT COUNTY—NATIONAL

National Mining Company—J. H. MacMillan and G. B. Holleran, of Goldfield, have purchased the Fairview, Fairview No. 1, Charleston, and West Virginia claims from Jesse Workman, on behalf of the National Mining Company. Work is in progress by both the company and leasers.

HUMBOLDT COUNTY—SEVEN TROUGHS

Mazuma Hills—From 100 tons of ore just run through the mill bullion worth about $11,000 was obtained. The run took 12 days. Assays proved the saving on this high-grade ore satisfactory.

Regan Lease—The new pump is handling 60,000 gal. of water a day. Underground development will soon be resumed on this lease which has been drowned out for about two months.

LANDER COUNTY—BATTLE MOUNTAIN

Kaurohat Mine—Machinery for the 200-ton mill for this mine in Jefferson cañon has reached Battle Mountain and is being hauled to the property. It is expected that the mill will start running by February.

Glasgow Western Exploration Company—A Keystone drill has arrived and is to be used prospecting on the Copper Basin property six miles west of town. It is the intention to drill to a depth of 1000 ft. This same company is running a long tunnel on the Copper Cañon property eight miles farther from town.

LINCOLN COUNTY—GOOD SPRINGS

Monte Cristo—Large zinc deposits are being developed in this group near Good Springs. The veins are 4 to 14 ft. wide.

LINCOLN COUNTY—PIOCHE

Pioche Consolidated—The property of this company at Pioche has been purchased by the Metals Exploration Company, of Goldfield, in which J. R. Davis, of Loftus-Davis, owns a large interest. The property consists of 13 claims known as the Point mine. Active development will be started at once by the new company.

LYON COUNTY—YERINGTON

Nevada-Douglas—A. J. Orem and a number of directors have visited the property for the purpose of selecting a smelter site for the big plant which the company expects to build very soon.

Utah-Yerington—This company has settled the litigation which has been going on for the last two years and has acquired the equity of the Home Bee in all the property in question. The settlement was on a stock basis, but the details of the settlement are not made public.

NYE COUNTY—CLIFFORD

The townsite name has been changed to Helena, although the district continues to be known as Clifford.

Broken Hills—The last carload shipment averaged $197.12 per ton. It carried 104 oz. silver and $145 gold per ton.

NYE COUNTY—JOHNNIE

Crown Point—The following bullion shipments have been made: Nov. 8, $1900; Nov. 15, $1700; Nov. 20, $2400; Nov. 23, $1800; another brick worth $2000 is now ready for shipment. This gold has been obtained since Nov. 1 from [illegible] crushed by a single stamp which has been working only 12 hours a day.

NYE COUNTY—MANHATTAN

Ioquima Copper Company—[illegible] ago at a depth of 175 ft. so large a [illegible] water was met with that work had to be stopped. A pump has now arrived and is being installed. On that level [illegible] ft. wide and carrying from 3½ to 5 [illegible] copper and $6 to $8 gold per ton [illegible] found. This property is on the extreme eastern edge of the camp and is on the west side of the Ralston valley.

NYE COUNTY—TONOPAH

Production for the week ending Nov. 28 amounted to 5387 tons of ore valued at $134,675. The Tonopah Mining Company mined 2050 tons; Belmont, [illegible] tons; Montana Tonopah, 732 tons; Midway, 100 tons; MacNamara, 350 tons; West End, 205 tons; Jim Butler, 250 tons.

Tonopah Mining Company—Last week 487½ ft. of new ground was broken, this being a record week's work. One-third of this was in the Silver Top ground, the balance in the Mizpah and Red Plume claims.

Belmont—The orebody on which the winze from the 1000-ft. level was sunk has not yet been found on the 1100-ft. level, although the winze was in ore for 80 ft. On the lower level several veins have been cut; the country contains [illegible] quartz, but owing to the faulting and fracturing that has broken the [illegible] badly the main vein has not been found.

West End—On the 200-ft. level the west drift is being driven to tap the ore opened up in the level above. The face shows bunches of rich ore, the balance is [illegible] grade material.

STOREY COUNTY—COMSTOCK

For the week ending Nov. 28 the mines on the Comstock lode produced 545 cars of ore valued at $15,217. The Ophir produced 421 cars; Consolidated Virginia, 46; Mexican, 18 cars.

New Mexico

GRANT COUNTY

Comanche Mining and Smelting Company—Seth E. Hazzard has paid off, dollar for dollar, the indebtedness of this company, whose properties are near Silver City. Almost all of the stockholders of the Comanche have entered into an agreement with the recently organized Savanna Copper Company to accept stock of the new concern so that the Savanna will own and control the property of the old company. As soon as matters [illegible] and everything is in shape, the smelter will again be blown in.

SOCORRO COUNTY

Enterprise Mining Company—The machinery for the cyanide plant being built [illegible] has arrived at Silver City, whence it will [illegible]

[illegible] Whitewater river has arrived at Silver City. [illegible]

Pennsylvania

ANTHRACITE COAL

The Delaware, Lackawanna & Western and a number of other coal-mining companies [illegible] by the board of assessors of Lackawanna county. [illegible] and assessed the lands at $100, half the nominal value. The appeals are taken on the ground that the valuation was put too [illegible] face property.

Suffolk Colliery—This colliery, near Mahanoy City, caught fire Dec. 9 from a [illegible] promptly, and it has been necessary to [illegible]

[illegible]

	[illegible]	[illegible]
Earnings	[illegible]	[illegible]
Expenses	[illegible]	[illegible]
Net earnings	[illegible]	[illegible]

[illegible] earnings decreased $3,061,574, and the expenses $2,496,337; leaving a decrease of [illegible]

Texas

Petroleum production in the southeast [illegible] ported by the *Oil Investor's Journal* at 1,003,950 bbl., an increase of 60,210 bbl. over October. Shipments by rail were 555,335 bbl.; by sea, 234,795; delivered to refineries, 150,000; total, 940,130 bbl. This does not include oil used in the field.

There were 48 new wells completed in November, 41 being oil producers, one a gas producer and six dry holes. There [illegible]

[illegible] plant in El Paso has been disposed of at sheriff's sale as the result of foreclosures growing out of the suit of J. C. Lackland and others against the Federal Copper Company and W. C. Greene.

Utah

[illegible] railroad.

[illegible] northeast from the shaft.

PIUTE COUNTY

[illegible] copper-sulphide deposit already cut in No [illegible] from 2½ to 5 per cent. copper. On the Jennie Maud claim a silver-lead vein has been developed. More than enough work [illegible]

[illegible] sacked from a two-foot paystreak in the wide vein on this property.

SUMMIT COUNTY

[illegible] out. Mining will soon be resumed.

Wisconsin

[illegible]

Platteville—The Cruson has resumed, making seven active producers here. The [illegible] Toadville mines.

[illegible] are running again, including the Sunrise, Senator, Union Zinc, Coker, Washburn, Gruno, Slack, Peni and Peacock. The 50-ton mill equipment of the old Eberle, at Lancaster, is being moved to the Squirrel. The Ellesworth shaft has been equipped with two 12-in. lift p[illegible] power plant and compl[illegible] water level let by contract. The Big Tom [illegible]

Galena—The Royal Princess, a new producer which has accumulated a stock of 1000 tons of zinc concentrates, has made its first sale of ore. It is shipping under contract to the Platteville Separating Company.

Hoosier—This company has resumed shaft-sinking after installing two Columbus vertical pumps.

Klar-Piquette—This mine has developed heavy sheet jack in the east end workings, which will enable it to double its former output of 10 tons daily; the ore makes a 50 per cent. zinc concentrate.

Linden—The Pollard lease was sold Dec. 1 for $15,000 to Indianapolis men, represented by Jas. Billingsly, of Galena. The property adjoins the Dark Horse and was opened up by shaft last summer. A 50-ton mill will be erected by the new company.

Platteville—The Enterprise mine, the pioneer zinc producer in the Platteville camp, has resumed operations after a shut down of a year.

Philippine Islands

BENGUET

Benguet Consolidated Mining Company—This company has two small stamp mills and a cyanide plant steadily at work. The September yield was 225 oz. gold and 321 lb. cyanide bullion. The ore milled averages about $7 per ton. The company is now driving an adit which will drain the mine, and also serve as an outlet for ore. M. A. Clark is president; J. H. Seifert, secretary and treasurer.

Bua Mining Company—This company has been carrying development work on a group of 36 claims in Benguet, and has now completed the erection of a stamp mill and cyanide plant.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Dec. 5 were as follows: Coniagas, 59,000 lb.; Crown Reserve, 176,000; City of Cobalt, 85,140; La Rose, 282,000; McKinley-Darragh, 60,000; Nipissing, 237,870; O'Brien, 128,030; Temiskaming 60,000; Temiskaming & Hudson Bay, 60,000; Trethewey 127,200. Total 1,275,240 pounds.

Foster-Cobalt—A report just issued from Manager MacDonald shows that there are now 1745 ft. of drifts and crosscuts, 519 ft. of shafts, and 60 ft. of winzes. Describing the workings in detail it shows that the mine has run out of silver ore and is working in several places in cobalt ore in the hope of striking new silver deposits.

Nova Scotia—At the annual meeting held in Montreal the financial statement showed a profit for the year on ore shipments of $104,117. Screenings, ready for shipment and to be sold during the winter, were valued at $150,000, and second-class ore, to be disposed of during the next six months, was estimated at $100,000. The cost of ore extraction during the year was $103,198 leaving a surplus on ore account of $250,919. The orebody exposed in the mine varies from 4 to 8 ft. wide and has been tapped on the lowest or 165-ft. level where some rich silver veins have also been found.

Temiskaming—A dividend of 6 per cent. has been declared payable Jan. 1, 1909. The drift on the 200-ft. level has been extended into the adjoining Gans property.

NOVA SCOTIA

Dominion Coal Company—The output of coal for November was 244,304 tons, as compared with 385,811 tons for November, 1907.

Mexico

Proposed Mining Law—According to late press despatches the Mexican Congress closed on Dec. 15 without taking action on the proposed mining law which has been under discussion since last winter. Congress will convene again in April.

CHIHUAHUA

Parral Output—The production of the camp for the week ending Dec. 4 was 7510 tons, as compared with 9155 tons for the preceding week. About two-fifths of this product was treated at local milling plants.

Mexico Consolidated—The affairs of this company, which has extensive holdings in the Parral district, have been reorganized, J. A. Coram retiring from the presidency and management, and Frederico Stallforth succeeding him. Frederico Larsen is now treasurer and W. J. Freeman is superintendent of mines and assistant treasurer. The new cyanide plant is in successful commission.

International Gold Mines Company—This company, operating the El Socorro and other mines in the Ocampo district, will start up its new cyanide plant about Jan. 1. Col. J. H. Pender is the manager in charge.

Rio Tinto—This company's 300-ton copper-matting plant will be blown in during the present month. Custom ores of northern Mexico, as well as ores of the Terrazas district, will be handled.

American Smelting and Refining Company—The third furnace at the Chihuahua plant has been blown in and the daily tonnage now treated amounts to 400 tons. An increased ore supply has been provided for.

Cia des Mines de Chihuahua—This French-capitalized company, of which M. H. Thofehrn is general manager and M. G. Conein commercial agent, has begun development work at its Sogusta denouncement of 190 pertenencias in the Naica section. An installation of sinking machinery is planned.

Greene Gold-Silver—An exhaustive examination of these properties has lately been made by engineers representing the El Oro interests of El Oro, Mexico. It is reported at Chihuahua that the Concheño-Navidad properties are receiving particular attention and may be made the basis of a new working company. C. C. Chase, the general manager at the time of the shutdown, is now at the mines.

La Reina de Plata—Three carlots of ore are being sent out weekly from this Santa Eulalia mine, of which Capt. Lindsay Brown is manager. The ore runs approximately 60 oz. silver, but a small minable body of 1500-oz. silver ore is reported in lately opened ground.

Durazno—A 50-ton cyanide plant is under construction by this Pittsburg company, operating the Durazno and Tetamoa properties in the Chinipas section. Considerable high-grade gold-silver ore has been mined at both properties and a tonnage of cyaniding ore is available on the dumps and in the stopes.

GUANAJUATO

Production—The value of the ores and concentrates that left this camp for the smelters at Aguascalientes the week ending Dec. 4 were valued at $113,000 as against $116,000 for the previous week. The bullion sent to the Mexico City refineries was valued at $172,000 while $10,000 worth was sent direct by one shipper to New York, making a total of $182,000 for the past week as against $185,000 for the previous week.

Guanajuato-Jalisco Development Company—This company has been formed in New York by Dwight Furness, head of the Dwight Furness Company, and formerly consul of Guanajuato. The capital stock is $4,000,000. James C. Hinchcliffe of New Jersey is president; Thomas H. Wilson, secretary, and Walter Bamford, treasurer. Dwight Furness will be resident manager at Guanajuato. The company has undertaken the development of the following six groups of mines: The Agua Blanca group, a copper property in Jalisco; Dolores group, gold and silver property, Guanajuato; Calabasa group, a gold, lead, silver and copper property in Jalisco, and the San Gregoria, Cabrestante and Sevillana groups in Guanajuato. These six groups of mines cover nearly 1000 acres of highly mineralized territory. Already there has been installed on these properties milling plants, hoisting machinery, buildings and equipments valued at $350,000, gold.

DURANGO

Durango Iron Works—Arrangements are reported to have been made to resume work at the iron smelting and machine works in the city of Durango. Funds are said to have been secured from American capitalists.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 16—The coal trade in the West continues to gain very slowly, the steam coal trade shows the greater improvement, as manufacturing plants are buying a little more freely. They do not, however, show any general disposition to put in stocks ahead. In most of the larger centers contracting has been very slow so far, buyers generally seeming to prefer to take the risks of the open market. Domestic trade is generally dull, on account of the continued mild weather. December is proving a very quiet month, chiefly for this reason.

The Seaboard bituminous trade is quieter than for some weeks past. Very little business is being done in steam coal just now, and manufacturers seem to be taking matters very easily.

Anthracite is a weather market, and it has not been cold enough to start up the trade, which is about as dull as can be, for December. Supplies are more than equal to all demands, and it looks as if a good deal of coal was being stored.

By-product Coke Oven Transfer—The American Coal Products Company announces that it has sold its by-product coke-oven interests heretofore conducted by a subsidiary company—the United Coke and Gas Company—to the Oberschlesische Kokswerke & Chemische Fabriken Aktiengesellschaft of Berlin, Germany, the transfer to take effect Jan. 1. A new company is to be formed to be called the German-American Coke and Gas Company, with headquarters in New York, and a capital of $2,000,000. Of this $500,000 is to be paid in in cash at once. Director Wilhelm Altpeter, the head of the construction and operating departments of the Oberschlesische Kokswerke & Chemische Fabriken in Europe, will act as consulting engineer for the new company. The American Coal Products Company will have a stock interest in the German-American Coke and Gas Company. The Oberschlesische Kokswerke & Chemische Fabriken is one of the largest by-product coke-oven companies in Germany. The American Coal Products Company will henceforth give its entire attention to the manufacture and disposal of tar products and ammonia. The German-American Coke and Gas Company comes into possession of all the by-product coke-oven patents heretofore exploited by the United Coke and Gas Company, including the Otto-Hoffmann system, and the more recent designs known as the United-Otto system.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania lines east of Pittsburg and Erie, year to Dec. 5, in short tons.

	1907	1908	Changes
Anthracite	[illegible]	[illegible]	[illegible]
Bituminous	[illegible]	[illegible]	[illegible]
Coke	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total decrease this year to date was 22 per cent.

Coal tonnage of Chesapeake & Ohio Railway, four months, July 1 to Oct. 31, short tons:

	Coal	Coke	Total
New River	[illegible]	[illegible]	[illegible]
Kanawha	[illegible]	[illegible]	[illegible]
Kentucky	[illegible]	[illegible]	[illegible]
Connecting lines	[illegible]	[illegible]	[illegible]
Total	**4,141,892**	**99,570**	**4,241,462**
Total, 1907	**4,068,243**	**161,013**	**4,249,256**

Deliveries this year to points west of mines 2,158,604 tons coal and [illegible] coke; points east, 101,252 tons coal and 40,980 coke; tidewater, 1,588,376 tons coal; anthracite to line points, 3660 tons.

Coal passing through the Sault Ste. Marie canal, season to Dec. 1, short tons:

	1907	1908	Changes
Anthracite	[illegible]	[illegible]	[illegible]
Bituminous	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total decrease this year was 12 per cent.

New York

ANTHRACITE

Dec. 16—The all-rail trade is good, but tidewater business is dull. Both prepared and small steam sizes are in good supply.

Schedule prices are $4.75 for broken and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.90@2; barley, $[illegible]. All prices are f.o.b. New York harbor points.

BITUMINOUS

Little interest is shown in the soft-coal market in all consuming territories, especially in New York harbor. Good grades of steam coal fetch $2.45@2.65 with poorer grades quoted as low as $2.30. There seems to be some disposition to contract for slack coal for the whole of next year at prices ranging around 70c. per ton at the mines. Transportation is good and cars are in sufficient supply.

In the Coastwise-vessel trade vessels are plentiful and are finding it difficult to obtain charters. Freight rates, however, remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, [illegible]; Lynn, Newburyport and Bath, 80@85c.; [illegible] per ton.

Birmingham

Dec. 14—Coal operations in Alabama show a little more improvement, and in some places the normal output has again been reached. The production promises to be very good through December. The [illegible] ence as yet by car shortage, and none is yet in sight. The output for the year will show a decided falling off as compared to [illegible] December.

The coke situation is still [illegible] Alabama. [illegible] cast-iron pipe producers.

Chicago

Dec. 14—[illegible] the Chicago market, although the [illegible] of continued cold weather and the [illegible] products to this market undoubtedly keeps dealers in the [illegible]

Anthracite and bituminous domestic are closely responsive to weather conditions, and the best informed dealers look for active sales only with the coming of cold weather. Lump and egg from Illinois and Indiana mines bring $1.75@2.75; run-of-mine, $1.65@1.75, and screenings $1@1.65. The demand for steam coal is increasing, though slowly. Manufacturing industries are inclined to make contracts more heavily than before for many months.

Hocking Valley coal in general brings $3.15, the circular price, with the demand good. Youghiogheny moves steadily on contracts at $3 for ¾-in. steam and $3.15 for ¾-in. gas. Pittsburg No. 8 is quiet at $2.75 for ¾-in. lump. Brazil block is fairly active at about $3. Smokeless ranges from $2.70 for the lowest grade, run-of-mine, to $3.15 for the highest grade with lump and egg $3.15@4.05 per ton.

Indianapolis

Dec. 14—Pronounced opposition has developed against the bill proposed by State Mine Inspector James Epperson to pension or indemnify mine workers to secure them against financial suffering as a result of mine accidents. The opposition comes from the miners' locals, much to the surprise of Mr. Epperson, who expected from them ardent support. The bill provides for a tax of 0.8c. on each ton of coal mined to be paid by the operator and a tax of 0.2c. on the dollar paid to mine workers to constitute a fund out of which to pay stipulated sums to miners while rendered temporarily unfit to work; or in case of death to pay funeral expenses. In other words it is a form of insurance. Mr. Epperson has called a meeting of the officers of the Indiana Operators' Association and of the Indiana Mine Workers' Association, to consider the features of the bill. If the opposition to the bill continues after the meeting the proposition will be dropped. Mr. Epperson says he has not been advised of the cause of the opposition but hopes to bring the reasons out during a discussion of the bill at the meeting.

After a meeting of the representatives of the 11 mine locals in Indiana, which are affected by the bit controversy, the dispute is no nearer a settlement than heretofore. The miners are firm in their demands for the largest bit permitted by the new law, and the operators show no inclination to install the new bit. The Deering company has notified the miners it will take up the question soon and if possible reach a decision. A joint meeting of the miners and operators is to be held to adjust the matter.

Pittsburg

Dec. 15—The coal trade has brightened up a little and prices are firmer than a week ago. Mine-run remains at $1.15 but lump coal for the domestic trade is about 5c. higher, at $1.35@1.40 at mine. Slack is in demand and commands 75@80c. Operations do not show any improvement and the railroad mines continue at around 50 per cent. capacity. All the river mines are idle and stocks in the pools and harbor are large. It is probable that the rains of the past few days may bring up the rivers to a navigable stage and much of this coal will be sent out. The initial shipment of coal from the Kanawha district was sent down the river yesterday and amounts to fully 1,000,000 bu. It all went to the Cincinnati market.

Connellsville Coke—There is no material change, but prices on contract continue firm as follows: Furnace, $2; foundry $2.25@2.40. One large sale of foundry coke was made this week for delivery over the first six months at $2.50, but this is regarded as an exceptionally good price. For spot shipment these prices may be shaded 10@20c. Some consumers, it is reported, are deferring the placing of contracts in the hope that low spot prices will continue and in this way they will save by holding back orders. Producers, however, say that with the expected increase in demand after Jan. 1 prices likely will be much higher. About 1000 additional ovens were put in operation last week and more would be started but for a scarcity of miners. The *Courier* gives the production in both regions at 235,211 tons. The shipments were 8427 cars as follows: To Pittsburg district, 2758; to points west of Pittsburg, 5080; to points east of Connellsville, 589 cars.

Foreign Coal Trade

Austrian Coal Production—Coal production in Austria, nine months ended Sept. 30, metric tons:

	Coal.	Brown Coal.	Total.
Coal mined.........	10,648,554	20,106,705	30,755,259
Coke made..........	1,427,822	22,642	1,450,464
Briquets made.....	109,977	139,823	249,800

Nearly two-thirds of the production—65.4 per cent.—was of brown coal, or lignite.

German Coal Production—Coal production in the German Empire, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Coal	119,296,980	124,560,667	I. 5,263,687
Brown coal......	51,106,430	55,086,244	I. 3,979,814
Total mined...	170,403,410	179,646,911	I. 9,243,501
Coke made......	18,169,231	17,787,471	D. 381,760
Briquets made...	13,613,762	15,294,289	I. 1,680,527

Of the briquets reported nearly 80 per cent. are made from brown coal, or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Dec. 5: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.92; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Dec. 16—The iron and steel markets are dropping visibly into the waiting condition which is apt to characterize the closing weeks of the year. This has been helped in some degree by the conference of steelmen held in New York Dec. 10. At this meeting practically nothing was done, and there was no discussion of prices—at least so far as the public is informed. There had been hopes of some adjustment of structural prices, if of no others, and some disappointment is felt at the negative results. The tariff agitation has had some effect. There is a general idea that if any tariff reductions are made, the iron and steel schedules will have to bear most of them.

Pig iron has been quiet, except for some buying of foundry, chiefly from New England territory. The manufacturers there seem to have more hope for the immediate future than they have had for some time past. Southern iron has done fairly well, the large makers now claiming to be pretty well sold up for the first quarter. The furnace reports show more activity, and the number in blast is gradually increasing.

In finished material the market is quiet. Structural sales have been generally small, but in the aggregate amount to a fair business. Some car and locomotive orders are coming from the railroads. The Pennsylvania Railroad Company, it was positively announced on Tuesday, had placed orders for 135,000 tons of steel rails for 1909 delivery. Later, however, the company issued a statement to the effect that this report was not correct and was premature, no orders having yet been placed. The steel-rail business for next year, therefore, is still in the future.

Pig Iron Production—Reports from the furnaces on Dec. 1 show that there were 210 coke and anthracite furnaces in blast, having an aggregate weekly capacity of 381,100 tons; an increase of 18,400 tons over Nov. 1. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the approximate production of pig iron in the United States in November was 1,593,000 tons; for the 11 months ended Nov. 30 it was 14,122,500 tons. This includes the statement of the American Iron and Steel Association for the first half of the year.

. *Lake Ore Shipments*—The shipments of ore from the Lake Superior region, by ports, are given as follows, in long tons:

	1907.	1908.	Changes.
Escanaba........	5,761,988	3,354,952	D. 2,407,036
Marquette	3,013,826	1,487,487	D. 1,526,339
Ashland..........	3,437,672	2,513,670	D. 924,002
Two Harbors.....	8,188,906	5,702,237	D. 2,486,669
Superior.........	7,440,386	3,564,030	D. 3,876,356
Duluth...........	13,445,977	8,808,168	D. 4,637,809
Total	41,288,755	25,430,544	D. 15,858,211

All-rail shipments in 1907 were 956,315 tons; for 1908 they are not made up yet, but are estimated at less than 500,000 tons. Of the water shipments this year the Mesabi range sent 17,232,891 tons and the Vermilion range 841,544 tons; the balance—7,356,109 tons—coming from the Old Ranges. Of the water shipments this year 14,252,911 tons, or 56 per cent., were sent out by the United States Steel Corporation. The total decrease in shipments this year was 38.4 per cent.

Birmingham

Dec. 14—Heavy shipments of pig iron are being made from Alabama and the indications are that the movement will be steady for some time to come. The president of the Sloss-Sheffield Steel & Iron Company announces that more iron was shipped away from furnaces of his company during November than for any month in the history of the company. Other concerns report very healthy shipments. There appears, however, to be no inclination to start up additional furnaces in this district before the holiday season. The quotations are strong at $13 per ton, No. 2 foundry, with several concerns asking $13.50 per ton. Some sales have been made for delivery in the second quarter of the coming year, though it is admitted that the greater portion of this iron was disposed of at the old rate, $13. A prominent interest is quoted as saying that it is no trouble [illegible] delivery during the first half of the new year. One or two of the larger companies are still claiming to be out of the market and are waiting until conditions are more favorable. The make in this district continues good; 23 furnaces are reported in full operation with five ready to start. The Sloss-Sheffield, the Birmingham, the Tennessee and other companies are preparing to start repair work on furnaces in this section.

The Central Iron Company at Holt, Tuskaloosa county, Ala., has let contracts for the erection of a pipe plant. The cast-iron pipe industry has a large business booked already and more in sight.

The Birmingham Coal and Iron Company has purchased the brown-ore properties of the Tecumseh Iron Company, something like 10,000 acres of land in the eastern part of the State.

Chicago

Dec. 15—The iron market [illegible] quiet and is likely to be quiet for another month. There is the usual tendency to hold off from placing large contracts until after the first of the new year, and a feeling of uncertainty concerning legislation on iron and its effect is apparent. Melters in general are back to the old-time policy of buying for short-time needs. They will not contract generally for their probable requirements beyond the first half of 1909 in many cases not beyond the first quarter. On the other hand the furnace agents profess to be equally willing to hold off also, making a tight market for anything beyond the second quarter.

Southern No. 2 iron is the favorite of buyers in the present market at $13@13.50 for No. 2 ($17.35@17.85 Chicago) [illegible] Northern iron holds to $17 minimum for the first quarter and 50c.@$1 more for the second quarter, being steadier than Southern and more restricted as to output. At the prices quoted Northern would seem to have the advantage, but its limited output and the general supply of Southern make the latter more available. Lake Superior charcoal is [illegible] tively scarce at $19.50@20.

The iron and steel market improves steadily, though slowly. Sales of railroad supplies, structural materials and finished products in general continue good [illegible] is strong at $5 for first-class Connellsville, with increasing demand.

Philadelphia

[illegible] showing accustomed December vitality. The bulk of business has been in foundry irons and in small lots. The large buyers are out of the market and will not reappear until January. Even then there is no certainty that they will buy heavily. Furnaces in eastern and middle Pennsylvania have made inviting offers to large consumers, which are now under consideration. They are in the nature of 30-day options. Consumers generally have small stocks in yards. The mill people refuse to buy for more business than they have in sight. Southern irons are threatening to come this way.

Steel Billets—The business is of a hand-to-mouth sort.

Bars—Reports from various bar mills of the State show diverse conditions and no one statement can summarize all. Several mills have since Dec. 1 secured an encouraging volume of business and at regular prices, it is claimed. The iron manufacturers are generally standing firm on current prices. The retail distribution has fallen off.

Sheets—A few large consumers have just made offers for future requirements. The situation is generally better than a month ago.

Structural Material—The mills are executing large orders on which specifications have recently been delivered. Other large orders are in sight, and the mills are busier than they have been.

Scrap—Scrap consumers are now trying to get supplies, but find that dealers have their own views. An accumulation has been quietly in progress for some weeks and dealers claim to have large quantities now in the hands of owners. No. 1 railroad scrap is in special demand, and all kinds will soon begin to move.

Pittsburg

Dec. 15—About the only improvement in the steel market is an increase in the general run of small orders for finished products. Mill operations show an improvement, and production has increased. The American Steel and Wire Company has started the Donora works practically in full, and the company this week is operating its plants at 90 per cent. of capacity. The farmers have been good buyers of fence wire, and nails have also been in good demand. Agricultural-implement makers are specifying heavily for material and the Republic Iron and Steel Company is operating [illegible] of capacity. The Carnegie Steel Company has increased its production of billets and sheet-bars by starting the Mingo Junction plant, which had been idle for nearly a [illegible] the Carnegie company has been operating at around 25 per cent. of capacity on small orders and specifications on old contracts. New business booked during the past week included two orders of 500 tons each from the Pittsburg Railways Company and the Pittsburg Wabash Terminal. It also received some export orders and about 3000 tons of light rails.

New structural business is coming out slowly, but several good contracts are in sight. Bids went in this week for the new buildings of the Crane company at Oakmont which will require about 2500 tons. This order likely will be placed this week [illegible] The most important contract placed is for 800 all-steel dump cars by the Duluth & Iron Range railroad, a Steel Corporation interest. This is the largest single order ever placed by this line. The cars will be of the Summers type of ore-dump cars, and will be the first ever built outside of the sample car, which has been in use for six months. The cars will be made at the Hammond plant of the Standard Steel Car Company. The Carnegie Steel Company will furnish the plates from the Homestead plant and also 6400 steel wheels from the wheel plant at McKees Rocks, Pittsburg. The Pittsburg & Lake Erie railroad has ordered five locomotives which will be turned out at Pittsburg.

Pig Iron—The market is extremely quiet, sales for the past week not amounting to more than 2000 tons. Prices are firm, and this is keeping some consumers out of the market. It is not expected that active buying will begin before the opening of the first quarter. Sales of standard bessemer have been made at $17, but a small tonnage for prompt delivery was sold today at $16.50. Malleable-bessemer [illegible] at $16. An order for 600 tons at less than that price was rejected. A large consumer entered the market for 5000 tons of different grades of foundry iron, but upon receiving current quotations decided to defer placing the business. There is no [illegible] tions today are as follows: Standard bessemer, [illegible] $15.75@16; basic, $15.50@16; No. 2 foundry, [illegible] all f.o.b. Valley furnaces.

Steel—There is no demand for billets, but deliveries under contracts are satisfactory. Prices remain at $25, Pittsburg, for both bessemer and open-hearth billets. [illegible] steel bars at 1.40c.

[illegible] black sheets being quoted at 2.50c. and galvanized [illegible]

[illegible] trifle stronger, and indications point to a further advance. Quotations are $47@47.50 a ton.

Foreign Iron Trade

British Iron Trade—Values of exports and imports in Great Britain, 10 months ended Oct. 31, as given by Board of Trade returns.

	Exports.	Imports.	Excess.
Iron and steel	£31,439,195	£ 6,309,027	Ex. £25,130,168
Machinery...	26,129,994	3,953,641	Ex. 22,176,353
New ships...	9,520,905	..	Ex. 9,520,905
Total........	£67,090,094	£10,262,668	Ex. £56,827,426
Total, 1907..	74,990,285	10,297,127	Ex. 64,693,158

Total decrease in exports this year, £7,900,191, or 1.65 per cent.; decrease in imports, £34,459, or 0.3 per cent. The quantities of iron and steel were, in long tons:

	1907.	1908.	Changes.
Exports..................	4,451,148	3,454,949	D. 996,199
Imports...	743,755	909,707	I. 165,952

Imports of iron ore into Great Britain for the 10 months were 6,569,306 long tons in 1907, and 4,969,831 in 1908; decrease, 1,599,475 tons. Of the imports this year 3,681,803 tons were from Spain.

Iron Ore in Norway—According to the *Teknisk Ugeblad*, iron-ore production in Norway increased from 99,000 tons in 1906 to 139,000 in 1907. The exports increased in three years from 81,398 to 137,593 tons.

Metal Markets

New York, Dec. 16—The metal markets have been generally quiet this week with no changes of much importance to be noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold			
Oct. 1908..	$ 1,952,574	$ 3,782,705	Imp.$ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,087,919	" 14,936,871

Exports of specie from New York week ended Dec. 12: Gold, $850; silver, $681,954, almost all to London. Imports: Gold, $279,213; silver, $456,579, both from the West Indies, Mexico and South America.

A total of $5,400,000 gold has been taken in New York for export this week. Practically all of this will go to Paris. Exchange still remains high.

Gold—The demand for gold on the open market in London this week was less active. Gold bars were quoted at 77s. 9⅞d. per oz., or 1¼d. less than last week. The Bank of France took all the gold received from the Transvaal, amounting to $3,125,000, and has also secured gold from New York. American gold eagles in London, 76s. 5d. per ounce.

Platinum—Dealers still quote $24 per oz. for refined platinum; $26.50 for hard, and $20@21 for scrap. The business is fair. Sales to jewelers have fallen off, as is usual at this season, though less than was expected. Electric companies and builders of automobiles are taking rather more than they have been recently.

Silver—Silver has advanced a little owing to China buying; but there does not seem to be any special activity in the demand, and the chances are there will be no great change from current figures during the rest of the month.

SILVER AND STERLING EXCHANGE.

December.	10	11	12	14	15	16
New York....	49¼	48⅝	48¾	48¾	48¾	48⅜
London.....	22¾	22 7/16	22½	22½	22½	22 5/16
Sterling Ex..	4.8685	4.8685	4.8710	4.8710	4.8710	4.8685

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Dec. 3, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India.......	£10,289,254	£8,369,640	D. £1,919,614
China.......	331,750	571,400	I. 239,650
Straits......	691,150	164,885	D. 526,265
Total......	£11,312,154	£9,105,925	D. £2,206,229

Receipts for the week £2000 from Chile and £170,000 from New York; total, £172,000. Exports £2000 to Egypt and £10,000 to India; £12,000 in all.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.	Spelter.	
Dec.	Lake, Cts. per lb	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
10	14¼ @14⅜	14 @14⅛	63⅛	29¼	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00
11	14¼ @14⅜	14 @14⅛	63¼	29	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00
12	14¼ @14⅜	14 @14⅛	....	29	4.22½ @4.27½	5.12½ @5.15	4.97½ @5.00
14	14¼ @14⅜	14 @14⅛	62⅝	28⅞	4.20 @4.25	5.12½ @5.15	4.97½ @5.00
15	14¼ @14⅜	14 @14⅛	62⅞	29⅛	4.20 @4.25	5.12½ @5.15	4.97½ @5.00
16	14¼ @14⅜	14 @14⅛	62⅜	29	4.20 @4.25	5.12½ @5.15	4.97½ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Dec. 9 the market has continued dull. Some fancy brands of Lake copper have been sold to domestic consumers under exceptional conditions at 14.50 and 14.60c., but these prices are above the real market. The Lake producers to a considerable extent preserve their previous attitude of aloofness, but some offerings with a guarantee indicate a weakening of confidence. In electrolytic there is less stiffness. This grade has been freely offered by first hands at 14¼c., delivered 30 days, or 14⅛c. cash, and some sales have been made at that figure; in other cases these offers have been cut, while business for export has been taken at a shade over 14c., New York.

Speaking generally, the character of the market has not changed materially during the last week. There are still some of the larger sellers who have not reduced their quotations, but enough copper is available at the current level to provide for what small business is placed from time to time. The future course of the market will depend altogether upon whether or not there is going to be disappointment with regard to the revival in the demand which is expected after the turn of the year. Meanwhile, a holiday spirit is likely to prevail. The close is easy at 14¼@14⅜c. for Lake copper; 14@14⅛c. for electrolytic in ingots, cakes and wirebars. The average for casting copper has been 13¾@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

The Standard market in London fluctuated within narrow limits, but considering that the statistics for the first half of the current month increased to the extent of 1600 tons, prices have held fairly well. The close is quiet at £62 7s. 6d. for spot, £63 5s. for three months.

Refined and manufacturing sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Tin—The London market has been steady throughout the week, and while large transactions have taken place from day to day, prices have undergone hardly any change. The close is cabled at £132 for spot, £133 15s. for three months.

The domestic market is still as dull as it has been for some time past, the interest of consumers being manifest in their immediate requirements only. Spot tin at the close can be bought at about 29 cents.

Lead—Consumers are not showing any interest in the market, and on this account little progress has been made in disposing of the heavy quantities which are being offered from the West. The close is again lower and weak at 4.20@4.25c., New York, 4.05@4.07½c., St. Louis.

The London market is neglected and closes at £13 3s. 9d. for Spanish lead, £13 6s. 3d. for English lead.

Spelter—The market has been quiet and unchanged as to prices. Some producers who have sold out for December are now asking a price much above the present level, pending some straightening out of the ore situation at Joplin, where the market is still such as to leave no margin of profit to the smelters. The market closes steady at 5.12½@5.15, New York, and 4.97½@5c., St. Louis.

The London market is somewhat firmer, and closes at £20 15s. for good ordinaries, £21 for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Silesian Spelter Market—Paul Speier reports from Breslau under date of Nov. 30 that the current price for ordinary brands was 41.50@42.50 marks per 100 kg.; zinc dust, 39.50 marks per 100 kg., f.o.b. Stettin. Exports and imports in Germany, 10 months ended Oct. 31 were, in metric tons:

	Imports		Exports	
	1907	1908	1907	1908
Spelter	24,887	[illegible]	[illegible]	[illegible]
Zinc sheets	89	[illegible]	[illegible]	[illegible]
Scrap	871	[illegible]	[illegible]	[illegible]
Zinc dust	788	947	[illegible]	[illegible]
Zinc pigments	7,222	[illegible]	[illegible]	[illegible]
Zinc ore	148,458	[illegible]	[illegible]	[illegible]

Zinc pigments include zinc-white and zinc-sulphide.

Other Metals

Aluminum—Prices continue unchanged. Foreign metal is still offered at 22c. for ingots, but no large sales are reported. The Aluminum Company of America still quotes 24c. per lb., base for No. 1 ingots and 33@34c. base for sheets. No change is reported in the market abroad.

Antimony—The market is lifeless and no changes in prices occurred. Quotations are 8.15@8.25c. for Cookson's, 8@8⅛c. for Hallett's, and 7⅝@7¾c. for ordinary brands.

Quicksilver—Business has been only moderate, and the market is rather uncertain. The New York quotations are a little lower, at $45@46 per flask of 75 lb. San Francisco prices are $45 per flask for domestic orders, and $43 for export. The London price is unchanged at £8 10s. per flask, with 2s. less named by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 12—The highest price paid for zinc ore this week was $45.50, on a basis of $42@43 per ton of 60 per cent. zinc. For 80 per cent. lead ore $50 per ton was paid.

SHIPMENTS, WEEK ENDED DEC. 12

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	730,140		[illegible]
Cuba City	[illegible]	[illegible]	
Benton	[illegible]		
Harker	[illegible]		
Elmo	[illegible]		
Strawbridge	[illegible]		
Hazel Green	293,980	......	......
Highland	[illegible]		
Linden	[illegible]		
Livingston	[illegible]		
Shullsburg	[illegible]		
Days Siding	[illegible]		
Galena	[illegible]		
Mineral Point	[illegible]		
Total	[illegible]	[illegible]	[illegible]
Year to Dec. 12	[illegible]	[illegible]	[illegible]

In addition to the above there was shipped to the Platteville Separating Company, from Galena, 425,000 lb.; to the Joplin Separator Works, 317,100 lb. zinc ore.

Joplin, Mo. Dec. 12—The highest price reported paid for zinc ore was $47, and the base price ranged from $43@46 per ton of 60 per cent. zinc. Sales were made at Miami on a base price of $22.50 per ton of 40 per cent. zinc that are said to have equaled a base of $48.50 for 60 per cent. zinc, f.o.b., or $47.50 in the bin. Some sales were reported made today, for next week's delivery, as low as a base of $42, the general market weakening materially at the week-end. The average price, all grades, was $39.88. Lead ore was again lowered, the highest known settlement being at $51, though $51.50 was an unconfirmed report. The close was weak at $50. The average price, all grades, was $50.03 per ton.

With the advent of higher prices the output has been growing larger, now reaching the probable maximum, on account of a shortage of laborers to do the shoveling. United action is being taken among a number of producers to solve this problem by adopting machine shovels, as the American Zinc, Lead and Smelting Company is now using shovels operated by compressed air successfully.

SHIPMENTS, WEEK ENDED DEC. 12

	Zinc, lb.	Lead, lb.	Value.
[illegible]	[illegible]	583,100	[illegible]
Joplin	2,144,860	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	19,051
Prosperity	549,590	[illegible]	13,083
[illegible]	570,710		11,984
[illegible]	570,290		11,668
[illegible]	[illegible]	[illegible]	[illegible]
Granby	[illegible]	[illegible]	8,850
Aurora	[illegible]		[illegible]
Miami	358,160	[illegible]	8,402
Badger	[illegible]		8,343
Spurgeon	412,570	[illegible]	[illegible]
Carthage	321,910		[illegible]
Carl Junction	101,570	[illegible]	2,323
Quapaw	104,390		[illegible]
Zincite	50,180		1,004
[illegible]	39,420		[illegible]
Wentworth	51,160		[illegible]
Totals	12,089,440	1,212,010	$271,375

50 weeks [illegible] [illegible] [illegible]

Zinc value, the week, [illegible] 50 weeks [illegible]

Lead value, the week, [illegible] 50 weeks [illegible]

MONTHLY AVERAGE PRICES

Month.	[illegible]				[illegible]	
	[illegible]		[illegible]		[illegible]	
	1907.	1908	1907.	[illegible]	[illegible]	[illegible]
January	[illegible]	$37.60	$45.84	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	49.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible] Under zinc [illegible] give base prices for 60 [illegible]

[illegible] ores sold.

Chemicals

New York, Dec. 16—The market in gen- [illegible] ness is being done. Contracts are increasing and the demand is improving. The inquiry into tariff revision is keeping some buyers out of the market for the time being.

Arsenic—Prices are firmer and it is rumored that available supplies are not as large as was formerly believed. Practically no business is done below 3¼c. per lb. Spot prices are 3¼@3¾c. according to quantity, seller and terms of sale.

Copper Sulphate—The market is firm but few sales are being made. Prices are unchanged at $4.75 per 100 lb. for carloads and up to $15 for smaller lots.

Nitrate of Soda—The market is firm and some business is being done. No goods are available under 2.17½c. which is the current price for spot and futures.

Mining Stocks

New York, Dec. 16—The general course of matters on the Stock Exchange during the week showed prices fairly firm, with generally moderate trading on mainly professional lines. A special drive was made at American Smelting and Refining, and the stock was forced down several points. All sorts of rumors were used to depress it, including much talk of new competition. Sales were large. Outside of this there were few changes of importance.

On the Curb there was fair activity, but no pronounced tendency. Price fluctuations were in both directions. The copper stocks were inclined to be a shade weaker at the close. On the other hand, Standard Oil was forced up to $710 per share, the highest price this year.

The sensation of the week was the break in Rawhide Consolidated, a Nevada stock brought out by a well known actor who has gone into mine promotion. It was put on the Curb a few weeks ago at 50c., and gradually worked up to $1.40. This week it broke suddenly under large sales. The excitement lasted only a day or two, and the dealings dropped off to a small figure; the stock closing at about 77c. per share.

Boston, Dec. 15—Mining shares have suffered general declines the past week. There has been some liquidation, but the market is more or less professional, and in keeping with the New York list. Here and there strong spots presented themselves, but these were only temporary.

Amalgamated touched $85, but broke to $80.12½ today, with the final a trifle above this. Copper Range has declined [illegible] lowest. Lake Copper received good buying orders from Michigan, with the result that the price advanced $1.87½ to $23.87½, although it fell back to $21 today. North Butte, after striking $86.50, fell back to $83.50. Arizona Commercial spurted to $40.62½, reacting to $38.50, and Old Dominion rose $1.25 to $59.25, reacting to $57.50. Superior Copper rose $2.25 to $24.75, losing to $33.

Batopilas and East Butte mining have been placed on the unlisted department of the Stock Exchange, but neither has done much. Arcadian made a bow at $3. Formal announcement is made of a complete reorganization which includes a company under Michigan laws and a $1 assessment. The capitalizing of the Phelps, Dodge & Company into a $50,000,000 corporation is well received. Options upon the minority stock of the Old Dominion Company of New Jersey at $100 per share have been exercised on about 3500 of the 6000 shares out.

Franklin has lost $2 to $16.50. The Quincy has taken posession of the old Franklin mine and made partial payment; the full amount is $170,000. Osceola closed $5 off, at $129. The adjourned annual meeting of this company has been further adjourned until next month. Shannon is off $1.12½ to $17. Utah Consolidated has gone off $1.50 to $44.50. New and strong interests have gone into the Boston Consolidated board.

The Curb has been active and the new quarters have served to give stability to this body.

STOCK QUOTATIONS

NEW YORK Dec. 15 Name of Comp.	Clg.	BOSTON Dec. 15 Name of Comp.	Clg.
Alaska Mine	⅜	Adventure	9⅛
Amalgamated	81¼	Allouez	39
Anaconda	48½	Am. Zinc	25
Balaklala	‡2 1/16	Arcadian	4¾
British Col. Cop.	8¼	Arizona Com.	38¾
Buffalo Mines	3½	Atlantic	17
Butte Coalition	26½	Bingham	‡.30
Colonial Silver	⅜	Boston Con.	16
Cum. Ely Mining	8 1/16	Calumet & Ariz.	118
Davis Daly	3⅜	Calumet & Hecla	670
Dominion Cop.	⅝	Centennial	34
Douglas Copper	3	Con. Mercur	‡.38
El Rayo	4⅛	Copper Range	79¼
Florence	4 3/16	Daly-West	10
Foster Cobalt	.47	Franklin	16½
Furnace Creek	.12	Greene Can.	11¼
Giroux	6½	Isle Royal	23
Gold Hill	½	La Salle	14½
Goldfield Con.	8½	Mass	6½
Granby	104	Michigan	14
Greene Gold	¼	Mohawk	68
Greene G. & S	7	Nevada	19½
Greenw'r & D.Val.	‡.75	North Butte	83⅝
Guanajuato	2	Old Colony	.60
Guggen. Exp.	183	Old Dominion	57½
Hanapah	.15	Osceola	131
McKinley Dar	1.03	Parrot	30
Micmac	2½	Quincy	95
Mines Co. of Am.	1 1/16	Rhode Island	5½
Mitchell Mining	½	Santa Fe	2½
Mont. Sho. C.	⅜	Shannon	17
Nev. Utah M. & S	2 1/16	Superior	33½
Newhouse M. & S.	5½	Superior & Pitts.	17¾
Nipissing Mines	10⅛	Tamarack	82
Old Hundred	[illegible]	Trinity	17¼
Silver Queen	.97	United Cop., com.	14
Stewart	⅝	U. S. Oil	29
Tennessee Cop'r.	45½	U. S. Smg. & Ref.	44
Tri-Bullion	1 1/16	U.S.Sm. & Re.,pd.	46½
Union Copper	¾	Utah Con.	44½
Utah Apex	5¾	Victoria	3⅛
Utah Copper	46	Winona	6
Yukon Gold	4	Wolverine	152
		Wyandotte	2¾

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	32
Am. Smelt. & Ref.	84⅞
Am. Sm. & Ref. pf.	101¾
Colo. Fuel & Iron.	38
Federal M. & S.,pf.	81
National Lead	78½
National Lead, pf.	106
Pittsburg Coal	‡14¾
Republic I. & S.	26¼
Republic I.&S.,pf.	86
Sloss-Sheffield	78
Standard Oil	702
U. S. Steel	53¾
U. S. Steel, pf.	111⅞
Va. Car. Chem.	43

BOSTON CURB	
Ahmeek	125
Black Mt.	3¼
Chemung	20
East Butte	‡9¼
Globe Con.	7
Hancock	12
Helvetia	4½
Keweenaw	5¼
North Lake	8
Ojibway	13
Superior & Bost.	17½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 28

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.05	.03
Center Cr'k	2.00	1.75
Cent. C. & C.	72.00	70.00
C. C. & C. pd.	78.00	76.00
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	22.00	20.00
Doe Run	130.00	115.00
Gra. Bimet.	.30	.25
St. Joe.	15.00	12.50

LONDON Dec. 16

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	0	16	3
Esperanza	3	1	3
Tomboy	1	0	7
El Oro	1	7	0
Oroville	0	7	9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 16.

Furnished by Weir Bros. & Co., New York

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.11
Belcher	.28	St. Ives	.16
Best & Belcher	.45	Triangle	.03
Caledonia	.17	BULLFROG STOCKS	
Chollar	.09	Bullfrog Mining	‡.03
Comstock	.29	Bullfrog Nat. B.	‡.04
Con. Cal. & Va.	.79	Gibraltar	.02
Crown Point	.35	Gold Bar	‡.03
Exchequer	.30	Homestake King	.08
Gould & Curry	.09	Montgomery Mt.	‡.05
Hale & Norcross	.35	Mont. Shoshone C.	.87
Mexican	.86	Original Bullfrog	‡.01
Ophir	1.72	Tramp Cons.	.11
Overman	.20	MISCELLANEOUS	
Potosi	.14	Bonnie Clare	.06
Savage	.27	Lee Gold Grotto	...
Sierra Nevada	.26	Nevada Hills	1.37
Union	.23	Nevada Smelting	1.06
Utah	.04	Nevada Wonder	.35
Yellow Jacket	.47	Nevada-Utah	2.87
TONOPAH STOCKS		Penn-Wyoming	.17
Belmont	.92	Pittsburgh S. Pk.	.85
Extension	.47	Rawhide Coal	.70
Golden Anchor	.02	Round Mt. Sphinx	.15
Jim Butler	.17		
MacNamara	.30		
Midway	.18		
Montana	.82		
North Star	.04		
Tono'h Mine of N.	6.87		
West End Con.	.70		
GOLDFI'D STOCKS			
Adams	.02		
Atlanta	.17		
Booth	.31		
Columbia Mt.	.17		
Comb. Frac	1.34		
Con. Red Top	.12		
Cracker Jack	.03		
Dia'dfield B. B. C.	.11		
Goldfield Belmont	.07		
Goldfield Daisy	.78		
Great Bend	.28		
Jumbo Extension	.20		
Kendall	.18		
Lone Star	.07		
May Queen	.02		
N. Y. C. O. D.	.08		
Oro	.12		
Red Hill	.18		
Roanoke	...		
Sandstorm	.20		

COLO. SPRINGS Dec. 11

Name of Comp.	Clg.
Acacia	7⅝
Black Bell	....
C. C. Con	4
Dante	6
Doctor Jack Pot	9
Elkton	71½
El Paso	49
Findlay	18
Gold Dollar	10⅛
Gold Sovereign	3¼
Isabella	26
Index	....
Jennie Sample	6
Jerry Johnson	3⅞
Mary McKinney	31½
Pharmacist	3¾
Portland	1.05
Un. Gold Mines	4
Vindicator	80⅞
Work	7⅞

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev	Jan. 8	Feb. 2	$0.10
Blackjack Con., Utah	Dec. 15	Jan 6	0.01
Caledonia, Nev	Jan. 8	Jan. 29	0.05
Challenge, Nev	Dec. 11	Jan. 5	0.05
Confidence, Nev	Dec. 9	Dec. 30	0.20
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Exchequer, Nev	Dec. 30	Jan. 20	0.05
Julia Con., Nev	Dec. 21	Jan. 15	0.03
Little Chief, Utah	Dec. 15	Jan. 5	0.01
Lower Mammoth, Utah	Dec. 18	Jan. 8	0.05
Mountain Dell	Dec. 24	Jan. 12	0.02
New York Con., Nev	Dec. 18	Jan. 8	0.03
Oro Cobre, Cal	Dec. 31	Jan. 16	0.02
Overman, Nev	Dec. 2	Dec. 23	0.05
Prudential, Cal	Dec. 3	Dec. 21	0.05
Savage, Nev	Jan. 6	Jan. 28	0.10
Union Con., Nev	Dec. 23	Jan. 14	0.10
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Yellow Jacket, Nev	Dec. 28	Feb. 3	0.15
Zeibright, Cal	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.858
September	67.792	51.720	31.313	23.877
October	62.435	51.431	28.863	23.725
November	58.677	49.647	27.154	22.933
December	54.565	......	25.362	......
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62.386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	21.665	12.675	24.140	12.877	97.272	57.842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60.500
September	15.565	13.388	16.047	13.600	68.375	60.338
October	13.169	13.354	13.551	13.646	60.717	60.139
November	13.391	14.130	13.870	14.386	61.226	63.417
December	13.163	......	13.393	......	60.113	....
Year	20.004	......	20.661	......	87.007	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	......
			Av. year	38.160	......

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13.375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13.375
November	4.376	4.330	17.281	13.538
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	......	4.104	......	20.075	....
Year	5.962	......	5.812	......	23.771	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, DECEMBER 26, 1908. NO. 26.

Mining and Smelting in the Ducktown District

The Ore, Which Averages 2 Per Cent. Copper, Occurs in Great Lenses in Metamorphic Schist; Copper and Sulphuric Acid Produced

BY EDWIN HIGGINS

The Ducktown district lies in the extreme southeastern corner of the State of Tennessee and extends across the State line into Georgia and Alabama. The main portion of the district lies in Polk county, Tenn., and extends about four miles north and south and a little over two miles east and west, as shown in Fig. 5. The smelting plant of the Tennessee Copper Company is situated at Copperhill, on the Louisville & Nashville Railroad running between Knoxville, Tenn., and Atlanta, Ga. Connected with the Louisville & Nashville Railroad are two separate branch lines which connect the mines and smelters of the two companies operating in the district, the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company, Limited.

The Ducktown area is an eroded plateau, ranging in elevation from 1600 to 1800 ft. above sea level, and inclosed on three sides by mountains rising from 500 to 2500 ft. in hight. The rolling hillocks are devoid of timber and vegetation, this condition being due chiefly to the smelting operations conducted in the early days when the ore was roasted in heaps. The chief water course of the district is the Ocooe river, shown at the bottom of the map. The creeks shown contain little water, especially in the dry season.

The Ore

The country consists chiefly of foliated mica schist, with occasional intercalated bands of gneiss. These rocks are probably of lower Cambrian age. The ore [illegible] from 500 to 3000 ft. in length and from 25 to 75 ft. in width, although in one or two cases a width greatly in excess of this is attained. These lenses, or orebodies, indicated on the map in dotted lines, strike in a northeasterly-southwesterly direction; the dip is usually between 70 and 80 deg. southwesterly. They usually have well defined walls, but sometimes the ore is found grading into the country rock.

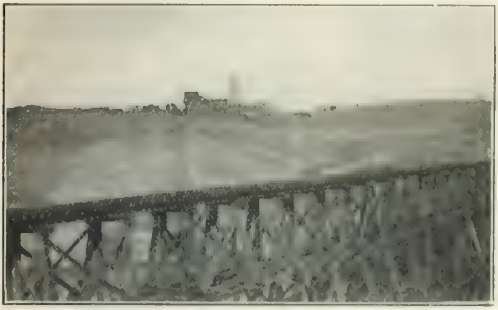


FIG. 1. POLK COUNTY MINE AND SURROUNDING COUNTRY

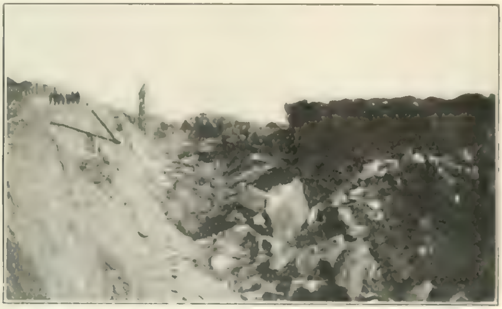


FIG. 2. BURRA BURRA [illegible]

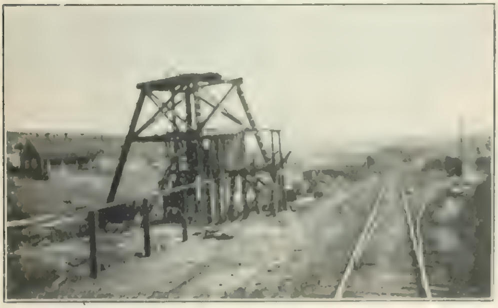


FIG. 3. MCPHERSON SHAFT, USED FOR PROSPECTING PURPOSES

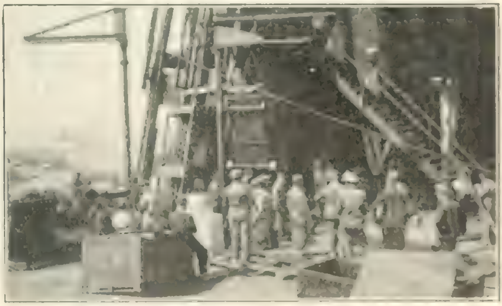


FIG. 4. [illegible] SHAFT SHOWING SKIP-CHANGING APPARATUS

The oxidized zone is shallow, extending [illegible] worked at most points for use in the iron blast furnace. This ore carries from 46 to 50 per cent. iron. The outcrop of the Burra Burra mine, from which the iron ore has been mined, is shown in Fig.

2. Fig. 7 shows an open cut in the Eureka-Isabella orebody; it is said that about 500,000 tons of iron ore have been mined here.

The ore below the oxidized zone and the narrow zone of secondary enrichment varies in the different lenses, but in general may be said to consist of chalcopyrite associated with pyrite and pyrrhotite in a gangue of quartz and metamorphic minerals. Biotite, calcite, actinolite and sphalerite are found in varying small amounts. In general it may be said that the ores have the following range of composition: copper, 2 to 2.5 per cent.; sulphur, 17 to 30; iron, 18 to 40; silica, 10 to 45; lime, 5 to 8; alumina, 2 to 4; magnesia, about 2; zinc, 1 to 2.

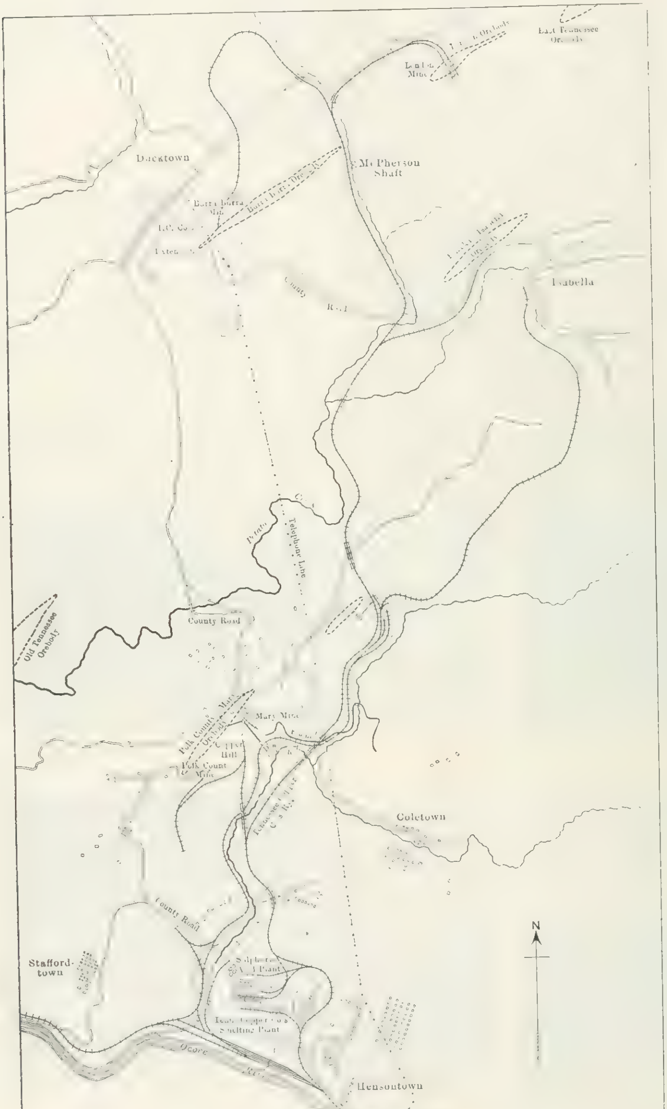


FIG. 5. MAP OF THE DUCKTOWN DISTRICT

Historical

Copper was discovered in the Ducktown district in the year 1843. By the year 1854, several mines were being worked and there were two small matting furnaces in operation. Most of the ore, however, was hauled by wagon 40 miles to a railroad, and shipped thence to Swansea for reduction. All work was suspended in 1863 on account of the American civil war. After the war the work was again taken up and the district prospered until about the year 1878. During this early period the mining was almost wholly confined to the exploitation of the rich "black ore" in the zone of secondary enrichment. In 1891 a British concern came into the district, and by 1893 had begun operations on a fairly large scale. This was the Ducktown Sulphur, Copper & Iron Company (hereafter referred to as the Ducktown company).

The Tennessee Copper Company (hereafter referred to as the Tennessee company) entered the district in 1897 and prosecuted diamond-drill exploration work. On account of the low price of copper this company relinquished its options, but had them renewed in 1898. In the spring of 1899 mining operations were started. The Tennessee company and the Ducktown company are the only operators in the district at present.

Mines of the District

The Tennessee company is operating the Burra Burra, Polk County and London mines. The Burra Burra is now down over 700 ft. and no change in the ore is indicated. The production of this mine is 1100 tons per day. The London mine is 562 ft. deep and produces 250 tons per day. The Polk County mine will soon reach the fourth level, at which point it will be 385 ft. in depth. Its production is 250 tons per day. The Old Tennessee orebody of the Tennessee company is not in operation. The Eureka-Isabella orebody is large, but will average only about 0.9 per cent. copper. It will, however, average about 40 per cent. sulphur. The Tennessee company owns two-thirds of the orebody, and the Ducktown company the other third.

The Ducktown company is developing its East Tennessee mine and is producing 500 tons per day from its Mary mine. The Isabella will be worked for pyritic ore. The Ducktown company also owns the Calloway mine, which was abandoned about a year ago, and an undeveloped property near the Ocooe river, about four miles from Isabella. The Tennessee company's smelter is at Copperhill; that of the Ducktown company is situated at Isabella.

The accompanying table shows the production of the Tennessee company's mines since 1901:

Year.	Burra Burra, Tons.	London, Tons.	Polk County, Tons.	Total, Tons.
1901	71,075	35,342	39,721	146,138
1902	105,820	85,840	59,109	250,769
1903	120,046	92,266	75,153	287,465
1904	88,510	31,716	24,573	144,799
1905	131,654	63,375	17,802	212,831
1906	201,926	72,212	89,603	363,741
1907	225,040	60,557	98,034	383,631
Total....	944,071	441,308	403,995	1,789,374

Mining Methods at the Burra Burra Mine

The mining methods of the Tennessee company are exemplified in the Burra Burra mine. Here the main shaft is sunk about 100 ft. from the orebody, in the footwall side, and at an inclination of 75 deg. Levels are opened at intervals of 100 ft. Six levels are now in operation and the shaft is being sunk to the seventh. At each level crosscuts are driven to the ore and a raise put up opposite the shaft to the level above. Stoping is started from this raise by cutting out about 30 ft. below the level above; thus a floor pillar of 30 ft. is left between each two levels. Underhand stopes are started in both directions on the vein and carried the full width of the orebody. These stopes are 70 ft. in hight. Where considered necessary additional pillars are left in the stopes. At a later period all pillars and floors will be robbed as completely as possible.

The broken ore is shoveled by hand into 2½-ton cars, which are trammed to the station and loaded into the skips; the skip holds two cars. At the surface the ore is dumped into bins, whence it is fed to an 18x36-in. Blake crusher. From this crusher the ore is carried by conveyer belts to storage bins of 2000 tons capacity. The conveyer belt is also utilized as a picking belt.

For the purpose of exploration, drifts are driven on every third level. From these drifts, at 100-ft. intervals, diamond-drill holes are bored into both foot and hanging walls for the purpose of determining the width of the ore. On the third level the orebody has been explored its total length, about 3000 ft., from the MacPherson shaft on the north to the Hiwassee shaft on the south. These are old shafts which were sunk during the early operation of this mine. On the sixth level drifting has progressed about 400 ft. north and 400 ft. south.

The Burra Burra mine makes about 12 gal. of water per min. This amount of water is easily handled by a small pump working six hours per day, and pumping from 50 to 60 gal. per minute.

Changing Apparatus

An interesting feature at the collar of the Burra Burra shaft is the apparatus for changing the skips. This arrangement is shown in Fig. 4. To the left is seen the post and beam arrangement. On the right-hand side the ore skip is seen hanging from the beam. The cage for hoisting men is seen in position over the shaft. When it is desired to place the ore skip in position, the cage is quickly detached and swung on the beam, the ore skip then being swung into position.

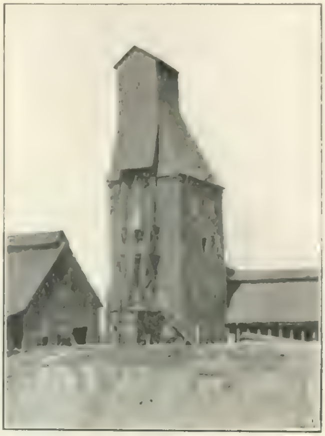


FIG. 6. BURRA BURRA HEADFRAME

Labor

The men employed in and about the mine are white and nearly all Americans; negroes are unknown in the Ducktown district. Most of the work underground is done by contract, the trammers receiving from [illegible] to 25c. per car of [illegible] tons. Miners are paid by the foot drilled. The following wages are paid men working by the day: chucker, $1.75; driller, $2.[illegible]; trammer, $1.90; general underground work $1.75.

Surface Plant

The surface plant at the Burra Burra mine consists of a housed headframe and crusher house (see Fig. 6), power and boiler house, machine, carpenter and blacksmith shops and change house for the men. The hoist is a Nordberg first-motion, 18x32-in. cylinders with two conical drums, 7 ft. diameter at the small end and [illegible] ft. diameter at the large end, by [illegible] ft. face. The hoisting rope is 1⅛ in. plough steel. There are two Nordberg two-stage compressors, steam cylinders 14 and [illegible] in., air cylinders [illegible] in. These machines have a capacity of 2000 cu. ft. of free air per min. each, furnishing air to the drills at 80 lb. pressure. There are four 150 h.p. Babcock & Wilcox water-tube boilers, equipped with Murphy automatic stokers. A small dynamo furnishes electrical power for lighting the surface and also the stations at each level in the mine.

Railroad and Equipment

The company's railroad has a total length of about 7½ miles, including the branches to the three mines. There are in addition about 4½ miles of track in the sidings in and about the smelter. The road is standard gage and is laid with 65-lb. rails.

The rolling stock includes four 105,000-lb. Schenectady locomotives of the switching type, and sixty-three 30-ton cars, of which 50 are Rodger ballast cars with drop bottoms and 10 are low-sided gondolas. One train transports the ore from the mine to the smelter, working only on the day shift. Day and night crews handle the traffic from the smelter to the railroad company. In connection with the railroad, storage yards for [illegible] quartz and ore are maintained.

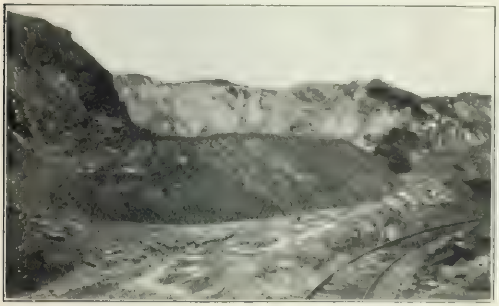


FIG. 7. OPEN CUT, EUREKA ISABELLA OREBODY; ABOUT 500,000 TONS IRON ORE MINED HERE

FIG. 8. MARY MINE OF THE DUCKTOWN SULPHUR, COPPER AND IRON COMPANY

The Smelter

The smelter bins have a capacity of [illegible] tons of ore. [illegible] additional space for the storage of flux and furnace products to be retreated. The four tracks under the bins are provided with scales for weighing charges. The cars used are side dumping, have a capacity of 44 cu.ft., and are hauled by electric locomotives.

There are seven blast furnaces, three of which are 56x180 in., and four 56x270 in. at the tuyeres. These furnaces are 18 ft. from tuyeres to charge floor, and 3½ ft. from tuyeres to sole-plate. Sole-plates are cast iron and water-cooled. The smaller furnaces have twenty-six 5-in. tuyeres; the larger ones, fifty 3¼-in. tuyeres, arranged in pairs.

Blast is furnished to the furnaces at a pressure of 50 oz. at the power house. Each furnace takes about 1000 cu.ft. of free air per min. per ft. of length. From 70,000 to 90,000 cu.ft. of air is consumed per ton of ore smelted.

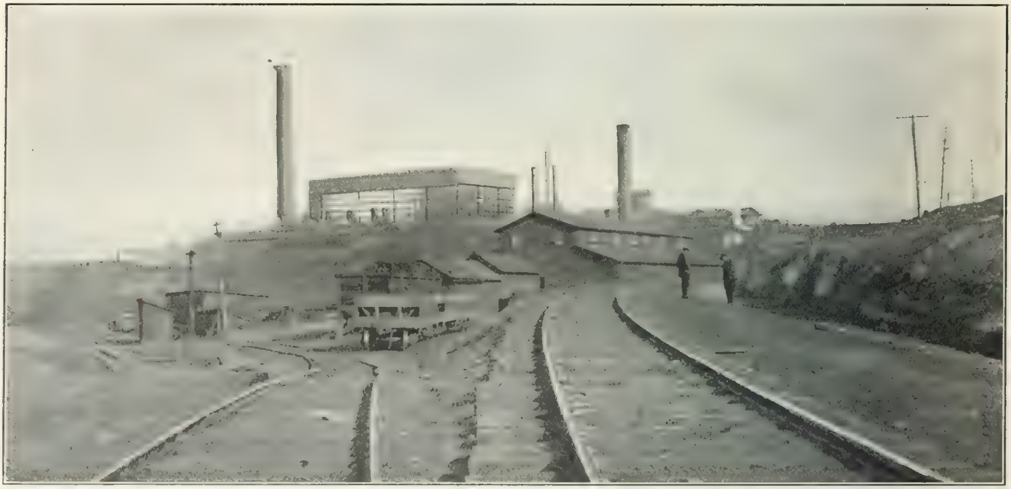


FIG. 9. SMELTER AND ACID PLANT, TENNESSEE COPPER COMPANY

The furnaces are provided with circular settlers, 16 ft. in diameter, lined with firebrick; chrome brick is used around the tap hole. The tapping plate is a block of cast iron inclosed in a copper plate. Slag overflows into sectional cast-iron pots of 105 cu.ft. capacity. These are hauled by locomotives.

The gases from the furnaces discharge either into a brick-lined balloon flue, or into a concrete flue below and back of the furnaces. These flues discharge into a dust chamber 209 ft. long, 30 ft. wide, and 20 ft. high, at the end of which is a brick stack 325 ft. high and 20 ft. inside diameter. Two 12-in. conveyer belts, working in a tunnel under the chamber, remove the dust from the chamber.

In the converter department there are four electrically operated stands and 15 converters of the trough, or Leghorn, type, 7x10½ ft. Matte is handled from the blast-furnace settlers to the converters by two 40-ton cranes. The copper is cast into pigs of 210 lb., and will run about 99.4 per cent. fine.

The Smelting Operation

Pyritic smelting is practiced here. There are two stages to the process. In the first stage the ore is concentrated to a low-grade matte which will average 15 per cent. copper. This matte is cooled on the slag dump, broken up, and hauled to the smelter bins. In the second stage the first matte is concentrated to a matte of converting grade. Although this can be varied at will, the present practice is to produce a matte of about 32 per cent. copper; this is easily handled in the converters. In the first operation only quartz is used as flux; on the concentration charge limestone is added in addition to quartz. The coke used in the two operations is from 6.5 to 7 per cent. of the weight of ore smelted, or about 5 per cent. of the total charge. Typical charges for the different ores are given in an accompanying table.

TYPICAL BLAST FURNACE CHARGES

BURRA BURRA MINE

	Lb.
Ore	4500
Quartz	1400
Coke	140

POLK COUNTY MINE

	Lb.
Ore	5000
Quartz	400
Coke	240

LONDON MINE

	Lb.
Ore	5000
Quartz	none
Coke	240

For the second operation the charge is about as follows: matte, 3500 lb.; quartz, 1400 lb.; limestone, 700 lb.; coke, 70 lb. The ore slag will carry from 0.2 to 0.3 per cent. copper; the concentration slag will carry from 0.35 to 0.42 per cent. copper.

In accompanying tables is shown the amount of ore and copper produced since 1901.

ORE PRODUCED BY THE TENNESSEE COPPER COMPANY

Year.	Tons.
1901	57,314
1902	221,194
1903	284,202
1904	241,855
1905	229,116
1906	362,900
1907	389,603
Total	1,786,184

COPPER PRODUCED BY THE TENNESSEE COPPER COMPANY

Year.	Pounds.
1901	1,948,759
1902	7,961,734
1903	10,690,389
1904	8,617,697
1905	7,977,982
1906	11,319,591
1907	12,599,019
Total	61,115,171

A late development in the work of the company is the manufacture of sulphuric acid from the blast-furnace gases. Construction of the present plant was started early in 1906, and was completed late in 1907, the manufacture of the acid beginning about Dec. 1, 1907. The plant has been in practically continuous operation since that time. Its production is 200 tons of acid per day, and this will soon be increased to the full capacity of 400 tons per day.

Power Plant

There are six boilers of the Babcock & Wilcox type, four of which are rated at 250 h.p. and two at 550 h.p. each. These are all equipped with Murphy automatic stokers. Blast at 50 oz. pressure is furnished by Nordberg duplex cross-compound piston blowing engines. There are six of these engines, three of which are rated at 20,000 cu.ft. of free air per min., with steam cylinders 13 and 24x42 in., air cylinders, 57x42 in. The three larger engines are rated at 30,000 cu.ft. of free air per min., and have 15 and 33x42-in. steam cylinders and 70x42-in. air cylinders.

The converters are supplied with air by Nordberg blowing engines, two of which were installed in order to guard against a breakdown. These have a capacity of 10,000 cu.ft. of free air per min. each, and furnish blast at about 12 lb. pressure. The steam cylinders are 15 and 30x42 in., and the air cylinders 40x42 inches.

Electrical power is provided by two 250-kw. 500-volt Westinghouse generators, direct connected to Nordberg tandem-compound engines 15 and 26x36 inches. The blowing engines are run condensing, whereas the engines running the generators are non-condensing and are used to heat the feed water.

The pumping station on the bank of the Ocoee river contains two 10-in. two-stage, Worthington turbine pumps, belt driven by motors, each delivering 2800 gal. per min. to large storage tanks located above the smelter. Only one pump is necessary to supply the requirements of the plant.

In connection with the plant there are maintained blacksmith, machine, plate-working, carpenter and pattern shops, and a foundry. The company also operates a hospital which is in charge of a competent medical staff. Here there are accommodations for 14 patients. The equipment is thoroughly modern and uptodate.

The Rare Metals V.—Thorium

By Charles Baskerville*

Thorium is a rare metal of the titanium-zirconium group. It occurs in combination in numerous minerals as shown in the accompanying table.

THORIUM MINERALS

	Thoria Content
Thorite, anhydrous thorium silicate	[illegible]
Calciothorite, a hydrous silicate of calcium and thorium	[illegible]
Uranothorite, uraniferous thorite	48-52%
Auerlite, a silico phosphate of thorium	[illegible]
Orangite, identical with thorite	
Monazite, phosphate of the cerium metals	[illegible]
Samarskite, a tantalo-columbate of iron, cerium, etc	[illegible]
Annerodite, a pyro-columbate of uranium and yttrium	[illegible]
Hielmite, a stanno-tantalate of yttrium, etc	
Aeschynite, a columbate and titanate of the cerium metals	[illegible]
Polymignite, a columbate and titanate of cerium, etc	[illegible]
Zirkelite, a thoriferous titano-zirconate of calcium, etc	[illegible]
Euxenite, a columbate and titanate of yttrium, etc	[illegible]
Polycrase, a columbate and titanate of yttrium, etc	
Arrhenite, a heterogeneous decomposition product	
Rogersite, a columbate of yttrium, etc	
Xenotime, yttrium phosphate	[illegible]
Rhabdophanite, a hydrous phosphate of the cerium and yttrium metals	
Churchite, a hydrous phosphate of cerium and calcium	
Uraninite, a uranate of uranyl, lead, thorium, etc	[illegible]
Bröggerite, thoriferous uraninite	[illegible]
Cleveite, uraninite containing about 10% of yttrium earths	[illegible]
Nivenite, a soluble variety of uraninite	[illegible]
Uranniobite, uranfierous samarskite	
Gummite, an alteration-product of uraninite	
Thorogummite, thoriferous gummite	[illegible]
Yttrogummite, a hydrous compound containing yttrium, etc	
Mackintoshite, altered to thorogummite	
Gadolinite, a complex orthosilicate of yttrium, etc	[illegible]
Eucrasite, a variety of thorite	[illegible]
Freyalite, a variety of thorite	[illegible]
Cyrtolite, an altered zircon	
Tachyaphaltite, an altered zircon	
[illegible], an altered [illegible]	
Yttrialite, a silicate of thorium and yttrium metals	[illegible]
Thalenite, a hydrous silicate of yttrium	
Allanite, a silicate of the cerium metals, aluminum, etc	[illegible]
Bodenite, a variety of allanite	
Muromontite, a variety of allanite	
Orthite, a variety of allanite	[illegible]
Uralorthite, a variety of allanite	
Cerite, a silicate of the cerium metals, etc	
Cenosite, a silico-carbontae of yttrium and calcium	
Keilhauite, a titano-silicate of calcium, yttrium, etc	
Tscheffkinite, related to keilhauite	[illegible]
Johnstrupite, a complex silicate of the cerium metals, etc	[illegible]
Mosandrite, related to johnstrupite	[illegible]
Rinkite, near johnstrupite and mosandrite	
Thorianite, cubical mineral from Ceylon, isomorphous with uraninite	[illegible]
Dysanalyte, a titano-columbate of calcium and iron	
[illegible], a columbate of cerium, calcium, etc	[illegible]
Hatchettolite, a tantalo-columbate of uranium	
Microlite, chiefly a calcium pyro-tantalate	
Fergusonite, a metacolumbate of yttrium, etc	
Kochelite, a variety of fergusonite	1-2%
Sipylite, chiefly a columbate of erbium	
Columbite, columbate of iron	————
Stibiotantalite, tantalite containing antimony	
Yttrotantalite, a tantalo-columbate of iron, yttrium, etc	————
Mossite, a tantalo-columbate of iron	
Skogbolite, iron tantalate	————
Tapiolite, a tantalate and columbate of iron	
Tysonite, a fluoride of the cerium metals	
Fluocerite, a fluoride of the cerium metals	
Yttrocerite, a fluoride of calcium with cerium and yttrium	
Cassiterite, tin dioxide	
Ainalite, tantaliferous cassiterite	————
Parisite, a fluocarbonate of the cerium metals	
Bastnaesite, a fluocarbonate of the cerium metals	
[illegible]	
Tengerite, an yttrium carbonate	————
Lavenite, a silico-zirconate of manganese, calcium, etc	————
Wöhlerite, a silico-zirconate of calcium, sodium, etc	
Eudialyte, a silicate of uncertain formula	
Eucolite, a silicate of uncertain composition	
Cappelenite, a boro-silicate of yttrium and barium	[illegible]
Melanocerite, a fluo-silicate of the cerium and yttrium metals	[illegible]
Caryocerite, related to melanocerite	[illegible]
Tritomite, a fluo-silicate of thorium, cerium, yttrium, etc	[illegible]
Zircon, zirconium silicate	0-2%

[illegible]

The important thorium minerals are thorite, auerlite, thorianite and monazite. Orangite and uranothorite, two varieties of thorite, will also be described.

Uses of Thorium

The economic interest in the thorium minerals centers in the property of thoria of emitting an intense white light when heated in the flame of a Bunsen gas burner. The mantle of the Welsbach incandescent lamp consists of about 99 per cent. thoria and 1 per cent. ceria.

Filaments for incandescent electric lamps have been prepared from thorium and thorium carbide, and thoria is used in the manufacture of filaments requiring an admixture of a refractory oxide, as the filaments for osmium lamps. Thoria has also entered into the manufacture of electric glowers, such as that of the Nernst lamp. Thoria alone is too easily volatilized to be used in the glower mentioned, unless yttria and zirconia are employed.

Alloys of thorium with other metals have been prepared. The crystalline alloy of thorium and aluminum has the color and appearance of aluminum, but is unattacked by aqueous solutions of the alkalies. As yet, thorium alloys have no technical application.

It should be mentioned here that thorium compounds exist in monazite, the chief source, as variable impurities, and that this mineral is the principal source of the cerium earths at the present time. Cerium salts are utilized in the incandescent lighting industry, in medicine, and in metallurgy; they have also been used in the paint, dyeing, and ceramic industries.

The production of Welsbach mantles is increasing at a tremendous rate. One factory increased its output in three years from 15,000,000 to 25,000,000 mantles. Each mantle weighs about 5 grams.

Thorite

The typical thorium mineral, thorite, is found in orange-yellow, brownish yellow, and black tetragonal crystals, which resemble those of zircon. It is also found massive and compact. Specimens of thorite are always more or less altered, and all analyses show water, and often uranium, lead, iron, cerium, calcium, magnesium, alkali metals, and aluminum. Thorite is a brittle mineral, having a conchoidal fracture, a hardness of 4.5-5, and a specific gravity of 5.19-5.40. The luster is resinous, and the streak is light orange to dark brown.

When heated in a closed tube, thorite yields water, and the orange variety becomes dull brown while hot, but changes to an orange color again on cooling. It is infusible before the blowpipe. It dissolves in borax, and the saturated bead is opaque on cooling, but may be otherwise, depending on the specimen. When it cannot be rendered opaque by flaming, the borax bead shows iron. With salt of phosphorus, it leaves a silica skeleton, and becomes opalescent and greenish on cooling. With soda on charcoal it yields a yellowish brown slag. It gelatinizes with hydrochloric acid before being heated by the blowpipe, but not after.

Thorite occurs chiefly in Norway. It has been found in granite of the Trotter mine, Franklin Furnace, N. J.

Orangite

Orangite occurs in bright orange-yellow

---

*Professor of chemistry, College of the City of New York.

crystals like those of zircon in angle. It was first described from the Brevik region, Norway, and the identity of orangite and thorite was early shown. Its specific gravity varies from 4.88-5.4. Orangite has not as yet been found in the United States.

Its deportment before the blowpipe is the same as that of thorite.

Uranothorite

This mineral occurs massive. Its color is dark reddish brown, and the luster is resinous to subvitreous. Its hardness is 5, and the specific gravity is 4.126. The streak is yellow-brown. Uranothorite has been found in the Champlain iron region, New York; a specimen examined from this locality contained 52.07 per cent. thoria and 9.96 per cent. uranium trioxide.

Uranothorite is infusible before the blowpipe. For other reactions, see thorite.

Auerlite

This mineral is found in tetragonal crystals, resembling zircon in habit and angles. Its color is a dull yellowish white to dark orange-red, and the luster is resinous. The hardness is 2.5-3, and the specific gravity is 4.42-4.77. It occurs in disintegrated granite or gneiss in Henderson county, North Carolina, being associated with zircon.

Auerlite is infusible before the blowpipe, but becomes brown on ignition and turns orange again on cooling.

Monazite

Monazite occurs in small brown crystals, having a resinous luster, or in yellow grains, disseminated or in the form of sand. It has also been found in masses yielding angular particles. Monazite is distributed as an accessory constituent of gneissoid rocks in North Carolina and Brazil. It is found in the United States in Connecticut, at Norwich and Chester; Yorktown, N. Y.; Amelia Court House, Va., and in Alexander, Madison, Mitchell, Yancey, Burke, Polk, McDowell, and Rutherford counties, N. C. It also occurs in the gold sands of southern Idaho, and in Greenville county, S. C. Some monazite has been found in the black sands of the Pacific slope. Monazite has a hardness of 5-5.5, and a specific gravity of 4.9-5.3, mostly 5-5.2. Its fracture is conchoidal to uneven, and the streak is white.

Monazite is infusible before the blowpipe, but turns gray, and colors the flame a blue-green when moistened with sulphuric acid. Its borax bead is yellow while hot and colorless when cold; a saturated bead assumes an enamel-white color on flaming. It is decomposed by hydrochloric acid, leaving a white residue. With boric acid and iron, iron phosphide is formed. A monazite solution added to a nitric acid solution of ammonium molybdate causes a yellow precipitate.

Thorianite

This interesting mineral was discovered in 1905 near Balangoda, Ceylon, associated with corundum, zircon, tin, topaz, spinel, etc. It was found to contain 78.86 per cent. thorium oxide. The specific gravity is 9.32, and it was found in hard, black cubical crystals, giving a brown streak. It is not improbable that this mineral may be found in the tin, topaz, zircon, and monazite localities of the United States.

Thorianite has the advantage of containing uncombined thoria, soluble in nitric acid with the formation of thorium nitrate. The pulverized mineral dissolves easily in dilute sulphuric acid, but is scarcely attacked by hydrochloric acid.

Other Minerals

Thorogummite and nivenite will be described under uranium minerals; they occur in Llano county, Texas.

Phelps, Dodge & Co. Form a $50,000,000 Corporation

The various mining enterprises controlled by the Phelps, Dodge & Company's interests are on Jan. 1, 1909 to be consolidated into a single corporation under the name, Phelps, Dodge & Company, Incorporated. The new company will have a capitalization of $50,000,000, and the stock is to be listed on the Boston or the New York Exchange. The announcement was made on Dec. 10, and on the same day the purposes of the change as explained by the partners were mailed to the shareholders concerned.

The old firm will transfer its metal-selling business and its good will to the corporation and go into liquidation. The $50,000,000 of capital stock of the new corporation will be used for the purchase of the following shares at the valuations stated:

Copper Queen Consolidated Mining Company at $135 for each $10 share	$27,000,000
Moctezuma Copper Company at $307 9-13 for each $100 share	8,000,000
Detroit Copper Mining Company of Arizona at $150 for each $25 share	6,000,000
Stag Cañon Fuel Company at $800 for each $100 share	4,000,000
To be held for future issue	5,000,000

Subscriptions will be binding when holders of 75 per cent. of the stock of each company have signed in approval of the incorporation. There will be nine directors in the new company.

On Nov. 1, 1908, the investment in the plants to be taken over by the corporation, exclusive of the mines themselves, was $28,949,739.53.

The partners in the firm of Phelps, Dodge & Co., are: James Douglas, Cleveland H. Dodge, Arthur Curtiss James, James McLean, George B. Agnew, E. Hayward Ferry, Francis L. Hine, George Notman and William Church Osborn.

The old firm of Phelps, Dodge & Co. began business in 1885. The members of the firm were William Earl Dodge, D. Willis James, James McLean, Cleveland Hoadley Dodge and Arthur C. James.

In 1885 the partners owned the Copper Queen, which was then 700 miles from a railroad. Fuel was brought from England by way of San Francisco, and the mine had many ups and downs. It finally became a great money maker and the firm built railroads and developed it and gradually bought other mining properties.

The number of employees directly engaged by the copper and coal mines, ore-treating works and railroads operated by the Phelps-Dodge interests in Mexico and the United States is 10,000. Directly and indirectly these copper mines and railroads and the fuel-producing interests under the same management support upward of 60,000 persons. The length of the railroads is about 1000 miles. From July 1, 1907, until June 30, 1908, the Phelps-Dodge railroads carried 4,582,728 tons of freight, the great bulk for their own and adjacent mines in Arizona and Mexico.

None of the stocks in any of these mines has ever been listed on a stock exchange, all the shares being owned by the partners and affiliated interests in commercial life.

A statement by the comptroller gives the following information about the various properties.

Copper Queen Consolidated Mining Company

This property consists of 135 mining claims in the Warren mining district, Cochise county, near the town of Bisbee, Arizona, a large smelting plant at Douglas, of a capacity of 3000 tons a day, which treats the product of the mines of the Copper Queen Company, and for the time being the ores of the Moctezuma Copper Company, and does general custom work. The company conducts a mercantile business, and has large stores and warehouses in Bisbee and Douglas, and a branch store in Naco, Arizona, as well as other pieces of real estate. It also owns mining interests in other localities.

For the last five years the production of the mines has been as follows:

1903	37,257,470 lb.
1904	50,151,552 "
1905	64,625,955 "
1906	79,219,655 "
1907	63,341,055 "
Total	294,595,687 "

The output of the Douglas Reduction Works, including purchased and custom ores, for five years has been 363,121,911 pounds.

The earnings of the company during the five years have been as follows:

1903	$2,201,640.40
1904	2,960,659.70
1905	5,609,486.30
1906	7,625,854.76
1907	4,471,137.08
Total	$22,868,778.24

The difference between earnings and dividends is represented by expenditure on increased plant facilities, and undistributed assets, consisting of the larger stock of coke and fuel necessitated by increased operations; and the accumulated stock of ores at the works, amounting in value to over $1,000,000, as well as by increased cash and increased reserves.

A large portion of the company's mining property has as yet been undeveloped, though situated within the recognized mineral zone of the district, and, owing to the difficulty of holding up the soft, shifting ground in which the ore occurs, it has always been found impossible to block out ore reserves as large as mines of such capacity elsewhere have usually maintained, as nominally "in sight." There is, however, at the present time as much ore "in sight" as at any other period of the mine's history.

The valuation of the company's property as of Nov. 1, 1908, exclusive of the mines, is as follows:

Invested in plant	$1[illegible]
Other assets	10,915,492 97
Liabilities	[illegible]

Moctezuma Copper Company

This property consists of about 2500 acres of mineral ground in the State of Sonora, Mexico, on which has been opened the Pilares mine. This is in a mineralized body, oval in shape, and which retains approximately its dimensions between surface and the 700-ft. level. It is about 1700 ft. in diameter from north to south, and 1200 ft. in diameter from east to west, and contains a large area of profitable ore. A narrow-gage steam railroad five miles in length connects the mine through the Pilares tunnel with the concentrating mill at the town of Nacozari. The tunnel itself, with its branches, is over a mile in length, and is large enough to allow of the railroad cars' reaching through it the different sections of the mines, and receiving their charge from large bins excavated out of the ore. These bins are of a capacity of several thousand tons each, and are fed through chutes extending to the surface levels, the chutes also being excavated from the mineralized ground.

The quantity of what may be considered ore depends entirely upon the grade which it is profitable at a given price for copper to work, but the mine is at present opened up for an extraction of 1500 to 2000 tons a day of ore of an average grade of 3 per cent. The daily capacity of the concentrating mill just completed at Nacozari is 2000 tons. At Nacozari is a well designed power plant, equipped with Curtis turbines of over 4000 h.p., for transmitting high-voltage current to both the mill and the mine. For the time being it is found to be more profitable to convey the concentrates and rich ores by the Nacozari Railroad to Douglas, Arizona, 70 miles distant, than to smelt them on the spot, the ores being treated at Douglas at the same profit to the Copper Queen Company as though they were custom ores supplied by an unallied customer. This feature of the company's operations explains the comparatively small quantity of supplies carried by the Moctezuma Copper Company as compared with the other companies.

The old concentrating mill, which is still intact, with its very efficient gas engine and gas generating plant, which up to within a few months treated 600 tons of ore a day, is now out of commission, though it can be started at short notice as a supplemental plant to the new mill, should this course be desirable.

The production for the last five years has been as follows:

1903	10,281,970 lb.
1904	[illegible]
1905	10,160,016 "
1906	[illegible]
1907	9,640,390 "
Total	53,858,751 "

The increased capacity of both the mine and the concentrating mill, owing to recent improvements, is indicated by the fact that in May, 1908, the production was 784,892 lb. of metallic copper, whereas by the month of October it had reached 2,300,000 lb. of copper, contained in 9500 tons of 12½ per cent. concentrates. A production of approximately two million pounds of copper a month can now be maintained; and, if the market demanded it, this production could be increased to three million pounds per month.

The net earnings for the last five years, while the mine was still in a stage of development and the works were contracted, were as follows:

1903	$156,524 55
1904	598,992 36
1905	533,117 66
1906	1,195,424 18
1907	833,236 25
Total	$3,617,295 00

The company has built and owns the whole town of Nacozari, and has provided it with a well furnished library and amusement hall, a thoroughly equipped hospital, hotel boarding houses and schools. At the Pilares mine the company has provided its workmen with comfortable houses and supports a school. At both Nacozari and Pilares the company has large stores and warehouses, and conducts a profitable mercantile business.

The valuation of the company's property as of Nov. 1, 1908, exclusive of the mines, is as follows:

Invested in plant	$3,046,384 32
Other assets	944,663 08
Liabilities	347,221 22

Detroit Copper Mining Company of Arizona

The mines of this company are situated in the Clifton district, Arizona, in the same beds of felspathic rock which at the present time are yielding the product of the Arizona Copper Company, the Shannon Copper Company, and certain less prominent organizations. The property owned by the company consists of [illegible] mining claims, and the ore now extracted amounts to about 36,000 tons per month, yielding about 3 per cent. of copper. The bulk of the ore is concentrated mechanically to a grade of about 15 per cent., and smelted at Morenci in the company's own smelting works.

The company's production for the last five years has been as follows:

1903	16,569,300 lb.
1904	16,424,394 "
[illegible]	[illegible] "
[illegible]	[illegible] "
1907	17,974,581 "
Total	[illegible] "

The production for the eleven months of the present year has increased to 21,500,000 lb. owing in great measure to improved facilities for treatment. The future production with the present equipment can be maintained at approximately two million pounds of copper per month.

The earnings during the last five years have been as follows:

1903	$743,456 00
1904	603 340 00
1905	532,684 28
1906	[illegible]
1907	814,874 11
Total	$3,467,810 81

The company runs a large store and hotel, and owns considerable other property in the town of Morenci, besides a powerful pumping plant on the San Francisco river seven miles distant.

The valuation of the company's property as of Nov. 1, 1908, exclusive of the mines, is as follows:

[illegible]	$2,158,106 00
Other assets	2,934,465 97
[illegible]	149,878 48

The ores from the Copper Queen mines carry about twice the quantity of copper contained in those of the Nacozari and Morenci districts, but this advantage is offset by the higher cost of mining the Queen ores, owing to the character of the deposits in which they occur. Moreover, as the Queen ores cannot be subjected to preliminary mechanical concentration, which raises the smelting grade of the Nacozari and Morenci ores, they must be subjected to furnace treatment as they come from the mines; hence the cost of smelting a ton of Queen ore is higher than the cost calculated on a ton of crude Nacozari or Morenci ore, as it comes from the mine previous to mechanical concentration.

[illegible] Fuel Company

The Dawson coalfields are situated at Dawson, Colfax county, New Mexico, and were purchased in 1905 to secure for the copper mines of the Southwest a certain and steady supply of coal and coke. They were the property of the El Paso & Northeastern Company, and are represented by [illegible] of [illegible] are [illegible] of El Paso & Northeastern Company property aggregating $5,000,000. A sinking fund provision of 5c. a ton begins in 1911.

The equity in the Dawson Fuel Company has been transferred to the Stag Cañon Fuel Company, which owns 11,078 acres of coal lands adjacent. These combined properties consist, beside surface plants, of 38,718 acres, of which about 36,000 acres are underlaid by coal. The company likewise has the right to mine coal over 17,500 acres, of which, however, only 2500 are known to be underlaid by coal. All this property has been acquired from the owners of the Maxwell Grant, and is, therefore, held under unquestionable title.

There are several beds of coal on the property, but only one has been prospected and worked. From it 437 acres of coal have been worked out, leaving approximately 38,000 acres available for future extraction. Making the usual allowance for loss, more than 200,000,000 tons of coal should be extracted from this single bed.

As the outcrop of these beds follows with remarkable uniformity the deep indentations of the foothills of the Raton range, under which the coal dips, the geographical conditions afford every facility for opening new mines. Up to the present six mines have been opened on the outcrop of this single vein, the output of four of which is screened and loaded from a single tipple. A separate tipple serves the fifth and sixth mines, situated two miles distant from the first, up the Vermejo cañon.

The present mines opened are equipped for a total capacity of about 120,000 tons of coal a month. The output at the present time is about 90,000 tons per month. This is an increase over the output in January, 1908, when only about 65,000 tons were mined, and in February, when the output was only 41,688 tons. Of the present production about 50,000 tons, screened from the run-of-mine coal, passes to the washery and thence to the coke ovens. Of the total coking plant of 550 ovens, 100 ovens are of the old-fashioned beehive type, and 450 are of underflue design, from all of which the waste gases can be recovered for the generation of power. The gases from only 200 of the ovens generate steam enough to run the washery, the pumping plant and the electrical underground transportation. The tipples and crushing plant, as well as the washery, are built of steel, every piece of machinery, even the jigs, being incombustible. As a precaution against explosions, electric firing is practised in all the mines.

The expenditure on the steel buildings constituting the surface plant has been great, but danger of delay from destruction by fire is eliminated, and the expense of insurance is reduced.

The capacity of the coke ovens is 27,000 tons a month. The present output is 25,000 tons. The quality of the coke is from actual tests equal in efficiency to within 7 per cent. of the best eastern coke. The railroad connecting the coal mines with the copper mines has provided a supply of coke rack cars and of steel coal cars sufficient to handle the product, and, therefore, the shortage and irregular supply of fuel to the copper mines which has hampered smelting operations in the past, will, it is hoped and believed, be avoided.

The operations of the company during the fiscal year ending June 30, 1908, which was a year of deep industrial depression, with only a part of the new ovens in operation, were as follows: tons of coal mined, 846,473; tons of coke made, 177,043.

The gross earnings were $1,518,809.69; and the total net earnings, $283,942.61.

The present increased output, which it is hoped to bring in prosperous times up to the full capacity of the mine, namely, 120,000 tons of coal per month, has resulted in a correspondingly increased net profit.

The company has built for its miners comfortable houses, provided a hospital with an efficient staff of doctors and nurses and a large amusement hall with reading and billiard room. A general store is run by the Southwestern Mercantile Company, of which the stock is owned by the Stag Cañon Fuel Company. The actual cost of the permanent improvements on the property since the present owners came into possession has been $2,452,388, but the mines are now so well equipped, and the plants so nearly completed, that but little further expenditure on construction will have to be made in the near future.

The valuation of the company's property as of Nov. 1, 1908, exclusive of the mines, is as follows:

Invested in plant	$3,226,488.42
Other Assets.	$1,749,272.00
Total Liabilities................	$2,388,492.96

A California Mine Complication

Special Correspondence

The now famous Tightner quartz mine at Alleghany, Sierra county, California, owned by H. L. Johnson, is in trouble, as happens to so many mines after they are proved to be rich. The Dead River Gold Mining Company has begun suit against Mr. Johnson, claiming that that portion of the ground from which the rich ore of the Tightner came, is covered by the placer location of the company. The property in dispute was originally owned by the Alleghany Mining Company which finally dwindled down to two stockholders after considerable unsuccessful work had been done. These two stockholders held on to the claims which were originally placer claims and did the assessment work each year to prevent the property from being jumped. To better protect their interests, after they had discovered that quartz veins existed in the property, they made two quartz locations, thinking that the placer locations would not protect them in holding the quartz veins. The locations were called Contact and Contact Extension. Later the placer properties passed into other hands. Capt. J. W. Morrell got control of the placer locations and sold them to the Dead River Gold Mining Company, which is composed of prominent Scranton, Penn., capitalists This property has been extensively worked. The quartz locations passed into the hands of H. J. Johnson, who now owns them. Johnson got the property for $10,000 and has taken out large quantities of gold from the vein at small expense.

Mr. Johnson has been working the Tightner for seven or eight years, and at one time bonded it to other parties, who failed to make payments, so the mine reverted to him. Finally he came upon phenomenally rich ore, which has since continued and this has made him a wealthy man. Moreover, the fame of the Tightner brought numbers of mining men to the locality where it is situated, who have since invested in other properties, so that last year the mining region around Alleghany was probably the most active in the State.

Low-Phosphorus High-Silicon Pig Iron

According to Colne & Co., New York, high-silicon pig iron very low in sulphur and phosphorus is used in making steel with the surface-blown converter, and analyzes as follows: Silicon, 2.25 to 3.50 per cent.; manganese, 0.50 to 0.90 per cent.; carbon, 3 to 4.50 per cent.; sulphur, 0.03 to 0.04 per cent.; phosphorus, 0.03 to 0.04 per cent. Iron so low in phosphorus is very scarce in the United States, the production small, the price high, and is confined principally in the hands of one house.

The surface-blown converter has been introduced with much advantage as an adjunct to cast-iron foundries, malleable-iron works and open-hearth steel foundries. It fills a field not reached by the open-hearth process for making small and medium perfectly sound castings of high tensile strength, free from blow holes. Steel is rapidly being substituted for cast or malleable iron. There is much demand for good castings from the machinery trade, steam fitting, electrical business, etc. The surface-blown converter being now free, the patent having expired, it is to be expected that its use will be largely extended.

Diamond drilling on the Rand, according to an editorial in the *South African Mining Journal*, Oct. 10, 1908, apart from strengthening the knowledge that the Main Reef does go down, has not obtained adequate return for the vast sums that have been expended in such prospecting.

Mine Labor and Supplies in Mexico

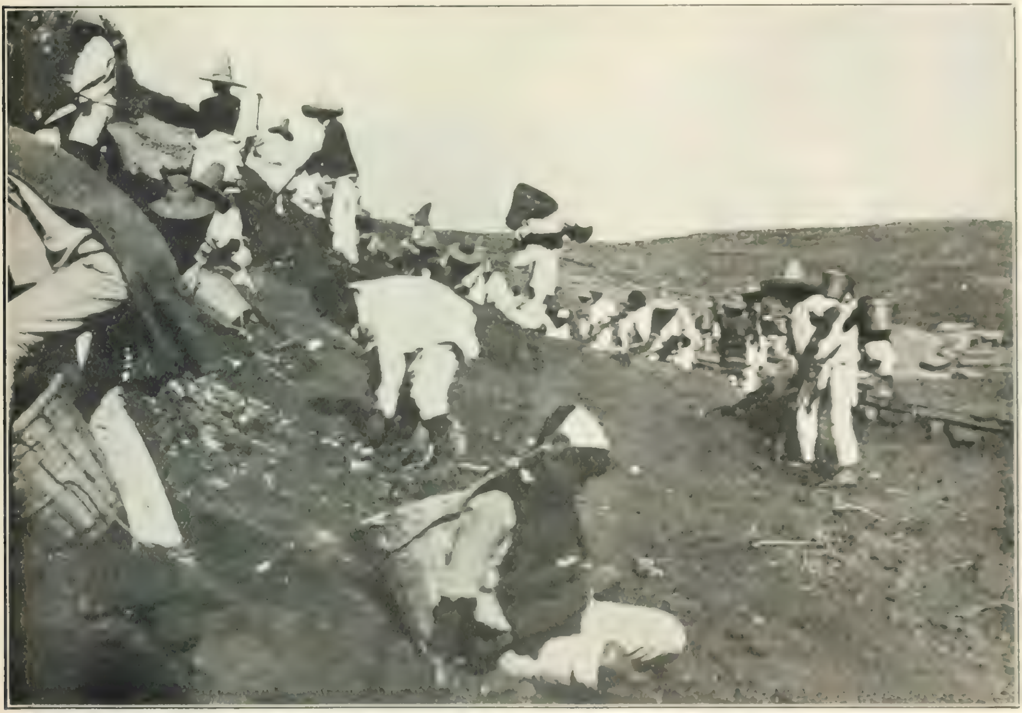
Quality of Native Labor in Mexico. Cheap Labor and Machinery. Trade in Mining Supplies; Sources from Which Materials Are Drawn

BY MARK R. LAMB*

Labor conditions in Mexico differ so widely and radically from those across the border in the United States, that some notes and illustrations of how work is done there seem to be of interest and service to engineers and investors.

Methods of Mexican Laborers

Labor in Mexico is a problem which has to be solved every day. A mill is built, but from the first hatful of dirt moved troubles are experienced. Not real troubles like American troubles, where a laborer is free to work or to quit—and is free to allow his neighbor to work or to prevent him. Here there is none of that. Labor is docile and willing when it is labor, and when treated properly, but pulque, high wages (comparatively) and church-feast days conspire against the employer to reduce the supply. The illustrations of the excavations for the Pinguico mill show a condition which seems incredible to one not acquainted with local conditions. Note that with car tracks laid to the face of the cut it is cheaper to carry the dirt in baskets to the edge of the fill than to fill cars and tram them. The task on this piece of work, for each man, was 300 well-filled baskets per day. Mr. Empson, the manager, explained that account should be taken in such work of the graft between the timekeeper and the laborer, and about 50 baskets should be deducted. The basket holds slightly over a cubic foot and for 300 baskets (less graft) the peon is paid 50 centavos, or 25c. gold. The men are much better satisfied at the rate of 300 baskets than if actual count was kept and they were paid the same amount for 250, since at the higher rate they beat the company. These baskets are a great improvement over the old method of using hats for carrying, and the improvement was only possible after the American began paying such high wages—25c. gold per day. The baskets cost 15c. gold, so the laborer has little trouble getting one. The sight of these men trotting back and forth with their loads, really doing much work considering their limited diet of corn and beans, much resembles an excited ant heap. They are famous for their ability to carry loads which would put an American out of business. They are really only undersized boys in build and to see a group of four load a motor weighing 470 lb. on the back of a fifth man gives one curious sensations. It became necessary to take [illegible] upon the bent necks and shoulders of two men and four went along to take the [illegible] These four could barely lift one end down [illegible] carry—nor did they!



EXCAVATING FOR PINGUICO MILL, [illegible]

Skilled Labor

[illegible]

---

*Mining engineer, Mexico, D. F., Mexico.

skilled laborers—such as carpenters, masons and machinists—have their chance and here the influence of the foreigner begins to show. There is a Mexican proverb which says, "Beware of the *gringo* who wears a Mexican hat and of the Mexican who smokes a pipe!" The first part of this is all right, but a pipe is a long step above the cigarette for a Mexican and he should be given credit for it. It is a time-saving change for his employer.

The Mexican of the higher class is instinctively and hereditarily opposed to manual labor, so that though the mining school in Mexico City is excellent, one rarely sees one of its graduates in a modern mill or plant working with his hands getting the details of experience. This feeling is slowly passing, but for a long time mill-men, mechanics and shiftmen must be drawn from the United States or England. It is not fair to the native, but as yet the native does not appreciate his opportunities and advantages. Caste feeling is very strong; it would, and does often, interfere, as a machinist may be of the peon class and be obliged to give orders to a gentleman, a thing which could not be tolerated for a moment. It is even difficult for some men in the City of Mexico who have the outward appearances of gentlemen to pay car fares to such low creatures as are the conductors. And the latter consider the gentlemen perfectly right! One of the most hopeful signs is the sight of bright, eager young fellows in overalls, caps and shoes who seem proud of the dirt from the shops. They have discarded the broad straw hat and white cotton pants, and it is this class which is making it more and more difficult for the *gringo* handy-man to find a place in Mexico.

Labor and Machinery

The usual line of talk of the machinery salesman in Mexico is that labor is so uncertain that, even though it costs more to do the work by machinery, this would be better than to depend upon such a variable factor. To a large extent this is true, but one should always bear in mind the extremely low cost of labor. Where else can dirt be moved at the cost given for grading for Pinguico mill? They are not even doing it at Panama! A comparison recently made by a manager using Blaisdell machinery clearly showed that this system saved both time and money and that a very few stoppages due to lack of labor for discharging tanks would pay for the equipment. The margin must indeed be close when 100 tons of sand can be shoveled to conveyers from tanks for $2.50 gold. Compared with similar work in Nevada and California it is simply too low a cost to include in finals per ton. This very cheapness of labor has its disadvantages. A metallurgist used to intelligent laborers of other countries will design a mill along good lines for those countries and those laborers, utterly ignoring the men who must run his mill. The latest refinements in concentrators, Huntington mills, high-speed Chile mills, separately driven stamp batteries, grinding pans, classifiers, etc., should be looked at with a prophetic eye in an endeavor to see what they will resemble after being turned over to the tender mercies of helpers who do not know a left-handed saw from a round square and can hardly speak Spanish, many being full-blooded Indians.

Sr. Narvaez at Hacienda La Union at Pachuca is running Chile mills and says, "You Americans and English have had the results attained by these slow, heavy Chile mills before you for centuries, and have known that they are particularly strong on reducing coarse ore to slime for the patio. Now that sliming is again in order for the new cyaniding, how long will it take you to discover the Chile mill?" He says that there are only two conditions under which the Chile does not work well. One is when it is too well fed and the other when it is not fed at all. The commonest of peon labor can remedy these conditions and get good re-

EXCAVATING FOR PINGUICO MILL, GUANAJUATO sults, which can be said of no other machine for reducing ores. He proves what he says in the results attained in his plant. To be sure, it seems a pity not to buy the latest ore-reducing machinery, but with this labor which costs so little and is so unmechanical and with no staying qualities—where the entire plant crew changes from month to month—the designer should frankly make the best of it. Use more labor if necessary, but make the mill as near repair-proof as possible. If good American mechanics at $5 gold per day allow mortars to become loose on concrete blocks, can more be expected of Indian helpers at nothing per day? Unfortunate examples of such conditions can be discovered throughout Mexico.

Holidays

During Holy Week foreigners go on working as usual, but it is a frantic scramble to get men enough on the job to keep the mill going. Even though there may not be enough in the larder to last over the week, all want to see the festivals—a veritable week of passion play ending with fun, jollifications, firecrackers and the burning of thousands of Judases. After this is all done there is no trouble keeping the mill going until some special saint is to be crowned or some noted bull-fighter is to appear, or until the first rains, when all must plant corn.

Cost of Supplies

Mill machinery, supplies and materials are cheaper in Mexico almost without exception than in the States. One of the exceptions is Standard Oil products. Manufacturers in the States allow a special export discount of from 5 to 10 per cent. from their lowest prices for home consumption. There is a slight duty on machinery for mines, but when proper representation is made to the Department, even these small duties are refunded when new plants are built. The Mexican government certainly fosters the mining business sedulously and impartially, and it is exactly this treatment which has given miners such confidence. Money will continue to come to Mexico for mining investments, while the evidence is all one way as to the treatment received. Railroad rates to Mexican camps are much lower than similar hauls in the States. The same applies to passenger fares, and with even greater force to telegraph tolls. The latter service double-discounts Western Union, in cost, expedition and accuracy, to say nothing of the fact that complaints receive attention and proper adjustment. All these differences are due to government control, the latter having as much to do with low freight rates, perhaps, as the competing water hauls. A consul went through this central mesa of Mexico some 70 years ago on horseback, and casually said that though the country had great agricultural possibilities, the fact that the central mesa was so surrounded by mountains would prevent wagon roads being built into it, and that consequently it could never amount to much. He was like most prophets.

PAY-DAY AT DOS ESTRELLAS

Sources of Supplies

Most machinery which comes to Mexico is American, though ordinarily steel plate is cheaper and has better delivery from Scotland or Germany. At the time of writing the American prices and deliveries are best even in these items, though as soon as the market is better in the States the Mexican market will be abandoned. English machinery is rarely seen here, and this seems strange as Englishmen were first to appreciate the mines of Mexico. Even English-owned mines are supplied with American machinery. There seem to be no strong English houses represented here. The noted Cyanide Supply Company, of London which has built many plants in other parts of the world and which should easily underbid less experienced manufacturers in the States, is credited with but one plant in Mexico. All cyanide comes from Germany and during prosperous times most structural and railroad steel comes from there. Steel buildings complete can be obtained to better advantage in the United States, as foreign houses require the customer to supply complete plans and specifications down to the last rivet hole, while American companies will design and construct your building; even if you desire, choose the paint for it. Even the famous house of Krupp has furnished little machinery outside of ball and pebble mills. The business opportunities of the country do not seem to be appreciated abroad as much as in the United States.

Former Customs

In the old days supplies consisted principally of fodder for the mules and corn for the laborers and the owner of the [illegible] ranch, being thus his own jobber. He paid both silver and corn, so that even when resting the miner generally had corn in the house. The patron also loaned money to his men and was allowed by law to hold them until the debt was paid. This gave him a fairly constant and dependable labor supply, as the officers would bring back delinquents for him. Pay was in the form of retort silver at the rate of eight pesos per *marco* of eight ounces. This silver the laborer took to the mint and sold.

The men liked this method, but later it was changed as high-grading existed in all treatment plants and mines. The old, old men of the community tell how they would buy the right to concentrate the treated *torta* as it issued from the patio on its way to the river. They would pay a percentage, perhaps, but more frequently money up to about 50 pesos. The purchaser of this privilege would arrange his *planillas*, or inclined concentrating floors, and would carefully work over the tailings. The concentrates were roasted in tiny reverberatories, reground by hand and worked into a mixture *torta* from which much amalgam would be extracted. The retorting was done by filling a narrow-mouthed clay *olla* with pieces of hard amalgam. After the mouth of this vessel was choked with fragments of broken clay pots it was inverted over the mouth of another similar one which was half full of water. The two were luted tightly with clay and buried in the ground, room being left around the upper amalgam *olla* for fire. The fumes went down to the water and were condensed and collected. "These days," an old man complained to me, "If we do find concentrates in the tailings from the big mills, the managers buy the *planilla* privileges from the city and prevent us from working in the river. Why [illegible] the river?"

The Operation of a Coal Washery in Colorado

Previous Experience Showed That the Coal Must Be Delivered to the Ovens Finely Pulverized, and in as Dry a Condition as Possible

BY W. F. MURRAY*

The constantly increasing demand for coke and the universal desire to eliminate waste and improve the product from the ovens, is operating to make the use of coal washeries more general; a recent estimate by one thoroughly acquainted with the industry shows that at the present time the daily capacity of the coal washeries in the United States is approximately 110,000 tons.

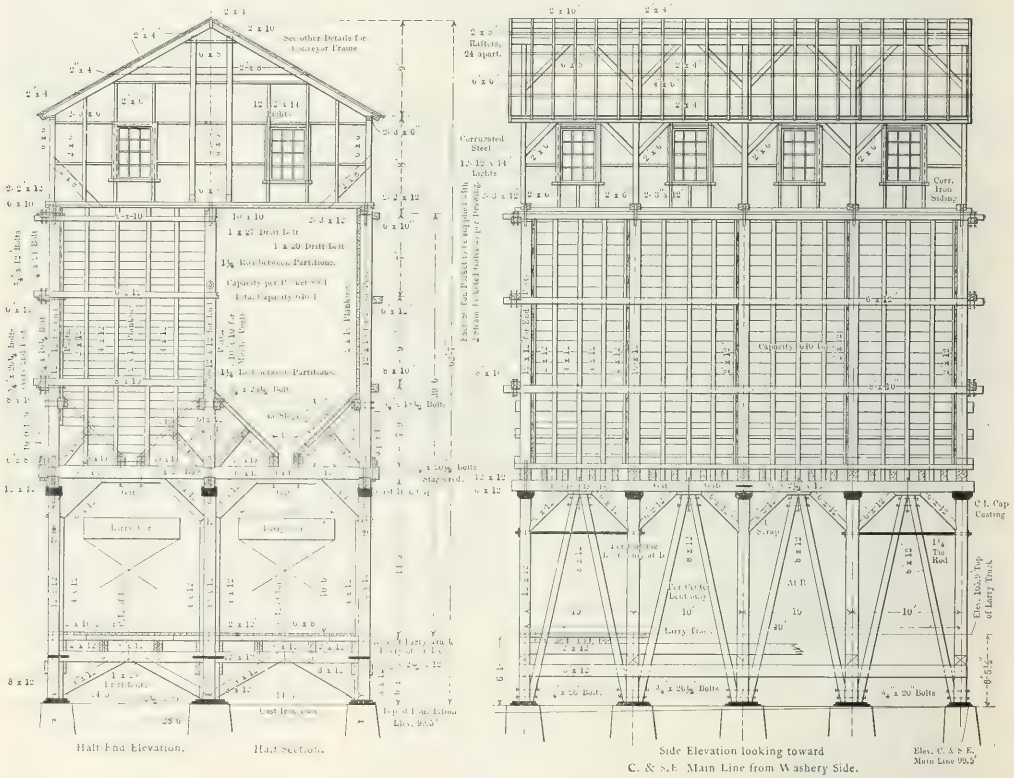


FIG. I. DETAILS OF END AND NORTH ELEVATION OF WASHERY BUILDING

Engineers have given the subject considerable study, and many devices have been brought out, some of them new, while other systems have been copied from European practice. Among the devices most prominently used in this country are the Robinson coal washer, Scaire trough washer, Campbell bumping table and a large variety of jigs, of which those most commonly used are the Forester, Luhrig and Stewart. Nearly all of these different machines have at one time or other been used in Colorado.

In the eastern coking coalfields of Pennsylvania and West Virginia, the coals which do not need washing before coking are becoming more and more scarce, and washeries are being extensively introduced. In the southern or Birmingham coking coal district, no coal is made into coke that is not first washed. In Colorado there are many coals which make excellent coke, but practically all of them contain such a large amount of foreign matter in the way of slate, bone-coal, etc., that all of the coal which is used for the better grades of coke is first washed.

THE FIRST WASHERY IN COLORADO WAS BUILT ABOUT 25 YEARS AGO.

The first washery built in the State of Colorado was erected at the El Moro mine by the Colorado Coal and Iron Company, now the Colorado Fuel and Iron Company, in the early 80's. The jigs used were of the common Hertz type, and the coal was supplied by the Engleville mine, as it is today.

In 1888 a washery was built at Hastings, Colo., in which the Forester jigs were used. This mine is located in the southern part of the State of Colorado, about 19 miles from Trinidad, on the line of the Colorado and Southeastern, which is a feeder to the Atchison, Topeka and Santa Fe, Denver and Rio Grande, and the Colorado and Southern railways. This plant is now owned and operated by the Victor Fuel Company of Denver.

---

*Engineer with Victor Fuel Company, Denver, Colo.

Old Methods Were Discarded.

In 1906 it was found desirable to build a new and modern washery at this mine, as the old washery was getting in bad condition, and it was thought that with more modern appliances better results might be obtained. In the operation of the old plant, the particular needs of this coal and the best methods of preparing it for the ovens were well understood, so that when the new plant was decided upon, it was known just what the plant should be expected to accomplish. After a careful investigation into the various types of washeries in use in various parts of the country, it was decided to adopt Stewart jigs in this new plant, and the Roberts & Schaefer Company, of Chicago, Ill., was given the contract to build the new washery complete.

The new plant had to be so built as not to interfere with the regular operation of the mine. Since the old washery was built entirely on one side of the tipple and ground was available on the opposite side, it was decided to build the new plant entirely independent of the old plant so that building operations might be conducted without interfering in any way with the operation of the mine and of the old washery. This plan was successfully carried out; the washery was built and the final connections to the new washery were made, putting it into commission and throwing the old washery out of commission without losing a single day's output of the mine.

The previous experience with the Forester washery demonstrated that in order to get the best coking results the washed coal must be delivered to the ovens in as finely a pulverized condition as possible, and in addition it must be delivered to the ovens in as dry a state as possible. It was, therefore, demanded that the washed coal be delivered into the washed-coal bin finely pulverized and as free as possible from water. How these conditions were met will best appear in the description that follows:

In order to prevent the losses of coal in the refuse, which hitherto had seemed unavoidable when the coal was ground to a fine state before washing, it was decided to wash the coal in a relatively coarse condition; that is, from 1 in. square mesh down and then crush again after washing. Since there was a fairly good demand for a nut coal, a sizing screen for the unwashed coal was installed so that an unwashed nut coal might be made, and only that coal which had passed through a 1-in. square mesh would be sent to the washery.

Construction of the Buildings

There are two buildings comprising the washery; the washery proper, which contains the engines, jigs, elevators, etc., and the larry or storage bin, which contains [illegible]. All [illegible] concrete, composed of one part cement, three parts sand, and six parts broken stone. The depth of the foundations is 8 ft. below ground level. The lumber entering into the construction of the buildings is fir, pine and native woods. The sides and roof are covered with corrugated steel.

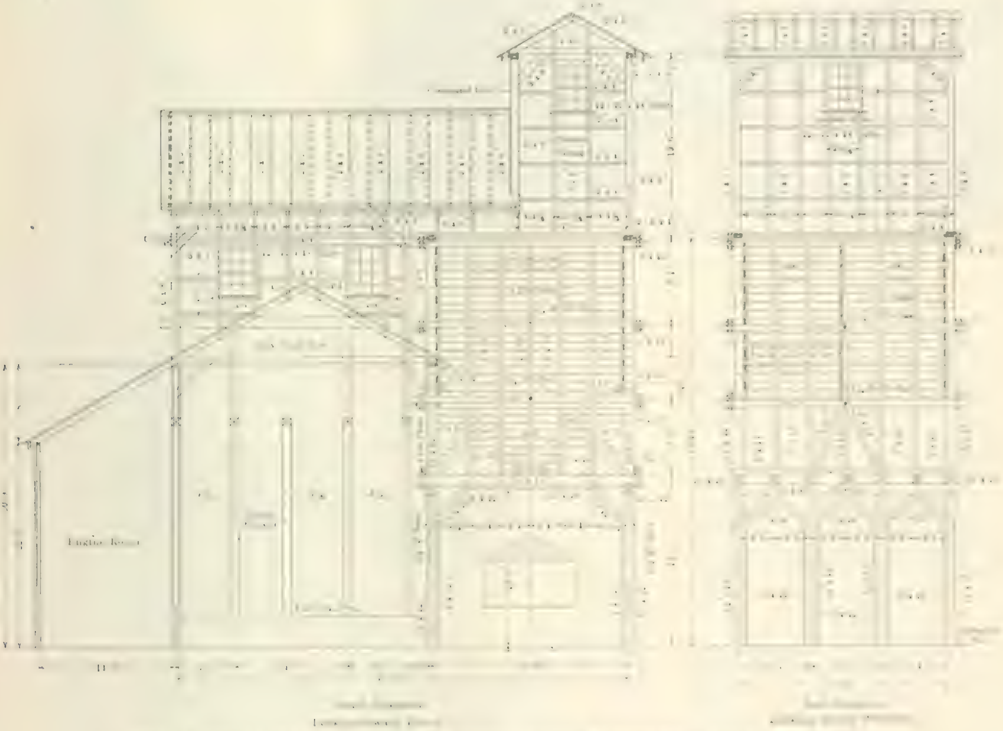


FIG. 2. SOUTH AND EAST ELEVATIONS OF WASHERY, SHOWING [illegible]

Method of Operation.

The run-of-mine coal is discharged over screen bars at the tipple, which are three-fourths of an inch apart. That which goes through the bars is discharged into a

62½-ft. elevator, which consists of a No. 126 roller chain fitted with 24x10x11-in. No. 10 continuous buckets. This elevates the coal to a three-size product revolving screen, 6 ft. in diameter and 12 ft. long, fitted with wire cloth. This screen rests on the nut and pea bins over the railroad track, and is for the purpose of taking from the slack, the pea and nut coal when it is desired to market the same.

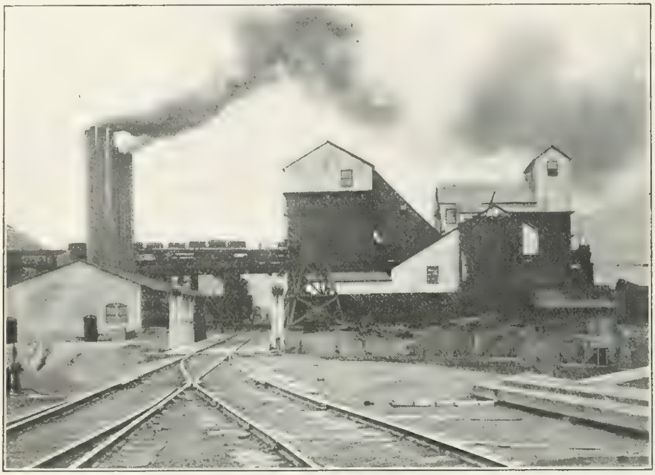


FIG. 3. GENERAL VIEW OF POWER HOUSE AND NEW WASHERY BUILDING AT HASTINGS, COLORADO

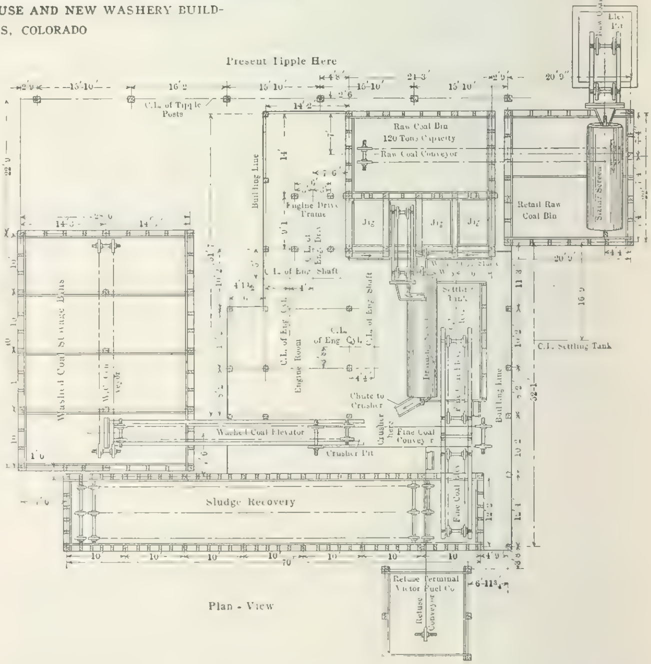


FIG. 4. GENERAL VIEW SHOWING ARRANGEMENT OF THE VARIOUS SCREENS AND BINS

The coal which is to be washed is delivered to a conveyer, which consists of double-strand No. 126 roller chain, fitted every 30 in. with ¼x8x24-in. steel flights. This conveyer delivers the coal to a 120-ton raw-coal bin, from which it is spouted direct to three Stewart jigs, where it is washed. The washed coal is then sluiced to a revolving draining screen which is 5 ft. in diameter and 20 ft. long, covered with ⅛-in. mesh wire cloth. This screen removes from the washed coal the bulk of the water and fine coal which drops to a primary settling tank underneath, from which the fine coal is elevated to a horizontal drag conveyer operating over perforated plates, whence it is delivered to the washed-coal elevator.

The water from this settling tank overflows into a sludge-recovery tank 12 ft. 4 in. wide by 75 ft. long, which serves to clarify the water and removes therefrom the fine float coal where it is elevated to the horizontal drag conveyer previously mentioned, by a special washed coal elevator fitted with 30x12-in. No. 12 steel perforated buckets.

The coarse coal from the jigs, which passes through the revolving draining screen, is spouted to a Stedman disintegrator, where it is crushed and delivered to the washed-coal elevator. All of the washed coal is elevated to a storage bin of 640 tons capacity, where it is distributed into the bin by means of a conveyer placed over the bin, consisting of ¼x8x24-in. steel flights mounted on a steel roller chain. The washed-coal bins are provided with steam-jacketed gates to prevent freezing in cold weather.

An Aerial Tramway Is Used to Dispose of Waste

The bone, slate, etc., is elevated from the jigs to a conveyer which delivers it to a refuse bin from which there is an aërial wire-rope tramway 2450 ft. long, which carries the refuse to a remote point where it is dumped. This tramway is capable of transporting 15 short tons per hour; the waste material weighs 120 lb. per cu.ft. This tramway was erected by A. Leschen & Sons Rope Company, of St. Louis. It works satisfactorily and removes the waste cheaply and quickly.

The raw-coal machinery and crusher is driven by an Atlas four-valve engine, size 16x22 in., generating 140 h.p. The washed-coal machinery is driven by an Atlas four-valve engine, size 15x20 in., generating 115 h.p. The water from the sludge-recovery tank is pumped to a reservoir back of the jigs by an 8-in. centrifugal pump. All bins are lined on their bottoms with No. 10 gage steel. Sluiceways are lined on bottoms with No. 12 and partly on the sides with No. 14 steel.

The washed coal has been brought down to a point where the percentage of ash is less than when the old washery was operated. The refuse shows only a trace of coal. The fine crushing has been satisfactorily accomplished by the Stedman mill and this fine crushing, together with the extraordinarily dry condition of the washed coal, has permitted the making of a better grade of coke than had been possible before the building of the new plant.

Coal Mining on the Retreating System

By Harvey J. Nelms*

This method insures the operator a greater amount of coal than when the seam is worked advancing on the room-and-pillar sytsem. Since mining men in the United States now recognize that our supply of fuel is exhaustible, it certainly behooves all operators to mine every ton of coal possible.

In this retreating system, the main entries are driven 50-ft. centers with crosscuts every 100 ft. The middle entry, in the three-entry system, is used for the haulage road, being also a main intake airway. After turning a pair of butt entries off the main, the second crosscut, 200 ft. from the last butt entry, should be a 45-deg. chute for motor haulage.

The dotted lines on the main entry at the bottom of the butts show the position of the "parting." The motor, hauling twenty-five 1½-ton cars comes in the middle main entry, swinging its trip of empties in the chute, the motor running up the straight where the drivers have stocked their loaded coal. The motor can then pull its loaded trip outside and the drivers proceed to distribute their cars, two drivers going in each butt entry. The drivers make two trips, while the motor makes one.

Face Entries are 1400 ft. Apart

The butt entries are driven on a 90-deg. angle from the main entries, and at a distance of 1400 ft., they intersect a set of three-face entries running parallel to the main entries. The butts are driven 50-ft. centers, with crosscuts every 100 ft. This system of turning butts off the mains is an ideal one for haulage and ventilation. Instead of driving rooms off the butts beginning near the main entry, the rooms are started from the face-entry side and all coal is worked toward the main entries.

Usually 60 ft. of solid coal is left to protect the face entries, and 60 ft. to also protect the mains. The rooms are started four at a time, and as soon as the first four have been driven 50 ft., the next four are started on both butts. The rooms are all driven on sights 90 deg. off the butt entry and driven 25 ft. wide for a distance of 240 ft., there being a 15-ft. pillar left in each room. The crosscuts in the rooms are from 80 to 100 ft. apart, and should be "staggered" across the different rooms so as not to make a weak place in the roof as would occur if the breaks were all opposite.

Four Pairs of Butt Entries Will Produce 1200 tons of Coal Daily

After driving the rooms the full distance, they should be cut over to the next room by the mining machine, the cut being 20 ft. wide. The great advantage to be gained in this system is the method of not having work scattered all over a mining territory. Four pairs of butt entries mined, according to this method and in the condition shown in this plan will produce 1200 cars of coal each working day.

In the plan shown, there are 32 "machine" rooms working on the pair of butts, and requiring 32 men (loaders), two men having two rooms and working them together. It is the general practice to clean up one room at a time and so always have coal to load in one room or the other. Each machine loader receives six cars, thereby producing 192 cars per day

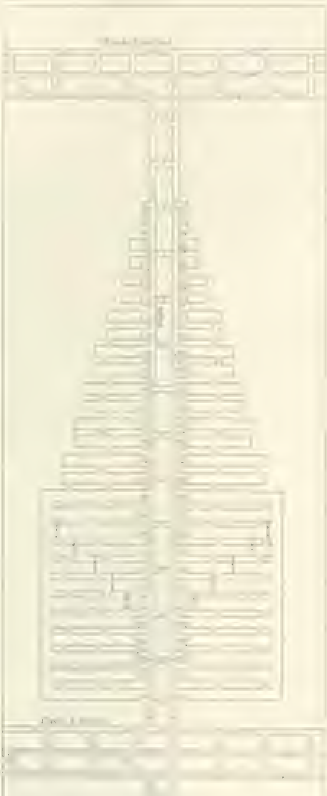


FIG. 1. GENERAL SYSTEM OF WORKING ON THE RETREATING ROOM AND PILLAR PLAN

There are 10 pillars being robbed, and these produce 30 cars of coal, as the pillars are worked by one man. In some places, two men work the pillars. The "turn" in coal mines is such that a machine loader receives two cars to the pick miner's one, thereby equalling each other's wages, as pick coal costs about twice as much as machine coal. The chain pillar and stump will produce 12 cars per day, four men working these. The two butts produce 234 cars per day.

The Method of Ventilation is Simple

The engineer can advance the work in such a standard way that his machine coal will always total to the proper amount. A mine foreman should find this an easy way to keep his men standardized, the machine loaders always having machine places and the pick men pick places, thereby increasing the safety factor of his mine as his machine men would never have to do pick work.

The ventilation shown by the arrow heads is the most practical to use; the splits are shown and also the overcast at the bottom of the butt entry, there being a regulator in this overcast. The motor road is clear of doors on the main entries. The arrangement of chutes on the left side would be slightly different.

---

*Mining engineer, Bentleyville, Penn.

The Rich Coalfields in New Mexico

About two years ago all the public land in New Mexico supposed to contain coal was withdrawn from entry by the President pending an investigation and classification now being carried on by the United States Geological Survey. During the past few months the valuable coal beds in the vicinity of Raton have been investigated. The deposits here located have an area 15 miles wide, extending from Johnson's Mesa westward to the mountains.

Careful investigations, carried on by the United States Geological Survey, have shown that most of the coal contained in this field is a high-grade bituminous and of coking quality.

Geology of the Field

The field work done shows that the oldest geologic formation exposed at the surface near Raton is the dark-colored rock on which the town is built, a formation known to geologists as the Pierre shale. The dark color of this shale has led some people to search for coal in it, but it contains no coal, though there are local indications that it may contain oil. Above the Pierre shale is a white, cliff-making sandstone, the rock may be seen in the cliff at Goat Hill, Raton. This is known as the Trinidad sandstone, and though in some places it includes layers of carbonaceous shale with thin beds of coal, it is not to be regarded as a coal-bearing formation. To the coal prospector, however, it is of the greatest value as a reference horizon, as it immediately underlies the real coal-bearing formation throughout the Raton field. Its white color and the characteristic markings locally known as "petrified corncobs" make it easily recognizable. The "corncobs" are supposed to be impressions of seaweeds.

Coal-bearing Rocks

Above the Trinidad sandstone is a coal-bearing formation, which varies considerably in thickness in different parts of the field. Near the mountains it is 150 to 250 ft. thick and includes several beds of coal. In the vicinity of Raton it may be 20 to 50 ft. thick in some places and contains the Raton coal—the most important coal bed in the field; in other places, however, it has been eroded away, allowing the younger geologic formations to rest upon the Trinidad sandstone. In other words, after the sediments that contain the Raton coal were deposited, they were exposed to erosion and in some places were entirely removed. This may be seen near the Van Houten mine, where conglomerate rests directly upon 13 ft. of coal, while a quarter of a mile to the south, this conglomerate rests directly upon the Trinidad sandstone. The recognition of this interval of erosion is of great importance to the coal miner, for it explains why the coal is absent in certain places where it might naturally be expected to occur.

In many places along the outcrop of the coal-bearing formation is a deposit of conglomeratic sandstone or "pudding stone" that varies in thickness from a few feet to several hundred feet. The lower part of this conglomerate, including pebbles 5 in. in diameter, grades upward into finer material and finally to shales and sandstones that contain beds of coal scarcely less valuable than the lower or Raton coal.

Coal Changed to Coke and Graphite

During some period of volcanic activity after the coal beds had been formed, igneous rock was intruded into the beds. In some places this took the form of dikes, such as the "stone wall" at Raton; in other places it formed intrusive sheets thrust in between the beds. Where a comparatively small amount of this melted rock came in contact with the coal it changed the coal to coke, but where a large amount was injected, the greater heat transformed the coal into graphite. This transformation was effected over an area of several hundred acres in Red River Valley.

During the coming winter analyses of the coal of the Raton region will be made, the fossils collected will be examined, the notes and other data will be studied, and a preliminary report will be issued, probably in the spring of 1909, which will be obtainable free of charge from the Director of the United States Geological Survey. Later, when the survey of the field has been finished, a final and exhaustive report will be published.

Colliery Notes

Whenever it is practicable, the abandoned portions of a mine should be ventilated by a separate current of air, returning directly to the main return airway; this system prevents any accumulated gases being carried on into the workings.

Natural air-bridges, that is, those built directly in the overlying or underlying strata, although costing more, are not so likely to be injured in the case of an explosion. Natural undercasts are even safer than overcasts, but they have the disadvantage of being so easily stopped up either by water or accumulated débris.

Much care should be observed in entering a room or other working place where a body of gas has accumulated. The explosive condition of the firedamp is usually more dangerous at the intake side than on the return side, where the diffusion is more complete. For this reason it is often better to examine the air on the return side of the chamber, or brattice.

For securing the top and sides in a mine, the batter of the legs in a timber frame should be about 2 in. per ft. of hight. When the bottom is soft and wet the timber frames should be set upon sills running either longitudinally or across the entry. To prevent the track slipping down the slope in a steep seam, it is advisable to use occasional long track ties lodged in hitches cut in the ribs.

In sinking a shaft, a good light is necessary for the proper performance of the work; it is well to employ an electric light capable of being raised or lowered from the surface, and hung sufficiently high for safety. In addition to this light, it is advisable to have several good safety lamps hung near the men to test the atmosphere for gases, which may at any time be given off from faults, or on approaching a coal seam.

All of the recent coal commissions appointed by the different foreign governments to investigate the depth at which coal can be mined, have agreed in their reports that the workable limit of a coal seam is 4000 ft. from the surface. At a depth of about 4000 ft., a temperature of nearly 98 deg., or blood heat, would be encountered. It is, of course, possible that the price of coal in future ages will be such as to justify the use of methods at present considered impracticable, so that coal beds lying below the present 4000-ft. limit will be successfully mined.

Engineers in England are at present devoting much time and study to a solution of the coal-dust problem. For some time past, it was the general belief in England, that the only remedy against coal-dust explosions was to spray the rooms and entries with water; there is at present a great difference in opinion concerning this plan, and as a consequence, attention has been directed toward the discovery of an alternative remedy, which many engineers believe they have found in the use of stone dust. All experiments along this line so far have demonstrated that the effect of coal-dust explosions may be neutralized by using this stone dust.

It is safe to assume that for domestic purposes, such as heating, cooking, etc., we consume in the United States about 100,000,000 tons of coal per year. When we consider that 1 lb. of coal burned in a well-constructed steam-engine boiler will evaporate 1 gal. of water, and when we compare this result with the insignificant quantity of water which can be evaporated by a pound of coal consumed in an ordinary kitchen stove, we will be able to better appreciate the enormous waste which takes place when coal is burned for culinary purposes alone. In warming our houses, more than 80 per cent. of the fuel value of each pound of coal is wasted; it is true, therefore, that our fuel supplies are not only unnecessarily lost in poorly devised systems of mining, but in burning the fuel after it reaches the market.

There are at present several types of mining machines which are giving excellent service. Each style of machine has its particular advocate. One English engineer who has given the subject much thought makes the statement that the "bar machine" is the coal cutter of the future. In his argument he gives the advantages of this machine as follows: (1) The spiral bar and reciprocating motion bring out all the cuttings. (2) The bar works its own way into the coal and needs no assistance by hand cutting. (3) It is not likely to be buried by coal as it will work its way out. (4) The coal can be spragged up to a few inches from the solid. (5) It will cut on either side of the machine. (6) The motor is gas-tight, therefore less liable to fire CH_4. (7) It is claimed to require less power to drive it than other machines.

During recent years, a number of coal mines have been started on the coöperative plan. Now comes the report from France that the largest coöperative mine in that country has proved a failure. The mine was started in 1890 and a grand fête marked the inauguration ceremony. Three years later the managers of the mine quarreled and after considerable litigation, several of the founders were evicted from their positions; the remaining stockholders terminated their connection with the Miners' Union, which had coöperated in starting the mine. Up to the present time, mining has been carried on by shareholders and workmen, who were described as auxiliaries. At present there is no money to carry on the work and no further financial assistance can be obtained. The miners were informed that they would be responsible for finding their own wages.

The New Steel Corporation Plant at Gary

The Largest Steel Plant in the World. Handling Material from Iron Ore to Finished Steel on the Latest and Most Approved Lines

SPECIAL CORRESPONDENCE

The new plant at Gary, Ind., to which reference has frequently been made in the JOURNAL, will be, when completed, the largest steel plant in the world, and will be equipped throughout in accordance with the latest and most approved machinery of every kind. It is built by the United States Steel Corporation, through a subsidiary concern known as the Indiana Steel Company, and is intended to furnish material largely for the trade of the central West and Northwest; as the Carnegie Works at Pittsburg are the production center for the trade of the East.

The Gary Works are peculiar, in that they are not the outgrowth or enlargement of older plants, as most of our great steel plants are; and therefore they could be planned on entirely new lines, including the latest practice, and generally arranged to secure the best and most economical handling of raw and finished material.

SITUATION OF THE WORKS

The site selected is near the southern end of Lake Michigan, 23 miles southeast of Chicago, where a new town has been built, called Gary. The land owned by the company includes 9000 acres, with a water front of 1½ miles, having deep water enough to permit the docking and unloading of the largest Lake vessels. Iron ore, coal and other material can be delivered by water directly to the storage and distributing yards. The Grand Calumet river, which empties into the lake at this point, has been converted into a canal, or harbor, 250 ft. wide and bordered with docks built of cement, which have a total length of nearly a mile. At the end of this harbor is a turning basin 750 ft. in diameter.

HANDLING ORE

The plant for handling ore from the vessels consists of five Hulett unloaders and Hoover & Mason bridges of sufficient capacity to furnish material for the eight blast furnaces already built, each of which will deliver 500 tons of pig iron daily, and the eight additional furnaces yet to be constructed. The bridge dumps the ore into large concrete ore pockets at the rear. From the pockets, which have walls 5 ft. to 8 ft. thick, with concrete bottom 5 ft. above lake level, the ore is taken, as required, by grab buckets operating on bridges 498 ft. long, which are the largest ever constructed, rising to a hight of 85 ft. above the floor of the pockets. [illegible] equipped with clam-shells, carrying 14 tons at a trip. By means of the bridges ore is conveyed to hoisting bins, divided by concrete walls spaced 87 ft. apart, which are built or laid out for nearly a mile parallel to the dock, and, with the pockets at the water line, have a present capacity of over 1,000,000 tons, sufficient to supply the furnaces during five months or more of closed navigation. With the completion of the bins this storage volume will be about doubled. By means of auxiliary track facilities, provided for handling ore in and out of cars, the entire system is rendered mobile. From the bins the ore is taken by electrically operated larries and hoisted on skips to the tops of the blast furnaces.

The ore bins and auxiliary apparatus were constructed by the Brown Hoisting Machinery Company of Cleveland, Ohio except the electric hoists operating the skips to the blast-furnace tops, which are of the Otis Elevator Company's standard design for this service.

STORAGE OF COKE AND LIMESTONE

Storage of coke, coal and limestone will be provided for just west of the site of the mills at a point on the lake shore known as Stockton. These yards, which are shared with the Illinois Steel Company, will be the largest of their kind in the West. Material is mechanically handled here by means of unloaders of an improved revolving-conveyer type, having each a capacity of about 50 cars for a nine-hour day. These were built by the Hamilton Manufacturing Company, Columbus, Ohio.

SHIPMENTS OF FINISHED MATERIAL

Shipments from the works to almost any point can be readily made. The Baltimore & Ohio and the Lake Shore & Michigan Southern are the railroads directly passing the works; while the Chicago, Lake Shore & Eastern, a belt line owned by the Steel Corporation, provides connection with all the other railroads entering Chicago. When the site at Gary was selected, it was found that the main line of the Baltimore & Ohio and Indiana Harbor railways would run through the center of where the great mills are now located. It was therefore necessary, in order to build the plant at this particular place, to change the location of these two roads, and also, in carrying out the general scheme of the Steel Corporation, to alter the route of the Lake Shore [illegible] Railway. A new line was built for the Lake Shore and is now in operation by that road for a distance of about 14 miles, the old tracks having been taken up. A new double track road was also constructed for the Baltimore & Ohio from Indiana Harbor to Millers, Ind., a distance of 12 miles, and one of seven miles for the Indiana Harbor road to take the place of its old line. These newly constructed lines have all been elevated through the city of Gary.

The Chicago, Lake Shore & Eastern, which, as previously mentioned, is a subsidiary company of the Steel Corporation, has arranged to serve the steel plant without undue delays, by elevating its tracks over those of all of the other roads.

TERMINAL YARDS

The location of the plant, with direct access to all railroads, through the United States Steel Corporation's own lines, required classification yards. These are laid out on the plan known as the Kirk yards. They are designed to accommodate 15,000 cars and interchange yards being built by connecting lines will hold fully 10,000 more. In them the freight handled in and out of Gary will be made up into outgoing trains or classified for switching to various parts of the steel plant. They are laid out on the unit system and up to the present time about one-half of the work has been completed. In addition to its trackage the yard now contains a locomotive round house, car repair shops, sand houses, coal bunkers and fire pits for cleaning the engines. All of the rolling stock of the Chicago, Lake Shore & Eastern will be cared for here.

INTER-WORKS TRANSPORTATION

Within the plant, itself, no feature has had more careful thought bestowed upon it than that of inter-works transportation. The lines from the railroads enter the mills at the southwest corner, through the Kirk yards, over nine main tracks crossing on a viaduct. These, upon entering the grounds, branch out to the shops, rail mills, open hearth furnaces and finally to the blast furnaces. To reach the furnace there is a long trestle carrying tracks at a considerable elevation, also trestles to the gas producers of the soaking pit buildings, for the coal-handling system above described. Around the open-hearth buildings there is a perfect network of tracks, crossing and recrossing, and on the charging [illegible] tracks come in on a long embankment from the north. The chief end sought was to secure direct access to every part of the plant by the most available route, with no chance of blockades.

On the dock and walls of the ore pockets are laid tracks upon which the ore unloaders and bridges travel, giving them a working range of nearly a mile along the blast-furnace fronts, and parallel with these run four switch lines, enabling ore or other material to be unloaded from vessels directly into cars when shipment is to be made elsewhere. Along the ore-bins tracks also extend their full length, so that, when it is not desirable to move the great bridges, the ore can be unloaded directly into cars, moved to any section required, shot into the elevator boots and hoisted to the tops of the furnaces.

The railroad system of the mills alone has a trackage of about 100 miles, and the Kirk yards have 125 miles, making 225 miles in all. Besides the large number of standard locomotives of the Chicago, Lake Shore & Eastern, there are required to handle the inter-yard traffic 40 light locomotives of the type built by H. K. Porter & Company of Pittsburg.

In the transportation and handling system of the plant large traveling cranes, up to 125 tons capacity, as well as jib cranes, are prominent. These were supplied by the Morgan Engineering Company, the Whiting Foundry Equipment Company and the Alliance Machine Company. They are supplemented by a number of locomotive cranes built by the Industrial Works, Bay City, Michigan.

General Design of the Plant

The works will include blast furnaces, open-hearth steel furnaces, rolling mills and all necessary subsidiary machinery for repairs. They are designed on the unit plan, so that any future additions can be made without interfering with the constructions already in use. The arrangement of each unit is such that material can be passed from one department to the next entirely by machinery, and labor is reduced to a minimum.

The Blast Furnaces

There will be 16 blast furnaces, eight of which are already erected. These require no special description, except to say that they are of the latest approved type. The methods of supplying them with ore, coke and flux have been already indicated. The main work of these furnaces will be to supply the open-hearth steel furnaces. The molten metal will be conveyed in 40-ton ladles, on special trucks, to the mixers, two of which, of 300 tons capacity each, are placed in each of the open-hearth buildings.

The blast-furnace plant is also provided with five pig-casting machines installed by Heyl & Patterson of Pittsburg. These are for making pig iron and loading it directly on cars, if for any reason the open-hearth plants are unable to take care of the product of the blast furnaces, when the mills are not in operation, or if it is desired to send the pig to any other plant of the Steel Corporation.

The Open-Hearth Steel Plant

An important feature of this plant is that there will be no bessemer converters. All the steel will be made in open-hearth furnaces. There will be 84 of these furnaces, arranged in groups, or units of 14 each. Two of these groups are now completed, and two more are under construction. Each unit is in a separate building, all of the same construction. Each building, lying upon monolithic concrete foundations, is 1200 ft. long and built in three spans, giving a total width of 193 ft., with a hight of 104 ft. above the floor line. The charging floors are of steel. Instead of being at right angles to the rest of the plant, the open-hearth buildings run northeast and southwest at an angle of 35 deg. This is an innovation intended to lessen the sharp curve of the railroad tracks which run through the buildings. At the north end of each building is a structure for the mixers, previously referred to, which is 120x86 ft. This also contains a pit for relining ladles. Parallel to the furnaces is a wing 24 ft. wide and running the entire length of the building, where the gas producers for the furnaces are located. Beyond the gas producers is a stock yard, 72 ft. wide, every point of which is reached by overhead cranes. Between each pair of open-hearth buildings is a scrap house and skull cracker.

The open-hearth buildings are equipped with electrically operated cranes, both traveling and fixed. There is one with a capacity of 125 tons in the casting department and another with a capacity of 125 tons on the charging side. The ladles handled in pouring off are of 80 tons capacity each.

With the four open-hearth buildings, now completed or under construction, in operation, the Gary plant will have a capacity of over 12,000 tons of steel per day, or 2,500,000 tons per year. With all six buildings in use, the total capacity of the plant, as planned by the United States Steel Corporation, will be upward of 4,000,000 tons per year.

The furnaces are 40 ft. long by 16 ft. wide. In the construction of each 800,000 brick was required. Each furnace will be supplied with gas from a producer built by the Morgan Construction Company.

As it takes about eight hours for a heat and the furnaces will never be allowed to cool except for repairs, the daily capacity of each of the 70-ton furnaces will be about 210 tons, giving, with one furnace down for repairs, a total of 3360 tons for each group daily.

Trend of Demand is Toward Open-Hearth Steel

The fact that the works at Gary is to be purely an open-hearth plant, emphasizes the trend of the industry away from the bessemer to the open-hearth process, due to the greater reliability of the latter, at least in the making of steel rails. A conference of railroad officials, held in New York some months ago, showed very plainly how strong is the preference shown by the steam roads for rails made by the open-hearth process, and the same change of sentiment is apparent in structural circles.

The Rail Mill

In the rail mill 4000 tons of steel rails can be produced daily; and in normal operation the mill is expected to turn out 100,000 tons per month. The group of rail-mill buildings is about 900 ft. from the lines of the open-hearth furnaces. The main structure is 1800 ft. long, and at right angles to it is another building 600 ft. long, with a width in a single span of 85 ft. This contains 12 soaking pits or furnaces, each of which is supplied with gas from an independent Hughes mechanical gas producer. The arrangement here is such that ingots enter from the open-hearth furnace buildings along the entire length of one side of the pit building, the other side being reserved for the electrically operated ingot buggies which transfer the heated ingots through the first stand of rolls. Each of the 12 pits has four holes 6x6 ft., and is provided with the usual equipment of hydraulic cylinder covers and reversing air and gas valves of the Dyblie type. The ingots used are 20x24 in. and 6 ft. long, weighing 8500 lb. each. For the operation of the two ingot buggies, the Cutler-Hammer Company, of Milwaukee, has developed an ingenious system of control to guard against the possibility of the operator becoming confused and bringing both ingot buggies to the mill at the same time, which would result in a collision. The special controlling system provides guards against this contingency, at the same time enabling the operator to stop the ingot buggy at any of the pits. There are two master levers for the control of the two buggies. Each of these levers can be set in any of eight positions, one corresponding to the rail mill itself, six to the six soaking pits, which each buggy serves, and one off position. A suitable interlock between the two controlling levers is provided which renders it impossible for the operator to throw both levers to the mill position at the same time, thus insuring a clear track for each buggy.

The arrangement for receiving and

handling coal through the gas producers consists of an elevated trestle upon which the coal is received and conveyed to overhead storage bins; thence it is distributed to the various producers by means of a five-ton crane equipped with automatic scales.

The rail mill is equipped with 12 sets of roll trains, all operated at varying speeds by General Electric alternating-current motors. These are housed in a separate bay running parallel with the rolls. The motors are 20 ft. in diameter and have a speed of 83 revolutions per minute. All of the motors are connected directly to the roll trains by regular mill couplings. The aggregate driving capacity is 24,000 h.p. Although the motors are provided with flywheels and operate in one direction provision is made for reversing in case of necessity. The control system has been worked out with the greatest nicety, all operations being under the instant control of the operator by means of a master controller.

The first group of rolls consists of four stands of continuous 40-in. mills, each two of which are driven by a 2000-h.p. motor. They are arranged in tandem, requiring no manipulation from stand to stand. Here, as elsewhere through the plant, sufficient distance is left between successive sets of rolls to enable a quarter turn of the ingot or bloom to be made, so that it is worked equally on all sides. The first two mills are at present equipped with 42-in. rolls, enabling 20x24-in. ingots to be used. After passing these four mills the ingot is sent to a 40-in. three-high blooming mill equipped with lifting tables and arranged with a combined hydraulic and pneumatic balancing device. This mill, which is operated by a 6000-h.p. motor, gives the ingot five passes. After being bloomed the ingot is sheared in a 10x10-in. horizontal blooming shear, and the crop ends or butts are taken outside of the mill by a butt conveyer. Each bloom then goes through a 28-in. roughing mill, which is three-high and equipped with tilting tables. This mill has actually three stands of rolls. The roughing stand, however, is the only one that is three-high, the other two stands being two-high. The mill is driven by a 6000-h.p. motor and gives the bloom three passes. After leaving the roughing mill the bloom goes through a two-high 28-in. forming mill driven by a 2000-h.p. motor, receiving but one pass. Then it is sent to finishing mills, which consist of three stands of 28-in. mills driven by two [illegible] motors. After the dummy pass, the bloom is transferred to the first edging, which is in this same mill but the second stand, and turns back on an elevated table to the second edging, which is in line with the 28-in. roughing mill. It then travels by chain transfer to the lower tables and on the leading pass goes through a stand which is also in line with the roughing mill and driven by the same motor and continues on to the third stand of the 28-in. finishing mill, this being the eighteenth and last pass. After the finishing pass the rail travels through to the saws, of which there are five provided, thus cutting four rails to length. These four-rail lengths consist of half the ingot. As the capacity of this mill is 4000 gross tons per 24 hours it will be seen that there must be a four-rail length sawed about every half minute. The saws are 42-in. blades, arranged to be raised and lowered in unison by one controller from the hot-saw operator. After leaving the hot-saw run the rolls pass over the usual cambering machine and are run on hot beds 100 ft. long, of which four are at present installed, with provision made for an additional two, if necessary. These hot beds extend to the south of the mill proper. In the finishing-mill section they are of unusual design, being made of structural material and placed 8 ft. above the floor, allowing for an extraordinarily large air space to facilitate the rapid cooling of the rails. The finishing building is 1383 ft. long, central with the hot beds, and provided with live rolls extending the entire length. The roller tables are equipped with stops and kick-offs to transfer the rails to the straightening presses, of which there are 16, built by the Hilles & Jones Company, of Wilmington, Del., these being of the usual type and motor driven. From the straighteners the rolls are transferred by the usual skids to three-spindle vertical drill presses furnished by Wm. Sellers & Company, of Philadelphia, which are also motor driven. These complete the rails for use. From the drill presses the rolls are transferred to a roller table, which extends the full length of the building and from which the rolls may be skidded to the loading beds immediately outside of the building.

The principal machinery was built and installed by the United Engineering and Foundry Company, with the exception of the finishing department, which was erected by the Morgan Engineering Company. For the lifting tables and transfers Westinghouse motors are used.

The loading yard is provided with the usual inspection beds and two tracks, each about 1400 ft. long, connected with the track system of the plant at both ends, thus avoiding any unnecessary shifting. The yard is also served by an 80-ft. traveling crane for the entire length of the finishing department and [illegible] this the rails are placed directly on flat cars.

All of the butts and scrap from the rail mill are loaded into cars from the conveyer above mentioned and carried back to the open hearth furnaces.

The Billet Mill

The billet mill consists of four continuous stands of 40-in. blooming mills, each two of which are driven by a 2000-h.p. motor. After leaving these the ingot is turned end for end on a turntable and passes through a five-stand 32-in. continuous mill, the entire mechanism of which is driven by one 6000-h.p. motor. At the end of this mill is placed a 12x12-in. horizontal blooming shear and also a 10x10-in. vertical blooming shear, from either of which shears either sale blooms or blooms for the 24-in. mill immediately following may be sheared. The sale blooms are run out on hot beds on the other side of the building, where there is a loading yard equipped with overhead traveling cranes. Blooms intended to be further reduced after being sheared are sent through the 24-in. continuous mill, which consists of six stands driven by a 6000-h.p. motor, reducing the blooms to 4 or 5 in. square. At the end of the 24-in. mill is placed a roller table. The billets may be transferred to an 18-in. continuous mill to be further reduced or, if for sale, to a shear and from thence to overhead billet pockets from which they may be loaded directly into cars.

For the further reduction of billets taken from the above-mentioned transfer skids, the billets are run through an 18-in. six-stand continuous mill, driven by a 6000-h.p. motor and equipped with flying shears, so that billets reduced in this mill (1¾ and 2 in.) may be run out on covered hot beds extending at right angles to the general direction of the mill into an extension of the same billet loading yard as that provided for the 10-in. and 12-in. sale blooms. Provision has also been made for the installation of an additional continuous mill for reducing 4-in. and 5-in. blooms to such small sections as the trade may require. This mill will be on the opposite side of the mill building from the 18-in. mill, thus providing additional capacity to take care of the enormous tonnage from the blooming mill proper. All of the machinery is electrically driven. The ingots for this billet mill are heated in 12 soaking pit furnaces of approved design, arranged similarly to those adjoining the rail mill. Each of the pits in both buildings is supplied with gas from one independent Hughes mechanical gas producer built by the Wellman-Seaver-Morgan Company.

An interesting feature of the billet mill is the handling of the scale. Usually in a mill of this size the problem is a serious one, but here means have been devised by which all of the scale from the various mills is collected in a large pit extending for some distance along the side of the building, whence the scale can be removed at any time without interfering with the operation of the mills.

Additional Mills

The additional mills to be built are a

60-in. universal plate mill, which will be the largest of its kind in the world, and a 44x160-in. sheared plate mill. These two mills will each be served by a 32-in. slabbing mill. Further extensions to the Gary works include an axle mill, structural mill and 18-in., 14-in., 10-in. and 8-in. merchant mills.

The mill buildings are steel frame with brick sides and corrugated-iron roofings. The open-hearth, stripper and soaking-pit buildings have steel frames with corrugated sides and roofings. The structural steel here and elsewhere in the plant was furnished by the American Bridge Company, supplemented by the Illinois Steel Company.

Other Shops and Buildings

In connection with the furnaces and mills of the steel plant proper there have been erected a group of buildings of general utility, consisting of a machine shop, foundry, boiler shop, blacksmith shop, pattern and carpenter shop, pattern storage building, roll shop, electrical repair shop, brick storage house and a well equipped general storehouse. These shops are of steel frame construction with brick walls and concrete tile roofing. There has also been provided a yard locomotive house, which is rectangular in shape, with tracks running through on an angle from one side to another, thus avoiding the use of a turntable.

Of these buildings probably the most interesting is the foundry, a structure 400 ft. long by 136 ft. in width, divided into three spans, 60, 40 and 36 ft. wide. It has two cupolas for iron castings and two 25-ton open-hearth furnaces for steel castings, and is served by eight cranes of capacities ranging from five to 50 tons.

The blacksmith shop is also noteworthy for the improved appliances which it contains. It houses boilers to generate steam for operating the steam hammers and heating the shops in this group.

Utilization of Gas for Power

Two important and remarkable features of this plant are the use of electric power throughout; and the generation of this power, in large part, by the utilization of the gases from the blast furnaces. This power plant is much the largest of this type ever erected, and a description of it is reserved for a future article.

Capacity of the Plant

With the furnaces already completed or nearly finished, the Gary plant will be able to turn out 2,700,000 tons of finished steel yearly. With the additions planned this capacity will be increased to 4,000,000 tons. This will be an addition of nearly 20 per cent. to existing capacity.

Provision for Future Growth

As previously mentioned, the plant has been designed upon the unit system, thus providing for a healthy growth, without tearing down and rebuilding. Future blast-furnace installations will be made on land redeemed from the shallows adjacent to the harbor, as a certain amount of filling in can profitably be done with the noncombustible material other than slag. The slag will not be available for this purpose, but is to be granulated and shipped to Buffington, a few miles west, for making into portland cement by the Universal Portland Cement Company.

The Town of Gary

Adjacent to the works the company has laid out a town for the accommodation of its employees. This is to be a model town, carefully planned and well provided with all necessary public utilities, such as water, gas, electric lights and trolley lines. The plans are on such a scale that the town will eventually be able to house 25,000 people. Owing to the situation of the plant, it was necessary for the company to undertake this work.

Monel Metal

Attention has been called to this alloy recently by its use in the sheet form in the roof of the new Pennsylvania railroad station in New York. This roof is covered with sheets of Monel metal, which was adopted after many tests in preference to copper or other metal. It is laid in the same manner as copper sheets would be, and the sheets are bent, corrugated and joined without difficulty. The sheets are fastened with nails made of the same alloy, which have been found best adapted for the purpose.

Monel metal is an alloy containing about 70 per cent. nickel and 30 per cent. copper. It is a natural alloy, being smelted and refined directly from nickel-copper matte produced from ores of the Sudbury district in Canada. The metal is made at the Orford Copper Company's works at Bayonne, N. J., and is introduced by the International Nickel Company, of which the Orford company is a subsidiary. The furnacing and refining of the matte involves only the removal of impurities and the reduction of the iron which is contained in the matte to a very small proportion, 1.5 per cent. being the maximum.

Monel metal has a high tensile strength, the tests showing much higher results than those goven by nickel steel. The accompanying table gives the results of a number of tests, the figures being in pounds per square inch.

TESTS OF MONEL METAL.

	Rolled.	Rolled and Annealed.	Rolled, Annealed and Cold Drawn.
Tensile strength, lb.	108,750	109,500	107,000
Elastic limit, lb.....	80,000	82,500	98,000
Elong. in 2 in., %....	27.0	28.5	20.0
Contr'tion of area, %	51.1	53.3	51.4

	CASTINGS.		
	Grade B.	Grade C.	Grade D.
Tensile strength, lb.	85,000	65,000	70,000
Elastic limit, lb.....	40,000	25,000	30,000
Elong. in 2 in., %..	10.0	30.0	20.0
Contr'tion of area, %	14.0	35.0	25.0

The sheets used in the roof above referred to were rolled in the Vandergrift mill of the American Sheet and Tin Plate Company. Owing to the hardness of the metal, it was found more difficult to roll Monel than steel sheets. More power was required, and generally more passes to bring them down to gage. It is probable that a special mill will be required for this purpose.

Experience so far with Monel metal shows that it possesses many good qualities. It resists corrosion, takes a fine polish, and possesses in a high degree the qualities of metallic nickel. It is applied to many purposes. Among others, perforated sheets for mining screens have been tried, some 60 or 70 tons having been furnished up to date. These have been found to wear much better than any other metal yet used for the purpose. Other uses will doubtless be suggested. Experiments in drawing and using wire are now being made.

Notwithstanding the high nickel content, the metal is placed on the market at about 2c. per lb. above the current price of copper. This can be done because the process of separating the nickel from the copper is not required; the alloy, as above stated, being made directly from the nickel-copper matte. There seem to be many purposes to which Monel metal can be advantageously applied.

Production of Diamonds

When its new plant is running, says a recent issue of *The South African Mining Review*, there is every prospect that the Premier company will be producing diamonds at the rate of 3,000,000 carats a year, an output of 7,000,000 loads of ground in excess of the quantity actually treated by the De Beers company in 1907. The estimate of working costs is about $1.50 per carat, as against the Kimberley and De Beers expense of about $5.

As the future of this industry depends upon high prices for diamonds, any attempt on the part of this company, says the *Review*, to popularize diamonds would effectively remove the general hope that with the return of prosperity in America, the output of De Beers and other companies would again sell at the old high prices, and the inevitable result would be the "vulgarization" of diamonds.

Examining and Fitting up a Hydraulic Mine—I

Methods of Examination and the Placing of Pipe-Lines, Receiving Reservoirs, Drain Tunnels and Sluices Are Discussed in This Instalment

BY H. A. BRIGHAM*

In this article I will present a brief review of the methods of hydraulic mining that were so successfully applied for many years in California, where these methods originated because they solved a problem. Hydraulic mining is so simple a process that its utilization in mining will always remain an alluring expedient, and where the requirements for its successful operation exist, it seems almost a calamity to the commonwealth that it should have ceased to be the great industry that once it was. Indeed it is not unreasonable to assert that with an intelligent study of the physical surroundings it should be possible now, under certain conditions, of course, to make practical use of hydraulic mining on a large scale in California.

While I do not intend to enter into any of the arguments and discussions that have been made so often, both before and since the time that hydraulic mining was enjoined in the most promising part of California, it does seem to me as though our technical men, our engineers and scientists should not give up all hope of an ultimate solution of this problem of rehabilitation, a problem so worthy and deserving of the keenest study.

Examining a Hydraulic Mine

Hydraulic mining consists of excavating and washing gravel by water under pressure through sluiceways provided with riffles for catching and saving the gold. To make profitable use of this method it is essential to have a large volume of gravel containing sufficient gold, an adequate grade to utilize the sluices properly, dumping facilities for the disposal of the tailings, ample water under effective pressure for breaking down and washing off the material, and a supply of timber for building sluices for other purposes.

In making an examination of a hydraulic mining property a general view of its situation, conditions and capabilities should be taken from the more elevated points in its vicinity. If the view from these higher elevations is not too much obstructed it should be possible, with an aneroid and with a hand and slope level, to ascertain the general conditions and adaptability of the locality for the purpose. This means an approximate determination of hight, length, width [illegible] the deposit to be handled, and its general trend; the elevation of the bedrock of the channel or bottom of gravel deposit to be worked; the outlets and dumps for tailings, their relations to the hight of the channel and the distance therefrom; the conditions and facilities for disposing of the tailings; the elevation, length, grade, required size, etc., of the sluices; the amount of water available, and the facilities for bringing it to the mine for economical and effective use; practical reservoir sites, both for storage, if necessary, and for receiving and distributing the water; available timber for building sluices and for general use; facilities for transporting the necessary material and supplies needed; labor conditions, climate, etc.

Detailed Examination

If the view from these elevated positions should be too much obstructed to obtain the general outlook needed to form an opinion, and if no impossible conditions have been previously encountered, then more elaborate surveys may be necessary for obtaining this required information.

If this preliminary work shows no insurmountable obstacle and all features appear reasonably good, then a more extensive and detailed examination should be started; commencing first with the title to the property. If this is found perfect, a very careful and exhaustive test of the deposits as to their value, extent, location, character, etc., and as to the elevation, formation, position and nature of the bedrock of the channel, or the bottom of the deposit to be worked should be made. The preliminary examination will have indicated whether the deposit should be tested by means of shafts, bore-holes, tun[illegible]

Many and numerous samples should be carefully selected from all sections, or, at least, from a sufficient area, in order to enable one to arrive at a general average value; the extent of the entire deposit and the elevation of the bottom of such deposit should also be taken into [illegible] showing the point from which each sample was obtained. All the samples should be marked and carefully weighed; they should be washed by pan or by [illegible] after being tabulated, should be finally entered upon the plan at the proper position.

If water in sufficient quantities can be obtained for the purpose, and conditions are favorable, an excellent method is to work off a measured section of the deposit by piping, or ground sluicing through, or by shoveling it into small sluiceboxes prepared for this test. This, however, while giving a larger and consequently a better general average value than the pan or rocker test, may not be so reliable, owing to the greater difficulty in preventing a falsification of the natural conditions of the deposits, and this may call for an additional check.

The thoroughness, care and caution observed in determining the extent and richness of the deposit, and in ascertaining the position of the channel, bedrock or bottom of the deposit, are of the utmost importance, for the success of the whole undertaking is centered in and dependent almost entirely upon the reliability of these tests; all the future examinations will be governed by and related to them.

When the results of this investigation have been satisfactorily verified, sufficient information as to the bedrock conditions should have been obtained to enable one to establish the elevation of the upper end of the sluice.

If all these preliminaries prove satisfactory, the next step should be to investigate the available outlet or outlets, the dumpage facilities, and the character of the bedrock or other ground through which the sluice will pass, whether by cut or tunnel. All these details must be thoroughly examined.

The elevation, the grade and the pavement of the sluices are of paramount importance, for the steeper the grade and the smoother the pavement, the greater the volume of fine material, and the larger the quantity and the sizes of stones and boulders that can be run off with a given amount of water. Most large hydraulic mines do not have fall enough, and are compelled, by their conditions, to be worked on inadequate grades. The determination of the elevation and grade of the sluice will depend upon the elevation and general condition of the available dump for the tailings, and also upon the relative positions of dump and deposit as to hight [illegible] upon the amount of material to be de[illegible]

If the tailings can be discharged into either a torrential stream of sufficient size and current to run them away immediately and effectually, or a ravine or channel of ample grade or fall to carry them off in their own water; or, if they can be discharged over a precipitous place where they will never accumulate high enough to back up into the sluices, the disposition may be considered ideal, and the elevation of the lower end of the sluice may be established at once.

---

*Mining engineer, 1111 [illegible], Oakland, Cal.

Note—An abstract of a paper read before the Technical Society of the Pacific Coast, and published in the *Journal* of the Association of Engineering Societies, October, 1908.

But if the tailings must be discharged into a place where they will accumulate detrimentally, it will be necessary to place the sluice high enough to prevent the tailings from backing up into the sluice, choking it and rendering it unfit for further operations on that grade.

To establish the proper elevation for the lower end of the sluice under such unfavorable conditions of dump, surveys are necessary to determine the storage space available below the grade of the sluice and to obtain an estimate of the amount of material to be washed off and the proportion that will remain in the dump. If the ordinary conditions make the slope or grade too small, it may be possible to place the dump end of the sluice at a lower level and to utilize a giant near the outlet to elevate or stack up the tailings on one or both sides of the line of the sluice, to be extended as the dump becomes filled; or, the upper end may be placed at a higher level with the installation of a hydraulic elevator to lift the water and gravel into the head of the main sluice. Either one of these arrangements—giant at the dump end or hydraulic elevator at upper end of the sluice—will provide a steeper grade.

The Hydraulic Giant

A hydraulic giant or monitor is a device attached to the end of the mine pipe-line, by which the stream may be controlled in direction. It consists of a metal tube so fixed to the pipe by flexible joints as to be moved readily in both planes. The tapering nozzle end varies in diameter from 4 to 9 in. and has a deflector attached at its extremity for the purpose of directing the stream readily to the proper point of attack. The hydraulic giant is the main implement of the hydraulic miner, and its successful development has made the process of hydraulicking what it finally became. It places a powerful stream of water, a confined force of great magnitude, at the immediate disposal of the operator, who utilizes this force by directing it, according to his judgment, to the point of attack.

The width and the proportions of the sluice are governed principally by the volume of water to be used, and, to a small extent, by the character of the material to be washed, sand and fine gravel requiring a wider sluice, while large boulders should have a narrower one for a given quantity of water. For washing fine material and sand the following widths for sluices under varying amounts of water will answer: For a 3-ft. sluice, 200 to 600 miner's inches; for a 4-ft. sluice, 400 to 1,200 miner's inches; for a 5-ft. sluice, 1000 to 2500 miner's inches; for a 6-ft. sluice, 2000 to 4000 miner's inches; for an 8-ft. sluice, 3000 to 5000 miner's inches; for a 10-ft. sluice, 4000 to 7000 miner's inches of water. If the deposit contains many large boulders, the above proportions of water should be increased 10 per cent., or perhaps more. The "miner's inch" varies greatly in different localities and is here assumed as equivalent to 1½ cu.ft. per minute.

Most hydraulic mines contain more or less fine gold which cannot be saved with the ordinary sluices, no matter how well the sluice is paved or how carefully it is manipulated. Under such circumstances, if conditions make it possible, one or more undercurrents should be used. The undercurrents should be placed near and below the lower end of the main sluice, for the reason that by placing them midway fully 5 ft. of the available grade will be sacrificed in order to lead the water and tailings from the under-current back into the main sluice again.

An undercurrent is an enlarged portion of the sluice; its construction is described later in this article. It is used for the purpose of receiving the finer material, containing the fine gold which would escape without this precautionary measure, together with a certain quantity of water. Since in the undercurrent the water is spread over a greater surface, its speed of flow is diminished; this slower current allows the smaller particles of the gold to settle in the riffles more readily.

Water Supply

The supply of water available for working the property should be thoroughly investigated. The total quantity of water, the amount of the regular and constant supply, the hight at which it may be delivered at the mine, the length and the proper grade of the ditch necessary to convey the water, the character of the ground over which the ditch line or lines will pass; the necessity for flumes, the supply of timber for building them as well as for other purposes; the necessity of using pipe-lines for crossing ravines or depressions and their length, size, pressure, etc., are features that require detailed inquiry.

If the supply of water is limited during the dry season, a survey of the drainage area and the available sites for storage reservoirs will probably be necessary. The conditions of the drainage area and the ability of the soil to retain water should be investigated, as well as the annual rainfall and how this is distributed through the different seasons of the year, so as to see during what months in the year water will be available for working the deposit.

The grade of the ditch should be as steep as permissible, taking into consideration the hight at which the water is required at the mine and the nature of the ground traversed by the ditch. In order to avoid the cutting or eroding action of too swift a current, the grade should be accommodated to the nature of the material through which the ditch passes.

Receiving Reservoirs

One or more receiving or distributing reservoirs are very essential; their capacity will depend upon the character of the deposit to be worked and the facilities for handling it.

If there is a wide face to the mine, so that washing can be carried on at several different points independently, or if there is little pipe clay and few boulders to handle, and the material is easily broken down and washed; if there are no hard bedrock cuts to excavate, and if the main line ditch is short and there is ample storage above the ditch line, then a small receiving reservoir will answer. But if the face is narrow and contracted, and there is much pipe clay to be broken, or many boulders or stumps that require blasting and removal; or if there is much hard bedrock to be shot away, and there are no storage facilities above the ditch, then receiving reservoirs of large capacity should be provided to prevent waste during the interim of cleaning up, shifting the giants, removing boulders, etc., or while doing other work around the mine. One of the receiving reservoirs should be near the head of the mine pipe-line, so that the water may be quickly regulated for the giants or turned off without waste in case of accidents or other causes.

Pipes for the Mine

The pipes that lead the water to the giants at the mine should be of ample capacity for carrying, without undue friction, the entire quantity to be used; seldom, if ever, is it good practice to run a portion of the water for the sluice over the bank. The pressure should be such as to allow the giants to be operated at a safe distance from the face, so as to prevent them from being injured or buried by the falling bank, and yet to exert sufficient force to undermine the bank rapidly enough to insure an ample supply of gravel for the sluices.

It frequently happens that the lower portions of the bank are so compact or so cemented that sufficient stream pressure cannot be obtained to cut it speedily enough to supply the sluice; other methods will then have to be used. In such an event, it may be possible to get an ample supply of material for the sluice by piping above the hard gravel into a softer stratum, and far enough ahead to insure the safety of the giant from caves; the giant may then be brought closer to the bank, where it can exert sufficient force to remove the remaining hard portion. While it may not be possible to cut this stratum fast enough to supply the full capacity of the sluice, possibly one giant can be working on this hard part of the bank while another giant furnishes the remainder of the gravel supply from a softer or caved portion of the bank.

Sometimes this hard material has to be loosened by blasting. This can be done by working the loose top off first and then blasting the remaining portion by means of drill holes, shafts or drifts; or it may be preferable to blast the entire face by running powder drifts into the bank at the bottom, with cross drifts at right angles at their inner ends. In this case the powder is placed in the cross drifts and the main drift tamped solidly with dirt before exploding.

The latter method of blasting the entire bank, while frequently resorted to in the earlier days of hydraulic mining, when small streams of water were used, is now seldom necessary, for the large streams of water under high pressure now used are generally able to overcome the difficulty.

DETAILS OF INSTALLING THE PLANT

In discussing the preliminary examination enough has been said to point to the fact that the arrangement of the sluice becomes one of the most important elements in the fitting up of the mine, for no problem requires better judgment and more careful thought than the establishment of the grade, which is determined by the beginning and end elevations of the sluice and the distance between these two points.

Generally the principal difficulty in hydraulic mining is to provide an efficient carrier to convey the tailings to the locality of disposition, a conveyer that will always perform its many important functions with the least interruption and loss of time.

It will be instructive, therefore, to discuss the practical installation of a sluice with more detail, referring to the preceding statements for a knowledge of the general principles that must guide one in determining the practical and economical possibilities, and also in studying the topography for the selection of the line.

THE SLUICE

Practically the sluice is nothing more or less than a flume of special design built for the purpose of conveying water, which is, again, the conveyer of gravel containing a valuable metal that must be segregated from the mass and saved by making use of its greater specific weight.

The available cross-section may have a width of from 2 to 12 ft. or even more, and a hight of from 2 to 4 ft., according to the volume of water used; it is made up of the sill, the posts and the side braces, the lining of floor and sides, and the walking plank on each side. There are no cross caps. The sluice contains the floor device for catching the precious metal, which, although almost primitive in its mechanical simplicity, is very effective and has been in use in one form or another from the earliest time in the history of gold washing. It consists of a pavement (which may be of wood, or of stone, or even of iron; in fact, of any suitable material), so placed and arranged that the greatest amount of gravel may be effectually conveyed over its surface; at the same time, since it must afford the gold an opportunity to leave the gravel and sand with which it is moving, numerous pockets, or receptacles, for catching the gold must be provided between the blocks.

In constructing the sluice, great care must be taken that the grade be uniform throughout its length; a short section of lighter grade will govern the transporting power of the material for the entire length of the sluice, while a section on a steeper gradient will cause a more rapid wear of the pavement, and this may necessitate a change or renewal of the pavement on the steeper grade before it is really required on the rest.

A straight sluice is an ideal one, but this is not always practicable. In making turns or bends in a sluice, great care should be taken not to make angles so sharp that the flow of water is thereby retarded or the surface of the water unduly disturbed, for that will cause a stoppage of the material, thereby choking up the sluice. Where an abrupt bend is unavoidable, it must be so constructed that the current will adapt itself to the turn and retain its velocity and smooth water surface. This can be accomplished by cutting the sluice boxes into such lengths that a short turn may be effected by small deflections at several joints.

Where the proposed turn cannot be made with the full length (12 ft.) of the boxes, by giving each box a 5-in. turn, the boxes may be made in shorter lengths, say 6 ft., each having a 4-in. turn; if necessary to make a still shorter curve, the boxes may be made [illegible] with a 3½-in. turn; even shorter lengths may be used if necessity requires it. At both ends of a curve the turn should be eased.

The outer curve, or that of the longer radius, should be raised a little above the inner one, say ⅛ to possibly as much [illegible] at the same time increasing the grade a little to overcome the check. Around a very short turn the gradient should be increased as much as 15 per cent., or possibly a little more than that. With this precaution few instances are likely to occur where a turn cannot be successfully made without sacrificing more than a few inches of the available grade.

The hight of the sides of the sluice will depend upon the hight and condition of the ground through which it passes. If the sluice is to be in a deep cut, in hard ground, high sides will be unnecessary, and 30 in. may be enough. This will not only save lumber, but it will also prevent a heavy strain on the sluice bottom, and, in the case of cleaning up and changing the pavement, it will afford a handier opportunity for piling the loose blocks on the top, which is so much easier to reach.

If a sluice placed in a deep cut through hard material should fill to overflowing because the gravel is run into it too quickly, or if it be obstructed in any way so as to cause an overflow, the water will return to the sluice without aid as soon as the flow of the gravel is reduced or the obstruction removed. On the other hand, if the ground of the outer cut is soft and liable to be eroded by the created current, or if it lie lower than the top of the sluice, care must be taken that the sides are high enough to prevent any overflow during an obstruction, for if this should occur in a case like this, even to a slight extent, while the sluice is fully charged with material, it would cause a congestion, and unless the flow of gravel from the mine be checked immediately, the entire head of water will overflow the sides, and it cannot be brought into the sluice again until the gravel is removed, which will cause a long and expensive delay.

PREPARING THE BED FOR THE SLUICE

Where the sluice is to be laid in a deep open cut through ground loose [illegible] under adequate pressure, it will prove economical both as to time and cost to utilize a giant in preparing the bed [illegible] but without pressure, recourse may be had to ground sluicing. The bed may be prepared in this way by getting it almost down to the proper grade and finishing it by hand labor subsequently. Where there is a large amount of material to be removed in this manner in order to prepare the bed for the sluice, a section may be hydraulicked or washed off and the sluices built therein and paved; it may then be possible and practicable to work off another section of the ground through the sluice already completed. In this way the sluices may be extended and continued until the field of operation is reached.

[illegible]

In opening up a mine, a drain tunnel [illegible] necessary, [illegible] of washing the material through it into the sluice in the tunnel.

The tunnel should be of sufficient width to afford room to place the loose pavement upon the top of the sluice while cleaning up and changing it. While it is possible to place the loose pavement on the bottom of the sluice during the clean-up, this makes the work awkward for the blocks must be shifted several times before completing the clean-up. If the head of a sluice tunnel is in deep bedrock, or if a shaft is used for any length of time in running material through it, the portion that is subjected to continuous wear and tear for long periods should be securely timbered and lined to prevent its ultimate destruction. Should the bottom of the shaft be in soft ground, liable to be eroded by falling water and material, it must be securely timbered to prevent undermining at its lower end. If the bedrock be very soft, it may be necessary to extend the timbering of the shaft downward a few feet below the bottom of the sluice. The bottom needs no protection other than to prevent the sides from caving.

In order to prevent a choking of the tunnel from an over-supply of gravel, at the shaft the tunnel should be 3 to 4 ft. higher than the ordinary hight, and from there should taper to the normal hight of the main tunnel in about 50 ft. If the tunnel is to be continued past the shaft, it will prove expedient to place the shaft to one side of the tunnel and far enough from it so that the shaft may be utilized for washing the material, or for running waste water through it without endangering the sluice after its extension ahead and beyond the shaft. This can be done by running a short drift from the main tunnel and placing the shaft at the head of this branch.

The main tunnel should be extended ahead at opportune times and another shaft constructed to be in readiness for continuing the washing without delay when the cuts from the former shaft lose their grade, become too deep in the bedrock or too long to justify their farther extension.

If, in placing the sluice in the tunnel, there should not be sufficient room to allow the loose pavement to be placed on either side while cleaning up, the sluice should be placed close to one side, so as to leave all the space on the other side.

DRAINS

If there be a large quantity of seepage water from the mine, it sometimes is well to construct a drainage box for conveying this water during the time that the pavement is replaced. This drain may be located on the outside of the sluice, its upper elevation even with the top of it. While this will require a high temporary dam to raise the water into the drain at the upper end of the section to be cleaned up, it has the advantage of clearing easily, while clearing would be difficult with a closed drain placed on a level with the bottom of the sluice, as is sometimes done. Unless there is a large amount of seepage water to handle, the drain may be dispensed with, for the miners soon become accustomed to paving the sluice with considerable water running in it.

Before turning on the water, some means of signaling should be provided near the upper end of the tunnel, a short distance below the shaft, so that in case the sluice begins to fill with an overload of material, or from some other cause, the mine can be signaled to let clear water run until the sluice frees itself.

Adjustable Mine Support

The *Comptes Rendus* of a recent meeting of the Société de l'Industrie Minérale contain a description of a metallic prop, adjustable in length, and suitable for temporary use in the timbering of drifts and tunnels. It is called the Mounier prop, and is made by Crozet & Co., of Chambon.

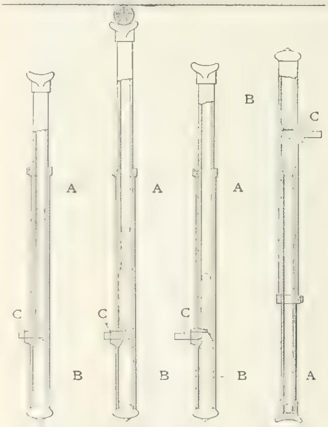


FIG. 1 FIG. 2 FIG. 3 FIG. 4

ADJUSTABLE MINE SUPPORT

The prop consists of two telescoping steel tubes containing a lot of small steel balls. The lower tube, *B*, is divided into two compartments, the orifice between which is closed by the movable plug *C*, which can be withdrawn so as to permit the balls to drop into the lower compartment. The bottom end of the upper tube is armed with an annular steel plug, having an opening just large enough to permit the balls to drop through freely.

When all the balls are in the upper tube, the prop is ready for use. It is placed in position by simply lifting the upper tube until its top presses against the timber it is desired to support; when this has been done, some of the balls fall through the conical opening into the lower chamber and then resist the pressure from the upper tube. Fig. 2 shows the prop in this position.

When it is desired to remove the prop, the plug *C* is withdrawn, allowing some of the balls to fall into the lowest chamber, and releasing the upward pressure on *A*. This is shown in Fig. 3. To prepare the prop for use again, it is turned upside down and after the balls have fallen back into *A*, Fig. 4, the plug *C* is inserted to its original position.

A prop 2m. long weighs, when loaded, only 48 kg. and can be carried around and operated with ease by one man.

The resistance of one of these props was tested in a hydraulic press and was found to withstand all deformation under a pressure of 35,000 kg. With this weight upon it, the upper end was forced into the lower for a distance of 10m., due partly to the contraction of the free spaces among the balls and partly to the elasticity of the tubes.

While under a pressure of 35 metric tons, not the slightest difficulty was experienced in withdrawing the escape plug, nor in removing the prop from its position. The bottom bearing of the prop is ingeniously shaped so as to take its load gradually and to settle into position without danger of producing lateral stresses which might break or distort the tubes.

Coal and Iron in Austria

Official reports for the full year give the production of coal in Austria for the full years named below, in metric tons:

	1906.	1907.	Changes.
Coal	13,473,307	13,850,420	I. 377,113
Brown coal	24,167,714	26,262,110	I. 2,094,396
Total	37,641,021	40,112,530	I. 2,471,509
Coke made	1,677,646	1,855,376	I. 177,730

In 1907 there were 2,602,372 tons of coal used in making coke, showing an average of 1.403 tons of coal to the ton of coke.

The iron ore and iron production are reported as follows, in metric tons:

	1906.	1907.	Changes.
Pig iron made	1,222,230	1,383,524	I. 161,294
Iron ore mined	2,253,662	2,540,118	I. 286,456
Iron ore imported	720,242	799,890	I. 79,648
Total ore	2,973,904	3,340,008	I. 366,104
Manganese ore m'd.	13,402	16,756	I. 3,354
" imported	44,100	43,418	D. 682
Total	57,502	60,174	I. 2,672

The average of ore to one ton of pig iron in 1907 was 2.41 tons. There were 42 blast furnaces active during the year, showing an average make of 32,941 tons to the furnace. The fuel used in making iron in 1907 included 1,485,272 tons coke, 793 tons raw coal and 33,281 tons charcoal. The larger part of the iron ore imported was from Hungary.

By-products reported in 1907 from coke making included 13,028 tons ammonium sulphate and 1073 tons coal tar.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

John A. Hill, President and Treasurer [illegible]
505 Pearl St., New York
London Office: 6 Bouverie Street, London, E. C. Eng.
Cable Address "Engminjour, N. Y."

Subscription payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for November, 1908, was 42,500 copies.

Dec. 5	12,500
Dec. 12	10,000
Dec. 19	10,000
Dec. 26	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE
Editorials:
The Anaconda Smoke Question Again 1261
The Tariff Hearings 1261
Copper Producers' Association 1262
The Geological Survey Suffers from Fire 1262
The Stock of Copper 1262
Smelting Competition 1262
*Mining and Smelting in the Ducktown District. *Edwin Higgins* 1237
Rare Metals—V. Thorium. *Charles Baskerville* 1241
Phelps, Dodge & Company Form a $50,000,000 Corporation 1242
A California Mine Complication. *Special Correspondence* 1244
Low Phosphorus High Silicon Pig Iron 1244
*Mine Labor and Supplies in Mexico. *Mark R. Lamb* 1245
*The Operation of a Coal Washery, Colorado. *W. E. Warner* 1248
*Coal Mining on the Retreating System. *Harvey J. Vernes* 1251
The Rich Coalfields in New Mexico 1251
Colliery Notes 1252
The New Steel Corporation Plant at Gary. *Special Correspondence* 1253
Monel Metal 1254
Production of Diamonds 1254
Examining and Fitting Up a Hydraulic Mine—I. *H. A. Brodhurst* 1257
*Adjustable Mine Support 1260
Coal and Iron in Austria 1260
Correspondence:
Alumina in Copper Blast Furnace Slags. *Chas. F. Shelby* 1264
The Conservation Commission in Washington. *Special Correspondence* 1265
A Statement by Daniel Guggenheim 1266
The Caddo Oil Fields 1266
Charles M. Schwab on the Tariff 1267
The Bureau of Mines Bill. *Special Correspondence* 1268
The Tariff Hearings in Washington. *Special Correspondence* 1268
Patents 1270
Personals, Obituaries, Societies and Technical Schools 1271
Special Correspondence 1272
Mining News 1274
Markets, etc. 1279
*Illustrated.

The Anaconda Smoke Question Again

In speaking about the proposed Bureau of Mines, we have several times referred to the mischief which such an organization might do to the mining industry unless its abilities be carefully restricted by the organic law. Our warnings were perhaps regarded at first as pertaining to a danger that might exist in an overwrought imagination, but would be unlikely to develop in practice. However, when we called attention to the vexatious, unwarranted and blundering interference with the mining industry by immature officers of the Forest Service, mining interests in the West received an object lesson in the meddling of a bureaucracy, and became more thoughtful about inviting a new one to take part in their affairs.

Another illustration comes to our mind. Suppose that some person in a Western metallurgical district, suffering from the perennial smelter-smoke dispute, should go to Washington and beseech a sincere, but impetuous, President to issue an injunction against the offending smelter on the ground that its smoke was destroying the adjacent forests, Government property. Suppose this President be a man who is thoroughly convinced, not only as to the fidelity, but also as to the omniscience of his executive organization, including the scientific bureaus, and be naturally disposed to act upon their advice rather than upon that of the outside engineering profession. Suppose this President calls upon his bureau of forestry, bureau of chemistry, bureau of mines, or whatever he thinks of, for advice as to action in this smoke question. Suppose he be told, "The solution is simple. Let this smelter [illegible] acid! That *ought* to be done anyway, because sulphuric acid is a valuable commodity. It *can* be done because the Tennessee Copper Company, at Copperhill, has [illegible] it. If the smelter [illegible] should make sulphuric acid out of its smoke, the forests would not be injured."

Of what avail would it be for the managers of the smeltery in question to argue that while the concern in Tennessee, near the phosphate field and a large market for acid, can profitably recover that by-product, [illegible] country produces, would be unable to sell it, and in short would not know what to [illegible] of the bureau, a few years out of school, who knows no more about the market for sulphuric acid than he does about the syntax of the Chinese language, has said that sulphuric acid *can* be made and *ought* to be made. With the President this advice goes.

This article is not intended to be humorous. It is simply our conception of the train of reasoning in connection with the new Anaconda smoke case, in which the Federal Government has taken a part. We understand that the President is considering the matter with a view to causing an injunction to be issued against the company. An expert from some bureau has been to Tennessee, and he knows *now* that a copper smelter can make sulphuric acid.

We hope that the Government will in this matter go outside of its bureaucracy and secure the advice of a chemical engineer who knows about sulphuric acid. The more quickly it does this, the more quickly will the great industrial company be saved from pestering and from expense in defending itself.

We are firmly convinced that a bureau of mines will find a great many things to do, and the bill now pending before the Senate will not restrict it. As we have said before, there would be no danger under Doctor Holmes, but what might happen under his successor?

The Tariff Hearings

The tariff hearings began as a joke. The feeling was strong that the tariff would be revised, but upward rather than downward. To lend some color of seriousness to the operation, Messrs. Payne, Dalzell & Co., caused an "investigation" of the cost of production abroad to be made by our consuls and other luminaries. The hearings began with demands by rapacious producers for an increase in duties of 5 to 500 per cent. Suddenly there was a change, brought about by general disgust at the nature of the hearings, by Carnegie's statement that the steel makers needed no protection, and finally by Mr. Taft's announcement that a real revision would be made.

Since then the hearings before the Ways and Means Committee [illegible] a different color. The hoggish manu- [illegible] has been taken by big captains of industry, who have gone to Washington under subpoenas. This manifests a desire on the part of the committee to learn facts. The men whom they have invited to instruct them are not theorists and doctrinaires. They know things, but are not always anxious to tell. The present problem of the committee is to extract information from them. The operation has been amusing, more so perhaps to their confreres in business than to the committee itself.

We can picture the jovial Mr. Schwab on the stand, ingenuously explaining that when he was president of the Carnegie Steel Company, nine years ago, he was still so young and inexperienced that he deceived himself as to the cost of producing pig iron and steel; and that he was then expressing an opinion to help Mr. Frick and Mr. Morgan crack up their goods, while in Washington the other day he was animated by a different purpose. With this fickle explanation, the committee must have felt that Mr. Schwab was a reliable adviser. For our own part we feel real sorrow that the poor iron miner of the Mesaba has been unable, even with all of the modern improvements, to prevent the cost of digging iron ore from doubling or trebling during the last 10 years.

Then there was Mr. Brush, of the American Smelting and Refining Company. The Japanese acrobat who performs on the tight wire at the Hippodrome has an easy task compared with his. The consumers claim that he jacks up the price of lead; the miners think that he jacks it down. He himself produces a lot of lead in the United States. Also he produces a lot in Mexico, which he brings into this country for refining in bond, scooping incidentally a certain amount of exempt lead, which is profitable. Then there is the matter of the National Lead Company that is to some extent interested in having cheap lead, in which the Guggenheims were once important factors. According to the last report of the National Lead Company they are so no longer, but they still have a representation upon the board of directors which seems to confuse the Ways and Means Committee. Mr. Brush was a perfect witness. Champ Clark might as well have tried to pick up a greased ball. We fear that the committee did not learn very much about the inwardness of the smelting business from Mr. Brush. However, he was generous in admitting that the duty on lead might be reduced a little without hurting the smelters very much.

Copper Producers' Association

A meeting of copper-producing interests was held at the office of Phelps, Dodge & Company, Dec. 18, to consider the revival of the former association for statistical purposes. Upward of 90 per cent. of the copper production of the United States was represented at this meeting and the sentiment appeared to be generally favorable to the proposal. A committee was appointed to frame a set of by-laws and another committee to consider the appointment of a statistician. A second meeting of the producers will be held early in January.

The prospect that this organization will be effected for the purpose stated is gratifying. We have repeatedly argued that what the copper industry needs more than anything is the publication of prompt and frequent statistics. This can be done only by such an association as is now contemplated.

The plan under consideration does not in any way contemplate an understanding for the regulation of production and price, except insofar as individual producers may act by the guidance of the statistical information that will be obtained. That is, of course, one of the purposes for which statistics are collected in any industry. There need be no fear of an "understanding" in the selling of copper. In spite of all wishes to control the price of this metal and the attempts to do so in the past, the market has remained open and competitive. It will continue to remain so.

The Geological Survey Suffers from Fire

The Geological Survey, on Dec. 16, had a fire in its headquarters at Washington, whereby many maps, photographs and other records of value were destroyed. About three years ago, the Journal forecasted that this would happen sooner or later, the building rented for the Geological Survey being a dangerous fire-trap. We urged then that Congress should provide the Geological Survey with a suitable headquarters. The failure to do this is another evidence of the incompetence of Congress. That body provides itself extravagantly with sumptuous office buildings, and absurdly builds stone post-offices in many hamlets by a log-rolling understanding to provide fat for constituents. But just as our embassies abroad are neglected, so has been the Geological Survey—one of the national institutions of which the country should be proud. We hope that the recent experience will prove a blessing in disguise by inspiring a slothful Congress to put aside its promotion of special interests sufficiently to provide the Geological Survey—which is an interest of all the people—with an adequate building. If Congress can be driven to do that, it might also be led to see the advisability of providing the Geological Survey with an endowment, or arrange that it should have a fixed annual appropriation that would relieve the director of this great scientific organization from the necessity of teasing and tickling members of Congress in order to secure the funds necessary to carry it on, which results in appropriations for miscellaneous, non-geological work of no particular value to anybody, to the exclusion of the work that is the main function of the organization.

The Stock of Copper

A good deal has been said lately about the stock of unsold copper in this country. We believe that there is such a stock, but, whether it is more or less than the stock at the beginning of the year (which was 120,000,000 lb. of refined) no one can say, because no one knows yet what the production and consumption have been. Statistical estimates are apt to be misleading unless they be compiled intelligently and upon a uniform basis.

There are three ways of computing the production, namely, (1) on the basis of the mine output, (2) on the basis of the smelters' output, and (3) on the basis of the refiners' output. For any given year the three figures may be nearly the same, or they may be wide apart. The year just closing is one in which they are likely to be wide apart.

Under no circumstances do we place any reliance upon statistics of the mine production, because we know the insuperable difficulties of collecting them accurately. The figures of the smelters and refiners can be collected accurately, but they represent materially different periods of time, because the product of the smelters is upward of two months in transit and process of refining before it appears upon the market. Consequently in a year like 1908 which began with the refiners operating at reduced capacity and several important smelters like Washoe and Cananea closed down, resuming operations later in the year, the respective totals are likely to show a good deal of difference. Obviously the estimate of the stock of refined copper can only be combined properly with reported production of refined copper.

Errors arising from the above particulars probably account for the present difference of opinion as to the amount of unsold refined copper. The selling agencies say that they have not got any to speak of, but the refiners do not say how much they may have in storage for speculators and other outside persons. As we said in the first place, we have no doubt that there is an unsold stock, but the amount of it will continue to remain a matter of uncertainty for some time to come.

Smelting Competition

When the American Smelting and Refining Company and the Utah Consolidated Mining Company fell out over a difference in the matter of a smelting contract, and the mining company made plans to build its own smeltery, the Smelting company probably did not think that this was going to lead to a general competition in the smelting business. At the worst it promised competition only in the Salt Lake market, which had previously been a competitive point owing to the operations of the United States Smelting Company. Now it has been announced that the syndicate headed by Cole and Ryan, which is going to build the smeltery where the Utah Consolidated ore will be treated, has more comprehensive plans; nothing less, indeed, than a general competition in the custom smelting business, involving the erection of plants at all points where there is a satisfactory prospect of profit.

Competition in the general smelting business has long been threatened. The United States Smelting Company has indeed embarked in it on an extensive scale, but its operations have been limited to comparatively few centers, having spread but little outside of the radius naturally commanded by Salt Lake. Its plans have not been formulated on a systematic exploitation of all the important ore-producing districts. Such schemes of that character as have been discussed have one after another come to naught, wherefore talk of competition in the smelting business has been considered like the cry of "wolf." We are led to believe that the present plans mean the real thing.

What those plans are has not yet been disclosed. However, it is indicated that they are far-reaching, and Messrs. Cole and Ryan are known to be ambitious. The weakness in the stock of the American Smelting and Refining Company indicates knowledge of what is impending. It would be interesting to discover to what extent the new scheme will be financed from the proceeds of bear operations in the stock market.

Mr. Carnegie Speaks

The Laird of Skibo had the day of his life with the Ways and Means Committee, Dec. 21. He was no witness to be heckled; rather did he heckle the committee. A retired ironmaster who has converted his brains and knowledge of the business into a hundred millions or more is not a man who can be flouted as an ignoramus. The committee-room became a class-room, with Mr. Carnegie the teacher and the committee the pupils, who were often dense. We can spare space for only a few of Mr. Carnegie's gems.

He laughed at the elaborate statements of cost submitted by Messrs. Schwab, Gary and Felton. "There are more ways of figuring cost than of killing a cat," said he. "These men who come here are trying to tell you the truth, but they speak in a language that you do not understand." (This to a committee that is going to equalize manufacturing cost the world over!)

Those minutely itemized statements of Mr. Schwab and Judge Gary, which had been mulled over in two long sessions, continued to trouble the committee. They wanted Mr. Carnegie to explain them, but he insisted that he was unable to make an analysis of the items.

"How, then, do you figure out the production cost of the United States Steel Corporation?" demanded Mr. Dalzell, with some asperity.

"Well," returned Mr. Carnegie, "the [illegible] [illegible] That is, roughly, $15.50 a ton. Does that enter your brain? Can you get at it in any other way?"

Mr. Carnegie is something of a "pawky chiel" himself. He smiled triumphantly while the committee remained silent

Incidentally Mr Carnegie punctured the vagary of Judge Gary that the trusts may defy the law of supply and demand, which [illegible] fessor, as our readers will recollect Mr. Cockran asked if a reduction of the price of steel products would not stimulate consumption. Replying in the affirmative, Mr Carnegie took advantage of the opportunity to give the committee a lecture on what manufacturing companies should do when a panic comes on. It is a great mistake to try to hold up prices in time of panic, he said. If he had been at the head of the Steel Corporation during the recent panic his policy would have been to reduce prices enormously. The result of such a policy would be that a man in New York who was contemplating the construction of a skyscraper would say: "Here's a bargain. I'll buy my steel and start work at once." This would be followed in other parts of the country and business would begin to pick up.

This is good economics and sound sense. It was by the practice of such a policy that the Carnegie Steel Company became so extraordinarily successful and Mr. Carnegie earned his millions

We learn from the secretary of the American Institute of Mining Engineers that the next meeting of the Institute for the reading and discussion of papers will be held in New Haven, Conn., beginning Tuesday evening, Feb. 26, 1909. Leading topics for consideration at this meeting will be the conservation of natural resources; professional education; and the Panama canal. The full program will be sent to members by circular in January.

[illegible] testimony in the case of the Marianna explosion, held a two days' session at Washington, Penn., and on Dec 18, rend- [illegible] was composed of five farmers and one machinist; the inquest was a bigger farce than is usually the case. We expect to review the evidence in detail next week.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Alumina in Copper Blast Furnace Slags

The contribution on this subject, by Harley E. Hooper, Nelson, New Zealand, published in the Journal of Dec. 5, and written with the intention of throwing further light on the subject insofar as my article in the Journal of Aug. 8, 1908, dealt with Carl Henrich's experiences at the works of the Champion Copper Mining Company, of New Zealand, and as published by him in the Journal of July 17, 1886, is interesting at least even though it might be considered disappointing. If his conclusions are correct, this incident only serves as another "instance to prove that unless all the conditions under which a furnace plant is operating are known or stated, that a few figures such as a slag analysis may sometimes be more misleading than instructive," a remark which may be found in my article of Aug. 8, 1908.

It is extremely disappointing to learn of any possible chances for criticism in Mr. Henrich's analyses. I never had the pleasure of his acquaintance and know nothing further about his New Zealand experiences than the information published by himself. However, the same article from which I extracted the few notes published as a part of my contribution of Aug. 8, 1908, also deals with his (Mr Henrich's) previous experiences at Morenci, Arizona, and the analyses he cites in connection therewith show substantially the same slags as those that are being made there today; his analyses of the Copper Queen slag, with 15.4 per cent. alumina is also unquestionable, as it has been duplicated many times since George B. Lee, who superintended the last year's operations at the old Bisbee plant of the Copper Queen, and who is at present in charge of the large Douglas works, has frequently mentioned making slags at Bisbee containing as high as 20 per cent. alumina. That he made them there is no doubt; but that an analysis of the dump will show that amount, there is also no question for doubt. It will not. The slags described were exceptions rather than the rule.

It is always the exceptions that attract attention, and when they indicate desirable possibilities they call forth study and an endeavor to make the exception the rule, and so on *ad infinitum* until perfection shall have been reached. The evolution of our copper-matting blast furnaces from the 36-in. circular type to Mr. Mathewson's furnaces 120 ft. long is a most striking instance of the value of noting exceptional features, all combined being the result of a study of slags, mattes, their tonnage ratio to each other, air volume, tuyere area, hearth area, labor efficiency, wall accretions, settler capacities, etc.

Henrich's Data

In Mr. Henrich's article stress is laid on the importance of correctly determining alumina as a separate constituent, mentioning some of the causes for error in its determination, which 20 years ago might have been more confusing than now. That Mr. Henrich was a student and kept himself informed as to the proceedings in metallurgy at that time is evidenced by his quotations from and references to the writings of others. Dr. M. W. Iles, from whose writings he quotes, was one of the pioneers of our present day chilled slag analytical methods, with which, we are entitled to infer that Mr. Henrich was familiar.

Mr. Henrich's description of the Nelson ores 22 years ago does not differ greatly from Mr. Hooper's present information, except that Mr. Hooper calls the gangue serpentine, and Mr. Henrich says that it is "locally called serpentine," and that:

"The country 'serpentine' in which the lodes are situated is a monosilicate of alumina and magnesia of approximately the following composition: $3\ MgO,\ Al_2O_3,\ 3\ SiO_2$. The 'serpentine' of the lode itself, occurring with the ore, has lost some of the magnesia and silica, removed probably by the action of the sulphatized waters engendered by the decomposition of the pyrites of the lode. This 'serpentine' is on an average of the composition: $MgO,\ Al_2O_3,\ 2\ SiO_2$. These formulas are based on the analysis of samples of large quantities of rock, and they represent the average constitution of the rock and not any of the rare crystals of the minerals contained in the rock.

"The lode serpentine sometimes contains more silica than is given in the above formulas, but frequently also less, and then more."

His Deductions Concerning Alumina

Mr. Henrich dates his article at Nelson, New Zealand, May 17, 1886, and supplements it with another under date of July 16, 1886, published in the Journal of Aug. 21, 1886, in which he mentions that he is satisfied with his opinion as to the acidic action of alumina in his blast-furnace slags by a further smelting of 140 tons of material, but does not state that he attempted slags with such high alumina contents. A deduction would be, that in view of the prevailing opinion at that time as to the basic action of alumina, he commenced operations on that supposition, the incorrectness of which he endeavors to prove in his first article, which cites the high alumina slags, and which evidently were subsequently abandoned for the more fusible combinations as given by Mr. Hooper and from which he selected his sample from 100 tons of the slag.

If Mr. Henrich gave us *ultra* or *infra* results as compared with his regular practice, it was with the idea of elucidating the then obscured action of alumina, and we owe him for it. While I consider Mr. Hooper's results as authentic, I do not think that they impair the authenticity of Mr. Henrich's. That Bisbee made 20 per cent. and higher alumina slags is unquestionable, but to find them there today would be as tedious as searching a haystack for a needle.

In reply to Mr. Hooper's inquiry if I have ever run a 31-per cent. alumina slag, I answer no. I gave Mr. Henrich's as the most extraordinary slags, in this respect, that I had what I considered an authentic account of, and even Mr. Henrich associates them with freeze-ups.

In reply to his inquiry as to, "What is the highest alumina content allowable for economic working under 'favorable' conditions," I should say that it all depends on what "favorable" implies. It generally simmers down to financially successful operations, regardless of conditions, and the answer would necessarily be vague. The highest I have ever been called upon to run approximates 16 per cent. alumina. But I should say, that with a proper furnace, either blast or reverberatory, and a fuel capable of intense heat, that the limit would be far above that point.

Magnetic Oxide in Slags

In reply to Mr. Hooper's inquiry with reference to the formation of magnetic oxide of iron in his reverberatory furnace, I may say that it is a very difficult question to answer, when a person is unfamiliar with all the conditions that may govern the case. Magnetic oxide of iron is generally the result of an incorrect balance between reduction and oxidation, and even though we realize this, sometimes it seems almost impossible to correct the difficulty. It seems rather queer, however, that a magnetic oxide of iron should settle on top of his furnace charges, from which we deduce that it floats on the slag. Its proper location in the reverberatory furnace would be between the slag and the matte. I have experienced troubles of this kind in connection with copper-matting blast furnaces, wherein this magnetic oxide of iron would appear as a "mush" in the settlers between the slag and the matte, and its origin is rather puzzling.

I have entertained the belief that its formation in the instances that I have in mind (in settlers into which the slag and matte were delivered by blast furnaces through a [illegible] boiler-plate spout, kept heated on top by means of a coal fire), was due to the burning away and disintegration of this coal and particles of coke, some of considerable size, formed by this coal fire, and which would be washed into the settler and hover near the entering stream of slag until entangled and carried below the surface. In this case it might be reasonable to believe that the particles of coal and coke would cause a reduction of some of the iron in the slag, a condition which would be appreciable [illegible] accumulation had taken place during a substantial period of time.

Now how this metallic iron could be reoxidized to magnetic oxide I cannot explain, nor am I ready to state that it is magnetic oxide. It may possibly be largely composed of elemental iron. On account of its location in the settler and its intermixture with slag and matte, it was practically impossible to secure an uncontaminated sample. What I have done is to take a ladle with a vertical handle, lower it into the settler below this "mush" and bring up some slag greatly enriched with this substance. All I can say is that the samples assayed abnormally high in iron, and were attracted by a magnet. Sometimes this material may disappear after a change in slag composition; but if not, my remedy has been to take the tap plates off the settler and to wash it out with all possible speed, assisting the operation after the settler was drained out by flushing it with hot converter slag

Present Practice at Cananea

Since the resumption of operations at Cananea, with probably unequaled facilities for mixing furnace charges on a large scale and obtaining uniform results, we have been making slags continuously that previously involved serious troubles. For the month of October, 1908, the average analyses of about 30,000 tons of slag from the blast furnace was: Silica, 39.5 per cent.; alumina, 10.3 per cent.; iron oxide, 30.8 per cent.; lime, 15.7 per cent., representing an oxygen ratio of acids to bases of 2.27 to 1, this with satisfactory furnace speed, or 4.52 tons per day per sq.ft. hearth area, with a charge containing so much fine material that 52.4 per cent. would pass through a ¼-in. square opening.

The highest silica-alumina slag we have obtained continuously from the blast furnaces gave the following analysis: Silica, 41.1 per cent.; alumina, 11.8 per cent.; iron oxide, 27.8 per cent.; lime, 16.1 per cent., representing an oxygen ratio of acids to bases of 2.53 to 1, and a hearth activity of 3.6 tons. This represents the smelting of a bed containing 4500 tons of material, and was the slowest furnace speed we have had. The fastest bed contained 5500 tons and delivered a slag containing: Silica, 37.7 per cent.; alumina, 10 per cent.; iron oxide, 33.9 per cent.; lime, 14.8 per cent., with oxygen ratios of acids to bases of 2.09 to 1, and a hearth activity of 6.1 tons. In all these slags we do not daily consider any other elements than those mentioned, whereas we appreciate and are aware of the existence of manganese oxide, magnesia and zinc oxide in small quantities, as well as copper and sulphur.

Our oil-fired reverberatory for the month of October, 1908, delivered a slag containing: Silica, 41.3 per cent.; alumina, 10.8 per cent.; iron oxide, 36.4 per cent.; lime, 3.7 per cent., with oxygen ratios of acids to bases of 2.91 to 1. There was also much more zinc oxide in this slag, and the furnace smelted a lower tonnage and with more fuel per ton than has since been the customary practice with a much more basic slag.

The accompanying table gives a week's exceptional results during the month of October, 1908, when we were introducing continuous fettling by dropping the sili[illegible] walls of our reverberatory furnace through holes in the roof.

[illegible] REVERBERATORY SLAGS [illegible] DURING AN EXCEPTIONAL WEEK

[illegible]	[illegible]	Alumina	Iron [illegible]	[illegible]	Oxygen [illegible] Acids to Bases
[illegible]	[illegible]	10.6	40.5	[illegible]	2.69
[illegible]	41.1	9.7	[illegible]	4.3	[illegible]
[illegible]	41.0	8.7	39.2	4.8	[illegible]
[illegible]	41.2	10.2	38.4	3.4	2.80
[illegible]	42.2	[illegible]	[illegible]	[illegible]	3.14
[illegible]	45.0	11.3	[illegible]	3.9	[illegible]
[illegible]	49.1	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

These latter results are not advised nor to be emulated. The slags were all clean as far as copper is concerned, but the fuel percentage was far too high and the normal capacity of the furnace should have been about 250 tons per day. The increased silica in the slag came from the fettling material that would float away before we succeeded in getting it to "bed" down properly. The following week was substantially the same, but in inverse order. The higher silicas cannot even be considered slags, as they were entirely too viscous to run and were only pulled out of the furnace with extreme difficulty.

[illegible]

Cananea, Sonora, Mexico, Dec. 7, 1908.

The Conservation Commission in Washington

Senator Flint, of California, who at the recent meeting of the National Conservation Commission in Washington, presented the report of the mineral section of the commission has issued a statement in which he estimates that the waste of mineral products in the United States amounts to $1,000,000 per day. The waste of natural gas amounts to 1,000,000,000 cu.ft. per day.

"The waste in coal mining is equivalent to about one-half of the total product mined, or for the year 1907 about 240,000,000 tons," says Senator Flint. "With an entire waste of all mineral products approximating $1,000,000 per day, and with the mineral production of the United States during the past year amounting to $2,000,000,000, this waste is equivalent to more than one-sixth the value of the total production."

During the past year in coal mines more than 5000 men were killed and more than 7000 injured. The number of men killed in the United States for each 1000 men employed in the mines is estimated as from two to four times as great as it is in other coal-mining countries.

Senator Flint presents expert estimates showing that the coal supplies of the United States contain about 1,400,000,000,000 tons of coal available for mining under existing conditions.

Iron-ore estimates, based upon data gathered from every available source, indicate that of the high-grade ores we have in sight available for use under present economic conditions 3,840,000,000 tons, of which nearly two-thirds are located in the Lake Superior district. In addition to this, the final estimate of low-grade iron ores, those not available for use under existing conditions, shows that there are about 50,000,000,000 tons distributed throughout the iron-producing districts. At the present increasing rate of consumption it is stated that the high-grade iron ores will have been largely consumed by the middle of the present century; [illegible] be extended to near the middle of the next century.

The chief waste in oil is alleged to be its excessive use for fuel purposes—more than 18,000,000 bbl. having been used during the past year for locomotive fuel.

As to copper, lead, zinc and the precious metals, it is estimated that without discovery of other deposits, at the present increasing rate of consumption, the known supplies of these materials will not last beyond the present century, and the probability of discovery of new supplies is diminishing with each year. The losses in the mining and treatment of these metals are greater than with iron With lead, zinc and iron ores the chief source of loss is through rust, electrolytic action, etc. Senator Flint urges that success in the effort to conserve resources will largely depend upon the State Governments rather than on legislation by Congress.

A Statement by Daniel Guggenheim

Daniel Guggenheim made the following statement to the press, Dec. 17:

Quite some years ago the speculating public were kept in a ferment by the cry of "wolf!" in connection with sugar refining stocks due to competition between the Havemeyers and the Arbuckles. It is now the Smelting Company with other large financial interests. It seems that the people must be fed upon something of this kind. As the American Sugar Refining stocks are now so largely absorbed and put away in the boxes, the American Smelting and Refining Company's common stock is being speculated with in its stead. This will continue until it is absorbed and put away in the boxes, unless some other security shall in the meanwhile become more popular with the speculators. There is nothing new that I can see or any change of policy in the so-called Ryan-Cole development of the copper-smelting business.

The group of gentlemen known as the Ryan-Cole and their following have been for many years in the copper mining and copper smelting business. They are great believers undoubtedly in copper as a metal. So am I. They can see that a great deal of money can be made in this business—as can be when intelligently prosecuted. They have interests in copper smelters and copper mines in various parts of the United States and properties in various parts of the world. It is a business they have gone into, and whether or not they have now formed a large company for the purpose of taking in other interests or for the purpose of building new smelters and buying new mines it is nothing new, nor is it anything that the American Smelting and Refining Company's shareholders need look upon with any concern whatsoever, because the American Smelting and Refining Company has not a single exclusive copper smelter in the United States. It has a few copper furnaces at some of its plants which are simply used as auxiliary furnaces to provide for by-products and such ores as are contiguous to their locality.

The American Smelters Securities Company has only one exclusive copper smelter in the United States. Neither of these companies is likely to have in the near future any more exclusive copper commission smelters because they look upon copper smelting as an extremely annoying business, and if one is fond of litigation and likes it as a steady diet I strongly recommend building a copper smelter in a farming locality. The American Smelting and Refining Company is largely interested in copper refining. I personally am very fond of and believe in copper mining as a highly profitable business, and copper refining as a very satisfactory business, but I would not personally go into the copper commission smelting business or advise any companies with which I am connected to go into the copper smelting business unless to smelt the copper ores from their own mines. By that I mean I do not believe that the smelting of copper ores on commission for others is a business that at the present time, at least, is desirable. If one has copper mines and a smelter located away from the farming district to treat the ores of those mines this is an entirely different affair.

As regards the lead smelting business of the American Smelting and Refining Company fully 90 per cent. of all the lead ores of the United States and in the Republic of Mexico are now controlled by ownership of mines and by long-time contracts. These ores are either controlled by the American Smelting and Refining Company or by its present competitors. And I wish to state further that the earnings of the Smelting Company at the present time, as well as of the Securities Company, are considerably in excess of the dividends that are being paid.

The Caddo Oil Field

The Secretary of the Interior has withdrawn from entry, by the President's order, all the public lands in the petroleum and natural gas field in northwestern Louisiana, known as the Caddo oil field, and embracing about 6500 acres. This action is taken pending a careful geologic investigation by the U. S. Geological Survey, with a view to preventing the great waste of natural gas now chargeable to the Caddo field.

Representatives of the Survey recently visited the Caddo district and report a waste of natural gas which is beyond all precedent. This field as a large oil producer has only lately come into prominence; but several years ago one of its natural gas wells began to leak badly as a result of poor work in packing the well above the gas-bearing sand. The leakage increased and the well "blew out;" the pipe, derrick and entire apparatus were engulfed in the hole and submerged by water which blew out with the gas.

Three additional similar cases are reported, due to indifferent work, the gas blowing out under tremendous pressure, and a fifth eruption is expected soon. In one well the waste has been going on for four years, an incredible amount of gas having been dissipated.

In another well a crater about 300 ft. in diameter has been formed, containing water and some petroleum, and in the center the gas boils up in the form of a large mud volcano. This well has been wasting gas about two years at a rate, variously estimated by persons familiar with gas wells, of 15,000,000 cu.ft. every 24 hours. In another well the discharge is constantly burning a gigantic torch, flaming night and day from 75 to 100 ft. high.

The total waste in the Caddo field, an only partially developed region, is estimated by the chief geologist of the Geological Survey at 75,000,000 cu.ft. of gas daily, or more than one-twentieth of the total amount of natural gas usefully consumed in the entire United States.

The work of drilling and packing many of the wells in the field is described as most careless and faulty, and it is this which is causing such deplorable waste of a great natural resource which should make prosperous the entire section. The object of the withdrawal of all the public lands in the vicinity is to insure the Government's retaining title to the land, pending necessary legislation as well as action by the State officials.

Remedial engineering work is also necessary to stop the wasteful flow of gas which is now depleting the common supply under the Government as well as under other private lands. No attempt is being made to stop the flow since the oil men have the fanciful belief that after the gas has exhausted itself the production of oil will be improved, an idea for which there is no geological justification, as this rapid escape of gas rather injures the oil chances of the field by permitting an influx of salt water as the gas pressure is removed. Up to the present time nothing whatever has been done to check this waste of hundreds of thousands of dollars, but it is probable that some effective measures will follow the action of the Secretary.

During 1907 there were 369 blast furnaces operating in the United Kingdom. These smelted 25,123,759 tons of iron ore and produced 10,114,281 tons of pig iron. The coal consumed by these furnaces was 21,119,547 tons.

Charles M. Schwab on the Tariff

The evidence of Charles M. Schwab before the Committee of Ways and Means in Washington was expected [illegible] interest, as it was thought that he would be able to contribute valuable information, owing to his long and intimate connection with the Carnegie Steel Company and the United States Steel Corporation. Mr. Schwab did give some information as to costs, and his opinions may be accepted as those of a man thoroughly posted on the details of steel manufacture and still actively engaged in it; but they can hardly be said to have thrown much light on the general discussion.

Cost of Steel Rails in [illegible]

The first part of Mr. Schwab's evidence was largely taken up in explaining a letter written by him in 1899, which was published some time ago. In that letter he estimated a good profit for the Carnegie company on steel rails at $17.50, and even $16.50 per ton, and said:

"As to the future, even on low prices, I am not sanguine. I know positively that England cannot produce pig iron at actual cost for less than $11.50 per ton, even allowing no profit on raw materials, and cannot put pig iron into a rail, with their most efficient works, for less than $7.50 per ton. This would make rails a net cost to them of $19. We can sell at this price and ship abroad so as to net us $16 at works for foreign business, nearly as good as home business has been. What is true of rails is equally true of other steel products. As a result of this, we are going to control the steel business of the world.

"You know we can make rails for less than $12 per ton, leaving a nice margin on foreign business. Besides this, foreign costs are going to increase year by year, because they have not the raw materials, while ours are going to decrease. The result of all this is that we will be able to sell our surplus abroad, run our works full all the time and get the best practice and costs in this way."

Mr. Schwab admitted that he had been carried away to some extent by "youthful enthusiasm and optimism," but stated that his figures were substantially correct at that time. He put the cost of 58 per cent. Mesabi ore at Pittsburg at $4.50 per ton of pig iron. This cost was made up of 15c. royalty per ton of ore; 25c. for mining; 65c. freight to Lake Superior; 60c. lake freight, and 70c. freight from Lake Erie port to Pittsburg. The cost of the coke used in making [illegible] at $1.75, and of limestone at 35c. The cost of labor he put at [illegible] making a total of $8.25 per ton of pig iron. Adding $3.75 per ton for converting pig iron into rails made the total cost of rails $12 per ton, as stated in his letter. He explained, however, that he included the materials and labor only with no allowance for general expenses, for depreciation of plant, for charges on capital, or for profits. He stated also that in that year the wages paid were very low, as a result of the surplus of labor available. For the same reason the cost of labor at the mines was low. The mining costs were also put very low, as the work on the Mesabi at that time was mainly on the surface and the ores could be cheaply handled.

[illegible]

At the present time, Mr. Schwab said, the cost of Mesabi ore in the ground—or royalty—has risen to $1 per ton of ore; freight to Lake Superior to 85c.; lake freight to 70c.; unloading and railroad freight to Pittsburg to $1. Moreover, the average grade of the ore has fallen from 58 to 50 per cent., so that, with allowance for loss, the cost of ore per ton of pig iron is $8.50. Coke is higher, costing about $2.60; limestone 75c. These items, with labor, would bring the cost of pig to $13.15; or with general expenses added, to $14 per ton. The labor cost has not increased, because the extensive use of machinery in handling material had reduced the number of men employed at a furnace. The cost of converting pig iron into rails has practically doubled, amounting now to $7.50 per ton. The last-named increase is mainly due to the higher cost of ferromanganese and other materials, to the greater care taken in making steel, the larger rejection on ingots, and other charges. This would make the cost of bessemer rails now about $21.50 per ton, and of open-hearth rails a little higher.

[illegible]

When questioned as to the cost of making rails abroad, Mr. Schwab was rather less definite in his statements. The difference in cost between the United States and Germany, he thought, was mainly in the cost of pig iron. The conversion of pig iron into steel and the rolling of the rails would cost about the same in both countries. In making pig iron the Germany had an advantage of [illegible] per ton, because there is less to pay for transportation and their methods are more economical. The cost of steel resolves itself into two elements, materials and labor. The steel can be made in the United States as cheaply as anywhere in the world if the cost of these items is kept down. With regard to conditions in Germany especially he said:

"The Germans have made the greatest advance in economic metallurgy of any nation in this world during the last five years. They have utilized their by-products to a greater extent than any [illegible] that, but they have developed their mechanical appliances with reference to [illegible] quality to a greater extent than any other nation during these past five years. In other words, manufacturing in Germany five years ago seems to have had a complete renaissance, and they have advanced very much more rapidly than any other nation, for the reasons I have given. For two reasons: the first, the very excellent technical education of their metallurgical engineers in Germany; the second, the most important, the labor conditions in Germany as compared with the conditions in England. I think the labor conditions in England are the worst of any of the great manufacturing countries of the world. * * * Germany is rapidly adopting the same methods and blast-furnace practices that we are, with reference to economies in handling the material, but they have gone much further than we have in the introduction of the use of their waste gases. Germany was the first country to use waste gases for the development of power, which makes a very large saving in the cost of pig iron. We are rapidly adopting it, but, to tell the truth, we are following Germany in that respect."

[illegible]

With regard to prices he said that in 1896 the price of steel rails was $28 at mill, the same as now. In 1899 there was competition among the steelmakers which brought down the price to a low point. Since the organization of the Steel Corporation the price has been uniformly $28 per ton.

With regard to finished steel other than rails, many questions were asked; but the following answer to one of them gives the substance of all: "The cost of plates and the cost of all steel structural shapes—that is, rolled products—in round figures is about $3 a ton above the cost of rails. There is a great variety of specifications and qualifications with reference to these special grades of steel that make their cost very considerable, but I am taking the common standard shapes. I mean by that columns for buildings, girders for buildings, or plates for ships, or any similar line, and you can reckon that as a general thing the cost is about $3 to $4 a ton above that of rails."

[illegible]

[illegible] summed up in the following answers:

"I believe that in the manufacture of [illegible] or 25 per cent. a year, he had better keep out, for the reason that changes in the methods have necessitated such frequent and radical changes in plants that the [illegible] preciation is very much gr[illegible] ple not in the business possibly dream of [illegible] that. During my superintendence of the [illegible] the converting department three times

Therefore, the ordinary charge of 5 per cent. for depreciation will not nearly cover the investment. I think that in any manufacturing, you ought to have at least 25 per cent. I think where you consider steel from the ore down, where you mine the ore and manufacture the coke, and do all those things incidental to the manufacture of steel, 25 per cent. is not a sufficient profit.

"I will give you an illustration of that: The latest plant built in the United States I have just built at Bethlehem. We produce only 500 tons of rails a day, and about 1000 tons of structural steel in this plant. That is a total production of 1500 tons of steel a day. The cost of the bare plant—that is not the blast furnace, but from the pig iron to the finished product—was about $15,500,000. That included no working capital. We have spent on that plant, in working capital and plant, approximately, $21,000,000. Let us take the cost of that plant at $21,000,000. Twenty-five per cent. of the cost of that plant is approximately $4,000,000. If you divide that by about 500,000 tons a year of steel output, which is about the output of that plant in rails and structural steel, it amounts to $8 a ton."

LABOR COSTS

The witness said that the labor cost per ton in the United States differed little from that abroad. Wages here are on a higher scale, but there is more use of machinery here and consequently fewer men employed. Another result of this condition, however, is that the original investment in plant is much greater per ton of product here than abroad.

EXPORT PRICES

With regard to prices of rails sold for export, substantially no new information was obtained. Mr. Schwab was, apparently, quite satisfied that the policy of making lower prices for export would be a judicious one under many conditions.

Not only for rails, but for structural steel and other finished material, he believed that consumers generally were better satisfied to have prices maintained at a nearly uniform level than to see constant variations. For this reason he believed that present conditions should be maintained.

BESSEMER AND OPEN-HEARTH STEEL

An opinion expressed by the witness, though not directly bearing on the tariff question, is of interest. He said: "I make this prediction, that in five years from now there will not be a single bessemer converting works for making steel in the United States. That means that every man who has his money invested in bessemer works for making steel rails will have to throw it away as useless and of no value before five years. The change is rapidly taking place now. If you will look at statistics you will see all the steel rails are getting to be the open-hearth. Bessemer will be of no use. The result is all these changes will have to be made at tremendous cost. The same is true of structural steel. The new mills which I have built at Bethlehem have made a radical change in the character of structural steel, so that most of the structural-steel plants of the United States will have to be changed within the next five years, and that has been the history of the steel business since I have been connected with it."

CONCLUSION

Mr. Schwab's views on the tariff, though diffused throughout his testimony, can best be summed up in the following: "My view in this: You can take the tariff off altogether if you want to, and we will be able to compete anywhere, but we have to put the conditions in a similar form. We have to put labor on a similar basis. If you will go into the detailed amount of labor entering into the cost of making steel, you will find it is practically everything but the cost of the raw material in the ground. Reduce those labor items along the line—I mean the labor of all the people who furnish firebricks and refractories and supplies and waste and oil and coal and everything that goes into the steel—and you will be able to put us on a basis with our natural resources, putting them in at the same price as anybody's else, to compete with the world free, and it will make a very radical and decided change in everything pertaining to the manufacture in America."

The Bureau of Mines Bill

SPECIAL CORRESPONDENCE

The adjournment of Congress for the holidays without action regarding the Bureau of Mines bill has thrown the measure over to the latter part of the session, but with an understanding that it will be called up in the Senate. It is now on the calendar under rule IX which implies that it cannot be advanced for discussion without unanimous consent. Some opposition to the measure apart from that attaching to every bill which proposes to enlarge the number of governmental bureaus, seems to be based upon the claim put forward by certain senators that they dislike the measure owing to its limitations. They assert that they would prefer to wait longer and then secure the passage of a bill creating a department of mines rather than to accept the bureau bill. The judgment of several of the friends of the measure is that it will be passed at the current session notwithstanding the concealed antagonism to it.

The Tariff Hearings in Washington

SPECIAL CORRESPONDENCE

At a hearing on Dec. 15 Walter Wood, of Philadelphia, representing R. D. Wood & Co., considered the cast-iron pipe situation and suggested a duty of not over $3 per ton differential over pig iron in lieu of the present duty, which is equivalent to about $8.96 per ton, or nearly $5 above pig-iron duties.

At hearings on Dec. 19 Charles Searle, Boston, Mass., in behalf of various users of high-speed steel asked that high-speed and crucible steel valued above 13 and not above 16c. per lb. be dutiable at 2c. per lb., instead of 25c., with similar products worth over 16c., 3.5c. instead of 4.7 cents.

LEAD ORE AND LEAD

At a hearing on Dec. 16 Edward Brush, representing the American Smelting and Refining Company, discussed the conditions of competition and cost of production of lead ore and lead. Mr. Brush said that the tariff might be cut to 1¾c. on pig lead instead of the present 2⅛c. The duty on lead bullion might be made 1⅜c. instead of the present 2⅛c. The duty on lead ore should not be cut below 1½c., the present rate.

MISCELLANEOUS PRODUCTS

Winthrop C. Neilson, Philadelphia, for the Republic Mining and Manufacturing Company, Philadelphia, has filed argument in support of a duty of $2 per ton on bauxite. The Marion Fluorspar and Lead Company, Marion, Ill., requests "a good, stiff duty on foreign stuff." Charles R. Brayton, Providence, R. I., requests the removal of the duty on imported gypsum rock and is supported by several New York and Connecticut concerns. George D. Miles, Newdale, N. C., requests an increase of duties on mica.

The H. M. Franklin Manufacturing Company, Syracuse, N. Y., requests the removal of the present duty of 8c. per lb. on aluminum. J. F. Frantz, for the Dentists' Supply Company, protests against the proposal to impose a duty on all platinum products except ingots 5/16x2x4 inches.

Abendroth Brothers, Port Chester, N. Y., urge that the duties on pig iron and cast scrap be reduced or abolished. The National Cotton Association, Atlanta, urges removal of the duties on cotton ties. F. W. Hickle, Hartford, Conn., for the Capital Foundry Company requests reclassification with incidental increase of duties on engine-cylinder castings. The C. F. Patterson Company requests reduction of the present duty of 40 per cent. ad valorem plus 1c. per lb. on wire rope.

The Kentucky Barytes Company, Nicholasville, Ky., by G. A. Roy, president, asks that the duty on crude barytes be advanced to $5 per ton. Mr. H. Schall, New York, for Gabriel & Schall, importers, has filed a reply to charges made by W. D. Gilman, of the W. D. Gilman Company, Sweetwater, Tenn., regarding alleged undervaluation of imported carbonate of baryta.

Drawback on Corundum

The Treasury Department's regulations of September 29, 1905, providing for the allowance of drawback on wheels and other articles manufactured in part with the use of imported corundum, have been extended, so far as applicable, to cover the exportation of wheels manufactured by the Massasoit Abrasive Products Company, of Chester, Mass. In liquidation, the quantity of imported corundum which may be taken as the basis for the allowance of drawback may equal that declared in the drawback entry, after official verification of exported quantities, but in no case shall it exceed 75 per cent. of the net weight of the exported wheels.

Manganese Ores

In response to the resolutions of the House of Representatives, introduced by Mr. Cook, of Colorado, and dated April 20, 1908, requesting information as to the authority for the admission of manganese ore free of duty at certain ports of entry, Secretary Cortelyou has just sent to Congress a letter in which he says that no manganiferous iron ores were admitted during the last fiscal year free of duty as manganese ore. Secretary Cortelyou says further that ores containing less than 10 per cent. of iron and from 40 to 50 per cent. of manganese, or over, are commercially known as manganese ores, valuable only for the manganese contained therein, and are, therefore, free of duty under paragraph 607 of the tariff of 1897. It further appears that the percentages of iron and manganese, respectively, in such importations have been determined by analyses whenever necessary, and that the analyses have never shown over 10 per cent. of iron, and, at New York, in but two instances, over 4 per cent.

The Cost of Steel Rails

At a tariff hearing before the Ways and Means Committee on Dec. 15 C. M. Schwab, of the Bethlehem Steel Company discussed the cost of producing iron and steel and said that while he would prefer no change "a moderate change is not going to seriously hurt" but "a radical change will make a very great difference." At the same hearing Robert Gilchrist for the Western Foundry Supply Company asked that the duty of $4 per ton on ferro-manganese be maintained. Prof. F. W. Taussig, Cambridge, Mass., suggested that iron ore, pig iron, steel rails, and ingots be transferred to the free list.

At a hearing on Dec. 18 Judge E. H. Gary, of the United States Steel Corporation analyzed the cost of production of pig iron and steel and took general ground in favor of maintaining the tariff on those articles with the addition of a maximum and minimum tariff provision.

On Dec. 21 Andrew Carnegie reviewed the iron and steel situation and supported the position taken in his recent article to the effect that no tariff duties whatever are needed by the iron and steel business. Mr. Carnegie maintained that protection has resulted in developing the industry to a point where the stronger concerns are independent of duties while others may properly be disregarded.

The interesting feature of the Schwab-Gary-Carnegie hearings is considered to be the widely varying opinions advanced with reference to costs of production. In this connection too it is worthy of note that Chairman Payne has made public with the consent of Judge Gary, given on the witness stand, the detailed figures prepared by the Bureau of Corporations with respect to iron and steel costs. These figures represent the labor of a substantial corps of men during the past two or three years under the direction of a practical steel manufacturer. Mr. Schwab in his public testimony makes the cost of pig iron as follows: Ore in the iron $8.76 per ton, coke $2.62, limestone 75c. conversion cost $1.30, general charges 65c., or $14 in all. The cost of conversion into rails he sets at about $7.50, a total cost for steel rails of $21.50. Judge Gary estimates the costs as follows: Ore $8.62 per ton of iron, coke $3.93, limestone 49c., scrap 16c., cinder and scale 11c., cost of labor material and expense of operating $1.37, depreciation 40c. or in all $15.30—this being the average cost at all the plants of the U. S. Steel Corporation. From pig iron to rails the cost, says Judge Gary, is as follows: Pig iron and scrap exclusive of depreciation $15.06, conversion pig iron to ingots $2.88, ingots to rails conversion cost $3.22, depreciation 84c., total cost $22.81. Mr. Carnegie regards the items of cost furnished by both Judge Gary and Mr. Schwab as fallacious and purely a matter of "bookkeeping," differing with them especially on the way in which ore costs are properly to be figured.

The figures of the Bureau of Corporations taken from the books of the iron and steel-producing companies are given as follows in a letter from the Commissioner of Corporations to Chairman Payne.

COST AND PRICE OF STANDARD RAILS.

	[illegible]	Price.	Profit per Ton.
[illegible]	$22 32	$27 65	[illegible]
[illegible]	[illegible]	28 07	[illegible]
[illegible]	[illegible]	25 70	4 17
[illegible]	21 30	27 13	[illegible]
1906	[illegible]	27 61	[illegible]
Five years	[illegible]	$27 31	$4 97

The cost items of rails produced for five years, 1902-1906, are given in detail, tons produced being 14,020,303. The cost items in the statement are: Bessemer pig iron, $14.52; waste, 1.95; total pig iron in rails, 16.47; labor, 1.98; manganese, etc., 0.99; fuel, 0.35; steam, 0.62; molds, 0.15; rolls, 0.17; materials in repairs and maintenance, 0.42; supplies and tools, 0.27; miscellaneous and general works expense, 0.51; general expense, 0.14; depreciation, 0.16; total cost, $22.23. Cost of conversion from pig iron, $7.71 per ton.

The lowest cost reported by any company in one year was $19.33; for five years, $20.74. The highest costs were $31.27 and $26.01, respectively.

The cost of bessemer pig iron, being an average for the years 1902-1906, is given at $14.01 per ton.

The average cost of all bessemer and open-hearth steel billets 1902-1906 is given as follows:

Year.	[illegible]	Price per Ton.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	$24 30

The cost of making bessemer and open-hearth billets, 1902-1906, is given as follows:

Final Commercial Cost.	Bessemer.	Open-Hearth.
[illegible]	$14 34	$13 78
[illegible]	[illegible]	1 64
[illegible]	[illegible]	$15 42
Variation in cost ingots.	0 36	[illegible]
[illegible]	1 08	[illegible]
[illegible]	0 37	[illegible]
[illegible]	[illegible]	0 94
[illegible]	0 19	[illegible]
[illegible]	0 16	[illegible]
Rolls	0 03	[illegible]
Materials in Repair and [illegible]	[illegible]	0 47
[illegible]	0 17	[illegible]
[illegible]	[illegible]	0 39
[illegible]	0 10	0 13
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0 11
[illegible]	$20 18	[illegible]

The cost sheets obtained for bessemer ingots cover practically all, and of open-hearth ingots more than 75 per cent. of the production of the country for the period. The reports include billets made for conversion into other forms in the various works, as well as those made for commercial sale as billets.

Four electrically operated stamp mills are now running on the Rand, South Africa. These are the Angelo, Cason, Jupiter-Simmers Deep and Cinderella Deep mills. The Angelo and Cason batteries have been electrically driven for a year or two, all the stamps being run from one main line shaft. The others are being driven in separate units, a separate motor being used for each unit. At the Cinderella Deep there will be 20 stamps [illegible] ter 10 in a unit.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

SMELTING—Process of Smelting Aluminum Ores. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company, Niagara Falls, N. Y., a corporation of Pennsylvania. (U. S. No. 906,172; Dec. 8, 1908.)

WELDING — Improvements in Welding Aluminum. Max U. Schoop, Garenne-Colombes, France. (Brit. No. 24,096 of 1907.)

CEMENT

SLAG CEMENT—Improvements in the Manufacture of Cement from Blast Furnace Slag and the Like. Wilhelm Lessing, Troisdorf, Rheinland, Germany. (Brit. No. 19,070 of 1908.)

COAL AND COKE

COAL-CUTTING MACHINE. Georges Leichnam, Denain, France. (U. S. No. 904,623; November 24, 1908.)

COAL-WASHING APPARATUS. William A. Knoyer, Masontown, Penn., assignor to Pittsburg Coal Washer Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 906,239; Dec. 8, 1908.)

COKING—Improvements in Distilling and Coking Coal. Samuel B. Sheldon, Buffalo, N. Y. (Brit. No. 138 of 1908.)

COKING-OVEN. Edmond Ledoux, Sheffield, England, assignor to Simon-Carves Bye-Product Coke-Oven Construction and Working Company, Limited, Manchester, England. (U. S. No. 904,268; November 17, 1908.)

SEPARATOR for Coal. John H. Walker, Scranton, Penn. (U .S. No. 904,738; November 24, 1908.)

SEPARATOR for Coal, Slate, etc. David E. Phillips, Mahanoy City, Penn. (U. S. No. 906,280; Dec. 8, 1908.)

COPPER

ELECTROLYTIC COPPER—Process for the Precipitation of Electrolytic Copper and Other Metals in the Form of Sheets or Cylinders, with Soluble Iron or Other Metal Anodes. Marie J. L. Wanger, Paris. (Brit. No. 3504 of 1908.)

TITANIUM ADDED TO COPPER—Copper and Process for Purifying, Casting and Alloying the Same. Auguste J. Rossi, New York, N. Y., assignor to the Titanium Alloy Manufacturing Company, New York, N. Y., a Corporation of Maine. (U. S. No. 905,232; Dec. 1, 1908.)

GOLD AND SILVER

EXTRACTION—Apparatus for the Extraction of Gold From Crushed Ores. Thomas E. Beaumont, London, England. (U. S. No. 905,048; November 24, 1908.)

IRON AND STEEL

BLAST-FURNACE CHARGING APPARATUS—Improvements in and Relating to Blast Furnace Charging Apparatus. David I. Miller, Sheffield, Ala. (Brit. No. 10,872 of 1908.)

CHARGING APPARATUS for Blast-Furnaces. Homer D. Williams and William Ahlen, Duquesne, Penn. (U. S. No. 903,423; November 10, 1908.)

CHARGING BLAST-FURNACES—Method of Charging Blast-Furnaces. Homer D. Williams, Willaim Ahlen and Ambrose N. Diehl, Duquesne, Penn. (U. S. No. 905,125; November 24, 1908.)

LADLE FOR SLAG—Ladle for Carrying and Tipping Blast-Furnace Slag. John H. Dewhurst, Sheffield, England. (U. S. No. 906,117; Dec. 8, 1908.)

MANGANESE

PROCESS OF MAKING MANGANESE and Ferromanganese. Anson G. Betts, Troy, N. Y. (U. S. No. 905,281; Dec. 1, 1908.)

MICA

TREATMENT—Method of Treating Mica. John P. W. Beckman, Parnassus, Penn. (U. S. No. 903,949; November 17, 1908)

SILICON

REDUCTION PROCESS—Process of Producing Silicon. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 906,338; Dec. 8, 1908.)

TIN

DETINNING—Improvements in Detinning Processes. Elmer A. Sperry, New York City. (Brit. No. 25,496 of 1907.)

ZINC

EXTRACTION—Process of Extracting Zinc. Edward H. Shortman, Bloxwich, England, assignor of one-half to New Delaville Spelter Company, Limited, Spring Hill, England. (U. S. No. 905,753; Dec. 1, 1908.)

PIGMENTS—Improvements in or Relating to the Production of Zinc Pigments or Mixtures Containing Zinc Sulphide. Henry W. de Stucklé, Dieuze, Alsace-Lothringen, Germany. (Brit. No. 575 of 1908.)

ZINC OXIDES—Reduction of Zinc Oxides. Pierre-Armand Brangier, Agnew, and John J. Faulkner, Berkeley, Cal. (U. S. No. 906,191; Dec. 8, 1908.)

ORE DRESSING

AGITATING AND AERATING APPARATUS. Lamartine C. Trent, East Auburn, Cal. (U. S. No. 905,025; November 24, 1908.)

CLASSIFICATION—Improvements in Apparatus for the Volumetric Classification of Ores. Jean C. Demaret, Paris. (Brit. No. 11,971 of 1908.)

CONCENTRATING APPARATUS. Wilton E. Darrow, Sutter Creek, Cal. (U. S. No. 906,205; Dec. 8, 1908.)

FILTER-PRESS—Continuous Filter-Press. Alexander J. Arbuckle, Johannesburg, Transvaal. (U. S. No. 905,129; Dec. 1, 1908.)

GRINDING-MILL. William R. Cunningham, Bucyrus, Ohio, assignor to the American Clay Machinery Company, Bucyrus, Ohio, a Corporation. (U. S. No. 904,686; November 24, 1908.)

MAGNETIC SEPARATION—Apparatus for Magnetic Separation. Clarence Q. Payne, Stamford, Conn., assignor to the International Separator Company, a Corporation of New Jersey. (U .S. No. 901,368; October 20, 1908.)

MAGNETIC SEPARATOR. Marcus Ruthenburg, Lockport, N. Y. (U. S. No. 904,280; November 17, 1908.)

MAGNETIC SEPARATION—Apparatus for the Magnetic Separation of Ore. Gustaf Gröndal, Djursholm, Sweden. (U. S. No. 905,815; Dec. 11, 1908.)

ORE-CONCENTRATING TABLE. Claude Sherwood, Black Bear, Idaho, assignor of one-half to Israel Walker, Taft, Mont. (U. S. No. 906,464; Dec. 8, 1908.)

ORE-DISCHARGE FOR JIG-TANKS. Charles W. Whitman, Elk Grove, and Thomas S. Baldwin, Benton township, Lafayette county, Wis.; said Whitham assignor to said Baldwin, Cuba, Wis. (U. S. No. 906,480; Dec. 8, 1908.)

PRESSURE-FILTER. Charles W. Merrill, Lead, S. D. (U. S. No. 905,341; Dec. 1, 1908.)

REDUCTION PROCESS—Method of Reducing Ores. George F. Rendall, New York, N. Y., assignor to American Reduction Company, a Corporation of New Jersey. (U. S. No. 903,318; November 10, 1908.)

REDUCTION PROCESS—Process of Reducing Metallic Substances by Volatilization and Precipitation. George F. Rendall, New York, N. Y., assignor to American Reduction Company, a Corporation of New Jersey. (U. S. No. 903,317; November 10, 1908.)

METALLURGY—GENERAL

ELECTROMETALLURGY—Process of Obtaining Metals From Their Ores. Karl Kaiser, Berlin, Germany. (U. S. No. 904,263; November 17, 1908.)

ORE TREATMENT—Process of Treating Metalliferous Ores. Franklin R. Carpenter, Denver, Colo., assignor to the American Iron and Steel Alloys Company, Denver, Colo., a Corporation of Colorado. (U. S. No. 904,838; November 24, 1908.)

RECOVERY OF METALS FROM SLAG—Metallurgical Process. Anson G. Betts, Troy, N. Y. (U. S. No. 905,280; Dec. 1, 1908.)

MINING MACHINERY AND APPARATUS

COMPRESSED-AIR WATER-ELEVATOR. Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn., a Corporation of Pennsylvania. (U. S. No. 906,395; Dec. 8, 1908.)

DRILLING MACHINE—Coal or Rock Drilling Machine. Albert Ball, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Company, Claremont, N. H., a Corporation of Maine. (U. S. No. 905,490; Dec. 1, 1908.)

MINE-DOOR. Joseph L. Dinwiddie and Albert F. Braun, Carlinville, Ill. (U. S. No. 903,846; November 17, 1908.)

MINE-ROOF SUPPORT. Frederick C. Keighley, Uniontown, Penn. (U. S. No. 904,878; November 24, 1908.)

PUMP for Mine-Shafts. Richard Heidecke and Otto Lellau, Neuhof, near Fulda, Germany. (U. S. No. 904,870; November 24, 1908.)

ROCK-DRILLS—Improvements in and Relating to the Valve Gear of Rock Drills and Other Tools Worked by Compressed Air. Communicated from Arnold Freiherr von Schmidt, Beuthen, Germany. (Brit. No. 24,533 of 1907.)

ROCK-DRILL. John R. Wilson and Frederick R. Thackrath, Benoni, Transvaal. (U. S. No. 903,936; November 17, 1908.)

ROCK-DRILLING MACHINES—Improved Method and Apparatus for the Distribution of Motive Fluid in Rock-Drilling Machines or Other Compressed-Air Machines Having Reciprocating Pistons. Arnold Baron von Schmidt, Charlottenburg, Germany. (Brit. No. 5965 of 1908.)

ROCK-DRILLING-MACHINE CHUCK. Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 903,948; November 17, 1908.)

ROCK-DRILLING MACHINES—Improvements in Fluid-Actuated Rock-Drilling and Other Percussive Machines. Wilhelm Mauss, Brakpan, Transvaal. (Brit. No. 13,759 of 1908.)

ROCK-DRILLING MACHINES—Improvements in Rock-Drilling Machines. Thomas Rasmussen, Johannesburg, Transvaal. (Brit. No. 22,100 of 1907.)

SAFETY-BRAKE for Elevators and Mine-Cages. Auguste Barbieux, Mecca, Ind. (U. S. No. 901,314; October 20, 1908.)

SAFETY BRAKE MECHANISM for Mine-Cages and the Like. Henry A. Walker, Johannesburg, Transvaal, assignor of one-half to Walter George Compton, Johannesburg, Transvaal. (U. S. No. 902,703; November 3, 1908.)

SAFETY DEVICE for Mine Skips, Cages, etc. James Spry, East Rand, Transvaal. (U. S. No. 902,694; November 3, 1908.)

SAFETY DEVICES FOR WINDING—Improvements in Safety Devices for Preventing Overspeed and Overwinding in Hoisting Apparatus. Fraser & Chalmers, Ltd., London, E. C. (Brit. No. 7664 of 1908.)

SAFETY LAMPS—Improvements in or Connected with Miners' Safety Lamps. Thomas J. Thomas, Porth, Glamorganshire, Wales. (Brit. No. 671 of 1908.)

SAFETY LAMPS—Improvements in and Relating to Miners' Safety Lamps. Otto M. Müller, Gelsenkirchen, Germany. (Brit. No. 16,296 of 1908.)

SAFETY MECHANISM for Mine-Cages and the Like. Kurt W. O. Schweder, Johannesburg, Transvaal. (U. S. No. 902,690; November 3, 1908.)

TRAMWAY-BUCKET GRIP. Charles A. Case, New York, N. Y., assignor to Case Tunnel and Engineering Company, New York, N. Y., a Corporation of Arizona. (U. S. No. 904,178; November 17, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

ELECTRIC FURNACES—Improvements in, or Relating to Electric Furnaces. Hans Nathusius and The Westdeutsche Thomasphosphatwerke, Berlin. (Brit. No. 7188 of 1908.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

There will shortly be a vacancy on the editorial staff of the JOURNAL, open to a young engineer, who must be a graduate of a technical school and must have had several years of practical experience.

Pope Yeatman has returned to New York from the West.

Henry S. Washington, of Washington & Lewis, New York, has returned from Brazil.

E. W. Walker has returned to Tombstone, Ariz., after examining some mines in Sonora, Mexico.

C. W. Purington is in Brookline, Mass., for the Christmas holidays, and will return to London early in January.

H. W. Turner, San Francisco, [illegible] examining a mine on the Mother Lode in Calaveras county, California.

George A. Flagg, secretary and treasurer of the Calumet & Hecla company, has been a visitor at the property.

Sydney J. Jennings has been appointed consulting engineer for the Boston Consolidated Mining Company, Utah.

Prof. Regis Chauvenet, of Denver, has been examining mines in Gilpin county, Colo., in the interest of Eastern capitalists.

H. V. Winchell, of St. Paul, Minn., has been visiting New York. He has resigned his position with the Great Northern railway.

W. S. Keith, of Seattle, Wash., has been appointed consulting metallurgist to the Gold Creek Mining and Smelting Company.

H. C. Browne, of Philadelphia, has returned East after a visit of inspection to uranium interests in Gilpin county, Colorado.

Frederick W. Ridley has been [illegible] superintendent of the Calumet & [illegible] succeeding Walter Fitch who [illegible] Nov. 1 last.

Ernest Thalmann, of Ladenburg, Thalmann & Co., New York, has been elected to the board of the Boston Consolidated Mining Company.

Dr. William Wahl, for many years secretary of the Franklin Institute, of Philadelphia, has resigned that position on account of ill health.

Prof. J. W. Richards, of Lehigh University, is on an extensive travel abroad, his intention being to visit Egypt and India among other places.

Samuel McKirahan has been appointed general manager of the Georgetown Mining, Power and Tunnel Company, operating at Georgetown, Colorado.

H. N. Spear, of Denver, Colo., [illegible] specting mines and mining methods in the Black Hills district, South Dakota, in the interest of London investors.

L. W. Trumbull has finished an engagement in Arizona and has gone to Van Vleck, Texas, for a few weeks' vacation, before undertaking any new work.

Byron G. Slining, of Chicago, has accepted the position of assistant superintendent and mining engineer with the Hercules Gold Mining Company, Galena, South Dakota.

Samuel B. Montgomery, of Cumberland, Md., has been appointed a special agent of the Department of Commerce and Labor, to collect information about mines and mine labor.

Spurr & Cox (Inc.) have transferred their main offices from Denver, Colo., to 165 Broadway, New York. Branch offices will continue to be maintained in Denver and Mexico Ciity.

W. B. Rhodes, superintendent of mines at Rosario, Sinaloa, Mexico, has been making a visit to Colorado points during the past month, inspecting mills and smelters in the interests of his company.

A. H. Roller and Warwick M. Downing, mining engineers of Idaho Springs, Colo., are making a business trip to Eastern points, in connection with the erection of a 300-ton mill at Alice, Colorado.

John McVicker, recently superintendent of the Marianna coal mine of the Pittsburg & Buffalo Coal Company, on Dec. 1, assumed the duties of general manager of the Zeigler Coal Company at Zeigler, Illinois.

George Mitchell, president and general manager of the Clara Consolidated Gold and Copper Mining Company, has just returned to Los Angeles, Cal., after a visit to the mines at Swansea, Yuma county, Arizona.

E. W. Pargny has been chosen president of the American Sheet and Tin Plate Company, in place of Charles W. Bray, who has resigned. S. A. Davis succeeds Mr. Pargny as first vice-president of the company.

J. H. Robeson, a former operator in the Clear Creek district, Colorado, has returned from Cobalt, Canada, where he was in charge of the Kerr Lake mine, and will go to Parral, Mexico, to look after mining interests.

W. L. Cumings, geologist of the Bethlehem Steel Company, at South Bethlehem, Penn., has been granted a leave of absence for a few months, and is doing some work in economic geology in Mexico with C. W. Botsford, of Guanajuato.

Baron Herbert Von Pohl and George [illegible] son's Consolidated, London, England, who have extensive mining interests in America, are in Toronto and will make a thorough inspection of the Cobalt camp.

Hon. C. R. Devlin, minister of mines and colonization for Quebec province, has returned to Canada from an extended European tour, during which he succeeded in interesting a number of capitalists and mining men in the mineral resources of the Province.

F. L. Wanklyn, vice-president, and G. H. Duggan, general manager of the Dominion Coal Company, have returned to Sydney, N. S., from a trip during which they visited the terminals of the large American coal corporations at Buffalo, Cleveland, Pittsburg, and other points.

The firm of E. N. Breitung & Co. has been formed to deal in Lake Superior iron ores, with office in the Rockefeller building, Cleveland, Ohio. The persons associated with the firm are E. N. Breitung, H. L. Kaufman, Mary Kaufman and G. F. Knapp. The firm will handle the ores from the Mary Charlotte, the Breitung [illegible]

Obituary

William A. Crist, who died at Johnstown, Penn., Dec. 3, aged 64 years, was for many years a coal operator and manager, well known in western Pennsylvania. He was general manager of the Berwind-White Coal Company for several years, retiring last year on account of ill health.

Patrick McBryde, who died at Wheeling, W. Va., Dec. 12, aged 63 years, was born in Scotland, but came to this country 43 years ago. He worked as a coal miner for a number of years in the Youghiogheny district near Pittsburg. He took a prominent part in organizing the miners, and about 1893 was chosen general secretary of the United Mine Workers, holding that position for a series of years, until he retired on account of ill health. When in office his influence was always exercised against strikes and in favor of conciliation and arbitration of disputes. After retiring he published a coal-mining [illegible] secretary of the Pittsburg Vein Coal Operators' Association, of Ohio.

Societies and Technical Schools

[illegible] held at Cleveland, Ohio, Jan. 11-16, 1909. In connection with the convention there will be a large and well classified exhibit [illegible] kinds. The papers to be read will deal largely with the cost of concrete construction and particularly matters per- [illegible] ters of interest to every user of cement. The data obtained through the reading and discussion of these papers will be valuable.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Denver, Butte, Goldfield, Salt Lake City and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 16—The Board of Supervisors of Contra Costa county has passed a county ordinance which is a blow to the smelting interests along the shores of Carquinez straits and Suisun bay. In that region are the smelting plants of the Selby Smelting Company, the Mountain Copper Company and the Peyton Chemical Company. Protests had been made by farmers from Ygnacio and Clayton valleys against the smelter fumes from the Mountain Copper and Peyton Chemical Companies plants and this ordinance is the result. The complaint is that the fumes are detrimental to health and vegetation in the smoke zone which includes those valleys. The ordinance is a copy of that passed by the supervisors of San Mateo county which prevented further construction of the Guggenheim smelting plant at Point San Bruno.

The Union Oil Company has leased the entire 7000 acre holdings of the Sunset Road Oil Company, known as the Jewett & Blodgett, in Kern county. The lease includes the refinery at Hazleton. The Sunset Company has the largest supply of extra heavy oil yet developed in California and it is especially useful for road oil. The product can only be moved in cars.

The Big Bend Consolidated Placer Mining Company is about to start a tunnel through the mountain on the south fork of the American river near the mouth of Silver creek in El Dorado county. The tunnel will be 800 ft. long, 12 ft. wide on the floor, 10 ft. wide at the top and 8 ft. in the clear. It will cut through the country rock and is not expected to be timbered. The turning of the water through this tunnel will leave exposed for working 4800 ft. of the present river bed which is supposed to be rich in placer gold.

Horace Monroe, of Chicago, has purchased the group of copper-gold claims owned by the Southern Oregon Company, in the Blue Ledge district, Siskiyou county. The group is one of the best developed of the Blue Ledge district. The claims are opened by tunnels, the longest of these being driven about 400 ft., from which a crosscut exposes the main orebody. The main ledge is from 7 to 10 ft. wide. The ore is sulphide, running from 4 to 5 per cent. copper, 5 oz. silver and $2.80 a ton in gold.

It is understood that the Hazel Mining Company, which owns the Gladstone mine at French Gulch, Shasta county, and also other properties, including the original Hazel mine in Siskiyou county, is about to reopen the latter, which, though formerly a producer, has been idle for some time. A new mill of 50 stamps will be erected and the property mined by steam shovel.

W. S. Brice, a mining promoter of Los Angeles, has been held to answer in the Superior Court on a charge of obtaining money under false pretenses from Charles J. Berry, a prominent Alaska miner. Berry claims Brice inveigled him into paying $4000 for stock of the Eclipse Gold Mining Company, in Placer county, pretending to invest a like amount himself, but brought stock worth only $350. Brice was formerly prominent at Auburn and was for two years manager of the Eclipse mine.

Goldfield, Nevada

Dec. 15—Another bonanza lease has been opened on Florence ground. After the Reilly lease made its famous production and established the standing of the Florence as a mine and the Little Florence and the Rogers Syndicate leases on the opposite end of the properties had jointly produced nearly $4,000,000, it was generally considered that the ore lay along the western side of the property, for the leases on the east side had failed to find ore. But finally the Baby Florence lease on the east side made a strike. Afterward, an old, forgotten drift of the previous leasers was broken into. This drift was within 2 ft. of the rich ore when the leasers quit, discouraged and broke. Then the Engineer's lease, after following a very low-grade stringer struck a "jewel box;" this lease produced over $1,000,000 in four months. The latest abandoned lease to be renewed and to produce bonanza ore is the Daisy Florence, now owned by Mitchell & Fairfield. The ore is the typical Florence ore and contains free gold in very fine grains placed so close together that the quartz appears to have a band of solid gold, about ¼ in. wide, through it. This lease expires next March.

As soon as the new Consolidated mill is put in operation the old Combination will cease treating Consolidated ores and will be leased to the Combination Fraction company, whose property adjoins the Combination mine and which is now controlled by Wingfield and Nixon. The Fraction has large quantities of $15 to $30 ore in the mine which cannot be shipped or treated at custom smelters at a profit, but which it will pay to treat in the company's own mill.

George H. Phillips, known on the Chicago Board of Trade as the "Corn King," who owns the largest part in the Hazel Goldfield lease, has been in Goldfield the past week. Mr. Phillips has put a very large sum of money into the Hazel lease for the shaft, now almost 800 ft. deep, has cost about $50,000; the new strike, however, satisfies the management, and the shaft will probably be sunk deeper.

Owing to the very low price of silver the newspapers have spread the report that the Tonopah mines, whose ores contain mainly silver, would close down. This is indignantly denied by all the Tonopah companies. It is true that the drop in the price of silver makes a big difference in the profits, but there is a large amount of gold in the Tonopah ores so that the mining of them is still profitable even with the prices of silver less than 50c. per ounce.

The oil excitement between Blair and Goldfield continues; last week owing to considerable jumping of oil locations, a mass meeting assembled at Blair to organize for protection, and a request was sent to the Governor to send a squad of the State police to prevent trouble. The operations of the Nevada Bay State are very encouraging. The Goldfield Oil and Gas Company is negotiating for a drilling outfit.

Suit to dissolve the Nat C. Goodwin Company, mining brokers, of Reno, has been brought in the district court by Warren Miller, formerly vice-president of the company. He asks for a receiver for the company and for $100,000 damages, alleging that he put in money to start the company, and that he worked for the completion of the deal which has netted the company its largest profits and saved it from failure. He states that Goodwin and George Graham Rice conspired to keep him in ignorance of the affairs of the concern and to cheat him out of his share of the company's holdings. Rice was formerly connected with the L. M. Sullivan Trust Company, of Goldfield; that company's history is still fresh in the minds of the JOURNAL's readers.

Salt Lake City

Dec. 16—The directors of the Uncle Sam Consolidated Mining Company at their last meeting declared a dividend of 2c. per share, in all $10,000, payable Dec. 21. This makes $95,000 paid in dividends during the last six months. Last year the company paid $70,000 in dividends, while the total paid to date is $295,000. About a year ago the mine had to shut down owing to the refusal of the smelters to receive ore. Last June the mine began to ship again.

The improvements to the Yampa smelter are now almost completed. The converter is working nicely and the blister copper produced is as high in value as in the first experiments. The McDougals and the reverberatories, as well as the blast furnaces, are working well. It is said that 800 tons of ore per day are being treated. The mine is in good shape.

The Boston Consolidated Company has benefited considerably by storing its concentrates at its mill for several months. During this time the American Smelting and Refining Company, so that the Boston company would not ship the concentrates to the smelter, has allowed the Boston Consolidated to draw 85 per cent. of the assay value of the concentrates at the time they were stored. But the final settlement must be made at the metal prices prevailing when the concentrates are received at the smelter. This supplementary agreement expires Jan. 1, and as the price of copper has advanced during the last few months, the Boston Consolidated will profit considerably. By Jan. 1 the company should have 9,000,000 lb. of copper in concentrates ready for smelter treatment.

The report of Duncan MacVichie on the mines belonging to the Silver King Coalition has been made public. This report shows that 99,000 tons, having a gross value of $5,580,781, or a net value of $3,671,649, are blocked out in the mines. The possible ore is estimated at 974,755 tons. Mr. MacVichie estimates that half of this is probable ore and that it will have the same average as the ore blocked out, which has a net value of $51.76 per ton; this gives a total value of $25,[illegible] for the probable ore.

Owing to the completion of the Western Pacific railroad so that connection is made at Shafter with the Nevada Northern freight rates on ores shipped to Argo, Colorado have been reduced. The present rates on ore from East Ely to Salt Lake, via the Nevada Northern and Southern Pacific are as follows: On ore valued at $30 per ton, $5.50; on $40 ore, $6.40; on $50 ore, $7.85. From Salt Lake to Argo the rate is $7.50 for all ores under $100, thus making the through rates on the three grades of ore $13, $13.90 and $15.35 respectively. The new rates from East Ely to Argo will become effective Dec. 19 and are as follows: On $30 ore, $7.50; on $40 ore, $8.50; on $50 ore, $9.50. From Kimberley the rate is 50 cents additional on all classes.

These rates have been established at this time for the benefit of the Giroux Consolidated, which is now making regular shipments of concentrates from its mill at Kimberly.

Butte

Dec. 17—The excitement incident to the report that the Government would institute action to enjoin the further operation of the Washoe smelter at Anaconda has subsided and business is resuming its normal condition. The real basis for the scare which the report created was the popular misconception of the powers of the President with regard to the situation. On more sober thought it was realized that the President has no power to close the smelter. True, he could request the Department of Justice to institute action in the Federal Court for the purpose of enjoining the smelter operations, and the Attorney General could file a bill in equity on behalf of the Government; but the same long drawn out legal battle would follow that came about when the Deer Lodge valley farmers instituted their action for the same purpose. In the case of the farmers against the company Judge Hunt refused to issue a temporary injunction pending the determination of the action and it is quite probable that the same result would follow should the Government begin action.

The Northern Pacific Railway Company's civil engineers are working on a plan to use electric power for trains going over the mountain west of Livingston in Park county. It is possible that a large power plant will be constructed on the Yellowstone river as there are several good locations within easy access of the town.

In the action of the South Butte Mining Company against the East Butte Mining Company for the purpose of quieting title and recovering damages for injury to a small parcel of ground under the right of way of the Great Northern Railway, the local district court has rendered its decision in favor of the South Butte company. By its decision the court quiets the title of the South Butte company to the property in question and awards it judgment in the sum of $19,531 as damages for the taking of ore from the property by the East Butte company. The judgment stands against the directors of the East Butte as well as against several leasers under the company.

Denver

Dec. 19—In the Central City district, the heading was started yesterday in the Newhouse tunnel on its course through Quartz hill to its projected terminus in Eureka gulch, a distance of about 5000 ft. The tunnel has been idle since early in 1907, for the reason that many of the owners in that district, whose properties were at that time full of water and not working, [illegible] for the drainage of their mines, which the further advance of the bore was certain to accomplish. So the tunnel managers declined to proceed [illegible] was properly remunerated for the benefits it was conferring. He has now apparently brought these people to terms, to the great delight of the whole district and the benefit of the gold-mining industry. This may serve as an object lesson to future promoters of long mining drainage and transportation tunnels, for all the delay and trouble and loss incident to the same in this case would have been saved had drainage contracts been made with the owners of the mines on the line of the tunnel before a shot was fired.

In the Cripple Creek district a decision by the judge of the District Court makes permanent the injunction prayed for by a mining company restraining the assessor of Teller county from issuing tax deeds for delinquent taxes of 1900. This was a test case for about 25 other companies, who contended that being nonproducing, their properties should not be assessed at the same rate, and in some instances much higher than that of other companies which were rich and producing largely

The new system which is to smelt copper ores by what is called "a hydro-oxygen-carbon process," which is to "produce pure metal in 30 minutes" and is to "revolutionize the mining industry," is still being ventilated in Denver papers.

Toronto

Dec. 18—The contractor having encountered many difficulties in constructing the road from Elk City, in the Montreal river district, to Gowganda lake, the provincial Public Works Department has decided to take over the work and push the road to completion without delay. A government engineer has been sent forward with instructions to engage a staff of experienced men and to finish the road as quickly as possible. A large number of merchants and building contractors are waiting to get material and supplies through to the new mining field

A number of charges of infraction of the Ontario Companies Act regarding prospectuses were heard this week. Frank C. Loring, as a director of the Obisse Mining Company, was fined the usual fine of $200 imposed. Several other cases [illegible] companies to comply with the law. Information has been received by the pro[illegible] mining companies are trying to avoid the operation of the law. Prosecutions have hitherto been confined to cases in which advertisements soliciting stock subscriptions have appeared in the newspapers. The plan now pursued to escape prosecution is to send out circulars through the mails, which fail to contain the information required by law. It is now announced that such documents, whether issued by the companies or by brokers, are just as [illegible] continued prosecutions will follow.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Cochise County

Shattuck-Arizona—This mine has put on a force of 60 men and has begun shipping the ore reserve of about 500 tons which had accumulated on the sixth level. It is anticipated that this will be shipped within a week and regular shipments of about 70 tons per day will be maintained.

Gila County

Inspiration—Control of this property at Globe has been secured by William B. Thompson. A new company will be organized.

Graham County

Arizona Copper Company, Ltd—Production during the month of November amounted to 1426 tons of copper.

Mascot Mining Company—This company is developing properties in the Clark district, in the south half of the Pinaleno range north of Wilcox. The formation is granite and limestone cut by heavy porphyry intrusions. The district is said to abound in large veins mostly mineralized. There are both copper and lead ores with more or less gold and silver.

Pinal County

Clark & Scanlon—Two stageloads of miners have been sent to work in the mines which were taken over a few months ago by the Calumet & Arizona company at a price of $65,000. This is the first instalment of miners ordered for the beginning of development work in the new properties. It is said that it is the intention of the management to increase the force as fast as the nature of the work will permit.

California

Amador County

Mitchell—At this mine, Pine Grove, a hitherto unsuspected orebody has been found near the surface. Some of the rock milled $50 per ton.

Butte County

Cohn & Goodday—At this mine, six miles south of Magalia, a hoisting and pumping plant and compressor have been installed. The incline will have to be 600 ft. long to tap the gravel channel.

Calaveras County

Columbia—In this mine, on the north fork of the Mokelumne river, a 2-ft. vein of ore carrying free gold was struck while doing annual assessment work.

El Dorado County

Excelsior—In this gravel mine owned by an English company and under management of Baring Gould, near Placerville, pay gravel is being taken from five different benches. This was formerly a hydraulic mine, but is now being worked by drifting. The gravel is crushed in a mill.

Fresno County

International Mining and Development Company—This new company has been organized to operate near Dunlap, near the Brushy Ridge and English Hill mines. There is both quartz and placer gravel in the ground purchased.

Humboldt County

Sugar Bowl—This ranch, near the Hoopa Indian reservation, has been purchased by George W. Hennings, who will develop the mining ground on the property..

Inyo County

Gold Spur—Thurman & Gray have leased this property at Ballarat to Colorado men on a working bond, and a tunnel will be continued on the 30-in. vein.

Loretta—Preparations are under way for reopening this copper mine owned by Charles M. Schwab and the Gail Borden estate. The property is situated in Termination valley some distance from Big Pine.

Montezuma—This old mine, near Big Pine, is now under lease to Stevens & Horn, and they are getting ready to ship ore to the smelter at Keeler.

White Horse—George Mans has leased this mine in the Panamint range where there is a small mill with concentrator.

Kern County

Piute District—Considerable development work is being done in the district this season and affairs are more active than for a long time.

Mariposa County

La Sarle—At this mine, F. L. Wallingford, manager, a new mill is being installed. The mine is better known as the Ortega or Turner.

Mount Gaines—At this property, near Hornitos, F. C. Longe, president, 75 men are employed and the 20-stamp mill is running steadily.

Mono County

Boston Masonic Mining Company—This new organization has a group of four claims in Masonic district and will extend the present tunnel.

Masonic Golden Cycle Mining Company—This Carson City, Nev., company, of which A. M. Duncan, of that place, is secretary, has recovered the ledge at Masonic at a depth of 85 ft. The finding of this high-grade ore to the north of the Pittsburg-Liberty mines is considered of great importance to the camp of Masonic.

Nevada County

Buena Vista Mining Company—Grass Valley men have incorporated under this name to reopen the Jackrabbit mine, near Buena Vista in Grass Valley district. The funds have been assured for development.

Idaho-Maryland—The 20-stamp mill of this company at Grass Valley has been started on ore from the 700 level of the old Idaho mine.

Placer County

Cañon Creek—After working several years and running several tunnels on this claim near Towle, G. W. Downing has struck fine gravel.

Plumas County

Dutch Hill—This mine, idle some time, is to be started up and equipped with electric hoisting and pumping machinery. A lower bedrock tunnel 2000 ft. long is to be cut. W. Savercool, one of the original owners, will be superintendent.

San Bernardino County

Daggett—This old camp is now very dull indeed. All the borax companies operating there have quit work and removed their plants and quartz mining in the vicinity has been steadily on the decline for some time.

Sierra County

Omega—In this mine, near Forest City, they have struck a broad pay streak of cemented gravel. W. G. Sharwood is manager and C. W. Brown, superintendent. The mine was formerly known as the Nellie Bly.

Siskiyou County

Johnson—In this mine at Oro Fino, Superintendent Addison reports having struck ore which is being sacked for shipment.

Trinity County

Globe—The mine at Dedrick will be closed for the winter, but five men will be left to continue the tunnel from the

Chloride-Bailey side of the mountain. Five stamps have been added to the mine this summer and electric power put in.

Colorado

Gilpin County

Gilpin Ore and R[illegible]—This company has purchased the Gilpin 40-stamp mill and improvements in Black Hawk, and will proceed to remodel the plant into a modern concentrating mill. H. Irving Jones, Central City, Colo., is manager.

Newhouse Tunnel—After [illegible] of operations for nearly two years, during which time the Gilpin County Chamber of Commerce and business men have labored assiduously with the view of having the tunnel extended through Quartz and Eureka hills, operations were resumed by Manager George E. Collins, of Idaho Springs, Dec. 15. The tunnel is in from the Idaho Springs side a distance of 17,470 ft., and a further distance of 5000 ft. will run it under territory which has produced largely from mines ranging from 500 to 2300 ft. deep. The tunnel will not reach its intended terminus at the Eureka mine inside of 18 months. It will drain a great many mines which have been [illegible] for years past on account of the enormous expense of handling the water [illegible] mines will be tapped at depths [illegible] from 1500 to 1700 ft. The basis of resumption is an agreement between the various mineowners along the line of the tunnel and the tunnel company, the former agreeing to pay 25c. per ton royalty on all milling ores and $1 per ton on smelting ores taken out of the various properties after the mines are drained, whether the ores are taken out through the tunnel level or hoisted out through the various shaft workings. The water in the various mines now stands about 600 ft. deep. Besides the drainage feature, there is also that of ventilation. It is estimated that within the next year employment will be furnished to at least 1000 additional men, as a number of mines will be able to work along liberal lines by that time. The starting up of the tunnel [illegible] in which British investors are interested, marks the most important epoch in the history of Gilpin county, and is the source of much rejoicing.

Tungsten—Frank Augustus, of R[illegible]ville, Colo., is arranging for the installation of an air-compressor plant on the Mammoth tunnel tungsten workings on North Beaver creek, and also for the daily shipping of 20 tons of tungsten ores to Henry E. Woods, of Denver, for treatment. The ores run about 10 per cent. tungsten for the milling ores, the high-grade ores to be shipped [illegible].

Lake County—Leadville

A. Y. & Minnie—About [illegible] tons a day is being shipped to the Western Chemical works at Denver; the work of cleaning out a number of drifts is still in progress and when completed the daily tonnage will be more than doubled. When the contracts for the output for the coming year are signed the company will be in a position to ship 150 tons daily, and in all probability the mill will be started.

Aztec Group—This group, in the same South Evans gulch, is being worked under lease by James Kavanaugh and associates. The work is being carried on in a drift from the old shaft at a depth of 125 ft.; 80 ft. from the shaft a good streak of ore was encountered carrying gold, silver, lead and copper. The mine is sending out in the neighborhood of 50 tons a week. The ore is found in the lime.

Aztec Group—This group, in the same district, is being worked by a tunnel, which is now in a little over 100 ft.; the tunnel will be driven a distance of 750 ft. when a shaft will be sunk at that point to the ore horizon.

Evelyn Shaft—This shaft, South Evans gulch, has been unwatered and drifting southwest and northeast is now being carried on. The drift to the south is expected to catch the oreshoots from Breece hill and that to the north should open an oreshoot before it reaches the Ball Mountain fault.

Hilltop—From this mine, Horseshoe district, about 100 tons daily of a good grade of zinc ore is being shipped from this property to the zinc works at Kansas City.

Lou Dillon—Work has been carried on in this mine, Iowa gulch, for the past few months. Within the last few days the ore has been caught, carrying gold, and when it is developed shipments will be started to the smelter. The lessees expect this to take place by the first of the year.

Idaho

Shoshone County

Reno Group—This property, situated near Burke, is to be operated by W. A. McCune, of Salt Lake, and Walter Mackay, of Portland. A force of men will be put to work about the beginning of the week to drive a 1200-ft. tunnel to tap the ore at depth. A large amount of development [illegible] showing made.

[illegible]—A contract for [illegible] ft. of tunnel work has just been let to Steve Barbora. At a meeting of directors held this week it was decided to levy an assessment of one mill a share Jan. 11; delinquent Feb. 8.

[illegible] *pany*—An arrangement has been made by which the company will ship its ore to the Panhandle smelter at Sandpoint. A force [illegible] plant are being installed.

[illegible] 20. Manager Spalding is in the district purchasing machinery and making all preparations for extensive development.

[illegible] $27,500, there has been paid $22,500, and it is announced that arrangements will be made to pay the balance in the near future. One car of ore recently shipped netted $135 per ton.

Saltese Consolidated—Four feet of solid copper ore has been encountered and arrangements are being made to commence shipments. Three cars of ore are already on the dump; this will be shipped to the smelter at Anaconda.

[illegible]—At the annual meeting of stockholders the following directors were elected for the ensuing year: Doctor Alexander, Katherine Green, E. B. Crawford, J. W. Hutchins, U. H. Fillio, C. D. Brock, M. Coal and W. Cluff. An assessment of one mill a share has been levied, payable Jan. 8.

Boise County

[illegible]—The property consists of 800 acres of ground, known as the Kemper ranch, situated about 22 miles northeasterly from Boise City. Prospecting has been carried on since 1906, and recently steps were taken looking to the beginning of active operations. The company is incorporated under the law of Idaho.

Iowa

[illegible]—At the annual meeting in Des Moines recently, the following officers were chosen: President, H. L. Waterman, Ottumwa; vice-president, David Dinning, Cincinnati; treasurer, E. C. Smith, Des Moines; secretary and commissioner, Joseph Sharp, Albia.

Michigan

[illegible]

[illegible] reached the ledge preparatory to diamond drilling on Sections 7 and 8 which adjoin the old Atlantic workings. It is to [illegible] drilling is being done.

Superior—This mine is practically ready to begin daily rock shipments to the Atlantic mill; the surface equipment is completed and the shaft has been enlarged to accommodate two skips and only a little [illegible] lateral openings has been resumed, and [illegible] to the mill and a preliminary run has been [illegible]

[illegible] the lode will then be started. It is believed that as greater depth is obtained the shattered condition, existing at the levels above will be eliminated. No. 1 shaft is sinking about 75 ft. below the first, or 500-ft. level, and the lode opened at this point was of a very substantial character and exceptionally rich.

LaSalle—Sinking has been temporarily suspended at the two shafts on the Caldwell tract and crosscutting is now under way; in this manner the surrounding territory will be exposed. Sinking is going forward in the Tecumseh shaft.

Centennial—No. 1 shaft is nearing the 35th level and No. 2 the 32d. The northern drifts from the lower levels of No. 2 shaft are approaching the mineralized zone of the Wolverine and a much better grade of rock is in evidence.

Hancock—No. 1 shaft is down to the 14th level and sinking has been discontinued. Developments on the west lode, opened by a crosscut from the shaft are encouraging, the formation being of a better grade and more consistent than the Hancock lode, which this company previously worked. No. 2 shaft is sinking close to the 15th level on its way to intercept the various lodes traversing the tract. From the 13th level a crosscut is being extended to connect with a similar one from No. 1 shaft, and when completed all rock will be hoisted through No. 2 shaft.

Elm River—This property continues sinking its vertical exploratory shaft preparatory to driving a crosscut to cut the various formations in that vicinity.

Tremont-Devon Mining Company—This is a new incorporation; the property consists of 680 acres adjoining the Victoria, and is believed to carry the strike of the Lake lode. The company is capitalized at 100,000 shares, par value $25. Charles Smith, of Hubbell, Mich., is president.

Montana

Beaverhead County

Gladstone Gold Mining Company—The installation of a new headframe and hoisting machinery and the erection of an engine house have recently been completed.

Broadwater County

Keating Gold Mining Company—At a recent meeting of directors it was decided to dispose of some of the treasury stock for the purpose of increasing the fund for development work. The company's property is situated about 10 miles from Radersburg and consists of eight claims on which development work has been done to a depth of about 400 ft. Shipments are being made steadily to the Butte Reduction Works.

Butte District

Butte & Superior—A body of copper ore of commercial grade was struck a few days ago at the 1350-ft. mark in the Black Rock shaft. Should the vein prove to be of sufficient extent to warrant development on a large scale it will mean a great deal for the properties in the northern part of the Butte district.

Deer Lodge County

Rock Mountain Gold Mining and Milling Company—This company has recently been formed to work gold properties in the neighborhood of Danielsville. James Belf is president, M. Whalen secretary, and D. Lappin, of Boston, and Dan Daniels and C. A. Winters, of Anaconda, are the directors. Benjamin Daniels will have charge of the work as superintendent.

Nevada

Esmeralda County—Goldfield

Goldfield Consolidated—The 600-ton mill will go into commission about the end of the year. It is expected that a dividend will be paid in January. The company is said to have $800,000 cash on hand.

Daisy Florence—This lease on the Florence recently acquired by Mithcell and Fairfield has developed bonanza ore in a raise from the 315-ft. level. This high-grade ore was found within 6 in. of the point at which the former owners abandoned the lease. Under the terms of the lease to Mitchell and Fairfield the Florence company gets a flat royalty of 25 per cent. and the former owners a royalty of 7½ per cent. The ore has a streak, about ¼ in. wide, of almost solid gold. Ten inches of ore alongside this streak assays between $400 and $500 per ton. Machine drills have been installed, the compressed air being obtained from the Baby Florence.

Joshua Man Gold Mining Company—This company owning patented ground on Vindicator mountain will start work on company account as well as by leases. A. H. Leisering has been granted the first lease and will begin work in the old 300-ft. tunnel. The lease has 2 years to run and the royalty to be paid is 20 per cent.

Goldfield Mining and Reduction Company—This company, owning four claims in the northern portion of the district two miles beyond Columbia mountain, has started work. The shaft, now 80 ft. deep, will be sunk to a depth of 200 ft.; at that depth crosscutting will begin. A gasolene hoist has been installed.

Shoshone—Morris Jones, of Manitou, Colorado, has started work on his Shoshone property on Horton mountain.

Stoneham-Moore Griffiths—This lease, which is on the Combination No. 2 claim, is stacking ore valued at $60 per ton. The extent of the orebody, found on the 400-ft. level at a distance of 170 ft. east of the shaft, has not yet been determined.

Little Florence Lease—The winze from the 300-ft. level is down 30 ft. An air hoist is being installed, and the winze will be sunk to the 370-ft. level. This winze is in a fine body of ore averaging about $40 per ton. The three-compartment shaft is now 600 ft. deep; it will be sunk 100 ft. deeper at once.

Esmeralda County—Rawhide

Grutt Mining Company—A few days ago a pocket of rich ore was found at surface near where the large boulder of rich ore was found last year. The main vein is 32 in. wide and contains some shipping ore.

Grutt Hill-Mint—The shaft is now 300 ft. deep and has passed through 6 ft. of milling ore.

Grutt Hill Truitt—A 10-in. streak of rich ore has been found on the 110-ft. level. There is considerable milling developed in the property.

Consolidated Mines Company—The Murray and the Big 4 leases on this company's property are preparing to build mills. The timbers for the Murray ten-stamp mill have arrived. Considerable milling ore assaying from $20 to $40 per ton has been developed in the Murray lease above the 200-ft. level. The shaft on the Big 4 lease is 200 ft. deep; considerable milling ore assaying $12 to $40 per ton has been developed.

Hooligan Hill—In the Holland Rickard, the Truitt and the Miller leases on Hooligan hill, considerable ore, rich enough to ship to Shurz for milling, has been developed.

Rawhide Rector—In this property, about 1½ miles west of Grutt and Hooligan hills where the ore contains mainly gold, are the best defined veins in the district; these veins contain mainly silver.

Esmeralda County—Tokop

Tokop Keystone Company—This property, 30 miles south of Goldfield in the Slate range, is being opened up in earnest. The Keystone incline is down 200 ft. on a 45-deg. slope and shows 8 ft. of low-grade quartz ore. A vertical shaft has been started to cut this vein at a depth of 300 feet.

Humboldt County—Chafey

Black Hole—The new power plant consisting of a 40-h.p. hoist, an 80-h.p. boiler and an air compressor has been started up. Crude oil is used for fuel.

Nye County—Bullfrog

Pioneer—The second carload of ore brought $4269; the shipment contained 74,461 lb. of ore. A 25-ton plant has been erected to treat the ore that will not pay to ship.

Mayflower—At the recent annual meeting of the company it was decided to erect a five-stamp mill. A. C. Eisen, of Goldfield, was elected president.

Yankee Girl—Work on a small scale has been resumed on the Yankee Girl.

Nye County—Clifford

Helena is now the official name of this camp, for the Government has established a post office by that name there. In the future the camp will be called Helena in these columns.

Broken Hills—Ground is being broken for the 50-ton stamp mill which will be erected as soon as possible.

Nye County—Johnnie

Crown Point Globe Mining Company—From the clean-ups at the one-stamp mill gold bullion amounting to from $10,500 to $11,000 was obtained during November.

Nye County—Tonopah

The output of the Tonopah mines for the week ending Dec. 11 was 5268 tons, having an estimated value of $131,700. The Tonopah Mining Company sent 3000 tons to the mills; the Belmont, 700; the Montana-Tonopah, 593; the Midway, 100; the MacNamara, 375; the West End, 150; and the Jim Butler, 350 tons.

MacNamara—From Jan. 1, 1908, to Dec. 1, 1908, the MacNamara mine produced a little over 400,000 oz. silver.

Tonopah Mining Company—Another record-breaking week's work was recorded for 520 ft. of development work was done. Ore has been found in the Red Plume shaft in a drift near the Tonopah Extension ground.

Jim Butler—The Stone Cabin shaft is now 725 ft. deep, having been sunk 9 ft. during the week. No further sinking will be done for the present.

Belmont—Winze No. 9 from the 1000-ft. level along the hanging-wall side of the Mizpah fault is down 125 ft. and has found several good bunches of ore. Drifts from the 50-ft. point in the winze have also opened up considerable good ore. A station is being cut at the bottom of the winze.

Montana-Tonopah—During the week ending Dec. 5 the mill treated 611 tons of Montana and 394 tons of MacNamara ores.

Storey County

Ward Shaft—On Dec. 13 the Ward shaft was pumped out and the sump on the 2500-ft. level emptied. The water is being easily handled by the Knowles-Blake pump.

White Pine County

Giroux—It is said that the Guggenheims are still trying to secure control of this company.

Oregon

Lane County—Bohemia

Vesuvius—Supplies for the winter and spring are being hauled to this property belonging to F. J. Hard and near to Bohemia post office. A contract for building three miles of road between the Vesuvius and the Riverside properties has been let. The stamp mill will start soon.

Riverside—A contract for 500 ft. of drifting on the Riverside vein has been let by the owner, F. J. Hard.

Mayflower—Machinery for the 100-ton mill is being hauled to the mine. About 15 to 30 men are working underground.

[illegible] at these mines, formerly known as the Oregon Securities property, will be started soon.

South Dakota

Lawrence County

Blue Belle—A lead and zinc ledge 30 ft. wide is being developed by Aaron Dunn, the owner.

Branch Mint—The old Richmond-Sitting Bull Company dumps at Galena have been purchased by New York men under Michael Hecht and test runs will be made in the big stamp mill.

Horseshoe—The new hoist at Terry is in commission and work has been resumed on the ground again.

Julius—James Julius, of Lead, has discovered a new ledge on his ground near there. The ore is free milling and shows values that average over $5 gold.

Phoenix—A deal is now pending for the purchase of this ground, together with the Jupiter ground owned by New York men. Both are old-time producers, but have lain idle for several years owing to disputes among the owners. The Phœnix is the old Deadbroke. J. G. Thomas, of Deadwood, is interested in the deal.

Mogul—The production is maintained at 400 tons daily. The Lucile claim has been unwatered and is again producing ore.

American Eagle—Extensive repairs are being made in the mill and considerable development work will be done on the property by Manager Goldbloom.

National Gold Mining Company—John Treber and associates have organized a new company to which the old property in Carbonate has been deeded.

Pennington County

Continental Copper—Preparations are being made to blow in the smelter at Sheridan as the property is being fast unwatered with the new pumps. Manager A. C. Overpeck, of Hill City, is in charge.

[illegible]—A [illegible] erected on the property near Mystic, as recent development has shown up good ore. Judge Bennett, of Mystic, is the owner and manager of the property.

[illegible]—A [illegible] good milling grade has been found on the 200-ft. level. So far it is several feet wide.

Bismark—Under the management of James T. West, of Chicago, a force of men is opening up this mine near Keystone and will shortly start up the 200-ton cyanide mill.

[illegible]—Superintendent Wise has gone to Minneapolis to confer with the owners about erecting a mill on the property near Mystic. Several good gold ledges have been opened up and the ore supply is ready.

Utah

Salt Lake County

Boston Consolidated—According to L. Hanchett, general manager, while steam-shovel mining has not been so successful [illegible] it will be many years before this method will be abandoned, inasmuch as it is the best and cheapest method for winning much of the porphyry ore. Recent developments have largely increased the tonnage of ore assaying 1.5 to 1.8 per cent. copper in the property of the Boston Consolidated. By the end of 1908 the concentrating mill will be in commission with its full capacity of 3000 tons of ore daily.

Wisconsin

[illegible]

[illegible] sinking on new ground where drilling showed disseminated jack at 23 to 45 ft. and a lower run at 60 to 66 feet.

[illegible] has started sinking on the Emma Harms land, one mile north of Elmo.

[illegible] the J. S. Jones property, formerly the Reliance, and will commence shaft sinking.

Shullsburg—The Maid of Erin and Bessie mines will be equipped with concentrators by Ironwood, Mich., parties, who hold lease and title to 300 acres adjacent to the village.

Toadville Mining Company—This company struck rich sheet jack recently at 42 ft. on the Hartshorn land just north of the St. Rose.

Weigle—Negotiations are pending for the sale of this mine and 75-ton mill equipment to Eastern interests

Canada

[illegible]

[illegible] Shipments [illegible] Crown Reserve, 57,000 lb.; Chambers-Ferland, 60,000; Drummond, 40,000; La [illegible] Nipissing, 202,562; O'Brien, 127,837; Right of Way, 185,480; Silver Queen, 127,000; Silver Cliff, 120,000; Temiskaming, 60,000; Temiskaming & Hudson Bay, 120,000; [illegible]

[illegible] Mining Company in the action against the Right of Way Company and the Temiskaming and Northern Ontario Railway Commission, has been dismissed by the British Privy Council. The suit began two years ago. The Ontario government in [illegible] property reserved a strip 99 ft. wide for the railway. The La Rose owners contended that this reservation did not include minerals beneath the surface. The T. & N. O. Commission, however, representing the government, granted the mineral rights to the Right of Way Company, but the La Rose extracted ore from the strip amounting in value to $175,000. The case was tried in the Canadian courts, which found against the La Rose, and the Privy Council has confirmed this view and awarded the amount mentioned to the Right of Way. The net earnings of the La Rose mine for November were $93,447, and for the six months ending November $560,418.

Beaver—Since a recent accident at the mine the shaft has been timbered to the bottom and development work is in progress at the 200-ft. level, where about 200 ft. of cross-cutting has been done. Drifting is being done at about the 75-ft level on a 12-in. calcite vein.

Buffalo—A boiler explosion occurred Dec. 16, E. Lavergne, an employee, being fatally injured. The company's operations will be delayed until the boiler which was specially made, can be replaced. It had been in use only two months.

Cobalt Central—An important strike has been made by diamond drilling at a point 350 ft. below the surface. At 58 ft. west of the intersection of "Big Pete" and No. 2 vein, a vein was cut running 5000 oz. silver to the ton, with native silver showing plentifully in the wall rock on both sides.

Kerry Mining Company—On the Peterson Lake lease of this company two calcite veins have been found; one of them carries silver on the surface. The main shaft is down 50 ft. and will be sunk to the 100-ft. level, where crosscutting will be undertaken to tap seven veins which show on the surface. On the company's Cart Lake lease, No. 1 shaft is down 100 ft., and drifting on the vein will be begun.

McKinley-Darragh—Nos. 1 and 2 shafts have been connected at the 150-ft. level, and crosscutting has been extended west to the Right of Way. In crosscutting under Cobalt lake seven veins have been worked and drifting will be begun on others during the winter.

Ontario—Montreal River District

Marcel—A shaft is being sunk on a vein from 1 to 8 in. wide, carrying calcite, cobalt bloom, copper and native silver, which has been traced for 500 ft. on the property.

Mexico

Aguascalientes

El Corralillo—This property at Cobre has been sold by William Davidov to a group of Pittsburg capitalists.

Chihuahua

International Oil and Gas Company—This company, in which Indianapolis men are interested, has begun drilling operations on its tract in the vicinity of Falomir along the line of the Orient railway east of Chihuahua. Two wells have been started and the drilling machinery is now en route. A. M. Nelson is the general manager in charge.

Chicago-Mexican—The five-stamp mill will be placed in operation early in January. The ore runs largely in silver. The mine is near Cusihuiriachic. W. W. Hinkle, of Chicago, is the secretary-manager.

Sta. Eulalia Exploration Company—The monthly shipments from this company's Santa Eulalia mines average nearly 3000 tons, the bulk of this tonnage coming from the Buena Tierra property. The ore runs about 25 oz. silver and 10 per cent. lead. Operations are in charge of F. Chapallet, manager, and J. H. Gilmore, superintendent.

Palmarejo & Mexican Goldfields, Ltd.—It is reported that this English concern, carrying on operations in the Chinipas section close to the Sonora state line, is to adopt a new milling system, in the event of which a new mill will be erected at a site near the mines. T. H. Oxnam, formerly general manager and President Southcott are now at the properties.

Velardeña—The opening up of a considerable body of ore running 50 oz. silver and 60 per cent. lead is reported on the 500-ft. and 750-ft. levels of this mine at Santa Eulalia. It is a holding of the American Smelting and Refining Company.

Guanajuato

San Matias Mill—This mill of the Mexican Milling and Transportation Company, one of the allied interests of the Guanajuato Development Company, has made its last purchase of ore from the larger shippers, and has set the last day for the buscones to bring their ore to this custom mill. The main reason for closing the mill is the present low price of silver, which does not permit a profit on the milling of the ores brought to the mill by the buscones and small shippers.

Sinaloa

Palmarito Mining Company—The 150-ton lixiviation plant of this Philadelphia, company in the district of Mocorito, is practically closed down pending changes in the crushing and roasting departments. Charles D. Smith is manager.

Mina Grande and Los Tajos—James B. Shepard, late of Jalisco, is developing these properties in the district of Santiago de los Caballeros, Badiraguato. A mill is contemplated and a test lot is being shipped to Denver for treatment. Both properties are producers of high-grade silver-lead ores and have produced a great deal of silver.

West Coast Mining and Smelting Company—This company, operating the Los Tajos copper mines on the Huajote river, Badiraguato, is erecting a 40-ton concentrating plant and installing a six-drill compressor and drills. The mill crushes wet. The equipment includes a 7x10-in. crusher, two sets of 20x12-in. rolls, screens, elevators, and Bartlett tables. The mines have been developed by a series of tunnels and during the past two years a large amount of ore has been opened up. Edward H. Hicks is manager, and R. N. Hines superintendent.

Rosario—This mine, San José de Gracia district, is operating on low-grade ore. The properties are still in litigation, with the defendants in possession of the mines.

Jesus Maria—This mine, San José de Gracia district, owned and operated by Francisco Paraza and Toriba Hermanos, is producing $60,000 per month in gold bars. The plant consists of stamps with cyanide annex. This property was owned and operated at one time by the Anglo-Mexican Mining Company, of Boston, and was sold to Francisco Paraza, son of the original owner.

Sonora

Silver Tiger—The property at Nacozari, formerly owned by the Kansas City-Credo Liberal Mining Company, has been reincorporated under the name of the Silver Tiger Mining Company, of Kansas City, Mo., which expects to resume operations in the near future. T. L. Crane, formerly resident manager, will be in charge of active operations. The new company expects to install a hoisting plant and complete surface equipment.

Moctezuma—The Mina Gruto de Monte Cristo is reported to have been sold to C. B. Bell, C. H. Jones and F. S. Douglas, of Nacozari and Douglas, for a price approximating $200,000, of which $25.000 is to be paid within 90 days. This property lies about 30 miles southeast of Moctezuma, and under the ownership of Don Carlos C. Soto has shipped about 1,000,000 oz. silver in ores averaging about 600 oz. to the ton. The maximum depth attained in the present workings is less than 200 feet.

Cumpas—The San Lorenzo property, about 25 miles west of Cumpas, has been sold by the owners represented by Martin Higginson to eastern men for a sum not made public. This property has been shipping high-grade copper ore carrying silver for some time.

Tamaulipas

Sulphur Discovery—A deposit of sulphur has been discovered about 50 miles from Matamoras, 35 miles from the nearest railroad and about the same distance from the nearest seaport. A deposit from 25 to 30 ft. thick, high in sulphur, covered by only 5 to 7 ft. of soil, is said to have been disclosed by 30 drill holes.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial
Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 23—Coal trade in the West is still quiet. Domestic demand is kept down by the weather, and there has not been sufficient increase in the call for steam coal to make up for the lull caused by the closing of the Lake trade. There is not as much over-production as [illegible] feared, and trade has been rather even, with little change in prices.

The Seaboard bituminous trade is still rather dull. Coastwise trade is falling off, but that is not unusual in December. Steam-coal demand improves slowly.

The anthracite market still depends on the weather. Shipments are large [illegible] the mines, but it is probable that a large quantity is going into storage. The companies are possibly accumulating stocks in order to be provided in case of trouble with the miners next April.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania lines east of Pittsburg and Erie, year to Dec. 12, in short tons.

	1907.	1908.	Changes.
Anthracite......	5,427,766	4,935,787	D. 491,979
Bituminous.....	38,131,372	32,295,861	D. 5,835,511
Coke............	12,816,027	6,822,053	D. 5,993,974
Total..........	56,375,165	44,053,701	D. 12,321,464

The total decrease this year to date was 21.9 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, 10 months ended Oct. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio........	18,558,560	2,459,605	21,018,165
Buff., Roch. & Pitts	4,522,931	273,788	4,796,719
Buff. & Susqueh'na	940,259	160,125	1,100,384
Penn lines, N. Y. C.	5,474,651	54,238	5,528,889
Pitts. & L. Erie.....	6,811,757	2,435,117	9,246,874
Norfolk & Western.	9,152,684	1,571,202	10,723,886
Total............	45,460,842	6,954,075	52,414,917
Total, 1907........	55,434,947	10,222,657	65,657,604

Total decrease, 13,242,687 tons, or 20.2 per cent. In addition the Baltimore & Ohio carried 823,293 tons of anthracite in 1907, and 632,013 in 1908; a decrease of 191,280 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, 10 months ended Oct. 31, short tons:

	1907.	1908.	Changes.
Hocking Valley......	4,399,571	[illegible]	D. [illegible]
Toledo & Ohio Cent..	1,506,729	[illegible]	D. [illegible]
Baltimore & Ohio....	1,909,401	1,184,887	D. 724,514
Wheeling & L. Erie..	2,910,115	2,257,118	D. 652,997
Cleve., Lorain & Wh.	2,443,620	1,996,796	D. 446,824
Zanesville & Western	[illegible]	[illegible]	D. [illegible]
Toledo Div., Pen. Co.	1,886,568	1,278,968	D. 607,600
L. Erie, Alliance & Wh.	[illegible]	[illegible]	D. [illegible]
Marietta, Col. & Clev.	27,898	43,967	I. 16,069
Total...............	16,423,905	12,683,587	D. 3,740,318

The total decrease shown this year was 22.8 per cent.

Coal shipments reported by the Southwestern Interstate Coal Operators' Association, nine months ended Sept. 30, short tons:

	[illegible]	[illegible]	Changes.
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

The total decrease for the nine months [illegible] for the month of September showed an increase of 0.5 per cent.

New York

ANTHRACITE

[illegible] quiet, and not much business is being done. The weather is mainly responsible for present conditions. Colder weather is promised, which will help the trade.

Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

The soft-coal market is dull and consumers are not taking coal, preferring to let their stocks get low until after Jan. 1, at which time they take their inventories. In the far East business is quiet, but along the Sound it is better. New York harbor has not improved, and good grades of coal sell at $2.45@2.65 per ton. All-rail trade is better than tidewater business, as a whole. Transportation from mines to tide is variable. Cars are in good supply.

In the coastwise-vessel trade boats are not plentiful, nor are they in good demand on account of the restricted business. A number of vessels are seeking business, but with small success. Freight rates remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, [illegible] Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

[illegible]

and there has been a steady operation at mines. Contracts recently have been renewed by coal operators in the Birmingham district for the hire of State and county convicts. The Bessemer Land and Improvement Company has made a contract for the use of 200 convicts at a price that practically equals what free labor is [illegible] victs according to their physical grade, or so much per ton, for run-of-mine; the advantage of this contract to be in a steady employment of the men. According to the contract either the president of the convict board or the governor can conclude the contract at will. The contract is to run for a term of five years. Other companies in the Birmingham district have been closing contracts recently for the hire of county convicts. There are quite a number of miners and mine employees who are waiting for an improvement in conditions.

There has been no change in coal quotations. [illegible] still considerable coke on hand, but the larger companies are going to need all of it during the winter.

Chicago

[illegible] active and shows little change from the previous week. Colder weather ought to have stimulated domestic trade, but few people buy at this season, if they can avoid it. Shipments from mines have slacked up a little, and there is not so much surplus to depress prices.

Illinois and Indiana coals are unchanged with a little better demand reported for steam coals. Brazil block is fairly active. Hocking Valley does not vary much from circular. Deliveries of Youghiogheny are [illegible] be said of smokeless.

Anthracite is selling only in small lots. There is plenty of all sizes; chestnut, which was scarce, now seems to be in good supply.

Cleveland

[illegible] cept for fine coal, for which there is a [illegible] 75@80c. at mine; No. 8 district slack, [illegible] little demand that Ohio producers are talking of short time, or a complete shutdown over the holidays. The demand for domestic coal continues small, on account [illegible]

Indianapolis

Dec. 21—The unusually mild weather continues to curtail the output of the Indiana coal mines. The output for November was considerably less than for the corresponding month last year. The operators say they have made no attempt to force coal upon unwilling buyers. The curtailment is due to a lack of demand for all grades except steam coal. They have had little difficulty during the past week in disposing of all the steam coal produced. Reports from the Northwest are to the effect that neither consumers nor local dealers are stocked up as heavily as usual, and they are inclined not to buy any coal in advance of the probable mild weather demand. Indiana operators say that if discomfiture overtakes them when the winter begins to strengthen, the burden will be on them, for they have been urged persistently for some time to supply themselves in order to avoid such a contingency.

Pittsburg

Dec. 22—Operations and prices continue about the same, but the outlook is somewhat better. The rains of the past week have made the rivers navigable, but the water was not sufficient today to let out any coal. Several large tows of empty coal boats and barges that had been held at down-river points for over six months came in and were immediately sent up to the pools. Arrangements are being made to start a number of the river coal mines that have been idle for lack of empties. The railroad coal mines are being operated at about 60 per cent. of capacity. There is an unusual demand for slack and prices are firmly held at 80c. Mine-run coal is still quoted at $1.15 and 1¼-in. at $1.40, an advance of 5c. over prices during the fall months.

Connellsville Coke—Conditions in the coke market remain unchanged. Consumers delay in placing contracts for next year. Producers insist that no advantage is to be gained by delay, as prices will be firmly held after the opening of the year. For spot shipment contract prices are shaded by from 10 to 20c. Furnace coke for the first half is quoted at $2 and foundry at $2.25@2.40 f.o.b. ovens. The *Courier* gives the production in the two Connellsville fields at 244,399 tons. The shipments were 9260 cars as follows: To Pittsburg district, 3218; to points west of Pittsburg, 5553; to points east of Connellsville, 489 cars.

Foreign Coal Trade

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Dec. 12: Best Welsh steam, $3.48; seconds, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $1.92; seconds, $1.68. All per long ton, f.o.b. shipping port.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, 11 months ended Nov. 30, long tons:

	1907.	1908.	Changes.
Coal	58,407,880	57,375,422	D. 1,032,458
Coke	875,639	1,087,618	I. 211,979
Briquets	1,360,798	1,345,705	D. 15,093
Total exports	60,644,317	59,808,745	D. 835,572
Steamer coal	17,080,575	17,815,990	I. 735,415
Total	77,724,892	77,624,735	D. 100,157

The larger exports this year were 9,538,322 tons to France, 8,951,104 to Germany, and 3,993,288 to Sweden.

Iron Trade Review

New York, Dec. 23—The iron trade generally seems to be waiting for the new year, and the past week has been rather a quiet one.

In pig iron there have been some inquiries for foundry iron, but they are of a tentative sort, not resulting in orders, but apparently intended to establish a range of prices upon which foundries can base calculations. Basic iron shows more sales, and more inquiries based upon actual demand. The scarcity and high price of scrap is helping sales of foundry pig. Basic-steel makers also find heavy steel scrap scarce and high, and are, therefore, inclined to take more pig.

Structural steel is very quiet for the present, with few orders being placed. Some orders for rails are coming forward, and quite a large tonnage is expected to be placed soon. Other finished material is quiet for the time being; the question is how soon a revival will come.

Ontario Iron Ore—A deposit of iron ore on the southwestern arm of lake Temagami, in Ontario, is being tested by five diamond drills. It is reported that this work is being done in the interest of the United States Steel Corporation.

Baltimore

Dec. 22—Exports from the port of Baltimore this week included 3,266,800 lb. steel billets to Liverpool and 1,128,000 lb. to Glasgow; 736,278 lb. tin scrap to Rotterdam; 147,285 lb. zinc dross to Liverpool.

Birmingham

Dec. 21—While this is usually the season for a lull in the pig-iron and steel market, Alabama furnace companies continue to book orders right along for delivery during the first half of the coming year. There is not great activity, however, producers apparently waiting for an advance in the quotations, and holding back from bidding on possible business. Inquiries that are heard of in the open market would indicate that there is to be a strong demand for iron by some of the larger consumers in the near future. During the past week one of the large cast-iron pipemaking concerns was in the field inquiring as to a large tonnage. The fact that there has not been a complete cessation of trading in the Southern iron and steel market with the holiday season at hand is accepted with considerable encouragement. There has been another lot of early-delivery iron sold above $13 per ton, No. 2 foundry, but a general advance has not been authorized in the quotations. No. 2 foundry iron is quoted at $13 per ton, delivery during the first quarter of the coming year, with two of the larger companies still out of the market. There has been no improvement in the make in this section lately, and none will be announced this year.

Chicago

Dec. 22—Pig iron is dull for the time, but the lull now apparent does not look like a set-back, but rather the quiet which we usually expect at the end of the year. What sales have been made are of small lots for early or first-quarter delivery. Some inquiries are in for second-quarter iron, but no sales of this class have been made this week.

Southern No. 2 holds at $13@13.50 Birmingham ($17.35@17.85 Chicago). The higher price is quoted for second-quarter deliveries. Northern is still $17, but at least 50c. more is asked, and some furnaces hold to $1 more for any deliveries after March.

In finished iron and steel there is a lull, as with pig iron, but it seems to be only temporary. Coke is unchanged.

Cleveland

Dec. 22—The Lake receipts of iron ore are at an end for the season. The dock stocks are being gradually drawn down, as shipments to furnaces are increasing. Some sales of iron ore are being made at the prices which have ruled through the season.

Pig iron is dull, the orders coming in being for small quantities only. There is no change in prices, though makers are inclined to be firmer in their views, as they look for better business in January.

Philadelphia

Dec. 23—The pig-iron market has developed strength for forward delivery, especially in basic pig. Negotiations are still pending for large lots for first-quarter delivery in this territory. General consumption is increasing. The feature of the week is a number of inquiries from large consumers for delivery during the second quarter of the year, but no business of importance of this character has been placed.

Another interesting feature is the larger quantities of iron asked for. Poor iron has been pretty well cleaned out of the market. Foundry iron has improved materially, although the bulk of the business is in small lots thus far. Makers of good brands are holding prices firmly. Forge still drags, although the bar mills are getting more work. The general situation is improving.

Steel Billets—Increased activity prevails mostly in small lots.

Bars—The feature of the market is the presentation of inquiries for large lots of iron for delivery during the first quarter of the year. The present demand is for small lots for prompt delivery. Stocks among consumers are low. Prices show no weakness.

Sheets—While there are few large orders for forward delivery there is more business going to the mills.

Merchant Steel—The retail demand has improved, and large consumers in a few instances have asked for quotations on first-quarter business.

Plates—The plate business has wonderfully improved, and large orders are coming along; but there is no toning up of prices.

Structural Material—Bridge work is coming along and car work is more promising than for months.

Scrap—Scrap was suddenly advanced 25 or 50c. for railroad and No. 1 yard. A further advance is announced. Millmen are anticipating this and are actively buying, but there is not enough material to supply them.

Pittsburg

Dec. 22—This is an exceptionally dull week in the iron and steel trade, only orders for small tonnages being placed; most of the active mills will be closed for the Christmas holiday. Some plants closed yesterday for the week as repairs are necessary but the rest will be idle only from Dec. 24 and will resume again on Dec. 27.

The feature of the past week was the placing of an order for 135,000 tons of steel rails by the Pennsylvania Railroad. The Carnegie Steel Company [illegible] tons of this order and will roll the rails early next month. While the tonnage looks large it is insignificant compared with the capacity of the rail plant. The Edgar Thomson works can produce 90,000 tons a month when running full. The Carnegie company, which is operating the Mingo steel plant at one-half capacity, will put the entire works on in full immediately after the opening of the new year, also the two idle blast furnaces. The company started one of the three Isabella furnaces in the Pittsburg district today and expects to put the other two in blast about the middle of January. The American Steel and Wire Company is rushing repairs at the steel plant and blast furnaces at Donora and will put them in full operation early next month. The wire departments are running full. The company expects to have all of its plants running at normal within the next three weeks as the outlook for the wire trade after Jan. 1 is extremely good. Independent wire interests also report excellent conditions. In tinplate there is a good run of business and the leading producer will have about 90 per cent. of its capacity [illegible] business in structural steel is limited to small tonnages. The only large work pending for which bids have gone in is for the plant of the Crane-Best Company at Oakmont. It was to have been let this week but was deferred. The contract calls for about 2500 tons of steel. The Republic Iron and Steel Company closed its bessemer-steel plant at Youngstown for repairs, but expects to have it going in full early next week. Other plants of the company in the Youngstown district are idle for repairs.

Pig Iron—The market continues quiet, but prices are firm and some furnaces have advanced current quotations about 25c. a ton. Sales of the week consisted of carload lots; one contract for 300 tons of No. 2 foundry was closed at the minimum rate of $16, Valley furnace. The American Car and Foundry Company was in the market for 8000 tons for its Detroit works. It does not usually buy Valley iron, but on this tonnage sent inquiries here. The prices, however, were not satisfactory and the contract was placed with Western furnaces. It is understood the company [illegible] Quotations for first quarter are as follows: Standard bessemer, $16.50@17; No. 2 foundry, $16@16.25; malleable bessemer [illegible] $14.50@15; all f.o.b. Valley furnaces.

Steel—There have been but few transactions in crude steel, most of the deliveries being on contract. The price of both bessemer and open-hearth billets remains firm at $25, Pittsburg. Tank plate is quoted at 1.60c. and merchant-steel bars at 1.40 cents.

Sheets—The sheet trade continues exceptionally good for a dull period and prices are strong. Black sheets are quoted at 2.50c. and galvanized sheets at 3.55c. for No. 28 gage.

[illegible] in the ferro market and quotations continue around $47 a ton.

Foreign Iron Trade

[illegible] of exports and imports in Great Britain, [illegible] Trade returns:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] £8,656,254, or 10.6 per cent.; decrease in [illegible] quantities of iron and steel were, in long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] and other half-finished material.

Imports of iron ore into Great Britain [illegible] in 1907, and 5,521,109 in 1908; decrease, 1,597,370 tons. Of the ore imported this year 4,073,204 tons were from Spain.

[illegible] reported by the Steel Syndicate for the 10 [illegible] tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

There were important decreases in all lines, the total loss from last year being 15.4 per cent.

[illegible] ports of iron and steel in Germany, 10 months ended Oct. 31, metric tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Imports			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] half-finished material, pig iron, steel bil- [illegible]

Metal Markets

[illegible] generally do not show any important changes in conditions this week. They are quiet, as a rule, and no great increase in activity is expected until the new year opens.

Gold, Silver and Platinum

[illegible]

Metal	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	615,169	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
" 1907..	54,211,240	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
" 1907..	4,187,378	[illegible]	584,973
[illegible]	47,111,982	[illegible]	[illegible]
[illegible]	57,212,168	[illegible]	[illegible]

[illegible]

[illegible] merce and Labor.

Merchandise:	1907.	1908.
Exports	$1,716,306,209	$1,564,023,950
Imports	1,330,927,836	1,004,474,822
Excess, exports	$ 385,378,373	$ 559,549,128
Add excess of exports, silver		9,296,706
Add excess of exports, gold		28,751,806
Total export balance		$ 597,597,640

The gold and silver movement in detail will be found in the table at the head of this column.

Gold and silver movement in France, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold	Fr.789,825,000	F.18,347,000	Imp. Fr.771,478,000
1907	389,243,000	94,004,000	Imp. 295,239,000
Silver	138,467,000	149,391,000	Exp. 10,924,000
1907	148,791,000	165,063,000	Exp. 16,272,000

Imports of copper and nickel coins, 86,000 fr. in 1907, and 57,000 fr. in 1908; exports, 623,000 fr. in 1907, and 586,000 fr. this year.

Gold and silver movement in Great Britain, 11 months ended Nov. 30:

	Imports.	Exports.	Excess.
Gold	£41,539,849	£45,197,929	Exp. £3,658,090
Gold, 1907	49,306,609	45,986,743	Imp. 3,319,866
Silver	9,588,812	11,804,119	Exp. 2,215,307
Silver, 1907	14,667,024	15,813,329	Exp. 1,146,305

Of the silver imported this year a total of £7,682,064 is credited to the United States.

Gold—The open-market price for gold in London shows no material change. As for several weeks past the Bank of France has taken all the available gold offered. In New York, nearly $1,000,000 additional has been taken for export to Paris, making a total of $6,100,000 going out on the present movement.

Platinum—Dealers quote this metal at unchanged prices: $24 per oz. for refined platinum, $26.50 for hard, and $20@21 for scrap. Business is good for the close of the year, and the market is strong.

Silver—Under China buying and some speculative covering, silver has improved in value with 22 9/16d. bid today in London. While stocks are large in the various silver centers, a more hopeful feeling would create a demand and help materially to distribute the stock.

SILVER AND STERLING EXCHANGE.

December.	17	18	19	21	22	23
New York	48 [illegible]	48¼	48½	48⅝	48½	48¾
London	22 7/16	22¼	22 3/[illegible]	22 7/16	22⅜	22½
Sterling Ex.	4.8690	4.8700	4.8695	4.8725	4.8710	4.8710

New York quotations, cents per ounce troy, fine silver: London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Dec. 10, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India	£10,531,354	£8,377,390	D. £2,153,964
China	417,350	641,400	I. 224,050
Straits	691,150	164,885	D. 526,265
Total	£11,639,854	£9,183,675	D. £2,456,179

Receipts for the week £2000 from Mexico and £115,000 from New York; total, £117,000 Exports, £7750 to India and £70,000 to China; £77,750 in all.

Copper, Tin, Lead and Zinc

Dec.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
17	14⅜ @14⅝	14 @14⅛	62⅛	29	4.17½ @4.22½	5.12½ @5.15	4.97½ @5.00
18	14⅜ @14⅝	14 @14⅛	62½	29	4.17½ @4.22½	5.12½ @5.15	4.97½ @5.00
19	14⅜ @14⅝	14 @14⅛	....	29	4.17½ @4.22½	5.12½ @5.15	4.97½ @5.00
21	14⅜ @14⅝	14 @14⅛	62½	29⅛	4.17½ @4.20	5.12½ @5.15	4.97½ @5.00
22	14⅜ @14⅝	14 @14⅛	62⅝	29¼	4.17½ @4.20	5.12½ @5.15	4.97½ @5.00
23	14⅜ @14⅝	14 @14⅛	63 1/16	29¼	4.12½ @4.15	5.12½ @5.15	4.97½ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Domestic consumers have taken a more active interest in the market during the week. It is reported that good-sized transactions in electrolytic copper have taken place for distant delivery at current prices. Business in Lake has also been active, and as the lots in second hands have been disposed of, the copper had to be secured from first hands, who had hitherto not met the extreme decline. Europe has played a small part in the business of the week, but at the close a good inquiry is reported from that quarter, stimulated doubtless by the firmer tendency of the Standard market.

Beginning with Dec. 17, considerable sales of Lake copper were made to domestic manufacturers at 14½c., these amounting to several million pounds and being participated in by at least three important selling agencies. Calumet & Hecla is reported to have made a sale at 14¾c., but this being under exceptional conditions does not represent the actual market. On the other hand, electrolytic copper has been freely offered at 14⅛c., while sales have been made at close to 14c.

At the close we quote 14⅜@14⅝c. for Lake copper; 14@14⅛c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper has been 13¾@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

The Standard market in London showed a slight but steady recovery throughout the week and the close is cabled firm at £63 1s. 3d. for spot, £63 18s. 9d. for three months.

Refined and manufactured sorts we quote: English tough, £66 10s.; best selected, £65 10s.@66 10s.; strong sheets, £77 10s.@78 10s.

The imports of copper into the United States, 10 months ended Oct. 31 were divided as follows, in pounds:

	In Ore.	In Matte.	Metal.
British N. America	7,859,165	1,588,090	23,741,312
Mexico	10,270,778	127,626	34,121,965
South America	7,577,252	....	23,732,072
Japan	....	....	2,929,673
Europe	....	....	13,492,188
Other countries	11,562,861	2,319,494	28,822,264
Total	37,270,056	4,035,210	126,839,474

The total was 168,144,740 lb

Tin—There was a firmer tone noticeable in the London market throughout the week, although quotations do not show much advance. The close is cabled at £132 12s. 6d. for spot, £134 5s. for three months.

The domestic market suffered so far as transactions were concerned from the holiday dullness, but closes somewhat higher, in sympathy with London, at 29.25 cents.

Arrivals of Bolivian tin ore in Europe in November were: Great Britain, 884 tons; Germany, 148; France, 140; total, 1172 tons, equivalent to 714 tons fine tin.

Output of the Federated Malay States in November was 4206 long tons tin; for the 11 months ended Nov. 30 it was 45,669 tons tin, a decrease of 2762 tons from last year.

Tin shipments from the Straits for the 11 months ended No. 30 were 48,776 long tons in 1907, and 55,539 in 1908; increase, 6763 tons.

Lead—A reduction in the price of the leading interest to 4.20c. on Dec. 22 has not relieved the deadlock. Other producers, particularly in Missouri, reduced their price correspondingly, but consumers continue to await developments and transactions are altogether of a retail character. The market opened at 4.17½@4.22½c. New York and 4.02½@4.07½c., St. Louis; the closing is weak at 4.12½@4.15c., New York, and 3.97½@4c., St. Louis.

The London market has been steady and closes at £13 3s. 9d. for Spanish lead, £13 6s. 3d. for English lead.

Spelter—There has been no change in the character of the market since last week and prices close firm at 5.12½@5.15c. New York, 4.97½@5c. St. Louis.

The London market is unchanged at £20 15s. for good ordinaries, £21 for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Aluminum—Prices continue unchanged. The Aluminum Company of America quotes 24c. per lb. base for No. 1 ingots, and 33@34c. base for sheets. Offers of foreign metal are still made at 22c. It is difficult to ascertain actual sales, but they are reported to be small. The foreign market is still demoralized, with prices low.

Antimony—The market is quiet and no business has been done during the week. Quotations are unchanged at 8.15@8.25c. for Cookson's, 8@8⅛c. for Hallett's and 7⅝@7¾c. for ordinary brands.

Quicksilver—The market is quiet with little business doing. New York prices are unchanged, at $45@46 per flask of 75 lb. San Francisco quotations are $45 per flask for domestic orders and $42 for export. The London price is steady at £[illegible] 10s per flask, with £8 8s 9d named by jobbers.

Nickel—Large lots, [illegible], New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb lots. The price is $1.40 per lb. for 5-lb. lots.

British Metal Imports and Exports

Imports and exports of metal in Great Britain, 11 months ended Nov. 30, figures in long tons, except quicksilver, which is in pounds.

	Imports	Exports	Excess	
Copper	155,159	63,304	Imp.	91,855
Copper, 1907	112,522	61,104	Imp.	[illegible]
Tin	42,946	[illegible]	Imp.	[illegible]
Tin, 1907	40,589	33,703	Imp.	[illegible]
Lead	216,811	[illegible]	Imp.	170,27
Lead, 1907	186,213	40,506	Imp.	145,707
Spelter	97,854	7,554	Imp.	90,300
Spelter, 1907	99,425	[illegible]	Imp.	[illegible]
Quicksilver, lb.	3,228,092	1,600,175	Imp.	1,627,917
Quicksilver, '07	2,939,796	2,140,753	Imp.	[illegible]
Ores				
Tin ore and con.	22,888	....	Imp.	22,888
Tin ore, 1907	18,946	....	Imp.	18,946
Pyrites	709,429	....	Imp.	709,429
Pyrites, 1907	698,327	....	Imp.	698,327

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports this year the United States furnished 6467 tons copper matte, 53,346 tons fine copper and 33,125 tons lead.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 19—The highest price paid in settlement for zinc ore was $46.50 per ton; the assay base ranged from $43 down to $41 per ton of 60 per cent. zinc, with the usual premium of a $46.50 base for ore carrying 6 per cent. iron. Silicate ore sold on a base of $19@19.50 per ton of 40 per cent. zinc with the high price at $26 per ton. The average price, all grades, was $39.78. Despite a further decline in pig lead this mineral held its own, receding no farther downward. Probably the principal reason was the reappearance in the market of the St. Louis Smelting and Refining Company for the purchase of several hundred thousand pounds at $50 per ton. Prices ranged down to $48, for under-grade ore, and all grades averaged $49.68 per ton.

Notwithstanding the enormous sales that have been made during the past month the reserve stock is decreased less than 2000 tons, as the output has been growing steadily and shipments on most of the heavy purchases have been made very gradually, leaving small accumulations widely scattered over the district. This week purchases were very light, a great portion of the shipment being from previous purchases. Thus new accumulations were made this week, as there was no decrease in the output.

SHIPMENTS WEEK ENDED DEC. 19

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	[illegible]	[illegible]	51,278
Galena	[illegible]	[illegible]	17,685
Spurgeon	[illegible]	[illegible]	[illegible]
Alba-Neck	[illegible]		12,865
Miami	[illegible]	[illegible]	10,154
Oronogo	[illegible]		9,161
Aurora	[illegible]		9,639
Prosperity	419,410	30,190	[illegible]
Duenweg	314,790	[illegible]	7,317
Granby	540,000	[illegible]	7,175
Quapaw-Baxter	[illegible]	[illegible]	[illegible]
Carthage	152,880		[illegible]
Carl Junction	[illegible]		[illegible]
[illegible]	[illegible]		[illegible]
Badger	[illegible]		1,870
Cave Springs	[illegible]		[illegible]
Sarcoxie	101,350		1,512
Wentworth	65,020		1,340
Reeds	[illegible]		[illegible]
Totals	11,947,630	1,100,620	[illegible]

51 weeks [illegible]

Zinc value, the week, [illegible]

Lead value, the week, [illegible]

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores			
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
March	49.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	47.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	46.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
August	44.56	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	41.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	41.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	38.60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	31.50		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

[illegible]

Platteville, Wis., Dec. 19—The highest price paid this week was $45 per ton for zinc ore on a basis of $42 per ton of 60 per cent. zinc, the base price declining $1 per ton from last week. For 80 per cent. [illegible] was paid.

SHIPMENTS WEEK ENDED DEC. 19

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
Galena	[illegible]		
[illegible]	[illegible]		
Mineral Point	[illegible]		
Total	[illegible]	[illegible]	[illegible]
Year to Dec. 19	[illegible]	[illegible]	[illegible]

In addition to the above there was shipped to the Platteville Separating Company, 1,005,700 lb.; to the Joplin Separating Works, [illegible]

The total shipment of zinc ore from the mines this week was 4,570,000 lb., the largest the district has ever recorded. Nearly 500 tons of this tonnage, however, represented reserve stock, shipped from Galena to the Platteville Separating Company, [illegible] moved from Linden to the Mineral Point Zinc Company. The tonnage of finished zinc ore shipped to the smelters was curtailed by the fact that the Platteville Separating Company shipped out only one car of zinc, its plant being used during the week to test ores brought in from Utah.

Chemicals

[illegible] steady and devoid of extraordinary features. The uncertainties of the tariff revisions keep consumers from contracting for large quantities of chemicals.

[illegible] ing has been done. Spot goods are offered at 3¼c. per lb., New York.

[illegible] ness is restricted on account of the uncertainty of the metal market. Prices, [illegible] lb. for carloads, and up to $5 for smaller lots.

[illegible] but firm, and prices are unchanged at 2.17½c. for spot and all future positions.

Mining Stocks

[illegible] market this week was characterized by a sharp break in quotations for the more prominent stocks; but this was followed today by a partial recovery. There was considerable activity, but the close is ragged and irregular. The liquidation on the break was large, and the recovery inclined to be slow.

On the Curb the course of events was [illegible]—a sharp break in prices, followed by some upward reaction. The movement was most apparent in the copper stocks, which close irregularly and rather soft. The Cobalt shares were stronger, chiefly on account of the declaration of some extra dividends. Nevada gold stocks were in [illegible]

[illegible] unsatisfactory week in the copper-share market. Prices have been weak, and con- [illegible] ganization of a new copper producers' association and the new smelter combine in [illegible] the traders an opportunity to force prices. Today, however the market turned, and prices were quite buoyant, following the [illegible] York. Superior Copper has been in the [illegible] rallied to $35.37½. Very favorable reports of mill tests have been responsible for the sharp advance, and the orders have come largely from the Lake district.

Amalgamated Copper has had a range between $82.25 and $76, rallying to $79.37½ today. Copper Range fell $2.50 to $77.50, but recovered to above $79 today. The Baltic company has declared a dividend of $7, making $9 for the current year. Copper Range owns all but 341 of the 100,000 shares. Arizona Commercial fell $3.50 to $36, closing at $37.25 tonight; Boston & Corbin fell $2.12½ to $20.12½, recovering partially. Greene Cananea spurted from $10.87½ to $12. Lake fell $2 to $21.25, recovering to $22.37½. North Butte broke $4.75 to $79.75, but was back to almost $83 tonight. Old Dominion fell $4 to $54, rallying close to $56. Utah Consolidated ran off $1.50 to $43, and Utah Copper $2.75 to $42.75.

New interests have come into the United States Smelting Company's board. This company has declared the regular quarterly dividend. President Cuddihy, of the Hancock Consolidated, has been on from Michigan relative to listing the company's shares on the Exchange.

The American Zinc, Lead and Smelting Company is offering $500,000 in five-year 6-per cent. debenture bonds to shareholders, this representing expenditures not capitalized. The issue has been underwritten at a commission of 4 per cent.

The Curb exchange is increasing its business and has taken on several new mining issues.

STOCK QUOTATIONS

NEW YORK Dec. 22

Name of Comp.	Clg.
Alaska Mine	⅜
Amalgamated	79
Anaconda	48
Balaklala	‡2 1/16
British Col. Cop.	7[illegible]
Buffalo Mines	3½
Butte Coalition	26¼
Colonial Silver	1/16
Cum. Ely Mining	7¾
Davis Daly	3½
Dominion Cop.	⅝
Douglas Copper	2[illegible]
El Rayo	4
Florence	4 7/16
Foster Cobalt	.47
Furnace Creek	.12
Giroux	6½
Gold Hill	½
Goldfield Con.	8 15/16
Granby	104½
Greene Gold	¼
Greene G. & S.	7
Greenw'r & D. Val.	‡.75
Guanajuato	2
Guggen. Exp.	183
Hanapah	.15
McKinley Dar.	1.03
Micmac	2¼
Mines Co. of Am.	1
Mitchell Mining	⅛
Mont. Sho. C.	⅞
Nev. Utah M. & S.	2⅞
Newhouse M. & S.	5½
Nipissing Mines	10⅜
Old Hundred	9/16
Silver Queen	.95
Stewart	⅝
Tennessee Cop'r.	44
Tri-Bullion	1 1/16
Union Copper	¾
Utah Apex	5⅝
Utah Copper	44½
Yukon Gold	4⅝

*Ex. Div. †Ex. Rights.

BOSTON Dec. 22

Name of Comp.	Clg.
Adventure	9
Allouez	36½
Am. Zinc	‡24⅞
Arcadian	3¼
Arizona Com	37¼
Atlantic	16⅜
Bingham	‡.30
Boston Con	15⅝
Calumet & Ariz.	115½
Calumet & Hecla	661
Centennial	31½
Con. Mercur	‡.38
Copper Range	79⅛
Daly-West	10
Franklin	15¾
Greene—Can	11½
Isle Royal	22¾
La Salle	14⅞
Mass.	5[illegible]
Michigan	13
Mohawk	67
Nevada	18⅞
North Butte	82⅝
Old Colony	‡.60
Old Dominion	55
Osceola	129
Parrot	28¾
Quincy	93
Rhode Island	‡5½
Santa Fe	2¼
Shannon	16¾
Superior	35⅜
Superior & Pitts.	16[illegible]
Tamarack	76½
Trinity	15½
United Cop., com.	11¾
U. S. Oil	29
U. S. Smg. & Ref.	42¾
U.S.Sm. & Re.,pd.	46
Utah Con*	43⅝
Victoria	3¼
Winona	6
Wolverine	‡150
Wyandotte	2⅛

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	‡31¼
Am. Smelt. & Ref.	81⅜
Am. Sm. & Ref. pf.	101¼
Colo. Fuel & Iron.	38¼
Federal M. & S., pf.	‡84
National Lead	77¾
National Lead, pf.	105¾
Pittsburg Coal	14
Republic I. & S.	24½
Republic I. & S., pf.	85½
Sloss-Sheffield	79
Standard Oil	678
U. S. Steel	53¼
U. S. Steel, pf.	112
Va. Car. Chem	42⅞

BOSTON CURB

Ahmeek	120
Black Mt	2⅞
Chemung	22½
East Butte	‡9¾
Globe Con	7
Hancock	11½
Helvetia	4½
Keweenaw	4½
North Lake	7½
Ojibway	11½
Superior & Bost.	16¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 19

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.05
Center Cr'k	2.00	1.50
Cent. C. & C.	79.00	78.00
C.C. & C. pd.	88.00	86.00
Cent. Oil	110.00	100.00
Columbia	7.00	4.00
Con. Coal	21.00	19 00
Doe Run	125.00	110.00
Gra. Bimet.	.30	.20
St. Joe.	14.00	12.00

LONDON Dec. 23

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	0 16 0
Esperanza	3 4 0
Tomboy	1 0 7½
El Oro	1 6 0
Oroville	0 8 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 23.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.26
Best & Belcher	.45
Caledonia	.16
Chollar	.08
Comstock	.25
Con. Cal. & Va.	.77
Crown Point	.36
Exchequer	.30
Gould & Curry	.10
Hale & Norcross	.36
Mexican	.90
Ophir	1.65
Overman	.20
Potosi	.12
Savage	.24
Sierra Nevada	.25
Union	.32
Utah	.04
Yellow Jacket	.70
TONOPAH STOCKS	
Belmont	.75
Extension	.50
Golden Anchor	.02
Jim Butler	.17
MacNamara	.32
Midway	.18
Montana	.65
North Star	.03
Tono'h Mine of N.	6.57
West End Con.	.31
GOLDFI'D STOCKS	
Adams	.02
Atlanta	.17
Booth	.33
Columbia Mt.	.17
Comb. Frac	1.38
Con. Red Top	.10
Cracker Jack	.04
Dia'dfield B. B. C.	.11
Goldfield Belmont	.07
Goldfield Daisy	.71
Great Bend	.25
Jumbo Extension	.20
Kendall	.09
Lone Star	.05
May Queen	.03
N. Y. C. O. D.	.05
Oro	.12
Red Hill	.19
Roanoke	...
Sandstorm	.18
Silver Pick	.10
St. Ives	.18
Triangle	.03
BULLFROG STOCKS	
Bullfrog Mining	‡.03
Bullfrog Nat. B.	‡.04
Gibraltar	.03
Gold Bar	‡.03
Homestake King	.07
Montgomery Mt.	‡.05
Mont. Shoshone C.	.87½
Original Bullfrog	‡.01
Tramp Cons.	.09½
MISCELLANEOUS	
Bonnie Clare	.07
Lee Gold Grotto	...
Nevada Hills	1.37½
Nevada Smelting	1.00
Nevada Wonder	.30
Nevada-Utah	2.81½
Penn-Wyoming	.16
Pittsburgh S. Pk.	.85
Rawhide Coal	.48
Round Mt. Sphinx	.15

COLO. SPRINGS Dec. 19

Name of Comp.	Clg.
Acacia	6½
Black Bell	....
C. C. Con	3½
Dante	5⅞
Doctor Jack Pot.	9
Elkton	66½
El Paso	49
Findlay	17½
Gold Dollar	8½
Gold Sovereign	3½
Isabella	24¼
Index	....
Jennie Sample	6
Jerry Johnson	4
Mary McKinney	32
Pharmacist	‡3¾
Portland	1.05½
Un. Gold Mines	4¾
Vindicator	81
Work	7¾

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev	Jan. 8	Feb. 2	$0.10
Caledonia, Nev	Jan. 8	Jan. 29	0.05
Chollar, Nev	Jan. 11	Feb. 3	0.10
Ely Con., Nev	Nov. 28	Jan. 11	0.02
Exchequer, Nev	Dec. 30	Jan. 20	0.05
Federal-Ely, Utah	Jan. 9	Feb. 1	0.01
Iowa, Utah	Jan. 5	Feb. 2	0.02
Julia Con., Nev	Dec. 21	Jan. 15	0.03
Little Chief, Utah	Dec. 15	Jan. 5	0.01
Lower Mammoth, Utah	Dec. 18	Jan. 8	0.05
Mountain Dell	Dec. 24	Jan. 12	0.02
New York Con., Nev	Dec. 18	Jan. 8	0.03
Oro Cobre, Cal	Dec. 31	Jan. 16	0.02
Savage, Nev	Jan. 6	Jan. 28	0.10
Silver King Con., Utah	Jan. 6	Jan. 26	0.10
Union Con., Nev	Dec. 23	Jan. 14	0.10
Wabash, Utah	Jan. 7	Jan. 30	0.10
Yellow Jacket, Nev	Dec. 28	Feb. 3	0.15
Zeibright, Cal	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York. 1907.	New York. 1908.	London. 1907.	London. 1908.
January	68.673	55.678	31.769	25 738
February	68.835	56.000	31.852	25 855
March	67.519	55.365	31.325	25 570
April	65.462	54.505	30.253	25 133
May	65.971	52.795	30.471	24 377
June	67.090	53.663	30.893	24 760
July	68.144	53.115	31.366	24 514
August	68.745	51.683	31.637	23 858
September	67.792	51.720	31.313	23 877
October	62.435	51.431	28.863	23 725
November	58.677	49.647	27.154	22 933
December	54.565	......	25.362	......
Year	65.327	......	30.188	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1907.	NEW YORK. Electrolytic 1908.	NEW YORK. Lake. 1907.	NEW YORK. Lake. 1908.	LONDON. 1907.	LONDON. 1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58 786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12.743	25.260	12.928	98.625	58 331
May	24.048	12.598	25.072	12.788	102.375	57 387
June	21.665	12.675	24.140	12.877	97.272	57 842
July	22.130	12.702	21.923	12.933	95.016	57.989
August	18.356	13.462	19.255	13.639	79.679	60 500
September	15.565	13.388	16.047	13.600	68.375	60 338
October	13.169	13.354	13.551	13.646	60.717	60 139
November	13.391	14.130	13.870	14.386	61.226	63 417
December	13.163	......	13.393	......	60.113	......
Year	20.004	......	20.661	......	87.007	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29 942
March	41.313	30.577	September	36.689	28 815
April	40.938	31.702	October	32.620	29 444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	......
			Av. year	38.160	... ...

Prices are in cents per pound.

LEAD

Month.	New York. 1907.	New York. 1908.	London. 1907.	London. 1908.
January	6.000	3.691	19.828	14 469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13 975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12 938
June	5.760	4.466	20.188	12.600
July	5.288	4.447	20.350	13.000
August	5.250	4.580	19.063	13 375
September	4.813	4.515	19.775	13.125
October	4.750	4.351	18.531	13 375
November	4.376	4.330	17.281	13.538
December	3.658	......	14.500	......
Year	5.325	......	19.034	......

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York. 1907.	New York. 1908.	St. Louis. 1907.	St. Louis. 1908.	London. 1907.	London. 1908.
January	6.732	4.513	6.582	4.363	27.125	20 563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26 094	21.075
April	6.685	4.645	6.535	4.495	25.900	21 344
May	6.441	4.608	6.291	4.458	25.563	19 906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19 031
August	5.701	4.702	5.551	4.556	21.969	19.350
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	......	4.104	......	20.075	......
Year	5.962	......	5.812	......	23.771	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

BINDING SECT. JUN 12 1980

TA
1
E42
v.86

Engin.

E/MJ. Engineering and
mining journal

ENGIN STORAGE

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY